Software Testing for BI

Lesson 3: Types of Testing

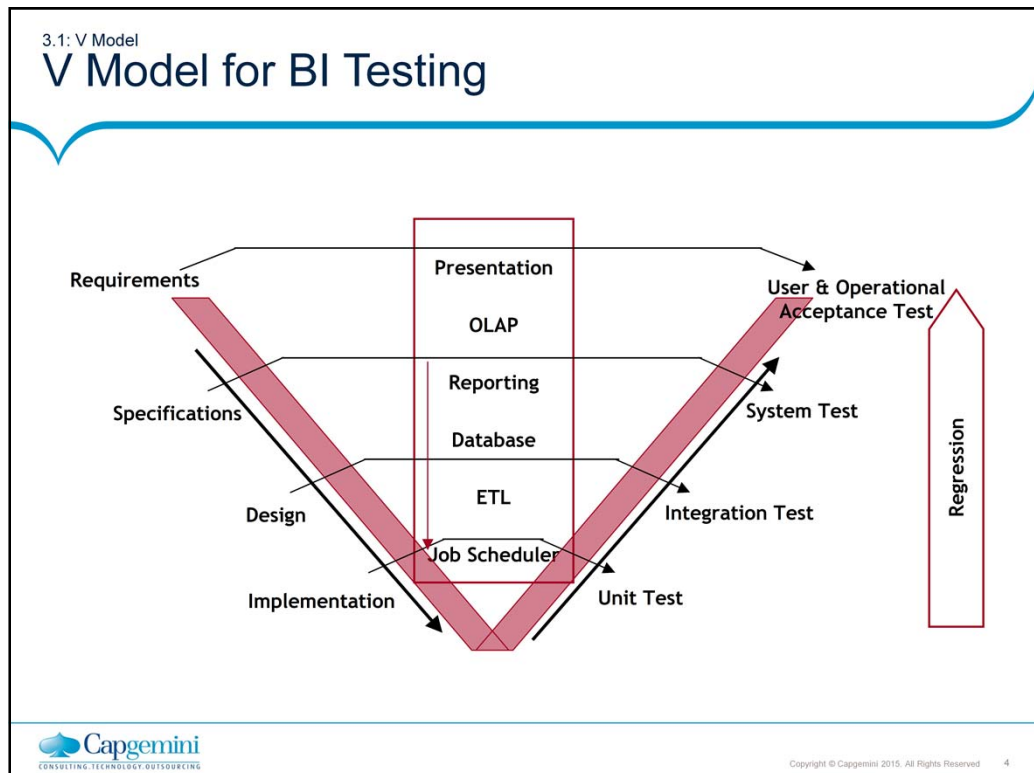# Lesson Objectives

- To understand the following topics:
  - V Model for BI Testing
    - Unit Testing
    - Integration Testing
    - System Testing
    - User Acceptance Testing
    - Operational Acceptance Testing

3.1: V Model

V Model for BI Testing

- There are some distinct test phases that take place in the implementation of BI project

- It is easier to visualize through the famous Waterfall model of development and V- model of testing

- The V proceeds from left to right, depicting the basic sequence of development and testing activities

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3.1: V Model
V Model for BI Testing

V model represents various phases of software development life cycle. Each phase is been tested with different testing types. Each testing type here is concerned for the separate phase of the life cycle.

There are various phases as follows:

Requirements

Specifications

Design

Implementation

Each of these phases has corresponding testing associated with it.

Unit testing – It is done at Implementation phase.

Integration testing – It is carried out in Design phase.

System testing – It is done at Specification phase

User & Operational acceptance test – This is done at Requirement phase.

Regression Testing is the testing of software after a modification has been made to ensure the reliability of each software release. Testing after changes have been made to ensure that changes did not introduce any new errors into the system. It applies to systems in production undergoing change as well as to systems under development Re-execution of some subset of test that have already been conducted.

Types of testing

- Manual Testing
  - This type includes the testing of the Software manually i.e. without using any automated tool or any script.
  - In this type the tester takes over the role of an end user and test the Software to identify any un-expected behaviour or bug.
  - There are different stages for manual testing like unit testing, Integration testing, System testing and User Acceptance testing.
  - Testers use test plan, test cases or test scenarios to test the Software to ensure the completeness of testing.
  - Manual testing also includes exploratory testing as testers explore the software to identify errors in it.

