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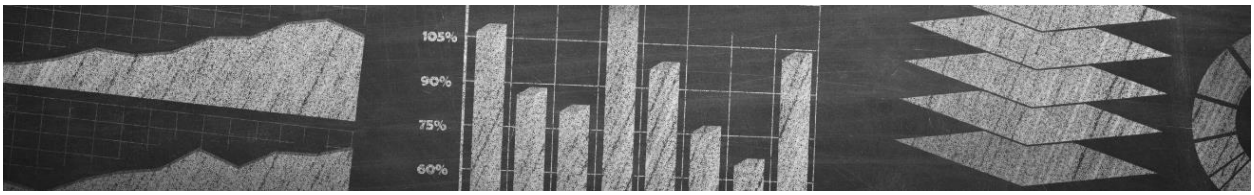
The Importance of Independent Verification & Validation



3773 Cherry Creek North Drive – West Tower, Suite 720 – Denver, Colorado 80209
Phone: 720.515.1377 Panorama-Consulting.com
Boston | Chicago | Denver | Houston | New York | San Francisco | Dubai | Lima

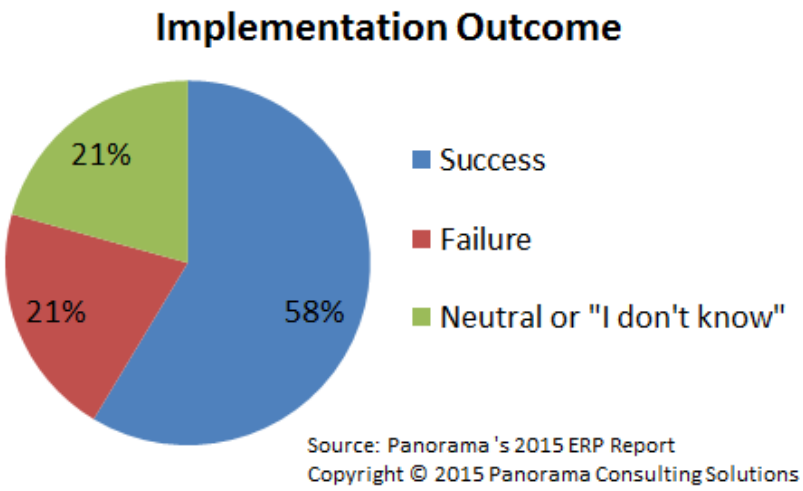
"It's still trust, but verify.
It's still play, but cut the cards.
It's still watch closely.
And don't be afraid to see what you see."
President Ronald Reagan
Farewell Address
January 11, 1989

Introduction

The increased complexity of software implementations continues to pose a challenge for many executives. While there is a growing field of highly skilled practitioners and a variety of tools, methodologies for ERP success, projects are still failing. A project failure can be the result of anything from budget overruns to unclear expectations. Sometimes, executives even abandon a project when it appears to be a waste of time and money.

Common Challenges With ERP Software Implementations

Each year, we conduct an independent analysis of ERP implementation costs, durations and the achievement of business benefits from both domestic and multinational organizations of varying sizes. According to our *2015 ERP Report*, nearly one-quarter of organizations (21-percent) do not know if their project was a success.

