

The Software Quality Advisor Online



Rice Consulting Services, Inc.
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August 2001 Newsletter

Strategies for Integration and Interoperability Testing

by *Randy Rice, CQA, CSTE*

In a world where it seems that just about every application interfaces with a number of other applications, integration and interoperability testing (IIT) is often not addressed adequately in a project. In this article, I deal with some of the issues and risks of testing highly integrated applications and will outline a test strategy for such applications.

You do not need to look far to see examples of software interoperability problems in the real world. Most organizations have a variety of hardware and software, often from a slate of several competing vendors whose products do work and play well together. You may be thinking that web-based applications enhance portability, and in some ways they do. However, web-based applications also introduce a new set of interoperability and compatibility concerns, such as browser compatibility and data interoperability, such as in the case of exchanging data via XML.

The Risks of Poor Integration and Interoperability

We've all felt the frustration of installing a software application on a PC and suddenly everything starts behaving very strangely – all the way from minor annoyances to system hangs and crashes. In some ways it makes you wish that there were rigorous compatibility and interoperability standards that software and hardware manufacturers must follow. On the other hand, if there were such industry-wide standards and enforcement, we know our choices would be limited and the products on the

market would be expensive. So, we are in a grand dilemma between reliability and flexibility in which other tradeoffs also abound.

Lack of reliability and flexibility are risks that are seen in diverse, highly integrated systems. It is up to the vendor to verify and validate applications to the extent the customer will not experience compatibility problems, however this is the rub. The possible number of computing platform combinations are endless and, therefore, impossible to test completely. In this article, we will examine the risks of such applications and some strategies to deal with testing a domain where there are no easy answers and no guarantees.

The risks often seen in integration and interoperability are:

- **Loss of data**

As data is passed between applications, there is a risk the data can be lost or misdirected.

- **Poor performance**

Bottlenecks can be inadvertently built in shared applications which results in poor performance.

- **Unreliable operation**

As software operates together on the same platform, a problem in one application can cause the entire system to crash.

- **Incorrect operation**

As data and control are passed between applications, are the results correct? Does the application operate as the user has been trained?

- **Low maintainability**

Although the goal of interoperability is to promote maintainability, that is not always the case. The application must be designed with maintainability in mind.

- **Obsolete applications**

If the application is built on any specific technology, there is a risk that two years from now that technology will be obsolete.

These risks can also be seen as the drivers for an IIT strategy. For example, to test the risk of data loss you would want to include passing data across defined interfaces and then using the data in other related applications.

Key Point #1 – IIT should not be confused with basic functional testing. The purpose of IIT is to test interfaces and interoperability. It must be assumed that other forms of testing such as functional and compatibility testing have already been performed.

First, we need to define some basic terms:

- **Compatibility testing**

Comparing an application against a set of established operating standards to determine operational compatibility.

- **Configuration testing**

Testing to validate that an application functions correctly on a particular computer configuration.

- **Integration testing**

Testing the points of integration between units and systems

- **Interoperability testing**

Testing with other applications that have met compliance standards; the ability of two or more systems or components to exchange information and to use the information that has been exchanged.

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- **Functional testing**

Testing from an external perspective of what the application should do. Functional testing is performed from a “black box” perspective, with no knowledge of the inner workings of the application. Functional testing is cause/effect in nature.

Key Point #2 – There must be a way to build and maintain an integrated test environment (ITE) that closely resembles the production environment. Your test results are only as reliable as the environment in which you perform the test.

Levels of Test Environments

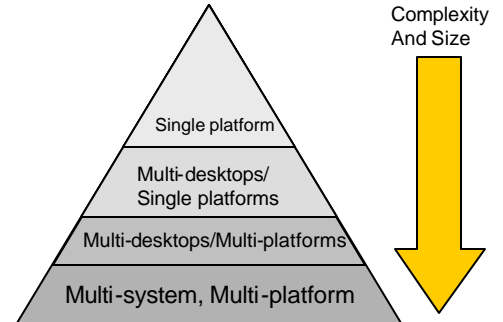


Figure 1 – Increasing Complexity of the Test Environment

The scope of IIT can be wide, including:

- **Multi-units**

These are the separate software units or segments that must work together correctly.

