Quality "Deep-Dive"
More Effective Testing Today

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Outline

Test Methodologies and Checklists
Testing methodologies enable testers to compute their test coverage and have confidence that all requirements will be tested. The use of methodologies in testing is an essential element of a quality assurance organization.
- Factor Analysis
- OATS — Orthogonal Array Testing Strategy
- Pairs and Magic Squares

Risk Analysis
In our applications not everything can be tested, so prioritizing the tests is a major requirement of the tester. For most systems a thorough set of tests may be impractical so identifying those crucial tests becomes imperative to the tester, we will help to identify those crucial situations.
- Categorical Analysis
- Factor Breakdown / Operational Matrix

Test Plan Reviews
The test plan is the verification document for the tester; the accuracy of this document could be the most important phase of the product delivery process. Scrutinizing the application for testability, completeness, sequencing, structure, and timings are the important factors for determining if the correct amount of testing has been completed.

Test Modifications
All of our systems will be upgraded or enhanced at some time; the applications must be tested to ensure that the existing functionality continues to function, but that the new functionality is working correctly. Analyzing the processes involved making modifications and the testing of those modifications is crucial to product success.
- Maintenance Issues
- Maintenance Testing
- Estimating the Modifications
- Cost Benefit Identification

Defect Prevention
A primary concern for the organization should be ensuring that the mistakes of the past are avoided in the future. The examination of the past lessons and suggests approaches to resolving problems. It recognizes that the chief responsibility of testing is defect prevention not defect detection.
- Checklists
- Functional Specification Defects
- Design Defects
- Coding Defects
- Testing Defects
- Coding / Testing Rules

Test Management
Recording results and investigating the origin of defects allows testers to develop measures that will be used as guidelines for future projects. These documents play a significant role in organizing and planning the final stages of the development effort.
- Test Logs
- Sample Defect Tracking Report
- Test Log Scenarios
- Retesting and Follow-up Procedures
- Root Cause Analysis

10 Changes to Make Now to Improve Testing
These are the ten items that New Instruction recommends for the improvement of quality in any organization. These suggestions when implemented correctly will have greatest possible impact on your organizational goals.
1. Requirements Documentation Techniques
2. Estimates of the Testing Efforts
3. System and Unit Test Plans
4. Regression Testing
5. Test Execution Process Management
6. Incorporating Standards into Our Teams
7. Formalized Reviews and Walkthroughs
8. Installing Traceability Into Our Systems
9. Test Automation
10. Staff Development & Cross Training

Test Methodologies
Part 2

Section 1

Test Methodologies

Testing methodologies enable testers to compute their test coverage and have confidence that all requirements will be tested.

The use of methodologies in testing is an essential element of a quality assurance organization.

Test Factor Analysis

Test Factor Analysis allows a tester to calculate a minimum and a maximum number of tests for a given selection options screen. This will give an approximation for exhaustive testing and allow a testing to make a better test assessment/decisions based upon risk based factors.

Compute Home Insurance Rate

Use a customer profile to determine the insurance rate, which will be used to produce an insurance quote.

Business Rules (factors):

Factor 1: Location
    3 options: urban, suburban, rural

Factor 2: Construction
    5 options: wood, brick, stone, logs, adobe

Factor 3: Lot size
    3 options: less than ½ acre, ½ acre-1 acre, 1+acres

Factor 4: Architecture
    5 options: ranch, colonial, cape cod, multi-family, under construction

Factor 5: Ownership
    2 options: own, rent

Factor 6: Distance to fire hydrant in meters
    4 options: 1-100, 101-250, 251-500, 500+

How many conditions (combinations) should be tested?

OATS – Orthogonal Array Testing Strategy

OATS, orthogonal array test systems, describes a pair-wise testing technique. The premise is that after individual components are tested and found to be working properly, the next step is to investigate the interaction of combinations of variables.

OATS – Naming Convention

	F1	**F2**	**F3**
Test Case 1	0	0	0
Test Case 2	0	1	1
Test Case 3	1	0	1
Test Case 4	1	1	0

| 0 | 0 | 1 |
| 0 | 1 | 0 |

Never Using

$$L_{RUNS} (LEVELS^{FACTORS})$$

Naming Convention not a calculation !!

$$RUNS = ((FACTORS - 1) * LEVELS)$$

OATS – Naming Convention

EXAMPLE:

F1 = CHIX, BEEF, FISH

F2 = PASTA, RICE, POTATO

F3 = BROCCOLI, BEANS, PEAS

F4 = WATER, SODA, BEER

$$L_{RUNS} (3^4) = 9 \text{ runs}$$

	Factor 1	Factor 2	Factor 3	Factor 4
Run 1	0	0	0	0
Run 2	0	1	1	2
Run 3	0	2	2	1
Run 4	1	0	1	1
Run 5	1	1	2	0
Run 6	1	2	0	2
Run 7	2	0	2	2
Run 8	2	1	0	1
Run 9	2	2	1	0

http://www.freequality.org/sites/www_freequality_org/documents/tools/Tagarray_files/tamatrix.htm

Testing with Magic Squares

While the statistical validity of this approach is not documented, it is a viable way to quickly identify unique paths and test a large number of pairs. The technique utilizes odd-order magic squares. A magic square has the property of all columns and rows summing to the same value. It is in essence an averaging technique that assigns variables to rows and columns with the same frequency.