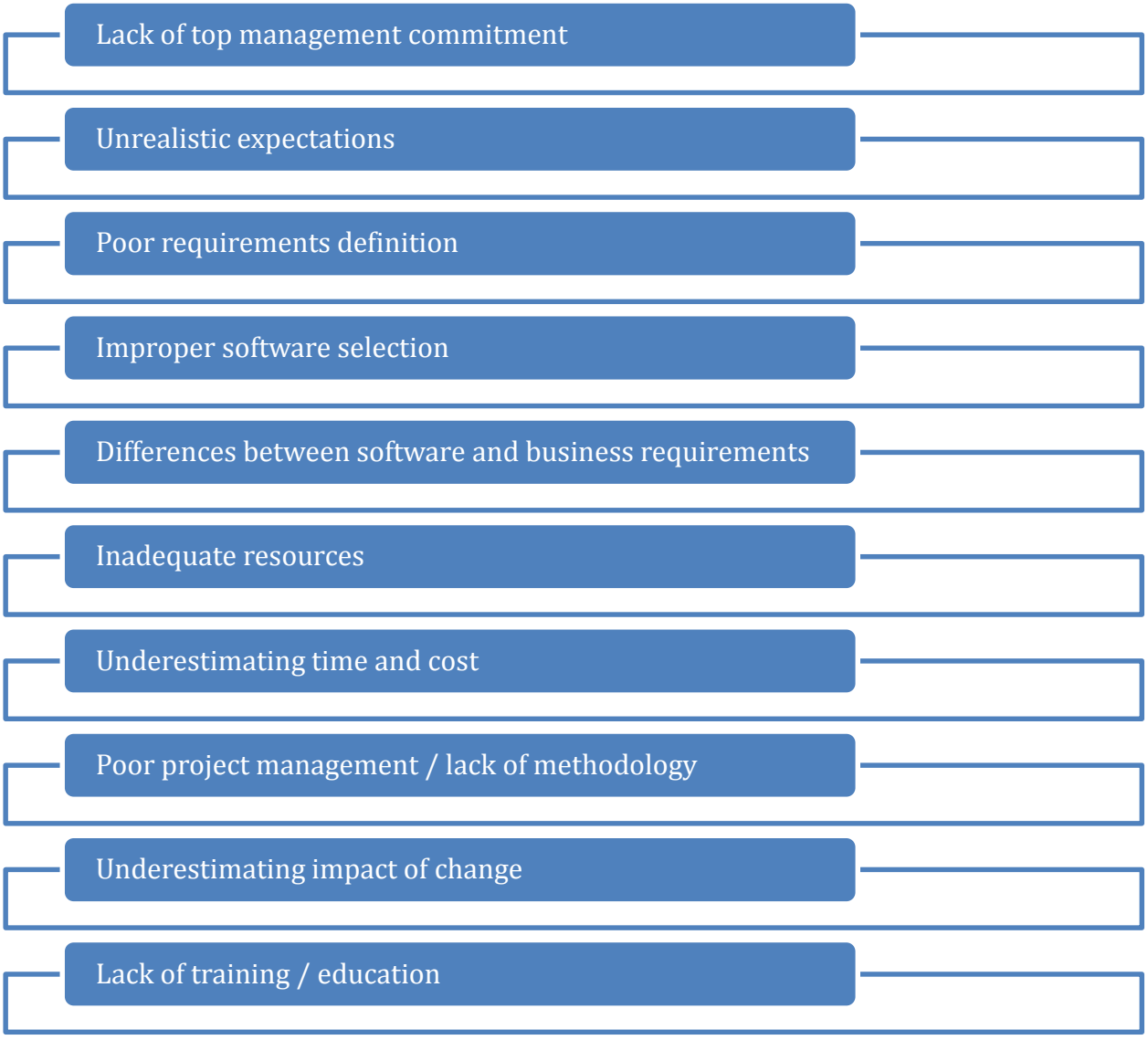


Source: Panorama 's 2015 ERP Report

Confusion regarding ERP success is typically an indicator that organizations did not invest adequate time in software selection, benefits realization measurement or post-implementation audits.

According to research from IAG Consulting, *The Impact of Business Requirements on the Success of Technology Projects*, more than 41% of the IT development budget for software, staff and external professional services will be wasted on poor requirements gathering. Simply stated, this means that a majority of implementations will fail, cost more than 150% of their original budget and take nearly twice as long as originally planned.

