How mature is my test organization: STDM, an assessment tool

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Abstract

Software Testing thought of as a support function until a few years are is now seen as a core function. Testers are seen as the last line-of-defense to determine the success or failure of a product in the field. CIO's looking closely at this area to assess quality and reduce costs, now look at how to accurately measure the effectiveness of process improvement initiatives.

Wipro's Software Test Diagnostic Model (STDM) is a practitioner's framework that uses a process maturity mapping similar to that of the SEI CMMi (Software Engineering Institute Capability Maturity Model). It incorporates the best practices of Test Maturity Model (TMM) and has been successfully used by consultants to study each aspect of testing, identify pain areas and create a roadmap of improvement.

STDM classifies key test processes as "Core" and "Surround" Key Test Areas (KTA). The Core Key Test Areas address the main Testing functions; those without which no testing can take place, while the Surround Key Test Areas constitute of functions that impact and interface with the testing process. Core KTA's include Test Strategy, Test Planning, Test Case Design, Test Execution, Defect Management, Metrics, Production Defect Root Cause Analysis and Test Result Reporting. The Surround KTAs are Review Processes, Release Management, Project Management, Development Models, Test Environment, Governance Structure, Test Tools and Automation Strategy. Each KTA has best practices and indicators to assess and determine the maturity of the Test Organization in each Test Area.

This practice presentation is an outcome of practitioners experience in rolling out process improvements in various test organizations throughout the world. It shares live examples and the benefits seen, which can be replicated by your organization.

Note: STDM Framework is an Intellectual Property of Wipro. The views expressed in this article are that of the authors and Wipro Technologies does not subscribe to the substance, veracity or truthfulness of the said opinion.
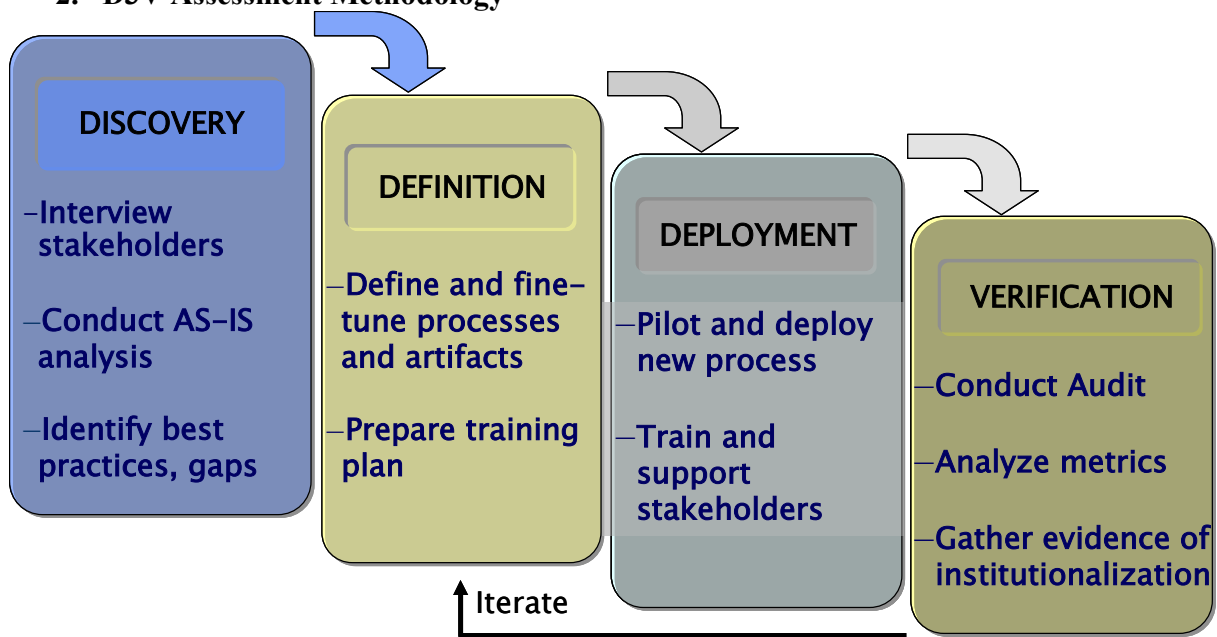
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1. Typical Issues in Test Organization

For a project or test manager, predictability & reliability are the key elements. Predictability in process and reliability in product quality comes as a result of maturity that the organization has a whole possesses. This is specifically applicable in the case of the test organization, often percieved as the gate keepers of quality.

