

A SUCCESSFUL APPROACH TO IMPLEMENT ENTERPRISE AUTOMATED REGRESSION TESTING “e -ART”

A White Paper
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1. Abstract

In today's world of global IT transformation, Software systems supporting intricate business processes are frequently modified or upgraded to stay in tune with changing business conditions. Complex interactions of systems demand robust testing capabilities. The owners of such systems are thus often caught between the need for quick deployment, time & cost constraints. Situations such as these result in limited or error-prone testing efforts that compromise the robustness and reliability of business-critical applications.

Extent of testing is unknown and must be inferred based on the stability of the application. Changes to any functionality may cause problems in other areas. Although standalone releases are usually stable, integration with other products often create challenges. This is a common fact since manual testers often face the problem of pressure to conclude a cycle of executions in the reduced time set aside for this purpose. They may be confused by the large number of tests to be executed, the similarity between them and the complexity of the tests.

Only a test team that can churn out test deliverables in shortest time can identify the issues quickly. The regression testing involves re-execution of previous tests as well as upgrading the core functionality regression packs with new test cases, thus constantly expanding the scope of testing. The expansion of scope directly impacts the testing timelines. The solution does not lie in increasing the team strength. The test team must move toward automation of frequently used core test cases!

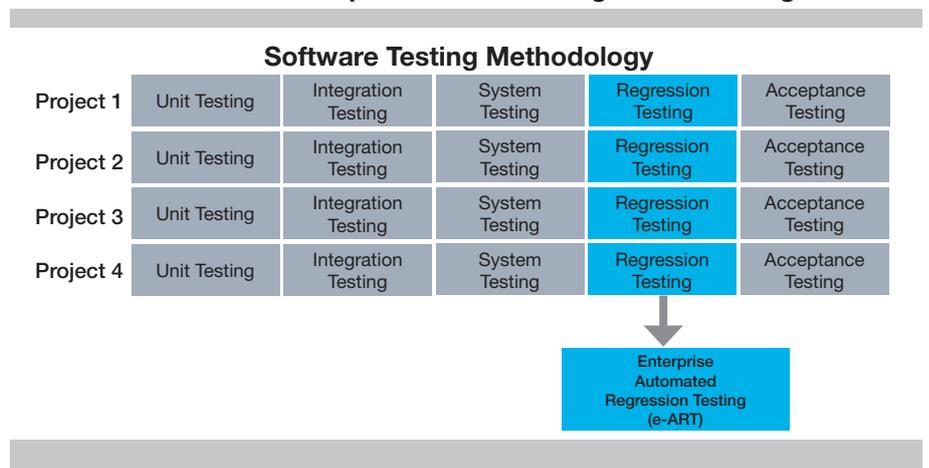
This paper explores the challenges in setting up Enterprise Regression test automation & puts forth some practical options to help put in place mature, structured Enterprise automation center of excellence. Also, helps organization to develop a business case for Enterprise Automated Regression Testing (e-ART).

2. Introduction

What is Regression Test automation?

Regression testing is used to check if any new bugs have been introduced through previous bug fixes. Regression testing is conducted after every change or update in the software features. This testing is periodic, depending on the length and features of the software. Test automation is an idea of having a computer run tests instead of running them manually. The tests can be rerun many times without spending too much effort, which makes it easier to find bugs early in life cycle and improves product quality before going live into production.

When to consider an Enterprise automated regression testing solution?



Imagine everyone doing something different to achieve the same regression testing!

It introduces inefficiencies, extra resources and unnecessary competition. Many different ways to manage test execution, results processing, redundant defect tracking and reporting.

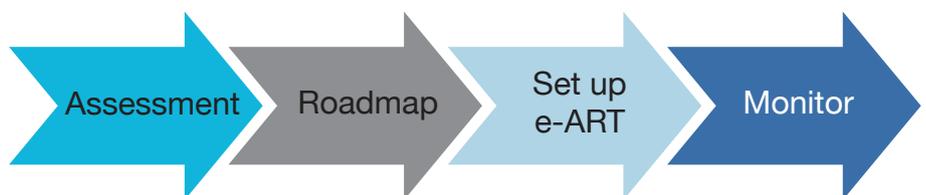
Few more reasons to consider are mentioned below:

- Having issues with your test scenarios involving complexly integrated partner systems
- Unable to ensure test suite adequacy for controlled and emergency releases
- Changes to any functionality may cause problems in other areas of application or integrated systems
- For every regression run, test case selection & corresponding test data set up is tedious & time consuming
- QA timelines are often slipped due to unavailable test environment, test data issues or other dependencies
- Errors that were fixed before start creeping back, because of long development cycles
- In need of increased test coverage involving emerging versus legacy applications
- Large number of test cases / business process to be tested repeatedly in very short time
- Team members unavailable to execute scripts after business hours

Enterprise Automated Regression Testing – Possible business value?