Magic Squares

A order-3 magic square:

8	1	6
3	5	7
4	9	2

EXAMPLE:

F1 = CHIX, BEEF, FISH

F2 = PASTA, RICE, POTATO

F3 = BROCCOLI, BEANS, PEAS

Exploratory Testing

Exploratory testing seeks to find out how the software actually works, and to ask questions about how it will handle difficult and easy cases. The testing is dependent on the tester's skill of inventing test cases and finding defects. The more the tester knows about the product and different test methods, the better the testing will be.

Exploratory testing to an extent is the opposite of scripted testing, in which test cases are designed in advance, including steps to reproduce and expected results. These tests are later performed by a tester who compares the actual result with the expected. When performing exploratory testing, there are no exact expected results; it is the tester that decides what will be verified, critically investigating the correctness of the result.

Risk Analysis

Section 2

Risk Analysis

In our applications not everything can be tested, so prioritizing the tests is a major requirement of the tester.

For most systems a thorough set of tests may be impractical so identifying those crucial tests becomes imperative to the tester, we will help to identify those crucial situations.

Categorical Analysis

Q1: How much time can be allocated for testing this particular feature?

Q2: Does this feature warrant the time allocation described above?

Q3: Will this test have a sufficient probability of detecting an error?

Factor Breakdown

When assessing risk inside of the test plan itself the author must quantify all of the situations listed above and provide a quantitative breakdown of the factors to the tester. When the time pressures associated with testing occurs there is no time to analyze the situation and to assess a balanced representation then.

This information should already have been assessed and calculated. The test plan must be the document that provides the completed analysis.

Risk Factors

➢ **Business Operations and Continuation**

➢ **Prior Defect History**

➢ **Customer Impact and Visibility**

➢ **New Functionality and Changes**

➢ **Enhanced Complexity Levels**

➢ **Prior Levels of Testing**

➢ **Gut Feeling and Instinct**

➢ **Coverage**

➢ **Confidence Levels**

Prioritizing the Test Plan

HIGH
These tests have the highest probability of detecting an error; these must always be run under every circumstance.
10% - 15%

MEDIUM
These tests should detect errors; these are run to build confidence in the released package, and they are usually run before each release.
15% - 25%

LOW
These have the lowest probability of detecting an error, but have sustained value in each of the tests that are being performed. These are run time permitting but each has a limited testing role involved, skipping one would not likely harm the system, but skipping all of them would prove to be extremely detrimental.
60% - 75%

Biggest Bang for the Buck

When testing time is short we must identify those tests that have the greatest probability of detecting an error.

The ideal tests are those that can detect multiple errors with a single test. Or those that can conversely prove multiple areas of the application are functioning correctly with a single test.

There are many tests that can be run to test different functions, but there is only one best test.

Test Plan Reviews

Test Plan Reviews

The test plan is the verification document for the tester; the accuracy of this document could be the most important phase of the product delivery process.

Scrutinizing the application for testability, completeness, sequencing, structure, and timings are the important factors for determining if the correct amount of testing has been completed.

Why are you doing reviews?

What is the primary purpose for doing code/test plan/specification reviews?

      1.

      2.

      3.

What is the primary benefit to the organization?

      1.

      2.

      3.

Knowledge Sharing

The primary benefit of having the reviews is to ensure a common understanding among all team members.

Too often there is not enough time for each team member gain a full understanding of each application that a team is working with.

The review is an opportunity for each team member to learn more about applications and to ask questions of those who are the SME's (Subject Matter Experts).

Domain Experts

One of the worst things from an organizational standpoint is to have a single expert with all of the domain knowledge for a particular subject or application. That knowledge needs to be spread among several team members.

➢ Do you find yourself calling the expert to ask questions about old they systems left behind?

➢ Is senior management perpetually concerned about losing the expert to another firm because of his/her accumulated undocumented knowledge?

➢ Do you find yourself trying to track down the expert while he/she is on vacation?

Interchangeable Parts

From an organizational perspective we should be looking to have as many interchangeable parts as possible. Personnel who can serve in multiple capacities, a rotation of job responsibilities in your organizations is a benefit that not many companies are able to take advantage of.

The code/test plans/methodology should looks like our corporate model, not an individual entity.

There **ARE** opportunities to improve the model, but everyone should have a chance to explore those opportunities.

Test Modifications

Section 4

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Test Modifications

All of our systems will be upgraded or enhanced at some time; the applications must be tested to ensure that the existing functionality continues to function, but that the new functionality is working correctly.

Analyzing the processes involved making modifications and the testing of those modifications is crucial to product success.

Maintenance Issues

1. Establish guidelines for implementing new ideas. New ideas or approaches to situations are not discouraged, but implemented only after discussion, assessment, and planning. Get these guidelines written and distributed.

2. Clever ideas should be written down. Document the ideas for later analysis and remember that even minor changes "on the fly" may result in significant additional testing.