Some of the typical issues that most IT organizations deal with are 'surprise' bugs in the product after release to customer, no release criteria or acceptance plan to gauge test progress, the test and development teams continually being on a fire-fighting mode trying to correct defects rather than spending valuable time on defect prevention, absence of quantitative measures and metrics to back your decisions on poor or good quality. In the end, the project manager is faced with a dilemma to try and salvage whatever is possible from among the triple constraint objectives of schedule, cost and quality.

2. D3V Assessment Methodology

DISCOVERY

– Interview stakeholders

– Conduct AS–IS analysis

– Identify best practices, gaps

DEFINITION

– Define and fine-tune processes and artifacts

– Prepare training plan

DEPLOYMENT

– Pilot and deploy new process

– Train and support stakeholders

VERIFICATION

– Conduct Audit

– Analyze metrics

– Gather evidence of institutionalization

Iterate

D3V: Wipro Technologies Approach to Consulting

The D3V approach can be used in any consulting context, and is useful in transitioning development and change efforts of various kinds. This is a multi-phased approach that intuitively chunks down the work into manageable components, with specific deliverables that each logically lead into the subsequent phase. Briefly, D3V stands for Discovery-Definition-Deployment-Verification.
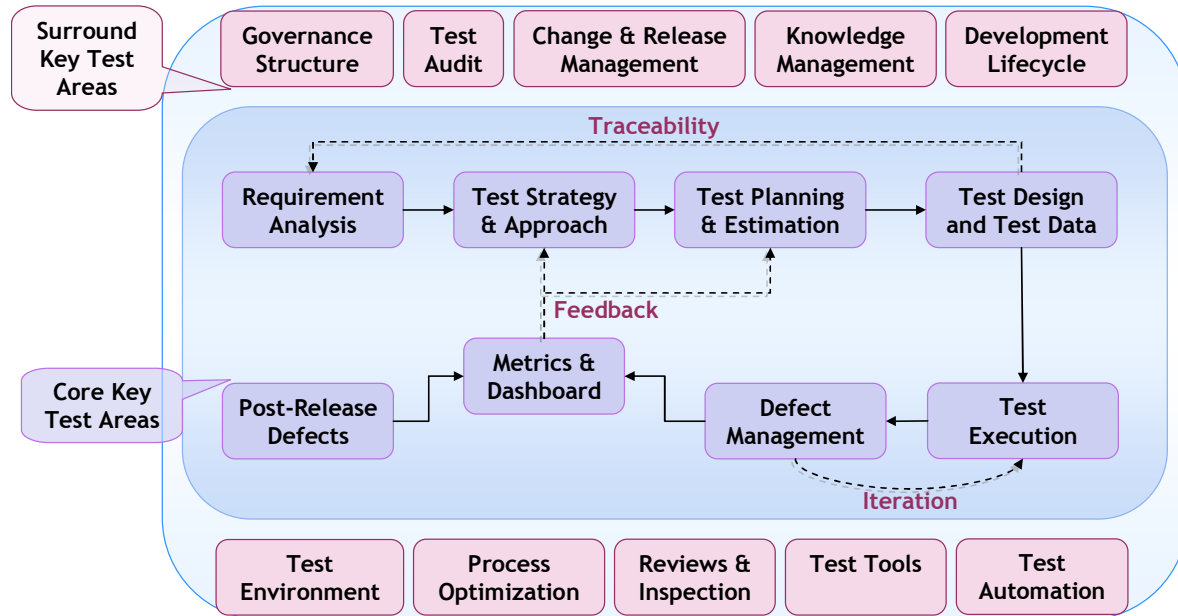
The Discovery Phase spans assessment of readiness and the creation of a roadmap for implementation.

The Definition Phase uses knowledge of the client environment and evaluation of options to select the right or ideal set of practices that are most suited to the problem, and to develop a lifecycle model for providing the solution.

The Deployment Phase rolls out the lifecycle model across different parts of the environment, with adherence to pre-defined criteria.

