



# INDEPENDENT VERIFICATION & VALIDATION (IV&V) QUICK GUIDE

**GUIDELINES ON ENGAGEMENT OF  
IV&V SERVICES (TESTING BY  
THIRD PARTIES) IN ICT PROJECTS  
UNDERTAKEN BY PUBLIC SECTOR  
AGENCIES**

**Version 1.0  
November 2018**

***Malaysian Administrative Modernisation and Management  
Planning Unit (MAMPU)***





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## Preface

The world today is heavily reliant on digital technologies which are driven by software. With multiple connected systems dealing with high-risk or mission-critical software applications, it is logical that the need for the independent validation & verification (IV&V) will be more pronounced in ensuring system quality.

Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) through Malaysian Public Sector Testing Centre of Excellence (MyTCoE) aims to strengthen the implementation of IV&V in Malaysian Public Sector towards higher quality of software application.

Hence, MAMPU released this IV&V Quick Guide to serve as quick reference for agencies to engage, manage and implement IV&V Services. It is in essence a simplified version of the IV&V Handbook Version 2.0. The principal reference is available at [www.mampu.gov.my](http://www.mampu.gov.my).

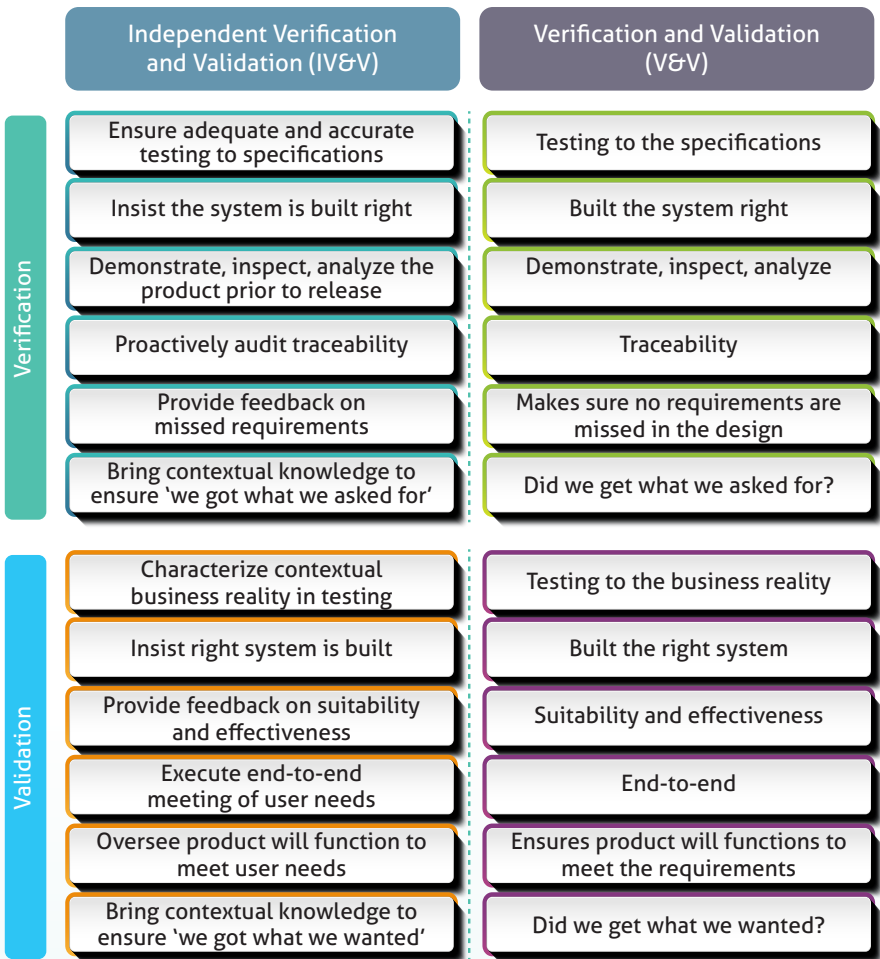
### Reference

MAMPU 2018. Independent Verification & Validation (IV&V) Handbook version 2.0: Guidelines On Engagement Of IV&V Services (Testing By Third Parties) in ICT Projects Undertaken By Public Sector Agencies

# Definition of IV&V

IV&V is verification and validation (V&V) performed by an organization that is **technically, managerially, and financially** independent of the development organization.