- **Multi-systems**

These are separate major systems or applications that must work together correctly.

- **Spanned hardware**

Software applications may reside on a variety of hardware platforms.

- **Integrated hardware**

Most hardware platforms have many compatibility issues with internal components.

- **Disparate data sources and structures**

Data does not come from universal sources and will be seen in many forms. Applications that work together must be able to accept and convert data to a useable form.

- **Spanned geography**

This introduces issues such as language and time zones, which add a new dimension to a project.

- **Internal and external software sources**

This speaks to the issue of control. We can control the test internal applications, but when we deal with other organizations, we must be able to communicate and get cooperation to achieve a total test.

The Process for Configuration/Release Management

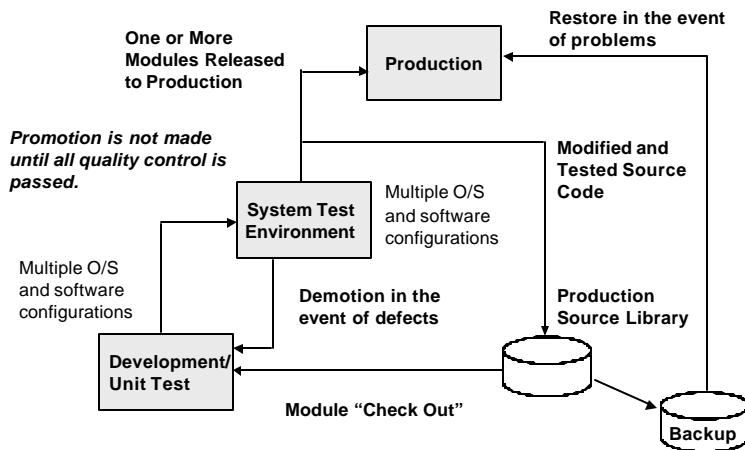


Figure 2 – CM in IIT

With this wide scope of testing, there must be a way to control and co-ordinate this type of testing, which is where the co-process of configuration management (CM) comes into play. CM is the process of tracking all components of an application or system throughout its operational lifespan. CM is how the development, test, and production environments are controlled.

In Figure 2, a typical CM process is used to manage the integrated test environment and migrate applications to deployment. This picture shows an ongoing view of systems maintenance where units or components are checked out of a production source library. This is to prevent multiple people from working on the same component at the same time. As low-level tests are performed and passed in the development environment, they are migrated to the system test environment for integration testing. Finally, after integration

and interoperability tests are passed, the application is deployed and the source code becomes the new production version. In the event of problems, the application is restored from the old version or fixed on the fly and reinstalled.

Key Point #3 – Communication is a primary success factor in performing IIT.

In other forms of testing, such as compatibility, configuration and basic functional testing, it is possible to perform the tests in relative isolation. True, you may need to speak with other people to get the job done, but not to the extent of coordinating tests between systems and organizations. In IIT, communication and coordination are paramount. If people aren't talking, then the test isn't going to be successful.

Organizations have learned an important lesson in two recent real-life technology efforts: Y2K and e-commerce. Both of these efforts required integration and interoperability testing to validate that organizations could send data and control through multiple points to achieve an overall successful completion. In e-commerce, we also learned that systems are sometimes closed loops back to the customer, with several trails to be followed (Figure 3). These types of integration needs have been present in the past as well as