The Verification Phase checks for effectiveness of the adoption and implementation, and its consistent and continuing maintainability and usability in the organization.
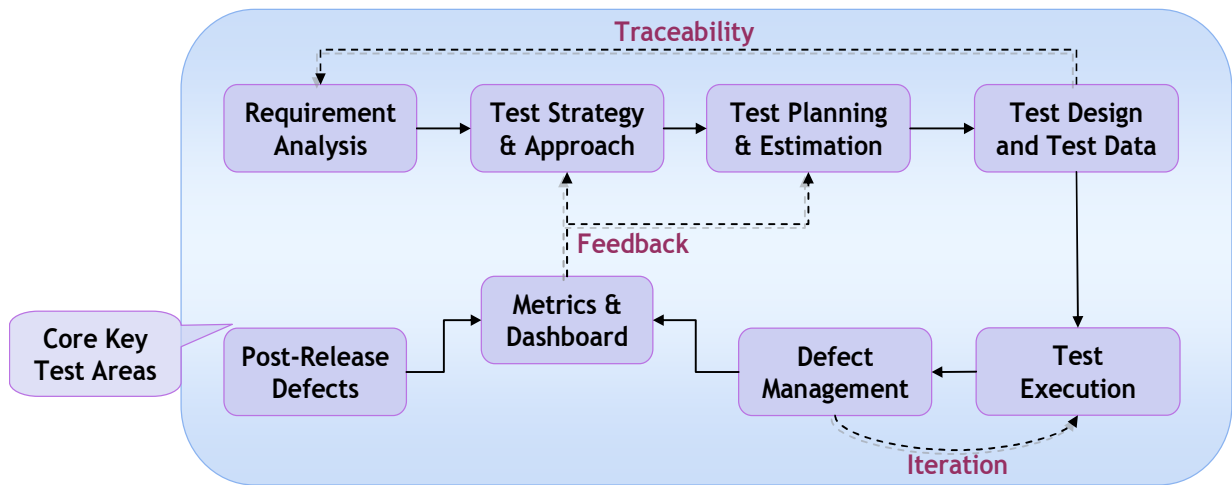
3.   The STDM Framework

   Wipro Technologies is a pioneer and leader in providing independent validation and verification services. In addition to testing services it also has a strong presence in the Process and Quality Consulting space wherein practitioners work with enterprise clients to improve their verification and validation processes, define frameworks, best practices and an overall roadmap for process improvement. Leveraging on its many years of enriched experience solving client's problems, the STDM framework was created. It is a practical representation of the Testing Process and can be used to diagnose the current problems in Software Testing from a process as well as execution perspective. In the sections below we will be exploring how the STDM Framework can be applied to an organization to create/optimize and improve a formal test process.

3.1 Core & Surround Testing Functions
   The STDM Framework is composed of several constituent functions that directly or indirectly impact the testing outcome. Core functions of testing are those without which no testing activity can take place and can be intuitively followed from a basic test cycle. These are clubbed as Core Key Test Areas, examples being Test Planning and Test Execution. Surround functions enable testing and impact the Testing process in varying extents. These are clubbed as Surround Key Test Areas - Test Environment and Release Management for instance.

4. Core Testing Function

4.1 Requirement Analysis

The requirements phase of a project is where the test team should ideally get involved. It is imperative that the test team gains a solid understanding of the scope of the project in terms of testability of requirements and any issues arising need to be clarified early on. From a STDM perspective this is a core key test area and defines the role of the test team during Requirement Specification phase.

4.2 Test Strategy & Approach

The test team should come up with a test strategy document that answers several vital questions such as how to verify a particular requirement implementation, what kind of processes would be required to meet testing goals among others. It has been found that this area is often a weak link in the whole testing process, hence requires extra attention and scrutiny. It is frequently seen that:
a)   An organization may not have any formal test strategy or
b)   A formal test strategy may be defined but not being used or updated for 2-3 years

4.3 Test Planning & Estimation

The Test Plan document is the guiding force for any test team and is often considered a living, executable document. It defines details of test activities in order to meet the test objectives and includes testing objectives, scope, estimates, risk mitigation, schedule, major milestones, test tools, entry and exit criteria.. Test Estimation plays an important role in ensuring that the test duration is not a result of guess work and adequate time is given to the test team to complete all its tasks to ensure quality of the released product.

4.4 Test Design and Test Data

Test cases are designed using a procedure, to verify the functional and non-functional requirements, and to discover defects. Processes and templates should exist to capture test data and clear guidelines need to be in place to ensure that test cases that are prepared are re-usable and maintainable. The quality of testing is impacted by the amount of structure you can bring in to the process in terms of evaluating and selecting the most suitable testing technique and defining a test approach that fits the bill.