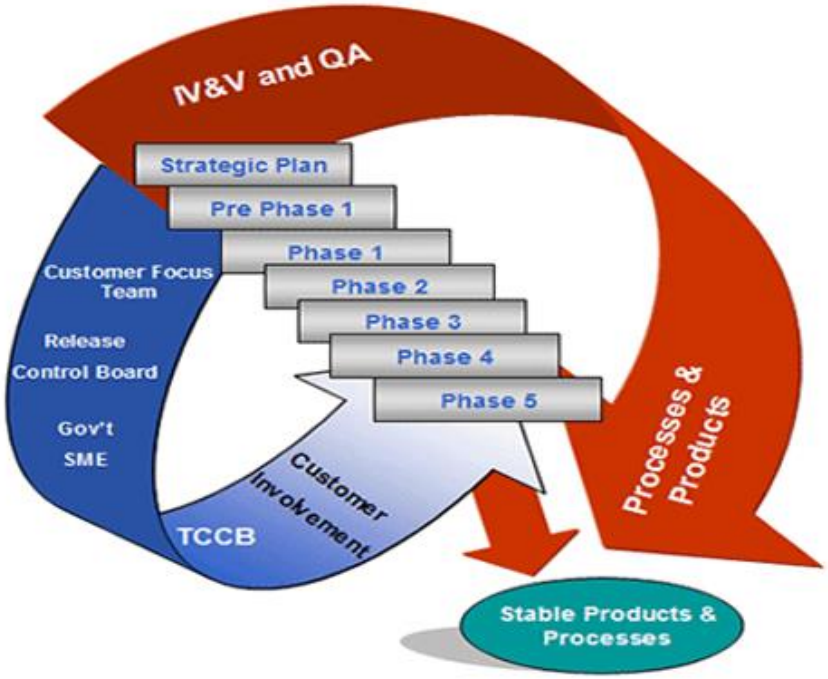
Top 10 Reasons Why ERP Projects Fail



“Are you building the right thing? And are you building it right?” –Barry Boehm

It is often said that independent verification and validation (IV&V) can be summed up in those two questions. “Are you building the right thing?” and “Are you building it right?” IV&V is a discipline with roots in science and the military. The methodology dates back to the early 1970s when the U.S. Army sponsored the first significant program related to IV&V for the Safeguard Anti-Ballistic Missile System. The standard is maintained by the Institute of Electronic and Electrical Engineers (IEEE), and has been adopted and widely used by agencies such as NASA, FAA, DoD and the ESA.

IV&V is a series of technical, managerial and financial activities performed by resources independent of the project team to provide management teams with an assessment of ongoing project health. The IV&V assessment and associated recommendations provide management and the project team with actionable advice based on industry standards and best practices to deliver a successful implementation.



Because IV&V is backed by the support of the customer while simultaneously being developer-independent, the effectiveness of the project increases. True IV&V relies on technical, managerial and financial independence in parallel with the development process. IV&V should be an overlay process that compliments the project lifecycle while adapting to unique applications for each individual project.

Key Elements of IV&V

Requirements Verification – This confirms that the software and interface requirement specifications are consistent with system requirements in a way that is unambiguous, complete, reliable (internal and inter-relational), testable (or verifiable) and traceable.

Design Verification – This ensures that interfaces between hardware and software are appropriate, and verifies that Interface Design Documents (IDD) are consistent.

Software Test Plan and Software Test Description Verification – This looks for effective test coverage. It is vital to build and examine traceability tables and document software requirements design artifacts. Data structure and algorithm analysis are also needed.

Implementation Verification – This ensures that design is accurately reflected in the implementation, and verifies that approved standards/practices are followed for coding, documentation, naming, data dictionary terms and both completeness and correctness of algorithms.

Application Verification – This allows for the verification of adherence to Software Test Plans and Software Test Descriptions. A duplication of some tests by an independent party often reveals perceived but unproven weaknesses, previously found but unsolved problems, and stress tests that have a large potential to crash the system.

Process Validation – This ensures that client standards and industry best practices are being employed to develop the product or execute the project.

Independent refers to the autonomous and impartial assessment of a project's adherence to project management plans and compliance with business requirements. These independent assessments are performed by an entity that is not responsible for developing the product or performing the activity being evaluated.

Verification refers to the process of determining if the project is adhering to project management disciplines, is planned and performed according to its project plans and adherence can be verified by an independent examination of project documents and other evidence.