3. Perform structured walkthroughs to assure that programs do not contain "inspirational" code and ensure that complexity guidelines have been adhered to consistently.

4. Emphasize teamwork. Explain to them that they are perceived as experts - an experienced member of the development team and is expected to take a leadership role.

5. Discuss career paths and be certain that the one you agree on is in the best interest of the team, the organization, and the individual.

Maintenance Testing

Rule 1: Testing the system capabilities is more important than testing its components.

Rule 2: Testing old capabilities is more important than testing new functions.

Rule 3: Testing typical situations are more important than testing extreme situations.

Estimating

❑**Micro Estimating -** A technique using a work breakdown schedule to simplify the larger more complicated task into a series of smaller manageable sized tasks, thereby making task estimation easier to leverage.

❑**Cuff Estimating -** Global estimating, a SWAG type method where the knowledge and details are not known. This method is best avoided in most situations.

❑**Practical Analysis -** A technique that uses existing knowledge from previous levels of experience and research and applying it to help answer questions about a current situation. Estimates are based solely upon experiences.

❑**Weighted Average -** An average that takes into account the proportional relevance of each component, rather than treating each component equally. Estimate Hours = (a + 4b + c) / 6

❑**Rand Delphi Appropriateness Method -** This technique combines interviewing, observation, document analysis, and visual methods, to facilitate triangulation of the breadth and depth of desired features. This analysis enhances confidence in the validity of findings.

❑**Re-estimation by Phase -** This procedure reevaluates the schedules and timings of the process as part of a turnover criterion. Missed phases and turnovers are rarely made up for during the course of a project so some light must be shed on constant inconsistencies.

Cost-Benefit Identification

This matrix represents a test strategy where the test budget and timeframe are tight. We manage the test cases according to a three-tier management system. All percentages are target levels for test coverage.

LEVEL OF RISK	RELATIVE COST OF TEST		
	LOW	MEDIUM	HIGH
HIGH	85%	60%	40%
MEDIUM	50%	30%	0%
LOW	30%	0%	0%

If we assume budget and timeframe are reasonable, the numbers above change horizontally in the HIGH risk area by about 15% across the board. In the MEDIUM risk category the HIGH cost number increases by 30% and in the LOW risk category the MEDIUM risk category increases by 15%.

Unit Testing

Unit testing is typically the responsibility of the programmer and is the first time that the newly developed code is executed.

The purpose of the test is to demonstrate that the program performs according to the specifications.

There are a number of different opinions about the value of unit testing. On one side of the argument is that unit testing is a terrible waste of a programmer's time. Opposition to this point of view stresses that no amount of later testing is as valuable as the unit test.

Integration Testing

Integration testing is a form of system testing that minimizes the number of components that interact. It is a desirable step if it seems likely that it will be difficult to diagnose the cause of defects that arise during system tests.

Testers and developers must give considerable thought to the degree of integration testing, the sequence of tests, and the number of components to be integrated at any one time.

System/Acceptance Testing

System testing is the highest level of testing performed by the Quality Assurance Department. In organizations where system testers also act as an advocate for the customer, acceptance testing may be the highest level. Regardless, system and acceptance testing are essentially the same types of tests.

The primary difference is that **system testing** is running destructive tests in an effort to locate defects, while the **acceptance testing** is confirming that desired functionality exists.

Automation

Decisions regarding automating the testing will reflect prior automation experience and the current expertise in the department. If the group has no experience with automation, this is probably not the best time to start learning.

While it is **not** recommended that people learn to use automation tools while they are dealing with a new project, if you have the expertise, consider automating the testing. One approach that may be the most productive is to ask the testing group to develop their test cases and then turn them over to automation specialists. These specialists might be two or three individuals that have a job responsibility that encompasses automated tests for the rest of the group.

Remember to **ADD TIME** to the estimate if a decision is made to automate.

Regression Testing

The regression test examines all functionality of a system. The test is actually a retest of the entire system.

It enables a tester to determine if a modification or addition in one area of the code has an impact elsewhere in the system.

The test is designed to operate each piece of functionality in the system at least once.

Regression Testing

The objective is to allow testers the flexibility to test the portion of a system that has been changed without the need to run the entire test. The entire regression test will be run subsequently, but it is sensible to test the section of the system that was just changed, because it is likely that defects will be found there if they are found at all.

This regional approach to regression testing may even allow multiple pieces of the regression test to be run simultaneously. Practically speaking, the ability to test regionally becomes a requirement as systems grow in size and complexity.

The regression test is one of the best pieces of insurance a tester can develop. It must be possible to test an entire system even after a minor change.

Defect Prevention

Section 5

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Defect Prevention

A primary concern for the organization should be ensuring that the mistakes of the past are avoided in the future. The examination of the past problems then suggests approaches to resolving future issues.

It recognizes that the chief responsibility of testing is defect prevention not defect detection.