4.5 Test Execution

The AUT (Application under Test) is subjected to the planned tests using a structured process. Test execution can be manual or automated using specially designed test scripts. Usually, the test maturity is assessed for all relevant test levels viz Unit testing, Integration testing, System testing and Acceptance testing.

4.6 Defect Management

Defect management process exists to log, review, classify, report and close defects. In order for accurate and consistent analysis and reporting of defects, it is imperative that the organization adopts a uniform defect status code and workflow.

4.7 Metrics & Dashboard

Regular tracking of Test Execution activity in terms of tests executed against the execution plan is vital for effective stakeholder involvement and management. In addition, other project vital statistics should be recorded and relayed to management for better planning and decision making. This process checks to see if an effective quantitative measurement program is in place.

4.8 Post Release Defects

Procedures to manage & analyze production defects and adopt defect prevention activities should be integrated into the overall process. This involves performing root cause analysis for defects occurring in production and implementing adequate measures to prevent similar defects from recurring.

4.9 Feedback for next cycle

Lessons learnt from the current test cycle are collated, analyzed and used as an input to improve the next test cycle. in an iterative lifecyacle, this could also involve improving the test assests (test plans, test cases etc) for the next incremental iteration. Post implementation reviews also form part of this process area. Post Implementation Reviews are done after successful release of the software to the customer and lets you capture lessons learnt and other best practices

5. Surround Testing Function

Governance Structure	**Test Audit**	**Change & Release Management**	**Knowledge Management**	**Development Lifecycle**

Test Environment	**Process Optimization**	**Reviews & Inspection**	**Test Tools**	**Test Automation**

5.1 Governance Structure

Defines how the test organization is structured with respect to overall organization structure. It defines the roles, responsibilities and practices within the test/QA organization. Analysis of this function gives vital clues on the integrity of the test activity performed. Ideally a test/QA organization should have independent authority and not report into the development team in order to retain their role as "Objective Advisors on Quality". Other mechanisms to control and track issues, process streamlining across teams, communication etc are governed by the team structure and organization that is in place.

5.2 Test Audit

Define the current Quality Management system or process being followed. It includes procedures to check compliance to defined processes.

5.3 Change and Release Management

Change management process exists to initiate, analyze, approve, track and close change requests. Release Management refers to the procedures to make the product/system available to the end-user, as per the requirements. This kicks in once the test team completes the testing and the product is ready for release. Checks to see if proper exit and acceptance criteria are met before releasing the software to the customer. Also involves the deployment activities associated with moving code from one environment to the next.

5.4 Knowledge Management

Information sharing and knowledge assimilation procedures are implemented. Mechanisms to collect and share best practices across projects are an example of knowledge management.

5.5 Development Life Cycle

One of the critical interfaces to the test team is the development team. All interactions between the development and test teams during normal operation as well as release handover are defined here. Also defines how the test team is impacted by processes selected by the development team.

5.6 Test Automation

Evaluate feasibility of test case automation and strategize it. Procedure to identify, evaluate and select automation test tools.

5.7 Test Tools

Identify tools that improve testing productivity, and measure tool usage. Commonly used tools in testing are the ones for test management but there could be other tools for specialized types of testing and simulations in different environments that are required.