- Are there defects in the design or code that cause unexpected results or fail to cause expected results with the import or export of data, user interface or hardware performance?
- Does the software work as expected for function and performance?
- Are we building the system correctly?
- Are applicable industry and best practices and standards being employed?

Validation refers to the process of evaluating a system or component during or following the development process to determine if it satisfies specified requirements. Validation is focused on the process used to build and deliver the application and takes more of an audit approach.

- Is the system internally complete, consistent and sufficiently correct to support the next phase?
- Does the system satisfy business and/or operational requirements?
- Are we building the right system?
- Are we following the defined process and executing to defined standards?

Primary Functional IV&V Activities

IV&V methodology mirrors the development process when requirements are fully defined prior to the creation of the design. The top-level, detailed designs fully implement the approved requirements prior to the development and coding. This is then tested at each level of integration before final system validation and acceptance testing.

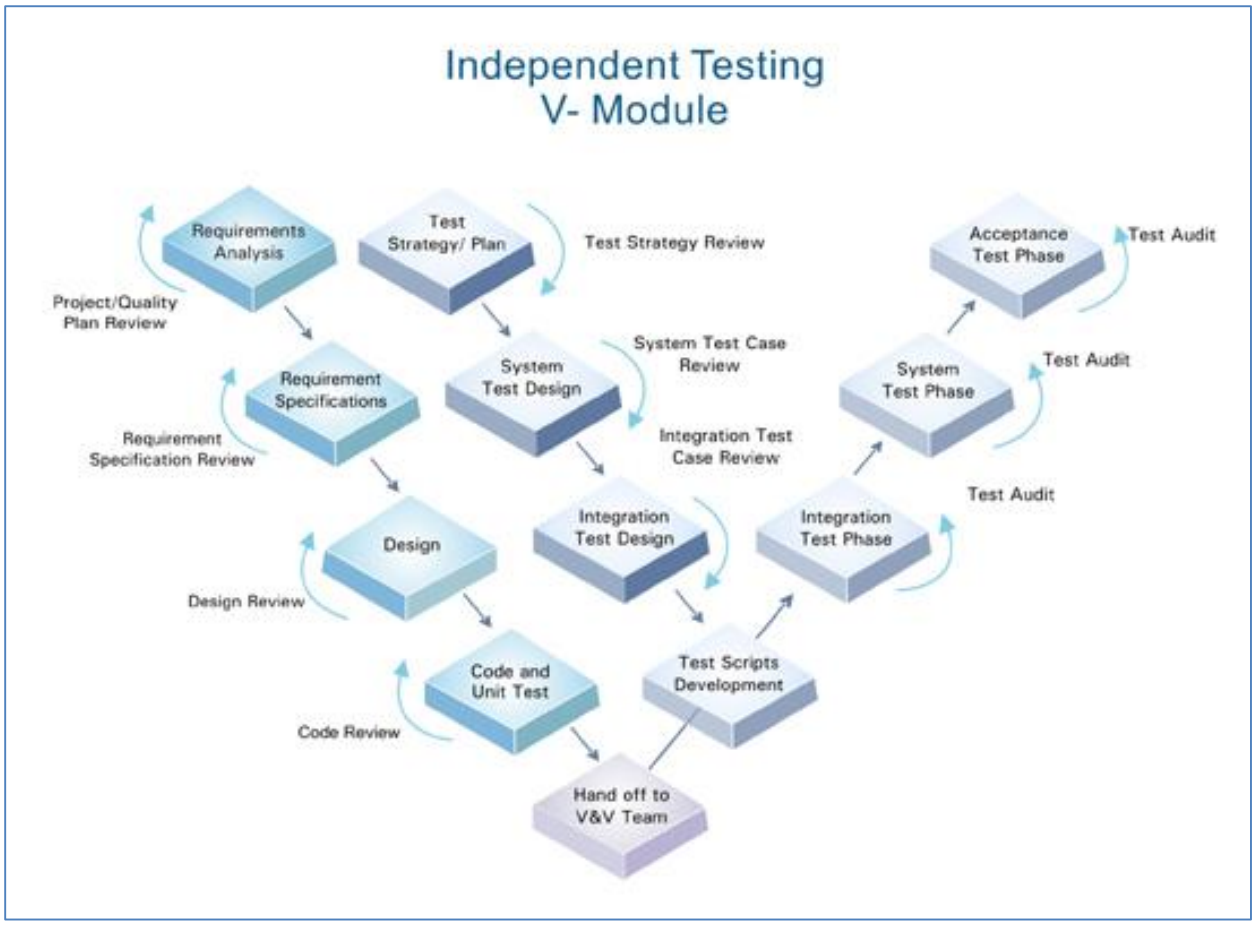


Diagram 1 – The Independent Testing 'V Module'

In the testing scenario outlined in Diagram 1, the team follows the V-model and participates in all phases of a project, such as formal technical reviews, audits and carrying out different levels of testing like "White box", "Black box" and "System" testing. Test automation solutions are regularly built and deployed to reduce test execution cycle-time. Developed Test Automation solutions are validated for compliance before being deployed for test cycle execution.

The team carries out meticulous reviews of all artifacts developed during the software lifecycle. This includes requirements, outputs of software development process, outputs

