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# Leveraging HP Quality Center for Requirements Engineering

## Best Practices Document

January 2010

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invent

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## **Executive Summary**

### ***Accelerating Your Return on Investment***

For organizations focused on delivering quality software products to their customers, requirements form the basis for developing and managing the entire quality assurance lifecycle. Without good requirements, testing becomes an exercise of shooting in the dark. For HP Quality Center customers who are looking to accelerate the return on their software investment, this document provides industry-proven requirements engineering best practices and guidelines that leverage the Requirements Module.

### ***Getting Started***

A critical success factor in the implementation of requirements engineering is getting started on the right foot. In addition to the requirements engineering processes listed above, this white paper includes a section entitled Setup Guidelines that helps an organization determine the best strategies for doing requirements engineering that are aligned with current processes, people and technology.

### ***A Trusted Advisor***

Orasi has an extensive background and knowledge of requirements management, quality assurance, both manual and automated testing best practices, and implementation. For over 15 years, Orasi engineers have focused professional services and training specifically on helping customers develop and deploy quality assurance environments that are maintainable and expandable to meet an organization's ever changing needs.

In addition to Orasi's talented staff of quality assurance engineers, Orasi provides its customers with remote testing centers located in Greensboro, NC and Atlanta, GA to support and supplement a customer's quality assurance staff, skills and best practices. Remote services include: manual testing; development of test automation frameworks; and automated functional, performance and security testing for custom, packaged and ERP applications.

Orasi is an HP authorized customer support provider that provides first-line customer support to over 180 of HP's best customers. Orasi's customer support facility located in the Atlanta, GA metropolitan area is staffed with senior customer support engineers with field experience. This allows Orasi to provide 97% first-line resolution of critical issues without escalation. Due to its outstanding performance over the past 2 years, HP named Orasi their 2009 Support Partner of the Year.

More information on Orasi's Requirements Management Services is available at the end of this white paper.

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## Introduction

### **Purpose**

The purpose of this document is to provide the reader with guidance and direction for the effective and efficient use of the HP Quality Center Requirements Module. The guidelines contained in this document apply to HP Quality Center 10.

The best practices contained in this document are based on industry standards, (e.g., CMMI, IEEE, etc.), requirements engineering authorities, and lessons learned by Orasi's professional services organization.

### **Scope**

Since there are numerous ways and methods to define and manage software requirements, this white paper is structured to address the common requirements engineering processes that include:

- ◆ Requirements Elicitation
- ◆ Requirements Analysis
- ◆ Requirements Specification
- ◆ Requirements Verification
- ◆ Requirements Management

### **Audience**

The intended audience of this document includes project managers, requirements analysts, testers, developers, and anyone else involved in requirements definition and management.

### **Assumptions**

It is assumed that the reader has a basic knowledge of the capabilities and features of HP Quality Center.

While HP Quality Center is used to manage requirements from many different industries, this document provides guidance primarily for managing requirements associated with software development projects.

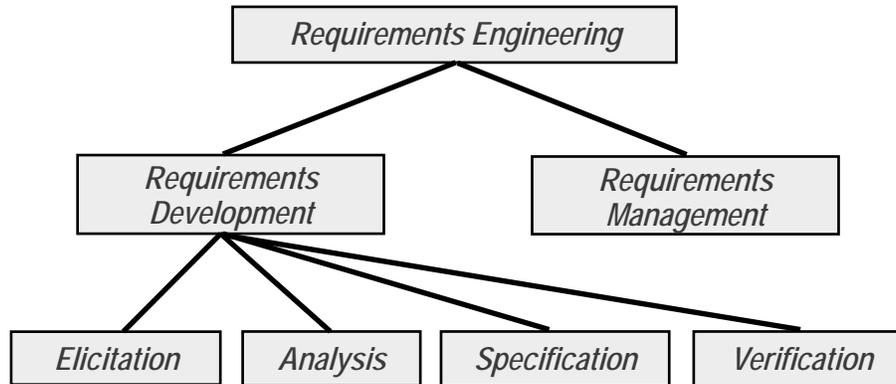
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## Requirements Engineering Overview

There are numerous authorities on requirements engineering and requirements management, and each tends to use its own terminology. Orasi has chosen Dr. Karl Wieggers' approach as a framework for describing HP Quality Center best practices. Wieggers' *Software Requirements* book (ISBN 0-7356-1879-8) is an excellent reference for any organization looking to improve its requirements engineering process.