One component to serve many groups with Consistent philosophical approach, Common focus, belief and understanding helps to improve efficiency and removes redundancy. Appropriate delegation of tasks across organizations will increase efficiency and removes redundancy. Exponential increase in delivery of objectives with a common scripting framework, a much larger delivery of test automation scripts can be accomplished. Automates the functional test cycle, specifically reducing regression testing time by implementing the test data automation. Provides incremental returns from the same investment, by reusing test cases throughout various phases with a centralized repository.

Approach to be followed to establish e-ART



Before establishing an Enterprise automated regression testing, we need to understand each organization requirements. An assessment will determine the level of sharing across the enterprise, what will stay the same? What will be different, shared work across teams using a common & different platforms, evaluate in the context of enterprise solution. By standardizing on industry-leading testing solutions, e-ART can realize significant savings.

3. Assessing an organization's readiness for e-ART

Like any new endeavor, e-ART transition begins with an assessment of areas like test automation process, methodologies, scripting techniques, moment of involvement in SDLC, test data process, test environment & knowledge management. The assessment can help, identify the key challenges in organization and analyze its readiness to begin the e-ART conversion process.

An IT organization that views quality as an integral part of the application lifecycle management will be more responsive for prioritization, planning and measurement as part of e-ART. In contrast, a company that treats application test automation as one-time, project based activity is going to have to implement additional standardization.

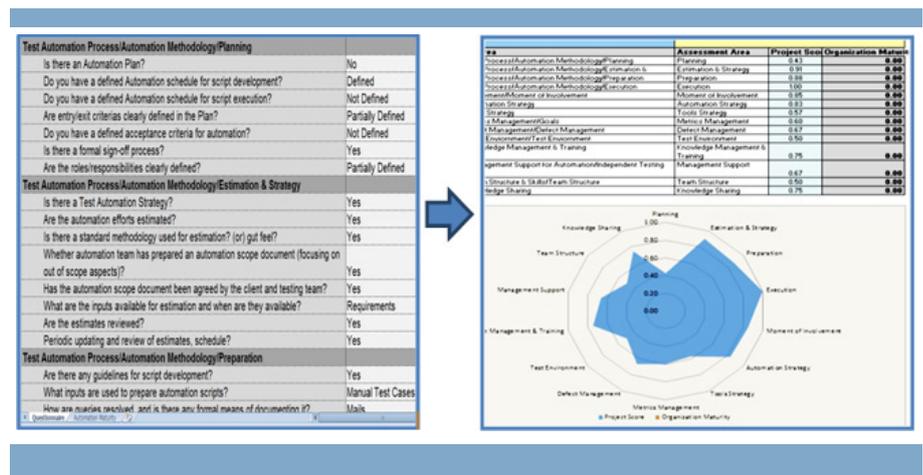
For an organization that has not adopted any best practices in other aspects of the business, e-ART can be the first step towards implementing structure, control and measurement standards. On the other hand, an organization that has demonstrated an ability to adopt and manage standards such as centralized testing center (TCoE) or shared services infrastructure in other areas is more likely to be more culturally receptive toward an e-ART solution.

Key activities:

- Automation maturity , automation potentials, challenges, stakeholder commitment, cultural maturity, skill set availability, need for test tools, environment, Key performance indicators will be measured during the Assessment process
- A questionnaire to survey “as-is” automation model and interview current teams about automation Process, test coverage, Infrastructure etc., need to be created

Exit Criteria:

- Assessment score card need to be developed based on survey details. It can help to determine the gaps, high potential opportunities, automation requirements & justifies the investments into enterprise automated regression testing
- Recommendations to develop a business case



4. Defining the e-ART transformation roadmap

The road to a fully operational e-ART solution does not need to be a lengthy process. In my experience, an organization can complete the initial transformation phase in the first 3 to 6 months, followed by stabilization and optimization efforts spanning an additional 6 to 12 months. With the right approach, in less than six months, organization can begin to see real and concrete improvements in regression efforts. Moreover, in less than a year and a half, you can expect to realize even greater cost and quality benefits as a result of improved process efficiency and an introduction of a new, optimized regression model for the entire QA organization.