Checklists – Analysis & Design

ANALYSIS

- Ambiguity
- Inconsistency
- Omission
- Lack of Stability
- Fuzzy Words
- Late Specification Changes
- Continuous Specification Changes

DESIGN

- Scope Creep
- Unstructured Design
- Insufficient Detail
- No Diagnostics
- No Flexibility
- Lack of Fit to Current Environment

Checklists – Coding & Testing

CODING

- Hard Coded Entries
- Poorly Documented Changes
- Failure to Initialize, Reinitialize
- Reinvented Code
- Shared Data Issues
- Lack of Explanatory Diagrams
- Coding Until Release
- Design As We Code

TESTING

- No Regression Testing
- Ad Hoc Testing
- Unrealistic Deadlines
- No Written Test Plans
- Developers Doing Their Own Testing
- System Testing Until Release
- No Testing Lab

Coding/Testing Rules

- RULE 1 - NO SYSTEM WILL INCLUDED DUPLICATED ROUTINES.

- RULE 2 – IF THE AUTHOR OF THE CODE CAN BE IDENTIFIED BY THE STYLE OF CODE, THEN THE CODE IS UNACCEPTABLE.

- RULE 3 – NOTHING IN THE SYSTEM SHOULD BE HARD-CODED.

- RULE 4 – A SEPARATE MESSAGE DISPLAY ROUTINE WILL BE USED.

- RULE 5 – DATA EXCEPTIONS AND UNEXPLAINED DIVISION BY ZERO ERRORS ARE CLOSE TO GROUNDS FOR DISMISSAL.

Coding/Testing Rules

- RULE 6 – CODE MAY NOT BE OVERLY COMPLEX. MAINTAINABILITY WILL BE STRESSED OVER EFFICIENCY.

- RULE 7 – ALL ROUTINES WILL HAVE A SINGLE ENTRY AND A SINGLE EXIT.

- RULE 8 – ALL FUNCTIONS AND ROUTINES WILL BE COMMENTED.

- RULE 9 – STANDARD NAMING CONVENTIONS APPLY TO POINTERS, LABELS, MEMORY VALUES, ARRAYS...

- RULE 10 – IF YOU CAN'T REVIEW AND UNDERSTAND A ROUTINE IN FIVE MINUTES IT'S TOO COMPLEX.

Test Management

Test Management

Recording results and investigating the origin of defects allows testers to develop measures that will be used as guidelines for future projects.

These documents play a significant role in organizing and planning the final stages of the development effort.

Test Tools

Automated Regression Tools	Test Case / Script Generators
Test Data Generators/Managers	Automated Code Reviewers
Complexity Measurement	Path Analyzer / Coverage Analyzer Tools
Performance Analyzers	Network Performance Simulators
Comparators	Protocol Analyzers
Probes & Traffic Monitors	Code Optimizers
Network Modeling & Simulation Tools	Transaction Processing Monitors
Application Partitioning Tools	Server Database Monitoring Tools
Pre-Compilers	Memory Leak Detectors
State Transition Diagrammers	Report Generators
Prototypers	Database Integrity Checkers
Real-Time Test Tools	Image Quality Checkers
Network Diagnostic Tools	Maintainability Evaluators / Re-Engineering Tools
Communications Emulators	Back-up & Disaster Recovery Tools
System Configuration Managers	Error Handling & Recovery Systems
Defect Tracking Tools	Reliability and Defect Predictors
Traceability Matrix Maintenance Tools	Version Control Tools