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An E-Commerce Schematic

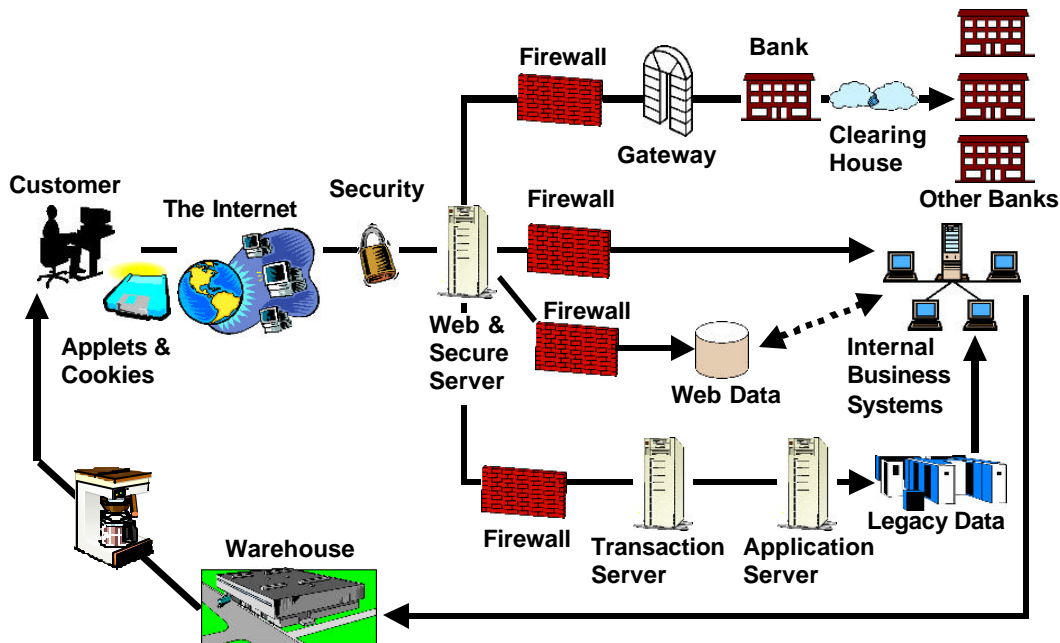


Figure 3 – E-commerce Integration with the Closed Loop Back to the Customer

This means that to test integration and interoperability you have to pick up the phone and call people to coordinate the effort. E-mail is great, but don't depend on it. In fact, never confuse an e-mail or a memo with effective communication. Effective communication requires both a sending and receiving party that is actively engaged in the conversation. This means sending the message clearly and listening intently!

The communication factor becomes especially important when the test spans time zones and multiple languages.

Test Strategies for IIT

We see that IIT is often complex and wide-ranging. In fact, most test (and development) processes fail on scalability when taken to the level of integration and interoperability. Casual test methods often fail to achieve the needed rigor and coverage. Rapid prototyping and other iterative methods are often focused at a single application level which minimizes IIT. So, what can be done to test effectively for IIT?

Key Point #4 - Understand that exhaustive testing is not possible in just about all software applications.

This applies especially to IIT. Leverage the risk of deployment by limiting your exposure. Then, take action on the information learned from problems found in small scope deployments.

What this means is that systems that are highly integrated and disparate are by their very nature risky. It's like eating spicy Mexican food and then complaining about the heartburn. If you want

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to still eat spicy food, you'll need to find a way to deal with the heartburn. In highly integrated systems, we can mitigate some of the risk by the following strategies.

- **Test Interfaces and Interoperability the Best You Can, Then Deploy to a Pilot Group**

This is essentially a beta test, but there are some important considerations.

1. Beta testing has risks, such as the possibility of production defects, the low quality of feedback and the high risk of bad PR.
2. Limited deployment will not mitigate risk in all situations. There are some cases where limited deployment to a small audience is absolutely acceptable, such as when the risk is low to moderate. However, in high risk applications like medical devices, avionics, nuclear power controls, etc., a defect even in one site can cause catastrophic results!

- **Build a Robust and Restorable IIT Environment and Perform IIT in That Environment**

There are still risks due to the reality of non-exhaustive testing, but you may be able to perform a pilot or other form of limited deployment.

- **Test Using Simulators**

Of course, the problem with this is that a simulator is a contrived world. However, for initial tries simulators help reduce some risks. Just ask any drivers ed teacher.

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- **Test Using a Live, but Segmented, Environment**

This is often called an Integrated Test Environment. This technique has the risk of accidentally introducing test data into real operational processes, but the concept is that test data is processed right along with real data in production, but the test data is identified in such a way as to never mingle with production data. For example, test accounts may span from 600000000 to 699999999.

Everything else is live data. The upside is that you can test transactions as they will flow in live processing – just be careful not to do things like mail out bills with test addresses, etc. Hey, it happened during Y2K testing in some companies.