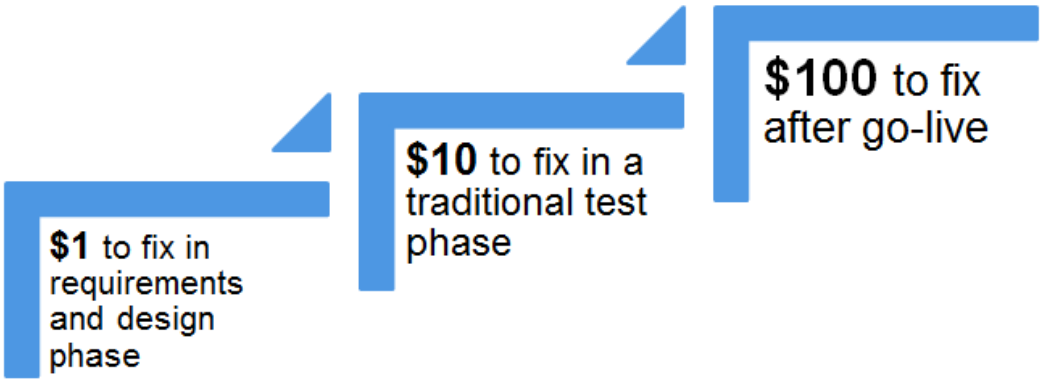
of integration process, outputs of IV&V process and the execution of test cycles in an independent manner.

Costs and Benefits of an IV&V Program

Full-phase IV&V development typically costs 10- to-20 percent of the cost of the software, which translates to only three- to four-percent of total project lifecycle costs. Detecting issues earlier in the project, can result in savings of up to 200-percent of the cost of the IV&V work itself.

From a maintenance perspective, one of the more crucial support items is documentation. An accepted fact (supported by numerous studies) is that post-deployment maintenance accounts for approximately 60- to 80-percent of the true lifecycle cost of an application. To facilitate effective post-deployment maintenance, the delivered documentation must reflect the actual application design, implementation and operational profile. With consistent oversight from the IV&V team, anomalies can be both addressed and resolved to result in higher quality documentation and training materials.

A defect increases in cost as it moves through the implementation phases:



Although numbers vary by project and environment, the cost to fix defects averages to what has come to be known as the "1:10:100" rule. [1]

Operational Value

The benefits derived from employing IV&V are substantial and span the product lifecycle. Beginning with improved requirements specifications and ending with a complete and

[1] "Achieving Software Quality Using Defect Filters," by Randall Rice

more maintainable application, IV&V can be viewed as an effective risk mitigation strategy that significantly increases the probability of producing a quality application, on-time and on-budget.

Quality Benefits

Although an IV&V firm cannot control the quality of the primary vendor's personnel, methodologies, work habits or commitment, an IV&V team can diligently review and analyze results, challenge and recommend processes and proactively protect the interests of the client.