One of the key items of a working e-ART model for any organization is the fact that the teams funding the effort will need to remain in control of what they fund, why, and when? e-ART should deliver to the funding teams the automation artifacts. The best approach is to have two separate tasks (and the entity to perform these tasks): one defining and one monitoring. The defining task would constitute the software roadmap and the breakdown of this roadmap into components, including timelines, procurable elements, and deliverables. This roadmap would need to take the business case as input and could be viewed as a practical plan of execution for e-ART. The monitoring task would monitor progress on the roadmap and would report and advise the funding teams.

The funding teams could then decide on continuation of funding based on progress. Periodic updates and contingency plans will be needed. We view an approach based on such defining and monitoring tasks as a plausible and realistic way to move forward.



An e-ART transformation roadmap includes the following key elements:

- **Scope and timeline:** Define the major activities, milestones and timelines for each of the implementation stages: setup, transition stabilization and operation
- **Goals:** Establish goals for each stage in the key areas including test scripting, test coverage, quality, defect reporting and governance
- **Integration:** Determine how the e-ART interfaces with projects, management, service providers and other existing quality initiatives

- **Staff and training:** Assess skill availability and determine the need for resource reassignment, training, additional hiring and augmentation
- **Core teams:** Establish core teams of SMEs around the areas of automation, governance, asset management and other essential parts of the automation life cycle
- **Infrastructure and tools:** Estimate the cost and resource requirement for buying and maintaining the new testing infrastructure and test management and automation platform
- **Communication:** Promote the e-ART through internal communications and discussions to ensure that the entire organization is on-board with the e-ART solution
- **Governance:** Define strategic KPIs and integrate the e-ART into the overall QA governance structure. The e-ART KPIs should be aligned with the CIO objectives – such as cost efficiency, software quality level, time-to-market, flexibility and agility

As a result of the assessment and planning effort, you should be able to estimate what organizational changes are required for the transformation to the e-ART, approximate the essential hardware, software, skills and outside services investment and set high-level milestones and timelines.

5. e-ART evolution: From Adhoc Process to managed Services

The main concept of e-ART is the establishment and sharing of best practices and reusability of tools and resources – not the mandatory relocation of the entire operation under one roof. One of the key advantages of the e-ART is that, it can initially be built on a small scale, with minimal upfront investment, and without disrupting the current project delivery schedules and commitments. As the organization begins to see improvements and tangible results, it can scale up to full capacity, resources, responsibilities and services.

5.1 Stake Holders Commitment's

The level of organizational support and executive sponsorship can determine how quickly an e-ART can deliver real results. If the entire organization or business unit is not committed to making the transition, it will be much harder to establish strong quality processes, governance and metrics. Hence, Stake holders commitment and management support is very important to establish working e-ART model.

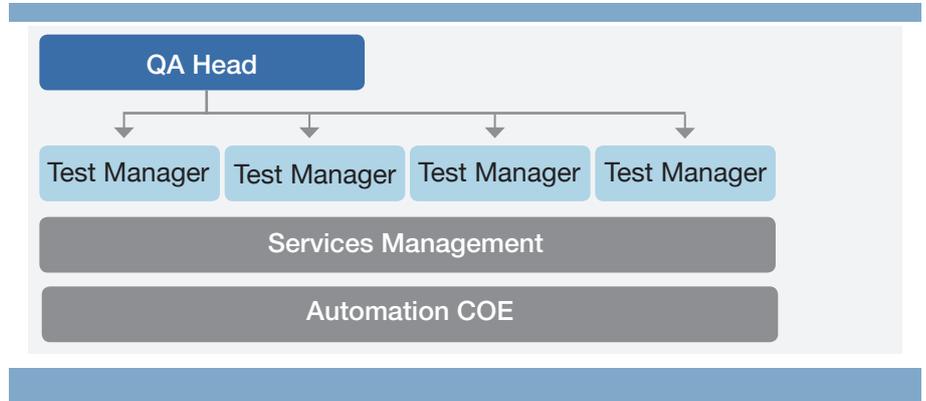
Also, lack of communication tends to be in the biggest stumbling block. With so many departments now involved in the success of e-ART, it is imperative that a project management system be put in place and all departments meet on a weekly basis to discuss updates to the initiative.