Verification and validation (V&V) are processes used to determine whether the products conform to the requirements and satisfies its intended use. Simply put, IV&V is about putting independence into V&V to assure quality and to avoid bias.





# Services Offered in IV&V

## Verification & Validation (Static Testing)

### Early Testing

- conduct reviews of documents e.g. System Requirements Specifications (SRS), User Requirements Specifications (URS) etc.
- assess the design, and conduct code walkthroughs.

## Verification & Validation (Dynamic Testing) - Functional Testing

### Functional Testing

- ensure the ICT product being acquired meets the business and operation specifications of the software.
- test functions by using test cases to see if inputs lead to the expected outputs (to describe what the system does compared to what it was expected to do).

### Security Testing

- assess the vulnerabilities in protecting data.
- assess the intended secured functionality

## Verification & Validation (Dynamic Testing) - Technical Testing

### Performance Testing

- assess the speed or effectiveness of the ICT system end-to-end typically involving quantitative speed tests done in a lab, such as measuring the response time of the ICT system to perform a task.

### Load Testing

- put demand on an ICT system and measure its response in keeping up with the requests.
- determine how well the ICT system will operate under normal and anticipated peak processing demand conditions.

### Stress Testing

- determine the stability of ICT system when pushed beyond normal operational capacity, often to a breaking point or system crash point.
- assess whether the system withstand the onslaught of information or requests required.

# Benefits of IV&V









-  01 An objective system development appraisal
-  02 A baseline set of testable requirements that match the user's need
-  03 Opportunity to identify problems early in the lifecycle
-  04 Increased requirements and design visibility and traceability
-  05 Early potential problem area indication
-  06 Development risk reduction
-  07 Improved maintainability and reliability

# When to Engage an IV&V Provider

According to Ministry of Finance (MOF) circular, PK2.1 Kaedah Perolehan Kerajaan, critical and high impact system development projects need to implement IV&V.

## Criteria for critical and high-impact ICT projects that need to implement IV&V

-  system development projects which are of high-risk and potentially life-threatening such as the tsunami alert system or traffic control system
-  system development projects that could potentially affect and harm public health such as patient information systems or vector control systems
-  system development projects that could potentially pose a threat to national security such as immigration systems or maritime systems
-  system development projects that could potentially affect national economy and finance such as tax systems or accounting systems
-  high complexity and cross agencies system development projects that has a direct impact on the people
-  system development projects which support agencies core business (mission critical)

## Criteria of IV&V Provider

IV&V Providers who intend to participate in government projects must have accreditation in MS ISO/IEC 17025 related to software testing from Standards Malaysia or recognition from TMMi Foundation in Test Maturity Model Integration (TMMi) Level 3 and above.



**MS ISO/IEC 17025**

General Requirements for The Competence of  
Testing and Calibration Laboratories  
(related to software testing)

OR



Test Maturity Model Integration  
(TMMi) Level 3 and above

# Guiding Principles of IV&V

## Essential Principles

01

IV&V must be independent at each stage of the systems development lifecycle.

02

The Agency must include IV&V services in Request for Proposal (RFPs) for software development and augmented testing.

03

IV&V engagement must not be left to the last stage.

04

IV&V Provider acts as The Agency's partner in representing The Agency's interest.

## Suggested "Good-Practice" Principles

05

Staff and skills augmentation may be key drivers for IV&V engagement.

06

IV&V Provider may provide services relevant to technical systems and standards being used.

07

IV&V Provider may be asked to verify design documents mapping to requirements before coding starts.

08

IV&V Provider may approve system documents and user documents for all Agency technology projects.