  Unit testing of software applications is done during the development (coding) of an application.
  The objective of unit testing is to isolate a section of code and verify its correctness. In procedural programming a unit may be an individual function or procedure
  The goal of unit testing is to isolate each part of the program and show that the individual parts are correct. Unit testing is usually performed by the developer.

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Manual testing

- Manual software testing is the process of manually testing software (having the possible forms for example, user interfaces navigation, information submission, or attempt to hack the software or database etc.), carried out by an individual or individuals.
- Manual software testing is labor-intensive and slow.
- It requires a tester to play the role of an end user, and use most of all features of the application to ensure correct behavior.

Automation testing

- Automation testing which is also known as Test Automation, is when the tester writes scripts and uses another software to test the software. This process involves automation of a manual process. Automation Testing is used to re-run the test scenarios that were performed manually, quickly and repeatedly.

- Apart from regression testing, Automation testing is also used to test the application from load, performance and stress point of view. It increases the test coverage; improve accuracy, saves time and money in comparison to manual testing.

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3.1: V Model for BI Testing
Test phases for BI

- Unit Testing
- System Testing
- System Integration Testing (SIT)
- User Acceptance Testing (UAT)
- Operational Acceptance Testing (OAT)

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3.1: V Model for BI Testing
Unit Testing

- It ensures that each component within the system successfully performs its individual responsibility when executed individually.

- The BI Solution development team should perform this testing on the BI development environment.

- There are some guidelines as to the general tasks that need to be executed during this testing type.

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3.1: V Model for BI Testing

Unit Testing (Cont…)

Layer/Area	Typical Tasks
ETL Testing	• Checking extraction rules • Transformation validation • Target system data integrity • Checking input data validation • Test the error-handling logic • Test slowly changing dimension implementation by checking • the integrity of surrogate keys • Test Notifications/Warnings/Error messages

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3.1: V Model for BI Testing

Unit Testing (Cont…)

Layer/Area	Typical Tasks
Report Testing	▪ Fields appearing in the reports, proper layout ▪ Drills down features, Report printed with proper format ▪ Column heading for business sense and functionality ▪ Column headers for 'Units' displayed, wherever applicable and conversion of data elements as per unit specified. ▪ Report Type, colour, labels and legends ▪ Header, footer, page header, page footer ▪ Charts and graphs, Archival of reports in different mode ▪ Data elements and labels to in the charts and the graphs

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3.1: V Model for BI Testing

Unit Testing (Cont…)

Layer/Area	Typical Tasks
Universe Testing	• Connection parameter and control and SQL parameters. • Refresh universe structure. • Check parsing. • Perform context and loop check. • Joins and cardinalities • Naming conventions • Hierarchy of class, sub-class, objects • Import/Export universe

3.1: V Model for BI Testing
System Testing

- It ensures that the system successfully supports the business requirements

- It also confirms that all functional requirements have been met.

3.1: V Model for BI Testing

System Testing (Cont…)

Layer/Area	Typical Tasks
Data Acquisition	▪ Successful source access ▪ Application and validation of cleansing algorithm/logic ▪ Proper delivery of the files to staging area/ODS – ▪ formatting, layouts, file naming convention, order of ▪ precedence ▪ File Loads, Dependencies, Completeness ▪ Formats and layouts ▪ Naming conventions ▪ Scripts and Triggers

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3.1: V Model for BI Testing

System Testing (Cont…)

Layer/Area	Typical Tasks
ETL Testing	- Successful staging area access, Order of Extraction - Successful extraction of data - Application and validation of transformation logic - Rejects based on applied algorithms - Recovery and Restart, Data Auditing/Logs - Proper generation of the code - Scheduling, Job triggers, Job decencies - Alerts and notification, Warnings and check point validations - Metadata recording/deliver to internal/external repositories

3.1: V Model for BI Testing

System Testing (Cont…)

Layer/Area	Typical Tasks
OLAP/ Reporting	• Correct reflection of the schema in the tool architecture • Source to object mappings • Correct formatting of the object, Report schedules • Correct definitions, constructions of derived measure/metrics • Population of universe, triggers, data and structures • Hierarchical Organization of Dimension, user friendliness • Online analytical computation, e.g. drill downs, running sums • Time computations, Report layouts, formatting

3.1: V Model for BI Testing

System Integration Testing

- It ensure seamless run of the entire process within an application or a specific stage.
- It focuses on the details of each of the steps/modules.
- It helps in capturing the responses as the data moves across the system.