5.2 Service Based Engagement Model

The internal group of the centralized testing team may mirror the larger organization structure i.e. it may be internally organized by LOB, skill or service to develop subject matter expertise. The right framework of support can help optimize resources of the centralized team and its automation capabilities – productivity, time and cost. To achieve operation efficiencies and to address the business needs more effectively, organizations adopting e-ART need to revisit and transform their test automation delivery process.

Key activities:

- Services menu need to be defined with a clear outline of service description, scope, deliverables, SLA for each identified service
- End users or stake holders (Business / App dev / QA) need to initiate service request to execute / maintain the test scripts.
- Test automation team stake holders will expedite the requests in pre-defined SLAs. Services based model process flow need to be pre-defined and informed to the stake holders.



Few common test automation service options are mentioned below:

- **New Script Development:** Development of new automation scripts for a given application using the best available tools and techniques
- **Regression Testing:** Modification of scripts to ensure they are ready for execution and script execution before completion of UAT phase
- **Maintenance:** Updating and maintaining the automation scripts for upcoming / current changes. Carry out architectural changes if required & execute on current releases
- **Scripts Execution:** Execution of already developed Automation scripts
- Migration of scripts from older version of framework to e-ART adopted framework, which is one time activity

5.3 Core Team Set up

It is essential to have dedicated automation testing resource(s) when using pre-defined services to support the enterprise teams. The number of testing resources will vary depending on the size of the project or organization. Having these capabilities in a specialized team, allows the organization to learn and grow its test automation initiatives faster. Team members should adopt factory model to maximize the productivity.

Role	Duties
 Automation Architects	Define automation test objectives, strategies, standards and metrics. Drive code and process standards across the automation life cycle. Lead automation project plan, scope, schedule and implementation of tests within automation framework. Facilitate technical input and growth opportunities for further automation improvement. Lead in the analysis, design, development, and ongoing maintenance of automated tests and automation architecture / Frameworks. Capture, analyze, and provide metrics, other test related communications to business and IT management.
 Automation Engineers	Understand application under test, by discussing Test Cases with Functional Analysts. Develop test scripts in adherence to scripting standards, analyze object recognition patterns, unit test, and debug the automated test scripts. Develop driver script, library functions, initialization scripts, recovery scenarios, control file and input data sheet pattern or database tables to drive the test data. Document reusable functions that were developed. Turn over the baseline automated scripts for batch execution. User manual creation. Report show stoppers / issues to Architect for clarifications. Good knowledge of test automation tool and testing is required.

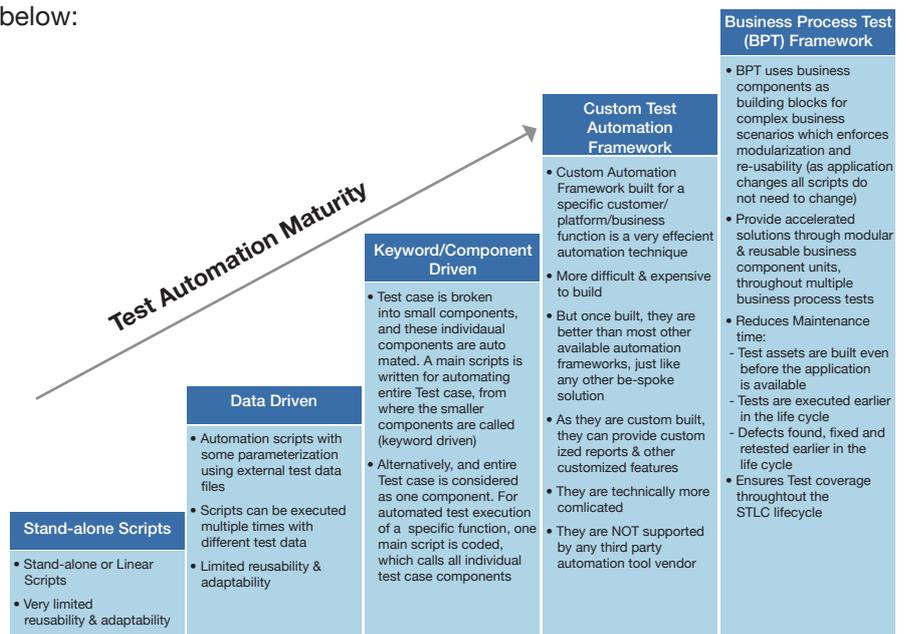
Role	Duties
 <p>Script Executors</p>	<p>Execute the automated test scripts in batch mode and analyze failures for multiple releases. Report the defects in test management tool and communicate the results to respective stake holders via e-mail.</p> <p>Once the test automation suite has been created, it is important to ensure it doesn't become obsolete as new enhancements and modifications are made to the existing applications. This requires the automation suite to be updated regularly. However, the script developers may not always have the required time to make changes to the script and complete testing. Hence, instating a dedicated team to maintain the automation suite is necessary.</p>
 <p>Functional Analysts</p>	<p>Identify and create test requirements using use-case documents, business requirements & detailed level design documents or a stable application build. Create new regression test cases in case of unavailability or standardize the existing test cases or evaluate already existing test cases to ease the test automation team activities. Create requirement traceability matrices by mapping the requirements to test cases and ensure the regression coverage. Bug contribution and reporting for every product release. Co-ordinate with automation team members to understand the test case validations by test case walk through. Analysts should also have knowledge of test environments, test data criteria to execute the test cases.</p>