Traceability Matrix

```
┌─────────────┐     ┌─────────────┐     ┌─────────────┐     ┌─────────────┐
│  Customer   │ ──▶ │  Business   │ ──▶ │ System Test │ ──▶ │ System Test │
│Requirements │     │Specification│     │   Scripts   │     │   Cases     │
└─────────────┘     └─────────────┘     └─────────────┘     └─────────────┘
                          │
                          ├──▶ ┌─────────────┐     ┌─────────────┐
                          │    │    Code     │ ──▶ │  Unit Test  │
                          │    │   Modules   │     │Scripts/Cases│
                          │    └─────────────┘     └─────────────┘
                          │
                          └──▶ ┌─────────────┐     ┌─────────────┐
                               │Integration  │ ──▶ │Integration  │
                               │Test Scripts │     │Test Cases   │
                               └─────────────┘     └─────────────┘
```
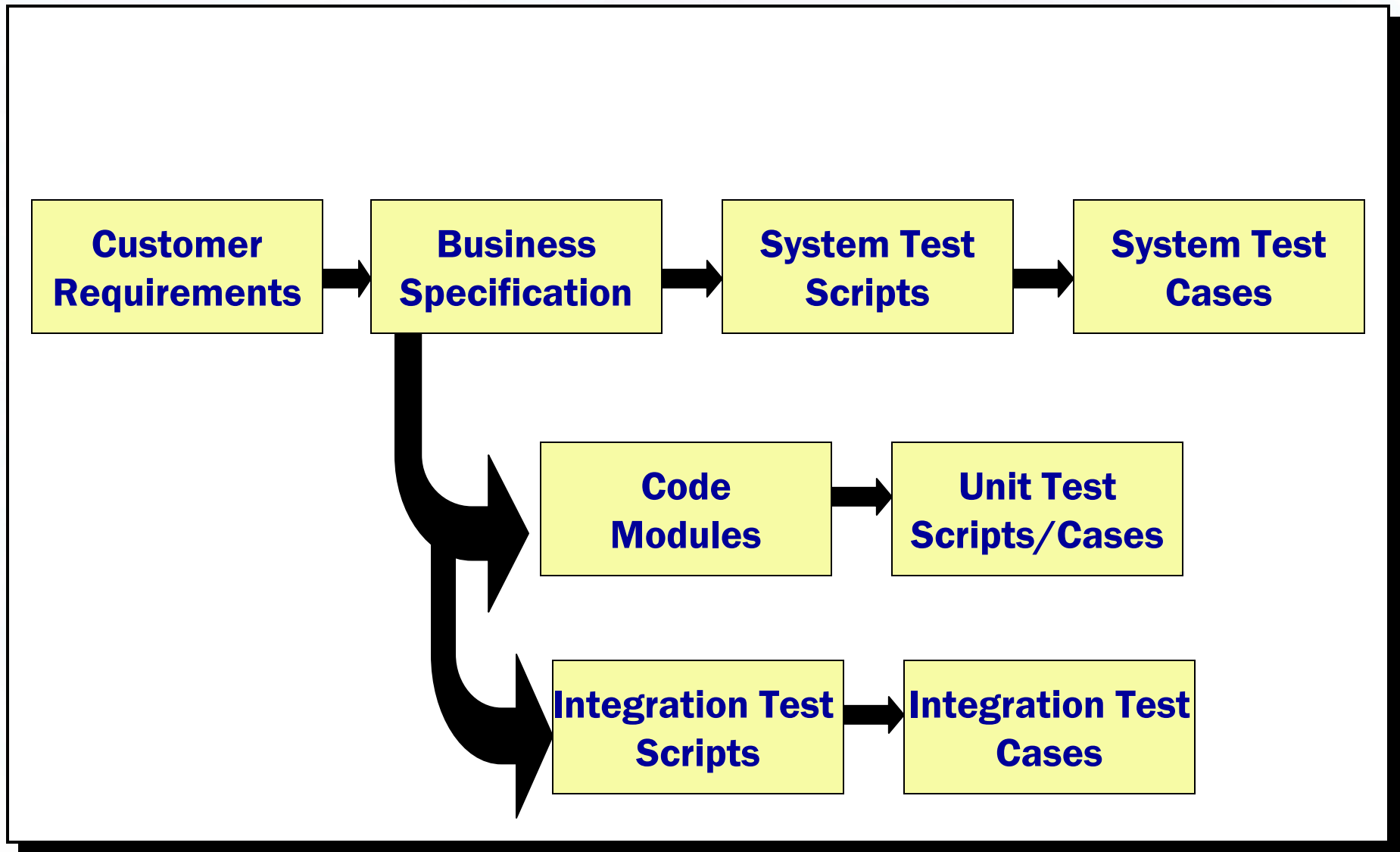
Prioritization

- ✓ You do not have a clear statement of objectives.

- ✓ You are uncertain how long the testing project will last (though you may have been given your delivery date as well.)

- ✓ It is not clear who should be assigned to this project.

- ✓ It will be extremely difficult to provide any sort of accurate risk assessment beyond the known risks of starting to test with incomplete information,

- ✓ Automating some, or all, of the tests is probably out of the question.

- ✓ Implementing an undocumented system will compound the long-term problems of maintenance and enhancement. Costs associated with all future activities will probably increase exponentially.

- ✓ We may not know when testing is complete.

Test Logs

Description	**Brief Description**
Test ID #	**Case # / Script # / Run #** **Traceability Matrix Reference**
Time & Date	
People	**Initiating Test** **Recording Results** **Receiving Results**
Result	**Pass or Fail / Suspend or Resume**
Version of Software	
Test Database	**Initial Test Conditions** **Disposition of Modified Databases**
Configuration	**Platform** **Video / Memory /** **Operating System / GUI**
Fails	**Expected Result** **Actual Result** **All Diagnostic Information** **Concurrent Activity**
Follow-up	**Problem Tracking Number** **Retest Scheduling** **Notifications**

Defect Reports

Company: **Date/Time:**   **Problem Report #**

Program: **Release:**   **Version:**

Report Type: *(1-Coding, 2-Design, 3-Suggestion, 4-Documentation, 5-Hardware)*

Severity Level: *(1-Fatal, 2-Serious, 3-Minor, 4-Undefined at this time, 5-Not Significant)*

Environment: **Configuration:**

Attachments (Y/N): _____   **Reproducible (Y/N):**_____   **Attempts to Reproduce:** ____

Test Case Number:

Problem Description:

Functional Area: _____   **Suggested Fix:** _____

Reported By: **Date/Time:**   **Assigned To:**   **Date/Time:**

Comments:

Status: *(1-Open, 2-Closed, 3-Pending)*   **Priority:**   *(1-High, 2-Medium, 3-Low)*

Resolution: *(1-Pending, 2-As Designed, 3-Fixed, 4-No Fix, 5-Deferred, 6-More Info.)*

Version: **Tested By:**   **Date/Time:**

Treat As Deferred w/ Reason: _____

Retesting Defects

The test plan will identify follow-up procedures. When a fail occurs, the tester will first examine the test case to be certain it is correct. Following this the programmer is notified of the problem. The organization of the test team and the magnitude of the development effort will determine the precise sequence to be followed. In the larger project the notification process may be very formal, and the testers will possibly not even meet the programmers.