09

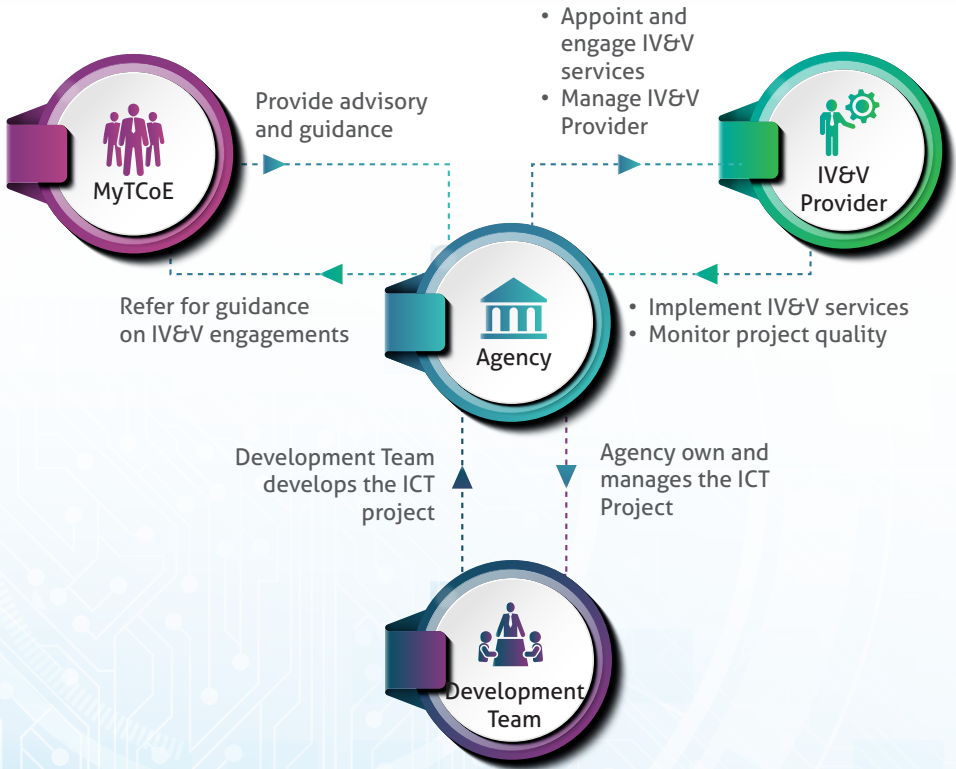
IV&V Provider may be involved in project management office (PMO type) operations.

10

IV&V Provider may provide risk management reports and monitoring services.

# Stakeholders Involved in an IV&V Project

The implementation of IV&V in government system development project involve four(4) distinct stakeholders: Agency, IV&V Provider, Development Team and MyTCoE. Relationships between the stakeholders are as below:



# Roles and Responsibilities of Stakeholders

- Scope out the IV&V contracts and statement of works.
- Perform the evaluation of IV&V Providers and engages their services.
- Work with the IV&V Provider and other stakeholders towards a successful ICT project implementation.



Development Team

- Perform the ICT development, COTS customisation and solution implementation as engaged by Agency.
- Know where and how they will need to interface and synchronize with IV&V Providers and Agency, during an ICT project.
- Perform the typical software development activities including requirements, analysis & design, coding, testing, training etc.

- Third-party organization that provides IV&V services
- Monitor the quality
- Communicate the quality assessment findings objectively and in a timely manner
- Collaborate with Agency's appointed Development Team and experts



MyTCoE

- Work with Agency to review quality plans, assist in determining the need for and selection of an IV&V Provider for specific projects.
- Confirm IV&V Provider independence and project estimations.
- Provide advice and feedback on matters related to IV&V Engagements, including IPP and Quality Gate.
- Measure or obtain measurements of quality level at respective milestones, also known as 'Quality Gates'.
- Educate and train Agency's staff on IV&V and activities across engagement phases, testing types, and testing needs.
- Support quality status reporting and issue close-out by Agency.
- Ensure project metrics and data are collected at Agency level, and then consolidate at MyTCoE.

# Phases and Activities of IV&V

IV&V Engagement typically consists of three (3) phases and an IV&V Provider may perform IV&V-related activities for all the phases.

## Pre-Engagement

1

### Activities

- i. Prepare for starting and defining the IV&V Engagement:
  - Stakeholder Requirement and Definition
  - ICT Acquisition
- ii. Appoint an IV&V Provider

### End of Pre-Engagement

- ✓ successfully engaged the IV&V Provider
- ✓ be able to conduct a joint Project Kick-Off, signifying both the IV&V Provider and Development Team can officially commence their respective engagement activities in a coordinated manner.