5.4 Test Data Management

Unlike traditional approach of test data been given attention during test execution phase (which consume lot of quality time), the test data planning starts as early as the test planning phase. In the test planning phase during test requirement analysis, the test data requirements are also identified which continues until the end of Test Design phase. The test data need is studied in depth to start creating test data in test repository space. During test design phase and before test execution phase, test data are validated against schema and requirement to ensure the correctness of test data before the test script execution. Preference should be given to store data criteria rather than storing the static data which may not be relevant for all runs.

5.5 Adopt the Most Suitable Automation Framework

A test automation framework is a set of assumptions, concepts and tools that provide support for automated software testing. Choosing the right framework, tool helps in maintaining lower costs. The costs associated with test scripting are due to development and maintenance efforts. The approach of scripting used during test automation has effect on costs. Various framework/scripting techniques are generally used are listed as below:



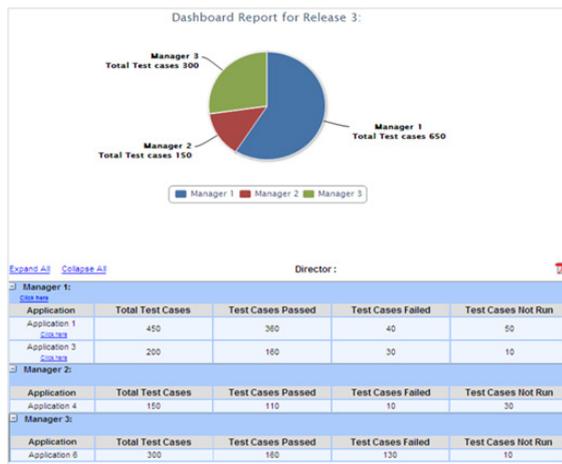
5.6 Dedicated test tools & environment

Centralized Ownership of the Testing tool: e-ART helps to reduce piecemeal tools and incompatible platforms used among various project teams. The centralized automation team is responsible to manage licenses and administrate them as well as distribute the tool around the organization. These are the very basic functions that can cut down on cost, license consumption and maintain consistency in e-ART deployment.

Virtual Automation Lab: Virtual test lab and environment automation helps you manage and govern pooled and shared virtual resources, including servers, storage and networks. Through proper provisioning network, server and storage resources can be scheduled and allocated on-demand across applications and processes. Utilize production-like test lab environments on-demand to run parallel tests rather than sequential execution in single physical machines and reduce the growing problem of server sprawl.

6. Monitor e-ART growth & success

Note that, e-ART initiative is always led from the top down and implemented from bottom up. Hence, governance with aid of reports will be helpful to sustain the e-ART initiative. Reports should be published at Organizational level, VP level, Director level, Manager level and Test Case level. Key factors like growth percentage, Initial success percentage (very first run), Overall success percentage (runs after defect fixes) need to be considered in the reports. Also, different status of the test scripts in test suite need to be clearly shown.



