

## Software Quality Management System

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## Introduction: How far will you allow technology to take you?

**SOFTWARE IS ESSENTIAL TO HUMAN LIFE AND IS UBIQUITOUS.** The rapid growth of software which is playing vital role in all areas of human life i.e. both business and personal lives, has surprisingly turned the society into a computer-oriented one. Since the development of software is very expensive and the users are becoming more sophisticated and demanding, companies should be able to deliver high quality software.

As the software continues to evolve in demand and complexity its characteristics are also continue to grow in importance. Some of the characteristics of software that are growing in importance include Availability, Quality, Reliability, Maintainability, Operability, Safety and Security.

The problem only gets worse as IT grows ubiquitous. This year, organizations and governments are expected to spend an estimated \$1 trillion on IT hardware, software, and services worldwide.

Hence the quality of software product and/or process should be given highest priority as the consequences of software failure can be disastrous. Some of the software-related failures are minor and some are catastrophic and resulting into loss of millions of dollars and even deaths:

- Software bugs, or errors, are so prevalent and so detrimental that they cost the U.S. economy an estimated \$59.5 billion annually, or about 0.6 percent of the gross domestic product, according to a newly released study commissioned by the Department of Commerce's National Institute of Standards and Technology (NIST)
- Another timely example might be the disastrous Sea sprite helicopter program for the Australian Navy. \$1bn spent, helicopters grounded, software problems are being mentioned explicitly.
- In August of 2006 a U.S. government student loan service erroneously made public the personal data of as many as 21,000 borrowers on its web site, due to a software error. The bug was fixed and the government department subsequently offered to arrange for free credit monitoring services for those affected.
- A software error reportedly resulted in over billing of up to several thousand dollars to each of 11,000 customers of a major telecommunications company in June of 2006. It

- was reported that the software bug was fixed within days, but that correcting the billing errors would take much longer.
- News reports in May of 2006 described a multi-million dollar lawsuit settlement paid by a healthcare software vendor to one of its customers. It was reported that the customer claimed there were problems with the software they had contracted for, including poor integration of software modules, and problems that resulted in missing or incorrect data used by medical personnel.
- In an article, an automotive software specialist indicated that the automobile industry spends \$2 billion to \$3 billion per year fixing software problems.

At the bottom level, software bug can be said to be root cause for software failures which lead to the disastrous conditions. Unfortunately, those bugs and software flaws are becoming very catastrophic by translating themselves into an excruciating level of business risk if they are not identified and rectified early in the stage.

The biggest tragedy is that software failure is for the most part predictable and avoidable. Unfortunately, most organizations don't see preventing failure as an urgent matter, even though that view risks harming the organization and maybe even destroying it. Understanding why this attitude persists is not just an academic exercise; it has tremendous implications for business and society.

At Adaequare, our approach is to Prevent rather than Detect and then Correct. We have SQA team in place to apply specialized expertise in software risk identification, alleviation and management along with advanced proven methodology and software technologies.

While being the back-bone to the industry and the human life, software poses significant risks to the organizations and persons who depend on it to be reliable and secure. Software failures can also stunt economic growth and quality of life, can imperil national security in government and can jeopardize an organization's prospects.

This white paper states and explains the methodology that Adaequare applies to avoid possible software flaws and failures from occurring with the very effective and highly practical Quality Management System.

## Quality Methodology: A historic approach to Quality

Our Quality methodology i.e. the software quality improvement program embedded through out the software development life cycle is practical, result-oriented and is based on the real-time experience supported by progressive technology research. Importantly, our methodology derived from the software development processes, defines the process and vice-versa i.e. it's a methodology that continuously and repeatedly evolves during each and every phase of software development process.

Software Quality Assurance is the methodology that offers a set of best practices for getting software services under the control of management. Quality Assurance is not a cost issue but rather a methodology that more than pays its own way.

Software Quality Assurance is defined as a planned and systematic approach to the evaluation of the quality of and adherence to software product standards, processes, and procedures. SQA includes the process of assuring that standards and procedures are established and are followed throughout the software acquisition life cycle.

Software development and control processes should include quality assurance approval points, where an SQA evaluation of the product may be done in relation to the applicable standards.