Conclusion

There is much more that can be said about this topic of integration and interoperability testing. We cover many of these topics in our new three-day course, *Integration and Interoperability Testing*. The main point I wish to convey is that the integration and interoperability aspects of systems should not be minimized. As platform possibilities continue to increase and global business needs drive more interoperability between critical supply chain system, this topic will only get more important to testers. The integrated domain is inherently risky and there is a tension between interoperability standards and the freedom to innovate and deploy new technologies quickly. I predict that IIT will be a key concern as global B2B application become reality and the sooner you develop your test strategies for IIT, the better.

Book Review

by Randy Rice, CQA, CSTE

Roundtable on Project Management : A Shape Forum Dialogue

James Bullock (Editor) Gerald M. Weinberg (Editor) Marie Benesh (Editor)



Format: Paperback, 200pp.
ISBN: 093263348X

Publisher: Dorset House Publishing
Pub. Date: May 2001



Overview

As a project manager or consultant, have you ever had the chance to sit around and discuss project issues with a group of peers? I have been on many projects and have been a part of many such discussions over dinner that

often go far into the night, then we realize that we have generated more heat than light and go home. This book gives you the chance to experience (in written form, at least) the discussion between a group of seasoned project management consultants and practitioners. The dialog is derived from the SHAPE forum, which is Jerry Weinberg's web-based roundtable on software engineering and management. From the thousands of postings, the editors culled out the most powerful and insightful comments to form the basis of the dialog in this book.

Who Should Read This Book

- Project Managers
- Development Managers
- Chief Information Officers
- QA Managers and Analysts
- People wishing to become any of the above

What I Liked About This Book

Overall, I enjoyed the dialog and the variety of viewpoints the contributors brought to each topic. Some topics spoke to me more than others, such as the one on determining the size of the project: How Big is It? Another very interesting question that I have often pondered is "How Do You Know a Project is in Trouble?" The contributors in some ways validated things I have said and taught in the past as well as giving me new angles on dealing with these issues.

I also liked the way that a simple case study was used throughout the book as a basis for discussion and for examples of possible solutions. Also, each chapter is closed very nicely with a summary which includes a brief "lessons" review.

Scoring

- Readability - 5
- Breadth of coverage – 5
- Depth of discussion – 4 (Each topics could take volumes to discuss – and some have volumes written about them!)
- Accuracy – 5 (Although there are no "exact" answers for many of the questions, the opinions expressed are insightful and represent many best practices in project management.
- Credibility – 5 (Each editor and contributor has a highly qualified background)
- Organization - 5
- Overall Score – 5

Sample Topics

- The Failed Success
- The Story of the Failed Success
- Getting Started Right
- Did the Project Planning Make Sense?
- Can People Tolerate Boring Development?
- How Big Is It?
- How Do You Size a Large Project?
- What Will It Cost?
- Planning for Success
- Plan on Supporting the People
- Who Is Doing It, and How?
- What Are You Managing?
- Is Commitment Being Managed?
- It's a Scope Negotiation
- Project Indicators
- How Do We Know That a Project Is in Trouble?
- Dealing With Impending Disaster
- Whom Do You Listen To?
- There Are Different Kinds of Damage
- Doing Something Different
- Introducing Unusual Ideas
- Core Myths Limit What You Can Change
- Dignified Project Death
- Change Means Admitting You're Wrong
- Take the Wheel Yourself
- Project Lessons
- In the End, Did You Learn?

Summary

This book is an easy read, yet thought-provoking. I wish everyone who has project management responsibilities would read even a few chapters in this book. It might actually cause people to ask higher level questions and make project decisions on some other basis besides "my boss wants it finished next week, no matter what." Reading this book will also serve as a good dose of reality and rational thinking for those of you what may have been sucked into the vortex of project la-la land, where the view of reality is often lost in the battle of daily problems.

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Frequently Asked Questions by Randy Rice, CQA, CSTE

Q: Who writes User Acceptance Tests – Users or Business Analysts?

A: Opinions vary on this, but my opinion is that the users should design, conduct and evaluate the user acceptance test. They will likely need facilitation from developers and testers, but the tests should be ones of their own design, not a repeat of another group's test.