5.8 Review & Inspection

Project artifacts are reviewed as per a pre-defined plan. The verification activities including reviews are critical to reducing and catching defects early on in the development lifecycle. The right processes and templates should be in place to implement this activity.
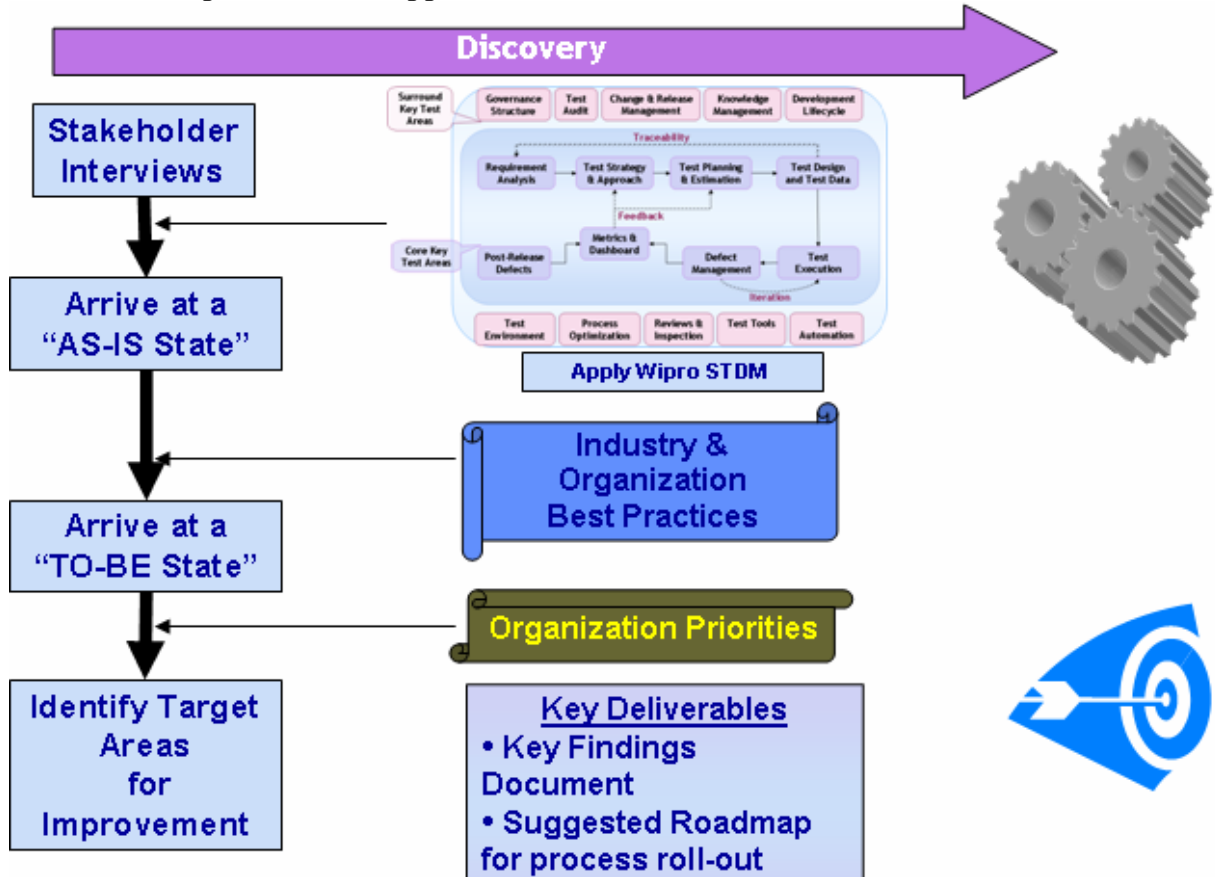
5.9 Process Optimization

A mechanism exists to continually verifying effectiveness of process deployed in the organization. This activity includes defining new processes, updating existing process as the case may be.

5.10 Test Environment

Procedure exists to manage (identify, allocate, set up, maintain and release) the resources required for executing the tests. These include test infrastructure in terms of software and hardware among other things.
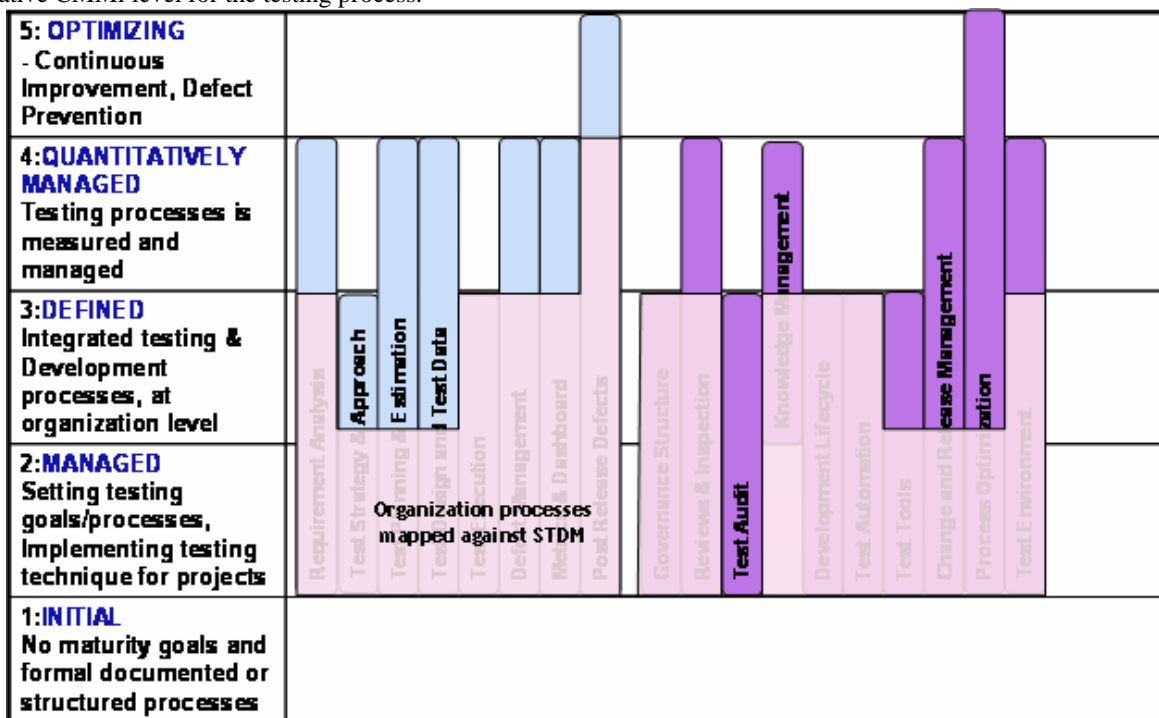
6. STDM Implementation Approach