## Engagement

2

### Activities

- Engage IV&V Provider for the reviews and augment testing during the process of:
- i. building, enhancing or modifying the ICT to be released to users
  - ii. operating and maintaining production ICT for business continuity

### End of Engagement

- ✓ Report Out - final documents and records over the course of the IV&V engagement regarding:
  - its results and achievements,
  - its management activities,
  - assessment of Agency testing skills and competencies,
  - lessons learned and testing improvements, and
  - any unresolved items.
- ✓ Handover - completed IV&V deliverables are handed over to the Agency. If IV&V engagement is not continuing, artefacts, test wares handover and knowledge sharing from IV&V to the Agency is needed.
- ✓ Normal and Abnormal Closure of IV&V engagement
- ✓ Suspension and Resumption of IV&V engagement

## Post-Engagement

3

### Activities

Work(s) performed after the IV&V Engagement is over, and may be covered by a separate contract:

- ✓ Data Report Out
  - Post-Engagement sizing and measurement
  - Data driven management - collecting Agency data, aggregating and sharing with MyTCoE
- ✓ Post Engagement Review
  - Usually completed 6 to 12 months after engagement to compare outcomes of expected results - ROI
  - Discuss lessons learnt and testing improvements
- ✓ Identify and implement continual improvements for future IV&V in public sector



# Application and Approval Process in Pre-Engagement Phase

Application and Approval: Engagement Definition



T h e A g e n c y

- Pre-Application: Engagement Definition**
- i. Produce Project Initiation document
  - ii. Produce Project High-Level Requirements/Specifications list (covers Development and IV&V)
  - iii. Produce detailed Project Requirements/Specifications list (covers Development and IV&V)
  - iv. Complete the IV&V Questionnaire Form/Checklist
- Pre-Application: Tender Development**
- i. Produce Tender Specification Documents (separate ones for Development (if co-sourced or outsourced) & IV&V)
  - ii. Perform Early and Quick Function Point count (E&Q FP)

Start of Pre-Engagement phase: (Project budget allocated and approved)

- IV&V Questionnaire Form/Checklist
- Project Proposal
- High Level Req Spec
- Detailed Project Req Spec
- Tender Specs
- Early E&Q

Review, advice and Recommendations

- Review & Recommendations**
- i. Review the completed Questionnaire Form or Checklist
  - ii. Provides advice and support to The Agency
  - iii. Makes recommendations to JTISA

IV&V Questionnaire Form/Checklist

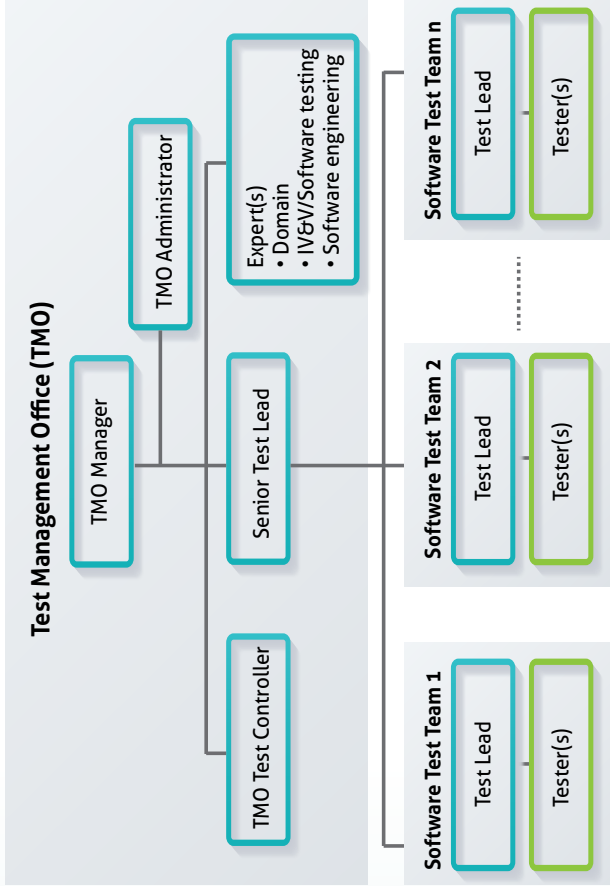
**Application for Final Approval**

- i. Obtain the approval from JP/ICT
- ii. Obtain the approval from JTISA (chaired by MAMPU) (depending on the project amount)