Q: I am regular visitor to your testing site and find it very useful in my job and also in general to upgrade my knowledge in testing. I am a Software Test Engineer looking for information on using "Use Cases" in testing. Can you please guide me in this topic? In the present project in which I am working I need to use the concept of Use Cases. Hoping to get valuable guidance from you.

A: Basically a use case is just a description of how a particular group of users will use the application. This is a part of the UML and the Rational Unified Process, so you should be able to find information at www.rational.com.

Use cases are structured, but they are not as rigorous as requirements, and therefore, were never intended to be a substitute for them.

There are some good books on use cases, such as *Writing Effective Use Cases* by Alistair Cockburn, *Use Cases – Requirements in Context* by Kulak and Guiney, and *Applying Use Cases – A Practical Guide* by Schneider and Winters.

Q: I'm wondering if you have any advice on how to implement a UAT process within a company that has no testing processes to speak of?

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A: Designing the process is not that hard, but you must first get consensus in your organization as to what the objectives of UAT will be. For example, will UAT be used to validate business use of the application, user requirements, or something else. In my opinion, the best value in UAT is to validate business use.

Users need to be consulted as to extent of their involvement, as well as senior management. UAT is a very business-oriented activity, therefore the leaders of the business should be very interested in its success or failure.

Once you have designed the process, then training can commence and you can start performing the process on a pilot project. By the way, Rice Consulting Services has a great course on User Acceptance Testing that describes the process from start to finish.

Q: I have gone through your website and in FAQ, and found that difference between test cases and test scripts has been explained very well. I have one more query related to software testing i.e., what is a test plan and what are the things to be mentioned in the preparation of a test plan?

A: Thanks for visiting my web site. The best way to answer your question is to show you an example of a test plan. Just go to http://www.riceconsulting.com/library/sample_web_test_plan.pdf and <http://www.riceconsulting.com/library/standard.pdf>



QA's Place in the Business Structure by Carl Chandler

The placement of quality assurance (QA) in the business structure is an important decision. More often than not

QA has been designated to a position of no authority causing the quality process to stop short of completion.

One common practice is to put QA in a lateral position with the development team. This is generally because testers in QA work closely with the development team. The problems come when the defects are reported and the development team begins looking at the QA team as a group of peers that are “being picky”. This can be eased somewhat with good leadership and an overall quality business culture.

Another common practice is to insert a non-qualified person in a QA position. This fails because the company has QA window dressing without substance.

The best QA process I have seen is the United States Air Force. One reason for their success is that they have a QA department with direct report lines to Director level management. Their position allows them the authority to enforce standards and oversee changes for continuing process improvement.

To change the practice from putting QA in a position of high responsibility with no authority to a unit unto its own with direct reporting to the highest level of management will require selling the idea to the highest level of management. They must make this decision simply because it changes the business structure.

In our “Becoming an Effective Test Team Leader” course we teach that raising management awareness is one of the more difficult problems to address because it requires cultural change in many cases.

To be successful in making your message to management, you need to focus on two key points: time and money. For example, management should be very interested in reducing the cost of rework and meeting the project schedule.

However, don’t be surprised if management is willing to trade-off rework for time!

Once management is committed to making change a reality there are a few basic steps that must be followed:

- **Know where you are**

This is determined by performing a self-assessment or having an independent assessment performed.

- **Know where you want to go**

This is done by brainstorming and working through a process.

- **Develop a plan to reach the goal**

This gives concrete dates and responsibilities to the goals and objectives.

- **Continuously improve**

There will always be something else to do and something left to improve.

Rice Consulting Services’ Consulting Offerings:

Testing Assessments

Rice Consulting Services’ testing assessment is a quick and effective way for an organization to determine where they are in terms of software testing maturity. The assessment looks at three areas that are critical to testing:

- **Test organization** - Who performs testing, what levels of experience are present, and when testing is performed in the development/maintenance life cycle.

- **Test process maturity** - How well-defined, well-deployed, and repeatable the test process is, and whether it incorporates good testing management, practices, tools, and techniques.

- **Readiness** - An assessment of the organization's readiness to improve the testing process. This involves an assessment of the staff's testing awareness, testing skills, and motivation to change current practices. The deliverable is a report detailing the assessment's findings, a recommended quality improvement strategy, and a plan for addressing the improvement needs identified. If the assessment uncovers the need for in-house skills training and consulting, we will include proposed training and consulting plans in the report. The report is typically about 15 pages in length.