The objective of the follow-up procedure is to prevent anything from "falling through the cracks."

Retesting Defects

These are the basic steps that may be taken to manage the follow-up and retesting procedure:

- ✓ Update test log to indicate that the fail occurred

- ✓ Review the test script, test case, and test bed

- ✓ Assign a tracking number to the fail

- ✓ Assign a severity level

- ✓ Notify programmer (or project leader) of fail and supply all available diagnostic information. (We may not always be in a find and fix mode.)

- ✓ Request that programmer estimate time to fix

- ✓ Evaluate fail to determine if additional test cases are necessary

- ✓ Reschedule test

- ✓ Update estimate of total test time if necessary

Root Cause Analysis

Glenford Myers suggests that organizations can improve the testing and development process by analyzing the errors that are found in a system. He recommends that the following questions be asked whenever an error is detected.

- When was the error made?

- Who made the error?

- What was done incorrectly?

- How could the error have been prevented?

- Why wasn't the error detected earlier?

- How could the error have been detected earlier?

- How was the error found now?

- What is the likelihood that this problem will occur in other systems?

- Have we had this problem before?

- Can this test be automated?

10 Changes to Make Now to Improve Testing

Section 7

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10 Changes to Make Now to Improve Testing

1. Requirements Documentation Techniques

2. Estimates of the Testing Efforts

3. System and Unit Test Plans

4. Regression Testing

5. Test Execution Process Management

6. Incorporating Standards into Our Teams

7. Formalized Reviews and Walkthroughs

8. Installing Traceability Into Our Systems

9. Test Automation

10. Staff Development & Cross Training

A. Functional Specifications   (business description)

The functional specification organizes customer requirements and states them in business terms. These documents should be understandable by the customer and may be the vehicle that allows them to approve a project. Ideally, the functional specification should demonstrate to the non-technical customer that the technical organization understands the requirements.

B. Design Documents   (technical description)

The design document is similar to the functional specification in that it deals with the same requirements, but organizes them with a technical perspective. References will be made to code modules and data structures that may not make sense to the non-technical customer.

NOTE: There is never enough text to explain things in a way that they will not be misunderstood. You must use pictures and diagrams to be clear.

Producing estimates of the total testing effort is a necessary responsibility of the testing group. The estimates should be recorded and reviewed at the end of each stage of the SDLC. This will enable the staff to refine the estimating process and construct better estimates with each effort.

REMEMBER: Estimation is NOT negotiation !

2b. Estimates of the Testing Efforts

Element	Example	Practice	Estimate
Functional Specifications	40 pages	10-15 test scripts / page	400-600 scripts
Test Scripts	500 scripts	2 - 3 test cases / script	1,000-1,500 cases
Test Case Development	1,250 cases	15 cases / day (5-75 range)	80 days
Test Execution	1,250 cases	50-100 per day	13-21 days
Test Re-run Overhead	1,250 tests (cases)	@ 15% - 20%	200 re-runs

Q1: How do you know when testing is complete?

Q2: How does someone who was not the original tester ensure that the original functionality is working as it was before?