Proceed to Engagement Phase

M Y T C O E

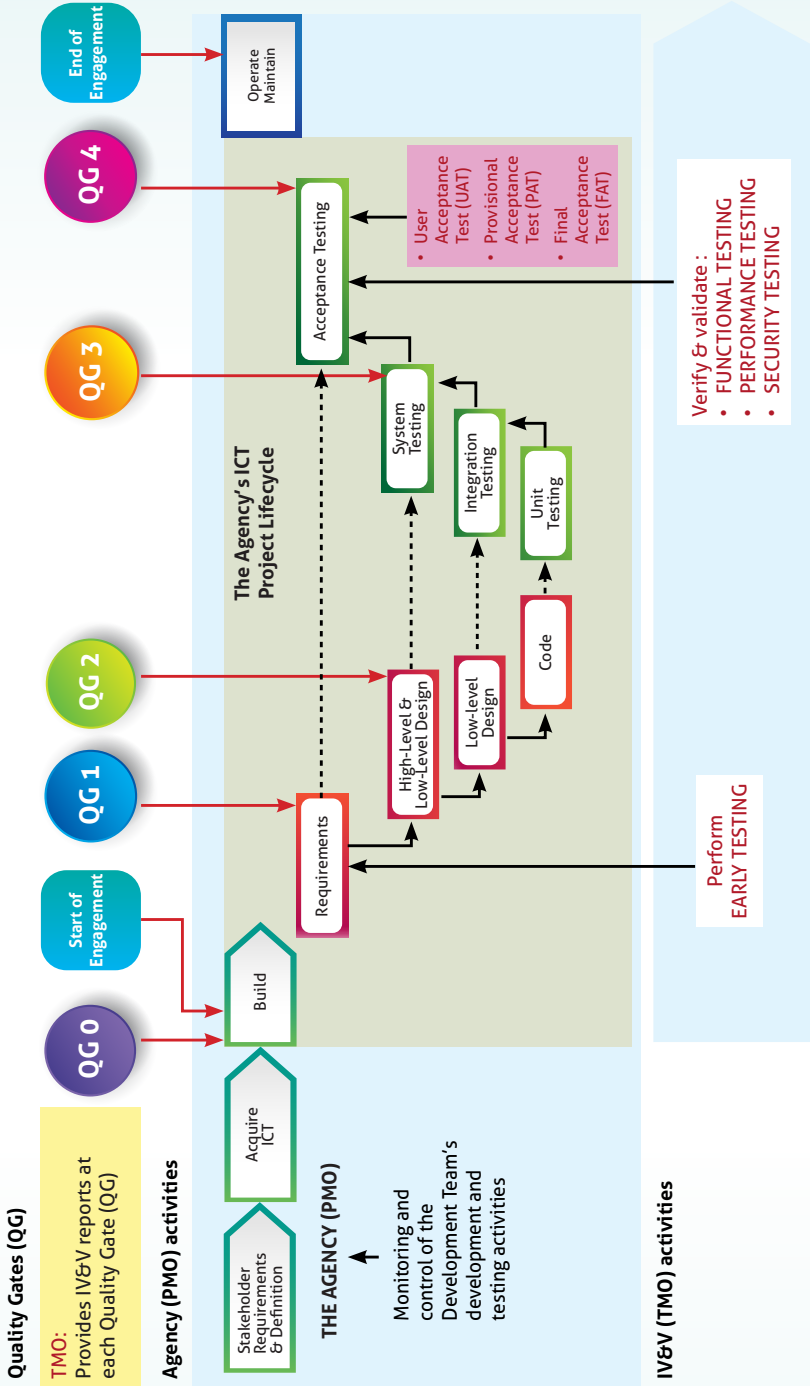
# IV&V Provider – IV&V Engagement Structure & TMO



Depending on the IV&V Engagement size and complexity:

- A role in the TMO may be fulfilled by one or more appointed persons, or
- A person may assume one or more roles in the TMO

# Engagement Phase: High-Level View of ICT Project Lifecycle



# Quality Gates (QG)

There are five (5) Quality Gates throughout IV&V engagement phases.