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Rice Consulting Services' Course Offerings:

If you would like to learn more about the information covered in Carl's article we at Rice Consulting Services, Inc. offer an excellent course that will enhance your company's software quality process.

Interoperability and Integration Testing

— 2 days, Intermediate

This course is designed to present strategies and techniques for testing within a framework of diverse technologies and applications. It is assumed that the attendees will have a working knowledge of testing and test terminology. Attendees will learn how to plan, conduct and evaluate tests in diverse technology environments, especially when the applications in those environments interact together. The testing of Commercial Off-the-shelf Software will be discussed, along with the role of regression testing, configuration management, automated test tools and ongoing validation in diverse technical environments. Attendees will leave this course with a solid foundation for testing in situations which are very diverse and dynamic.

Attendees will learn

- The basic issues and risk of integration and interoperability testing
- The deeper issues of performing a risk assessment
- Processes for integration and interoperability testing and configuration management in diverse environments
- How to leverage test tools in diverse environments
- The process for performing regression testing in diverse environments

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- How to build and manage a test environment that starts to simulate the operational environment
- How to measure Return on Investment (ROI) in a Commercial Off-the-shelf Software (COTS) environment
- The impact of various lifecycle models on integration and interoperability testing
- How to keep an application in a diverse environment in a validated state

Becoming an Effective Test Team Leader

2 days

This two-day session is designed for test leaders and test managers, people who expect to be in a test leadership role, or people who lead other test managers and test leaders. The main objective of this session is to teach you how to be the very best test manager and leader. This course also answers the question, "What does it mean to be the best?" There are many people functioning as test managers, but how many are really leading the team? In leading a test team, you must not only understand the basics of software testing, but you must also understand your own organizational culture. Once you understand your organizational culture, you might find that testers have a less than positive image. This session will discuss how to transform the image of testers from one of police to one of team members.

You will learn the terminology, process, and challenges of testing in the real world. Team-based exercises reinforce the concepts of facilitating team activities and performing leadership activities.

As a result of attending this seminar, you should have a good working knowledge of software testing and what it takes to design and conduct an effective test of software, regardless of the technology.

Becoming an Effective Test Team Leader will help you become more comfortable and confident in leading the testing effort in your organization. You will emerge from this two-day session knowing how to develop test cases and test plans. You will also leave with a knowledge of how tools can help you perform testing.

Sometimes people feel intimidated by the technical aspects of software testing and lack the confidence they need to be credible test leaders in their organization. Learn the issues and processes for effectively testing software by attending this hands-on course.

For more information on this course or one of our many other offerings please contact Carl Chandler at (405) 414-6759

Links...

“Test Your Troubled Site” – Infoworld Article from July 23, 2001 issue

<http://iwsun4.infoworld.com/articles/tc/xml/01/07/23/010723tctest.xml>

Open-Source Web Stress Tools

“VeloMeter is an open-source Java-based load testing tool for Web sites. It's designed to simulate the requests generated by thousands of typical users.”

www.velometer.com

OpenSTA (Open System Testing Architecture)

“A distributed software testing architecture based on CORBA. OpenSTA is designed to be used by Performance Testing Consultants or other technically proficient individuals.”

<http://www.opensta.org/>

Notable Quotes...

“I have traveled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last out the year.”

- **The editor in charge of business books for Prentice Hall, 1957**

" Anyone who has never made a mistake has never tried anything new."

- **Albert Einstein (1879-1955)**

“Creativity is allowing oneself to make mistakes. Art is knowing which ones to keep.

- **Scott Adams - The Dilbert Principle**

“Do you see a man skilled in his work? He will serve before kings; he will serve before obscure men.”

- **The Bible – Proverbs 22:29**

September 2001 Issue:

- **Regression Testing Dirty Systems**

by Randy Rice, CQA, CSTE

- **Metrics and Measurements**

by Carl Chandler



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To redeem complete the following information and submit to the Quality Assurance Institute at the time of reporting CPE credits.

Name: _____

CSTE/CQA Certification Number: _____
(circle one)

Email Address: _____



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