Q3: How do we ensure that we have the same understanding of the application?
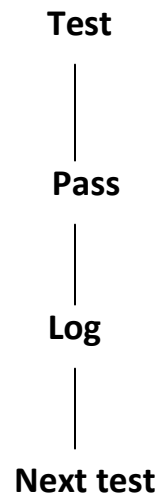
Regression tests are typically fashioned by combining portions of the system test with elements of the acceptance test.
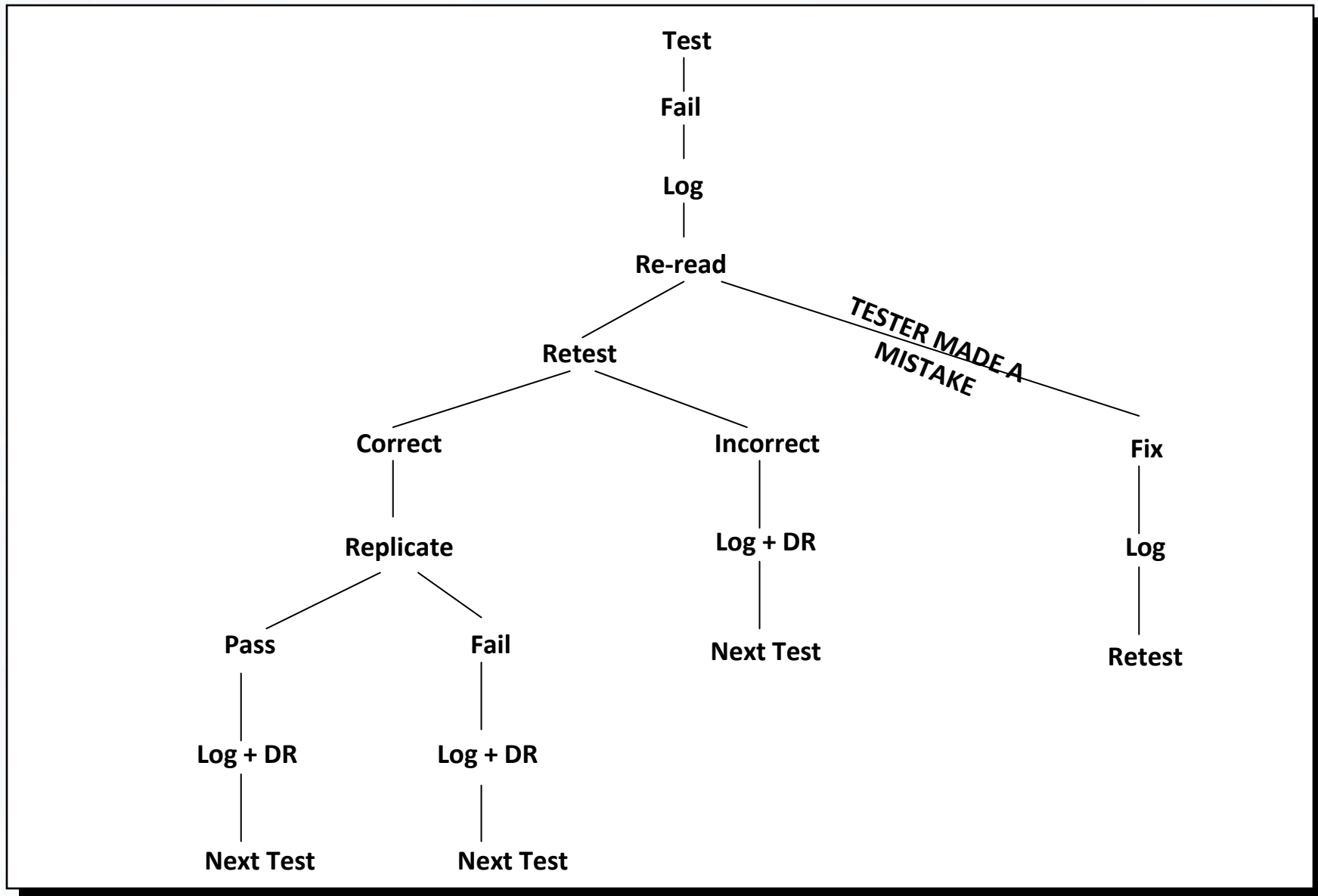
The regression test should be automated.

The regression test serves as a good mechanism to calibrate a system. After system modifications, the regression test is run immediately to determine the impact of the change. The test will then be updated to include the changed functionality.

5a. Test Execution Process Management

Test

|

Pass

|

Log

|

Next test

5b. Test Execution Process Management

```
                              Test
                               |
                              Fail
                               |
                              Log
                               |
                            Re-read ——————————————— TESTER MADE A
                            /       \                   MISTAKE
                         Retest       \                    \
                        /      \        \                    \
                   Correct    Incorrect                      Fix
                      |           |                           |
                  Replicate    Log + DR                      Log
                   /     \        |                           |
                 Pass    Fail   Next Test                   Retest
                  |       |
               Log + DR  Log + DR
                  |       |
              Next Test  Next Test
```

The following factors influence the success of the testing effort as well as the success of the entire project.

1. Well Defined Objectives

2. Methodology (Phased Approach, Detailed Work Plans, Checkpoints with Quality Controls, Tracking & Feedback Mechanisms)

3. Senior Management Commitment and Support

4. Skilled Project Manager

5. User Involvement and Rapport

6. Competent, Motivated Team

7. Built-In Quality Process

8. Change Control

9. Project Monitoring and Control

10. Documentation

SDLC Phase	Review
Concept & Viability	Customers and developers negotiate the functionality of the new system. The review is careful to emphasize customer expectations, not technical feasibility. The walkthrough will also evaluate test acceptance criteria.
Analysis & Design	The design reflects the MIS understanding of how the new software will function. The User Manual may be reviewed to verify that the requirements and implementation are accurate and satisfactory to the customer.
Build	Code walkthroughs have value, but walkthroughs occurring before actual coding provide a critique on the approach, language, platform, etc.
Test	Evaluates the test plan and reviews the test methodology, procedures, and test tools.
Installation & Production	The walkthrough will examine the plan for installation and the best approach for switching customers to the new product.
Enhancement	The original design should reflect the inevitability of "enhancing the system" and how well the product supports change.