## QG 0

### PRE-ENGAGEMENT PHASE

#### IV&V Activities

- Review of Tender Requirements
- Calculate project estimation and sizing measurements
- Review of Proposed Integrated Project Plan (IPP).
- Review SLA to fix defects to be imposed on Development Team.
- Review the Quality Software Certification Report for commercial off-the-shelf products (COTS).
- Review prototyping and/or Simulation – for new technology/ high risk solutions, if/as required.

#### Expected 'Quality-focused' Outcome

- Improved Application, Budgeting and Approval process.
- Improved Tender Specifications, that include:
  - improved Responses to tender by vendors,
  - improved 'Common' project expectation involving:
    - > The Agency as a buyer,
    - > MyTCoE, and
    - > Software Solution vendor understanding.
- IV&V Provider and related capabilities.
- Improved the IPP and the overall expectation of system readiness.

## QG 1

### REQUIREMENTS

#### IV&V Activities

- Ensure COTS products are certified prior to customization - QS Product Certification (QS)
- Review of Requirements Specifications document – ensure specifications are testable.
- Review of testing processes to be executed by Development Team.
- Review of traceability by Development Team of how requirements are being used in design and other lifecycle documents.
- Review of Integrated Project Plan (IPP).
- Record and report "defects and omissions", and present during Quality Gate 1 checkpoint meetings.
- Recalculate and provide project estimation and sizing measurements based on the approved requirement

#### Expected 'Quality-focused' Outcome

- Improved IPP.
- Improved Requirements Specifications at end of QG 1.
- Improved confidence before to proceed beyond current Quality Gate.
- Provide confidence for the project to move to Design.

## QG 2

### HIGH-LEVEL DESIGN

#### IV&V Activities

- Review of product design documents.
- Review of analysis & design completed by Development Team to ensure design are testable.
- Review of traceability by Development Team.
- Review of test plan by Development Team.
- Review of Integrated Project Plan (IPP).
- Record and report “defects and omissions”, and present during Quality Gate 2 checkpoint meetings.
- Recalculate and provide project estimation and sizing measurements.

#### Expected 'Quality-focused' Outcome

- Improved Integrated Project Plan (IPP).
- Improved Test Design, at end of QG 2
- Improved confidence to proceed beyond the current Quality Gate.

## QG 3

### SYSTEM TESTING/ SYSTEM INTEGRATION TESTING

#### IV&V Activities

- Review System Testing/System Integration Testing test result and analysis done by Development Team.
- Analyse test documentation to verify requirements are addressed correctly and completely.
- Analyse & review of traceability by Development Team
- Review of Integrated Project Plan (IPP).
- Record and report “defects and omissions”, and present during Quality Gate 3 checkpoint meetings.
- Recommend test scenarios to be monitored and specific test results to be independently analysed.
- Recalculate & provide project estimation & sizing measurements.

#### Expected 'Quality-focused' Outcome

- Improved Integrated Project Plan (IPP).
- Improved Testing by Development Team, at end of QG 3
- Improved confidence to proceed beyond the current Quality Gate.

## QG 4

### ACCEPTANCE TESTING

#### IV&V Activities

- Augment testing done by Development Team (functional, non-functional, risk-based, experienced-based, etc.).
- Execute additional tests specifically designed by IV&V Provider.
- Record and report “defects and omissions”, and present during Quality Gate 4 checkpoint meetings.
- Recalculate and provide project estimation and sizing measurements.

#### Expected 'Quality-focused' Outcome

Establish confidence before release, at end of QG4.





## Conclusion

IV&V promotes and strengthens quality of application software development process. This IV&V Quick Guide provides essential guidelines to engage, manage and implement IV&V in public sector agencies. It includes relevant processes and activities that could increase the understanding of agencies and IV&V providers on IV&V implementation.

# *Spearheading Quality of Application Software in Public Sector*



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