



# **Importance of Independent Verification and Validation (IV&V) August 14, 2007**

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# Independent Verification & Validation

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- What is Independent Verification and Validation?
  - IV&V Defined
  - The IV&V Role in Quality Management
  - IV&V Processes
  
- Importance of IV&V In the New World of Interoperability and Service Oriented Architecture
  - It Is More Important Than Ever
  - IV&V Focus Areas
  - State Approaches & Considerations
  
- Considerations for States to Keep in Mind



# IEEE 1012-1998 terms

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- **Independent Verification and Validation (IV&V):**
  - V&V processes performed by an organization with a specified degree of technical, managerial, and financial **independence from the development organization.**

\*IEEE Standard for Software Verification and Validation



# IEEE 1012-1998 terms

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- **Validation:** Confirmation by examination and provisions of objective evidence that the particular requirements for a specific intended use are fulfilled.
- In design and development, validation concerns the process of **examining a product to determine conformity with user needs.**
- **Verification:** Confirmation by examination and provisions of objective evidence that specified requirements have been fulfilled.
- In design and development, verification concerns the process of **examining the result of a given activity to determine conformity with the stated requirement for that activity.**



# V&V Simplified

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- **Validation** confirms that the system delivered meets user defined needs.
- Answers Question: Are we building the **right system**?
- **Verification** focuses on the quality of work products and deliverables.
- Answers Question: Are we building the **system right**?



# Project Management Body of Knowledge

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## Knowledge Areas

- Project Integration Management
- Project Scope Management
- Project Time Management
- Project Cost Management
- **Project Quality Management**
- Project Human Resource Management
- Project Communications Management
- **Project Risk Management**
- Project Procurement Management

## Process Areas

- Initiating
- **Planning**
- **Executing**
- **Controlling**
- Closing



# Quality Management

- Quality Management processes include all the activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken.

(PM-BOK Guide) Third Edition

Quality Management Consist of:

Quality Planning
<b>Inputs</b> <ul style="list-style-type: none"><li>Quality Policy</li><li>Scope Statement</li><li>Product Description</li><li>Standards &amp; Regulations</li></ul>
<b>Tools &amp; Techniques</b> <ul style="list-style-type: none"><li>Cost/Benefit Analysis</li><li>Benchmarking</li><li>Flow-charting</li><li>Cost of Quality</li></ul>
<b>Outputs</b> <ul style="list-style-type: none"><li>Quality Management Plan</li><li>Operational Definitions</li><li>Checklists</li></ul>

Quality Assurance
<b>Inputs</b> <ul style="list-style-type: none"><li>Quality Management Plan</li><li>Results of Quality Control</li><li>Measurements</li><li>Operational Definitions</li></ul>
<b>Tools &amp; Techniques</b> <ul style="list-style-type: none"><li>Quality Assessments</li><li>Quality Audits</li></ul>
<b>Outputs</b> <ul style="list-style-type: none"><li>QA Status Reports</li><li>Quality Improvement</li></ul>

Quality Control
<b>Inputs</b> <ul style="list-style-type: none"><li>Work Results</li><li>Quality Management Plan</li><li>Operational Definitions</li><li>Checklists</li></ul>
<b>Tools &amp; Techniques</b> <ul style="list-style-type: none"><li>Inspection/Reviews</li></ul>
<b>IV&amp;V</b> <ul style="list-style-type: none"><li>Trend Analysis</li></ul>
<b>Outputs</b> <ul style="list-style-type: none"><li>Quality Improvement</li><li>Acceptance Decisions</li><li>Rework/Adjustment</li><li>Completed Checklists</li></ul>



# Quality Measures

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- In a Quality Management approach each development effort should establish a set of quality attributes that define up front the important elements necessary to ensure quality
- Examples:
  - Performance
  - Dependability
  - Integratability
  - Maintainability
  - Usability
- *All From IEEE610, Glossary of Software Engineering Terms*
- These attributes change in an SOA setting



# IV&V Role In Quality Control

- Quality Control involves monitoring specific project results to determine if they comply with relevant quality standards, and identifying ways to eliminate causes of unsatisfactory results.

*(PM-BOK Guide) Third Edition*

## Quality Control

### Inputs

Work Results  
Quality Management Plan  
Operational Definitions  
Checklists

### Tools & Techniques

Inspection/Reviews  
IV&V  
Trend Analysis

### Outputs

Quality Improvement  
Acceptance Decisions  
Rework/Adjustment  
Completed Checklists

- Quality Prevention
  - Establishing quality processes
  - Utilizing an “Open Book” Philosophy
- Quality Inspection
  - Deliverable reviews
  - **Independent Verification & Validation (IV&V)**
  - Acceptance Recommendations
- Quality Improvement
  - Completed checklists
  - Acceptance Decisions



# Developing V&V Focus Areas

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- Criticality Analysis
  - Start by Identifying critical components—  
new or NBD\*
  - Mission critical functionality
- SVVP –All V&V activities must in defined and approved plan, as an Open Book
- Focus areas can include software, integration, conversion and business processes

\*Never Been Done



# V&V Qualities

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- **Correctness** – is each deliverable correct in respect to its methodologies, conclusions, and logic? Is each deliverable accurate in respect to facts and computations?
- **Completeness** – is each deliverable complete in respect to objectives and scope?
- **Consistency** – is each deliverable internally (within the deliverable) and externally consistent (across related deliverables)?
- **Traceability (and Testability)** – can each requirement be independently, repeatedly verified and validated. Are there objective acceptance criteria that the purpose and objectives of the demonstrated in the final product?