Having the team of specialists alone does not yet guarantee highest quality. Methodology is also one of the key factors which facilitate us to ensure that every customer's request and requirement is tracked and addressed most effectively.

The SQA process adopted by Adaequare is a rigorous and disciplined methodology that uses data and statistical analysis to measure and improve the company's operational performance by identifying and eliminating defects early in the stage in both product and process. They perform quality assurance activities on every software project, use metrics to develop strategies for improving software process, and as a consequence, improving the quality of the end product.

## An effective remedy to the ancient hitch

Software projects are notorious for running over schedule and budget, yet still having quality problems. Software measurement lets you quantify your schedule, work effort, product size, project status, and quality performance. If you don't measure your current performance and use the data to improve your future work estimates, those estimates will just be guesses. Because today's current data becomes tomorrow's historical data, it's never too late to start recording key information about your project.

Quality is not just absence of defects but the presence of value which can be acquired by developing the software under the guidelines, specifications and rules set by the customers. Measurement is the empirical, objective assignment of numbers, according to a rule derived from a model or theory, to attributes of objects or events with the intent of describing them. IEEE Standard 1061 [8] defines an attribute as "a measurable physical or abstract property of an entity."

A metric is a measurement function, and a software quality metric is "a function whose inputs are software data and whose output is a single numerical value that can be interpreted as the degree to which software possesses a given attribute that affects its quality". To develop a set of metrics for a project, one creates a list of quality factors that are important for it: Those may include Performance, Scalability, Cost/Benefit, Usability, Portability, Robustness, Correctness and Reliability, etc.

Software metrics can be classified into three categories: product metrics, process metrics, and project metrics. Product metrics describe the characteristics of the product such as size, complexity, design features, performance, and quality level. Process metrics can be used to improve software development and maintenance. Project metrics describe the project characteristics and execution. Some metrics belong to multiple categories. For example, the in-process quality metrics of a project are both process metrics and project metrics.

Adaequare's SQA team having special expertise in the field generates metrics by measuring the quality of products, projects and processes. By considering technical tradeoffs in terms of business context, Adaequare provides critical guidance to decision makers, resulting in higher quality software that is developed both faster and cheaper.

## Quality Policy and Quality Objectives

Adaequare strongly believes that '**Quality means to conformance to requirements**'. We, at Adaequare, are dedicated to supply the customer with services and solutions with a high level of reliability, maintainability, and functionality, delivered within budget and on schedule. In whatever we do, we assure our customer the highest possible quality with our Innovative approach, defined processes, proven best practices and forward-looking technologies.

The company aims to offer the highest standards of quality by the use of Quality Management System which will be assessed for its effectiveness and is reviewed and updated with the opportunities for improvement.

Adaequare believes that quality is the responsibility of every employee extending from the Board of Directors. All personnel are trained in the operation of the quality management system. All the employees are committed to work within the clients guidelines and specifications and to provide a high quality professional service to it's client base.

Quality objectives reflect our quality policy and are realistic and relevant. They are substantially coherent, aligned and compatible with the overall business objectives along with the customer requirements. Quality objectives are not static and are reviewed and updated in the light of the current business climate and the quest for continual improvement. The partial or full achievement of objectives demonstrates the continual improvement which results in revision of quality objectives. Management will ensure that the revised of quality objectives are communicated to the staff and are understood by them.

Continual improvement is possible by the quality objectives set by the management. Adaequare's quality objectives address:

- Improvement of processes
- Individual customer requirements
- Level of expertise needed in the relevant sectors

Our Quality objectives are suitably cascaded throughout the organization's structure and processes, linking the general strategic objectives to management objectives and down to specific operational objectives.

## Why an independent Software Quality Assurance team is necessary?

Organizations often face challenges in terms of processes not being followed despite being defined. There is a lack of an established channel to communicate the practitioners' point of view. Practitioners end up trying to fit same processes to different types of projects. SQA support is required to institutionalize the defined processes and foster an environment to support continuous learning through formal training, knowledge sharing, handholding and independent management of process compliance.