7b. Formalized Reviews and Walkthroughs

ADVANTAGES	DISADVANTAGES
Finds Defects Early	Time Commitments
Promotes Communication	Availability of SME's
Expectation of a Review Increases the Quality	Interruptions
Builds Involvement	Defensive Authors
Promotes Uniformity	Insensitive Audiences
Trains in Functionality & Design	Long Meetings
Identifies Opportunities for Improved Practices	Negative Rewards
	Unfocused Meetings
	Not Following Through on the Results
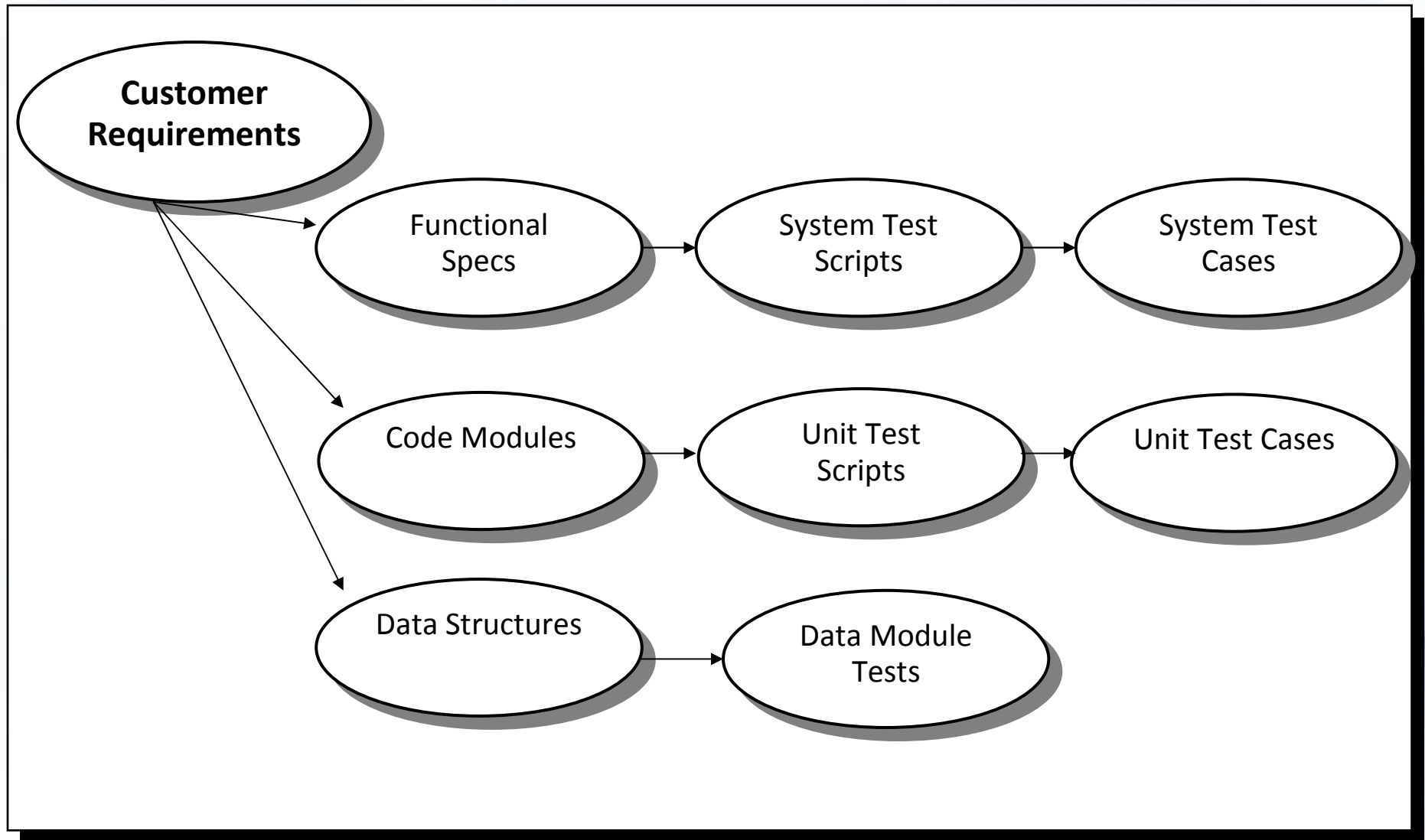
There is little debate about the need to maneuver testing organizations in the direction of automation. Increased system complexity and functionality continue to test the limits of manual testing, and the solution appears to center around the automation of any testing process that can be automated.

As reasonable and necessary as it may to institute automated testing procedures, there are a number of considerations that must be addressed before automation can proceed. The following checklist may help you determine if your organization is ready to automate.

✓ Are good testing policies and procedures in place today?

✓ Is there time to learn how to use the automated testing tool?

✓ Will there be ongoing training?

✓ Is the development team and test team in agreement about the use of automated testing tools and procedures?

✓ Are you ready to make a total commitment to the testing tool?

✓ Are your development language and platform supported?

✓ How many platforms will you test?

✓ Are you testing embedded systems?

✓ Is the budget adequate?

✓ How much support will your organization require?

Today many of our problems focus around poor communications, feedback loops are missing, making mutual understanding almost impossible. Solutions such as MBO (Management by Objective) and TQM (Total Quality Management) had one thing in common: they demanded that everybody talk to one another. They stressed proving that the business problem was clearly understood and the best solution was selected. To do this, the developer returns to the client with specifications, prototypes, user manuals and sample reports to stress that there is a complete understanding of the situation.

The emphasis now is on up-front analysis processes that fashion a comprehensive plan before setting the development team to work. Agile/JAD provides the opportunity for anyone who can make a contribution to the project to actually do so.