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3.1: V Model for BI Testing

System Integration Testing (Cont…)

Layer/Area	Typical Tasks
Data Acquisition	▪ Successful runs of each job ▪ Successful execution of each script ▪ Proper delivery of the files to staging area in the order ▪ Capture of errors ▪ Capture of rejects ▪ Processing of statistics/audits trails
OLAP	▪ Report Schedules ▪ Correct reflection of data from data warehouse onto reports, Query generation to test table joins

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3.1: V Model for BI Testing

System Integration Testing (Cont…)

Layer/Area	Typical Tasks
ETL	▪ Triggered start of the ETL process ▪ Successful extraction in order of precedence ▪ Count of rejects based on applied algorithm ▪ Successful run of dependent jobs, Failure of jib runs ▪ Restarts, Alerts and notification deliveries
Operational/Data Quality	▪ Audit trails, Triggered start of the Data Feedback process ▪ Successful audit trail in order ▪ Count of rejects based on applied algorithm, Restarts ▪ Successful run of dependent jobs, Failure of job runs

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3.1: V Model for BI Testing

System Integration Testing (Cont…)

Layer/Area	Typical Tasks
End-to-End	- Black-box Testing, Random Testing, Time computations - Source (File load) to object (OLAP) mappings - Report layouts, formatting, user friendliness - Hierarchical Organization of Dimension - Correct reflection of data onto reports - Ad-hoc features/builders, Online analytical computation
Performance	- Benchmarking, Gauge the impact of configuration, Tuning - Load/Volume Test, Availability, Log into Application

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3.1: V Model for BI Testing

User Acceptance Testing

- Business users of the system, Business Analysts and Test Analysts execute predefined Test Cases emulating production business scenarios.
- The test shall be designed to ensure that the users can interact with the system and accomplish daily business operations.
- Specific test cases need to be established, and expected results identified.
- This testing should be for specific BI functions, including data transformation rules, and data correctness.

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3.1: V Model for BI Testing
User Acceptance Testing (Cont…)

- User acceptance testing should be completed in the BI testing environment, during the construction stage and then in production at the implementation.
- Business Stakeholders should have a nominated Testing manager who will ensure that all UAT testing, is planed, prepared and executed, to the satisfaction of the BI Program Manager.
- UAT Testing covers
- Functional testing
- Business BI information testing

3.1: V Model for BI Testing

User Acceptance Testing (Cont…)

Layer/Area	Typical Tasks
Business Testing	• Information accuracy • Source data rejections • Data transformation/aggregation rules • Key performance metrics/reports • Information presentation • User access points to OLAP tools, query tools

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3.1: V Model for BI Testing

Operational Acceptance Testing

- It verifies that a solution is able to operate at the expected volumes in production and is able to support the response times as specified.

- It mainly focuses on system performance, deployments, backup and recovery.

- Operation Acceptance Testing (OAT) should be carried out by the IT team to ensure the technical operation of the EDW solution is acceptable to both the business users and to the IT's operational staff.

3.1: V Model for BI Testing

Operational Acceptance Testing (Cont…)

Layer/Area	Typical Tasks
Database	• Multiple users logging in the system • Queries retrieving massive amount of data, e.g., across • multiple time units • Simultaneous queries lunched to the system • Multiple users running large queries
Enhancement	• Ensuring all task change are carried out from previous baseline
Availability	• Availability of various components of BI solution

3.1: V Model for BI Testing

Operational Acceptance Testing (Cont…)

Layer/Area	Typical Tasks
Deployment	▪ Completeness
Disaster Recovery	▪ Disaster Recovery procedures ▪ Recovery using the customer daily back-ups procedure
Documentation	▪ Various documents as specified in OAT certification template
Monitoring	▪ Checking Automated Alerting
Middleware	▪ Checking Performance and Load of the system
Network	▪ Checking Performance and Load of the system

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Summary

- In this lesson, you have learnt:
  - There are various test phases of V model for BI testing like
    - Unit Testing
    - System Testing
    - System Integration Testing (SIT)
    - User Acceptance Testing (UAT)
    - Operational Acceptance Testing (OAT)

Summary

Review Questions

- Question 1: Testing a software with execution on a computer
  - Option 1: Static testing
  - Option 2: Dynamic testing
  - Option 3: Automated testing

- Question 2: Operational acceptance testing ensures that the system successfully supports the business requirements
  - True / False