# Design and Development

IV&V contractor assesses the design and development processes and the product artifacts using IEEE processes as adapted in SVVP to ensure contractor is complying with contract and meeting requirements, through proactive participation in process



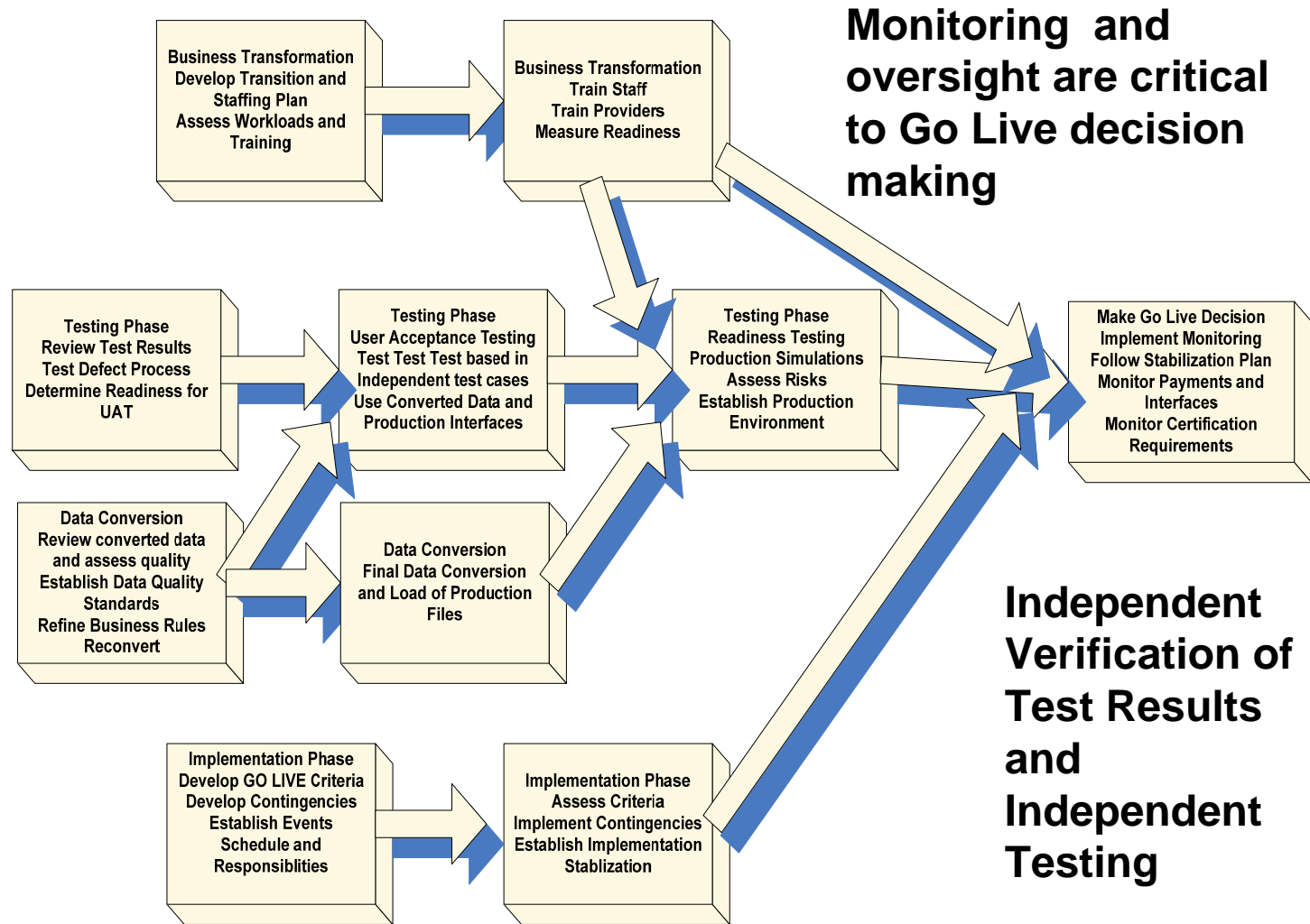
*Independent Requirements Management*

IV&V includes both process and product reviews

- Correctness
- Completeness
- Consistency
- Testability to Verify Requirements



# Testing and Implementation





# State Considerations

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- **Quality Planning begins in Procurement**
  - Development of Requirements that conform to standards
    - MITA provides industry specific definitions
    - IEEE Std 830-1998, Recommended Practice for Software Requirements Specifications
- **Define expectations for Software Life Cycle**
  - IEEE 12207 -- Process Definition
- **Define expectations for Quality Assurance**
  - IEEE 730-1998 -- Process Definition
- **Establish Milestones and Acceptance Criteria**
  - Progress Payments – Product Definition



# State Considerations

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- Quality Management components are loosely coupled and inter related
- IV&V should be considered a part of the overall quality management approach with and in addition to Quality Assurance
  - Quality Assurance can be a state or a QA contractor responsibility
  - Quality Assurance may include Risk Management (and Issue Management)
  - IV&V could focus on process assessment of how DDI contractor performs internal QA
- No Matter what it is called Quality Management must cover all the bases



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*“It's still trust but verify.  
It's still play, but cut the cards.  
It's still watch closely.  
And don't be afraid to see what you see.”*

President Ronald Reagan  
Farewell Address January 11, 1989