Detecting errors, problems and opportunities for improvement at the earliest possible points can significantly reduce the overall cost of an IT project.

Defect Management

In the software development phase, the expense and time to repair defects increases exponentially the later a defect is detected in the process. An ambiguous requirement that is detected during user acceptance testing will cost up to 100 times more to repair than if it is caught prior to technical specifications.[2] It is the responsibility of the IV&V team to sample test for defects at each stage, to audit the primary vendor's project management processes for deviation and to constantly challenge the comprehensiveness and accuracy of each deliverable and milestone achieved.

[2] "Software Testing and Continuous Quality Improvement," by William E. Lewis (http://www.slideshare.net/brprathap145423/software-testing-and-continuous-quality-improvement)

How to Build an IV&V Plan

Project governance

- Examine the project's use of project controls, such as project plan, milestones, budgetary controls and resource planning.

Executive buy-in and alignment

- Assess executive buy-in, alignment of expectations with actual progress, communication, support and involvement in critical decisions related to the implementation.

Vendor management and compliance

- Analyze vendor's contract, statement of work and service-level agreements against actual progress to date.

Project resources

- Evaluate level of internal and external project staffing relative to workload as well as qualifications of resources.

Business requirements

- Assess quality of requirements documentation, process documentation and alignment of requirements with the configuration of software.

Configuration and customization management

- Identify processes to manage configuration and customization, including scope, prioritization, definition and rationalization of potential changes to the software.

Data strategy

- Evaluate data migration strategy, including mapping to the new system, data cleansing, migration and testing.

Infrastructure

- Assess IT's organizational and physical infrastructure relative to requirements to support the new system.

Solution integration

- Analyze level of business and technical integration between multiple business processes and the system.

Solution testing

- Assess technical, organizational and user testing of system, including documentation, mechanisms to log and resolve issues and appropriate sign-off.

Quality assurance

- Evaluate mechanisms to assure solution quality from a technical and business feasibility perspective.

Organizational change management and training

- Examine competencies and activities to optimize user adoption and understanding, including employee communications, organizational impact, organizational design and training.

Internal controls

- Facilitate review of the organizational and technical solution against regulatory and compliance requirements, in conjunction with the internal or external audit group.

Business and go-live readiness

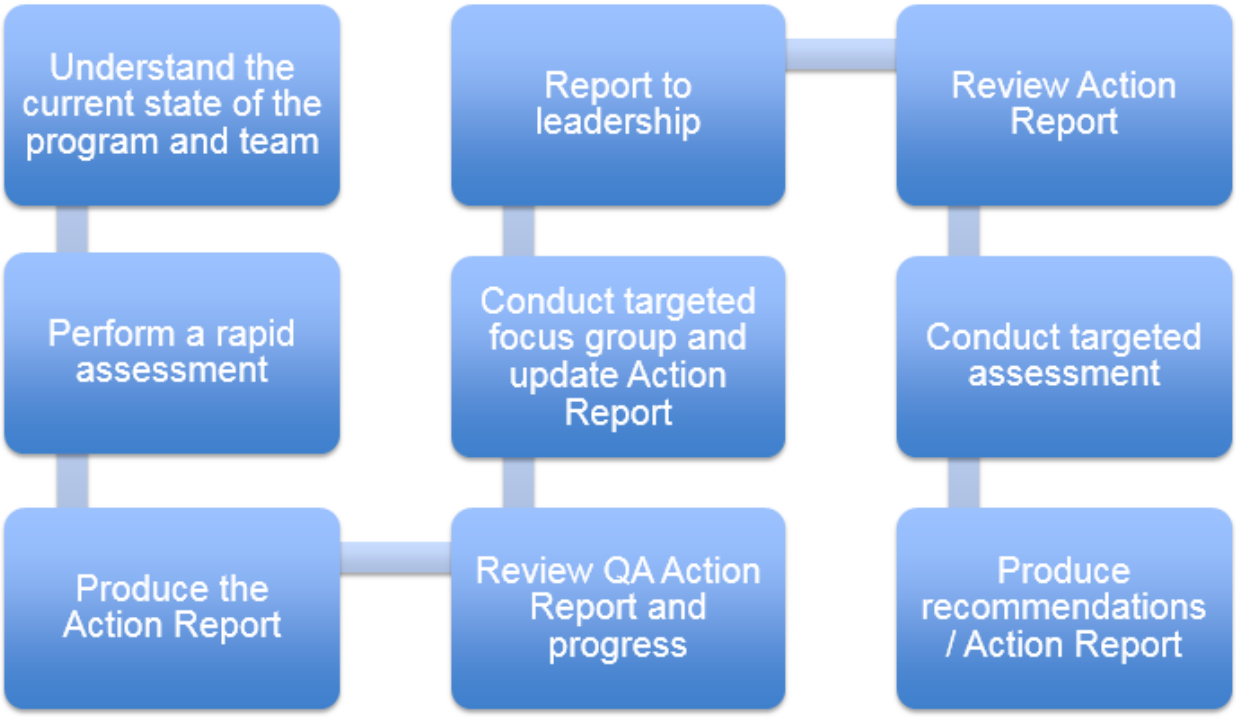
- Assess go-live readiness from a technical and organizational perspective, culminating in a go/no-go checklist prior to go-live.