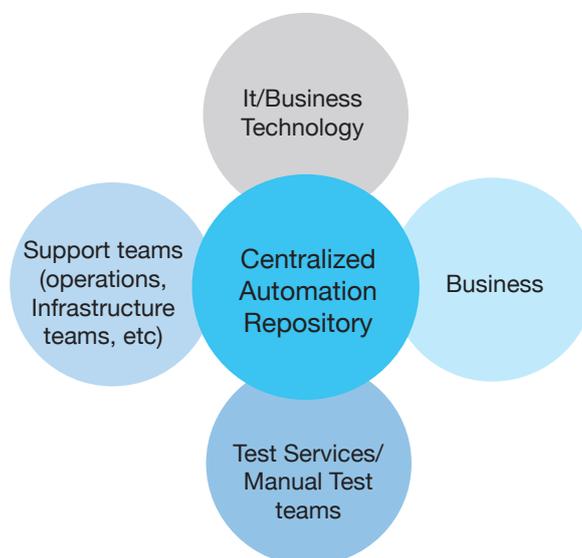
Illustrative Director Level Report

Illustrative Manager Level Report



Also, reports should have multiple dimensions and represent the execution results in different views. It helps senior management to get take an appropriate action to handle the situation. For example, consider the director level report as shown in the above left hand side; it depicts the status of total test scripts executed with respect to different applications grouped by manger. Also, in manager level report, comparison of execution for different applications with respect to various releases is shown above.

6.1 Leverage automation beyond regression



- Automation can be used to capture screen shots from various applications generating a document in a few short minutes that would take significantly longer to create manually, saving customer service representatives significant time when speaking to customers
- Automated test scripts from central repository can be used to create a complete end-to-end test that goes through many systems ensuring they all interact together as expected after test environment refresh. Scripts can be scheduled or executed on demand basis or triggered by an event like batch completion
- Perform application health checks at different operations center for every shift change by leverage test scripts from central repository and cut down recurring manual efforts by operations analyst
- Infrastructure validations, Data Refresh validations, Server power restore validations can be quickly performed to certify the respective applications are up and running which is helpful to the support teams

7. Envisaged Benefits

Faster time-to-market: Speeds up the functional test cycle, specifically reducing regression testing time by implementing the test automation. Projects that used to be delayed due to lack of available resources and the right skill set are now released on time, helping companies stay competitive and respond better to new business opportunities. On average, e-ART has reduced test times up to 30% or more & increased test automation levels up to 60% when compared to siloes test automation.

Cost efficiency: Lets you do away with the costs associated with building fresh test automation Suite for regression scenarios, while realizing cost reduction and productivity increase. Centralizing testing tools and resources can eliminate redundancy and lead to tremendous savings in resource utilization, as well as software procurement, setup and maintenance costs. Typical resource cost reduction is around 35% over a 3-year time frame

Higher ROI: Provides incremental returns from the same investment, by reusing test cases throughout various phases with a centralized repository and can be leveraged beyond regression testing

Increased agility: When a quality team can manage and scale their quality resources, they can better respond to the new business challenges and allocate their efforts toward highest priority projects. Hence, faster deployment of innovation and new features for business users is possible

Tighter alignment: The e-ART helps keep the quality effort aligned tightly with business needs by defining and measuring key performance indicators

Improved Quality & Accuracy: Early identification of defects before business is impacted. Greater accuracy in catching more defects

8. Conclusion

I believe that companies will increasingly realize economic benefits in cost savings, improved business agility, efficiency and quality. Harvesting economic benefits will continue to drive the industry's shift toward highly automated testing and away from manual approaches, as companies continue to push for higher quality execution and greater business agility at lower cost.

With its immense benefits, e-ART is the right regression testing strategy for organizations to follow. However, if not implemented smartly, e-ART initiative may leave an organization confused and with loss of credibility, disengaged employees and frustrated customers. A comprehensive plan built around the strategic assets and a robust governance model is required to transform the traditional regression testing into e-ART model. To conclude, it is clear that significant opportunity exists for additional growth in adoption of test automation. Also, global companies can increasingly realize the substantial benefits of test automation by adopting e-ART model.

About Author



Gokul Putta
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Gokul has over 10 years of experience in IT with proven expertise around fundamental QA Strategies, processes and accomplishments around a wide spectrum of specialized testing areas with special focus on test automation. He is adept in establishing enterprise level automated regression testing service that ensures consistency of application interoperability and user functionality for various application platforms. He has developed automation project management strategies, automation self-funding models governed by automation competency for multiple organizations. He holds a Master's degree in Computer applications. He is certified as QTP Product Specialist by HP and CSTE by Quality Assurance Institute, USA.

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