**Software Quality Assurance** is a planned and systematic approach to ensure that software process and products conforms to the established standards, processes, and procedures. The goal of SQA is to improve software quality by appropriately monitoring both software and the development process to ensure full compliance with the established standards and procedures.

The core activities of SQA team are Product evaluation, Process monitoring and Audit. At Adaequare:

- The SQA verifies the PMP for correctness and completeness before recommending for approval.
- Assists the PM at arriving at project quality goals and will validate the metrics data at end of each of the identified milestones.
- SQA team conducts periodic data audits to ensure the completeness and correctness of the data that is reported by the Project
- SQA reports the project deviations (with respect to the Project Plan, Project specific processes) to the Project manager
- The SQA reports to the management on a weekly basis and on the reviews conducted during the week, the deviations identified, any issues and areas for process improvement
- The SQA further escalates unresolved issues to the management if the issues are not solved within timeline
- Manage and control the configuration of Quality Records
- The SQA prepares a configuration management plan to manage configuration and change control of documents of Quality Function.

## Why Software Quality Management System?

Quality Management is a method for ensuring that all the activities necessary to design, develop and implement a product or service are effective and efficient with respect to the system and its performance. Software Quality Management System is the set of procedures for determining and implementing the intentions of organization as regards to quality.

An organization generally benefits from having an effective Quality Management System which is a set of co-ordinated activities to direct and control an organization in order to continually improve the effectiveness and efficiency of its performance.

The Quality Management System implemented by the top level management assists the organization by:

- Managing costs and risks
- Increasing effectiveness and productivity
- Identifying improvement opportunities
- Increasing customer satisfaction
- Making effective and efficient use of resources
- Having control on all processes

The design and implementation of a Quality Management system varies depending on the type, size and products of the organization. Each company has it's own objective, however most of the companies objective is to increase profitability.

## A model for Software Quality Management system

An effective QMS focuses on systematically developing and communicating a customer-focused mission, policies and action plans; and on improving the quality of the organization and it's processes by gathering and analyzing key performance indicators. A QMS will help the facility focus on prevention activities rather than the inspection or failure activities.

Adaequare finds it beneficial to set up Quality Management System based on the eight quality management principles that are defined in ISO 9000:2000, *Quality management systems Fundamentals and Vocabulary*, and in ISO 9004:2000, *Quality management systems Guidelines for performance improvements*:

- Principle 1 Customer focus
- Principle 2 Leadership
- Principle 3 Involvement of people
- Principle 4 Process approach
- Principle 5 System approach to management
- Principle 6 Continual improvement
- Principle 7 Factual approach to decision making
- Principle 8 Mutually beneficial supplier relationships

There is a strong need to document Quality Management System and the Quality Management System documentation includes:

- documented statements of Quality policy and Quality objectives
- a Quality Manual
- documented procedures
- documents needed by the organization to ensure effective planning, operation and control of its processes

The Adaequare's Quality Management System (QMS) is a comprehensive set of policies, processes and procedures that shows our dedication and commitment to the best quality possible in all products and services of Adaequare.

## **Role of Management**

It's absolutely a cultural change. It has to be top-down; the top guys have to be fanatical about it. It's not a book you go read. You learn to approach problems with a rigorous methodology instead of shooting from the hip—which is the IT methodology, traditionally. When IT workers get in a new situation, they fall back on what happened before.

Ultimately, our executive management is responsible for establishing, implementing and maintaining the Quality Management System across the organization by communicating its goals and importance to the entire staff. Management establishes the Quality policy and Quality objectives. They continually improve the effectiveness of the QMS in accordance with the

requirements by providing the necessary resources and take necessary measures to meet the standards always. Their objective is to ensure that

Management commitment is essential for the implementation and ongoing success of the Quality Management System. The role of our management is:

- Ensuring that QMS remains suitable, adequate and effective
- Identifying the processes needed for QMS and their application across the organization
- Monitoring, measuring and analyzing these processes
- Improving the effectiveness of QMS
- Improving the product by taking necessary actions to achieve highest quality and continual improvement of processes
- Addressing the resource needs by ensuring the availability of resources and information necessary to support the operation and monitoring of these processes