Benefits realization

- Assess the definition of performance measures and evaluate benefits realization plans.

Your IV&V consultant must use their ERP experience, research, implementation tools and best practices in order to assess each of these areas on a monthly, quarterly or milestone-based basis. The consultant will require the primary input and analysis of your project manager and steering committee along with input from subject matter experts. This concludes with an executive report and presentation to the executive steering committee that includes prioritized risks and mitigation recommendations.

IV&V Team Activities



Measuring Return on Investment

Return on investment is used to evaluate the efficiency of an investment and compare the efficiency of various investments in order to determine if the project is feasible.

A return on investment formula can be expressed as:
ROI = (Gain from Investment – Cost of Investment)/Cost of Investment

1. Was the gain tangible or non-tangible?
2. Was the gain financial or non-financial?
3. What was the cost of the investment?

While there is no industry standard on ROI values, the NASA PAE 2008 Study shows ROI values ranging from 1.5 to 12. It states, “There is a wide range of opinions and studies regarding the cost effectiveness of IV&V. The study team was unable to identify a common methodology for calculating ROI, and individual Case Studies using the same methodology resulted in a range of values.”

The Business Case for Incorporating IV&V Into Software Implementations

IV&V can increase the financial value, operational efficiency and quality of your project. With an unbiased audit and assessment of processes and deliverables, IV&V mitigates risk and provides greater visibility at the financial, managerial and subject matter level.

Overview of the Benefits of IV&V

- Increased likelihood of uncovering high-risk defects early in the development lifecycle
- Ongoing status indicators and performance reporting to program-level managers
- Stakeholders’ visibility into the progress and quality of the system software development effort
- Reduced need for rework by developing contractor, and reduced total cost of programs and development projects
- Reduced defects in delivered products
- Business process alignment with the new ERP system
- Organizational acceptance of new processes

Inflexible, archaic project management methodologies can result in significant cost overruns as well as failure to meet fundamental business requirements over the course of the project. After the software purchase, the most significant cost occurs during the development phase. If there are gaps in the business requirements and implementation plan during the development and strategy phase, disaster could be on the horizon.

About Panorama Consulting Solutions

Panorama Consulting Solutions specializes in enterprise consulting, infrastructure consulting and enterprise resource planning (ERP) consulting for mid- to large-sized, private and public sector organizations across the globe. One-hundred percent independent of affiliation, Panorama helps firms evaluate and select ERP software, implements the software and facilitates all related organizational changes to ensure that each of its clients realize the full benefits of their ERP implementation. We also offer our clients IT strategy, business process reengineering, ERP staffing, sales assessments, energy fueling assessments, emergency/disaster fund management, independent verification and validation, project management oversight and expert witness testimony.

More information can be found on its website, Panorama-Consulting.com and Twitter feed, Twitter.com/PanoramaERP.