SE 3501

SOFTWARE VALIDATION AND VERIFICATION

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Welcome!

This course is design to provide a comprehensive check of a software system against its specification and to ensure you understand the process in verifying and validating a software produced.

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I. Basic introduction to Software V&V

❖ Summary

✓ V & V is the process of investigating that a software system **satisfies specifications** and standards and it fulfills the required purpose.

➢ *Satisfies specifications and standards (verification)*

➢ *Fulfills the required purpose (validation)*

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❖ Verification

- ✓ Are you building the product right?
- ✓ It verifies whether the developed product fulfills the requirements that we have without bugs.
- ✓ Verification is ***static testing***
- ✓ Activities involved : *Inspections, Reviews, walkthroughs , Desk-checking*

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❖ **Verification :** Methods of verification

✓ Peer-reviews

- Easiest and an informal way of reviewing the document or program/ software for the purpose of finding faults.
- Give document or program/software to others to review it so as to give their views about the quality of the product and also expect them to find the fault in the program/software.

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- **Verification :** Methods of verification

✓ Peer-reviews

- Activities include the SRS document verification, SDD verification ,and program verification
- The reviewer may prepare a short report on their observation or findings.

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- **Verification :** Methods of verification
- ✓ Peer-reviews - Example
- ➢ Do a peer-reviews of your program of a previously written code.

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❖ **Verification :** Methods of verification

✓ Peer-reviews : Advantages

- You can expect good results without spending any significant resources.
- It is very efficient and significant in its nature.

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- **Verification :** Methods of verification

✓ Peer-reviews : disadvantages

- It leads to bad results if the reviewer doesn't have sufficient knowledge.

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❖ **Verification :** Methods of verification

✓ Walk-through Method

- More formal and systematic type of verification method
- The author of the software document presents the document to other persons which can range from 2 to 7.
- Participants are not expected to prepare anything
- The author is responsible for preparing the meeting.

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❖ **Verification :** Methods of verification

✓ Walk-through Method

- Document is distributed to all participants
- At the time of the meeting of the walk-through
- The author introduces the content in order to make them familiar with it and all the participants are free to ask their doubts.

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- **Verification :** Methods of verification

✓ Walk-through Method - example

- Do a walk-through demonstration of a program develop.

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❖ **Verification :** Methods of verification

✓ Walk-through Method: Advantages

- It may help us to find potential faults
- It may also be used for sharing documents with others.

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❖ **Verification :** Methods of verification

✓ Walk-through Method: disadvantages

- The author may hide some critical areas and unnecessarily emphasize some specific areas of his/her interest.

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❖ **Verification :** Methods of verification

✓ Walk-through of a mobile App

- There are three phases in verification testing

1. Requirement verification
2. Design verification
3. Code verification

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❖ **Verification :** Methods of verification

✓ Walk-through of a mobile App

1. Requirement verification

- The process of verifying and confirming that the requirements are complete, clear and *correct*.
- Before the mobile app goes for design, the testing team verifies business requirements or customer requirements for their correctness and completeness.

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❖ **Verification :** Methods of verification

✓ Walk-through of a mobile App

1. Requirement verification

Assignment (1)

- ***How can you test the completeness , clarity, and correctness of a requirement?***

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❖ **Verification :** Methods of verification

✓ Walk-through of a mobile App

2. Design verification

- The process of checking if the design of the software meets the design specification by **providing evidence**.
- The test team checks if layouts , prototypes, navigational charts, architectural designs and database logical models meet the requirements.

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❖ **Verification :** Methods of verification

✓ Walk-through of a mobile App

3. Code verification

- The process of checking the code for its completeness, correctness and consistency.
- The testing team checks if construction artifacts such as a source code , user interfaces, and databases physical model of the mobile app meet the design specification.

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❖ **Verification :** Methods of verification

✓ Walk-through of a mobile App

3. Code verification

- Assignment (2)

How can you test the completeness, correctness and consistency of a source code?

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❖ **Verification :** Methods of verification

✓ Inspections

- The most structured and most formal method type
- A team of 3 to 6 participants is constituted which is led by a moderator.
- Group members participate openly,
- After the meeting, a **final report** is prepared after incorporating necessary suggestions by the moderator.

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- **Verification :** Methods of verification
- ✓ Inspections

- Assignment(3)

How do you prepare a **final report** after a software inspection meeting?

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❖ **Verification :** Methods of verification

✓ Inspections : Advantages

- Very effective for finding potential faults or problems in the documents like SRS, SDD,…
- The critical inspections may also help in finding fault and improve the documents which can or in preventing the propagation of fault in the software development life cycle process.

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❖ **Verification :** Methods of verification

✓ Inspections : disadvantages

- They take time and require discipline
- It requires more cost and also needs skilled testers.

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❖ **Verification :** Other verification methods

✓ Formal verification

- It involves mathematically proving that the requirements are complete and consistent, and that the system will meet the requirements.

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- **Verification :** Other verification methods
- ✓ Formal verification

- Assignment (4)

How can we mathematically proof that requirements are complete and consistent, and that the system will meet the functional and non-functional requirements?

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❖ **Verification :** Other verification methods

✓ Prototyping verification

- In involves creating a working prototype of the system and testing it to see if it meets the requirements.

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❖ **Verification :** Other verification methods

✓ Acceptance Testing

- It involves testing the system with real users to see if it meets their needs and requirements.

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- **Verification :** Other verification methods
- ✓ User feedback
  - It involves gathering feedback from the users and incorporating their suggestions and feedback into the requirements.

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❖ **Verification :** Other verification methods

✓ Black-box-testing

- It involves testing the system without any knowledge of its internal structure or implementation, to see if it meets the requirements.

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- **Verification :** Other verification methods
- ✓ Model-based verification
  - It involves creating a model of the system and simulating it to see if it meets the requirements

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❖ Validation

- ✓ Are you building the right product?
- ✓ A process of checking whether the software satisfies the customer.
- ✓ Validation is dynamic testing
- ✓ Activities involved : Black box testing, white box testing, unit testing, integration testing.

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❖ Requirement Validation

- ✓ A process of checking the requirement defined for development, define the system that the customer really wants.
- ✓ We do requirement validation to check issues related to the requirements.

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❖ Requirement Validation

✓ We perform the following checks

- Completeness checks
- Consistency checks
- Validity checks
- Realism checks
- Ambiguity checks
- verifiability

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❖ **Validation of a mobile application**

✓ It checks the functionality, usability and performance of the mobile application.

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❖ Requirement Validation

✓ Output of req. validation is the list of problems and agreed on actions of detected problems

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QUESTIONS