An assessment at a client location typically starts with interviews and discussions with stakeholders. This is to bring forth the best practices, pain areas and areas of improvement. The STDM is used as a tool to ensure that each Key Test Area (KTA) is adequately covered.

Interviews and discussions lead to arrival at "AS-IS state" of the organization. Industry & Organization best practices go as an input to deduce a "TO-BE state for the organization. The recommendations are filtered on organizations priorities, to identify the areas of improvement.

7. Mapping to CMMi & Testing Maturity Model

The STDM framework includes a detailed testing process questionnaire that is used during discussions with key client stakeholders to analyse current maturity of each KTA. The framework also has an assessment sheet which can be used to rate the organization's processes against standard maturity levels as prescribed by the SEI CMM model. Thus, in the analysis chart for an organization shown below, the areas of immediate focus are: Test Strategy & Approach, Test Planning & Estimation, Change Control, Development Interface, Automation Strategy & Test Tools. In the staged representation of CMMi the process areas are organized by organizational maturity level. For example, a company interested to obtain a Maturity Level 2 rating would require company processes covering all of the Maturity Level 2 process areas.

STDM can be adapted to be complementary to CMMi levels by ranking each process area (core and surround) on a CMMi 1-5 scale of maturity. The consequent results can be plotted on a graph as shown below to arrive at a relative CMMi level for the testing process.

8. Conclusion

The **S**oftware **T**est **D**iagnostic **M**odel is a tool that provides an objective assessment of a test organization on its process capability. The tool incorporates best practices from Industry, Test Practitioners and various models like CMMi, TMM. The STDM can be a potent weapon in any consultant armor to nail down inefficiencies and weak areas in processes very easily. Wipro Technologies consultants have had tremendous success using STDM in various assignments over the past couple of years, also helped by the fact that the tool has been continuously refined and enhanced over the years.

Author Bios

Bonney Joseph has around nine years of experience working with a variety of tier-one global enterprises in the banking, insurance, technology, manufacturing & telecom domains. He currently works in the Consulting Services arm of Wipro Technologies and is exposed to end-to-end software development lifecycle process areas and techniques for quality and process improvement. He has specalist know-how and experience in Testing, Requirements & Project Management processes apart from models and process improvement frameworks such as CMMI, Six Sigma and ISO 9000. In addition to being a CSQA & PMP, he is also certified in Rational Unified Process (RUP) and TL 9000 internal auditing. Email Bonney at bonney.joseph@wipro.com.

Nikhil Gupta has about 18 years of industry experience, having worked as Project Manager, Quality Consultant & Software Quality Assurance Manager for various facets of Software Development Life Cycle. He has been involved in requirement collection, design, implementation, testing, test automation, sustenance and process improvement activities including a 2 year stint in the US/UK working on providing process consulting to client. One of his recent accomplishments is in having contributed to building the V&V (Verification and Validation) practice in Quality Consulting Group of Wipro Technologies. His professional certifications and accreditations include Certified Quality Black Belt in Six Sigma, PMP, PRINCE2 (Practitioner), presented a paper on "Managing your Test Organization in the outsourcing scenario" for Swiss Testing Day in Zurich, Switzerland. Email Nikhil at Nikhil.gupta@wipro.com