The terms "Requirements Engineering" and "Requirements Management" are sometimes used interchangeably to describe the processes of requirements development and requirements management. Dr. Wieggers splits the domain of requirements engineering into two separate sub-disciplines of requirements development and requirements management. Each is described below:

## In Search of Excellent Requirements Components of Requirements Engineering



### ***Requirements Development***

Requirements Development involves numerous iterations of elicitation, analysis, specification, and verification.

#### **Requirements Elicitation**

Requirements Elicitation involves the gathering of requirements typically through the interaction of project stakeholders. This is usually done through a combination of interviews, document reviews, surveys, and facilitated workshops.

#### **Requirements Analysis**

After requirements have been elicited, they usually require further analysis and definition to gain a better understanding of what is needed to develop the system. During this step, requirements are decomposed to lower levels of specificity and are prioritized. Additionally, once the requirements are somewhat stable, trade-off analysis is done to determine which requirements fall within the scope of the project or the planned release schedule.

#### **Requirements Specification**

Documenting the requirements is usually done through a set of specifications. A project scope document, a user requirements document, and a functional specification are examples of documents that are produced to support the requirements development process.

#### **Requirements Verification**

Requirements Verification is performed to ensure that the requirements are correct and meet a specified set of quality characteristics. The goal of this step is to remove ambiguity from the requirements and ensure that they are testable.

### ***Requirements Management***

By their very nature, we expect requirements to change throughout the development lifecycle. So as not to negatively impact the scope and schedule of a project, it is necessary to manage requested changes to the requirements and analyze their impact.

## Managing Requirements vs. Managing Documents

### *Introduction*

While documents and specifications remain a vital part of most organizations' requirements engineering processes, HP Quality Center allows required documents to be generated as an integral part of the requirements engineering process, as opposed to the specification driving the process.

### *It's Called Requirements Management, Not Document Management*

Studies have shown that the historical methods of requirements engineering—capturing and communicating requirements in a document, translating requirements from one source to another and inadequately communicating changes to requirements—are not effective in today's fast-paced, distributed development environment. Organizations need to re-evaluate their procedures, discard obsolete methods and break out of the self-defeating pattern caused by an imperfect, haphazard and unused requirements engineering process.

From a process improvement perspective, we must modify our thinking when it comes to managing requirements. In analyzing the requirements engineering process, the following “what-if” questions need to be considered:

- ◆ What if the requirements specification were treated as a group of integrated, reusable components instead of as a static document?
- ◆ What if requirements could be written by their owner instead of being gathered and translated from one source to another?
- ◆ What if requirements and their associated attributes and representations were stored in a central repository where they could be communicated to and collaborated on by the entire organization?
- ◆ What if all affected stakeholders were automatically notified when a requirement changed?

Let's discuss these “what if” questions and explore the advantages and benefits that can be derived when we begin to think and act in this new way.

Most companies initiate the requirements management process by writing a document that defines the system in detail, including what functionality the system should provide; its system properties such as performance, reliability and efficiency; and the constraints on the operation and development of the system. This document serves as the official statement of the system requirements for all stakeholders, which may include customers, end users, testers and software developers. The document is commonly referred to as the functional specification, the requirements definition, or the software requirements specification (SRS).

For organizations that have formalized the requirements management process, a typical requirements specification can consume hundreds of pages, depending on the scope of the system being developed. In many instances, the focus of requirements management is more on writing and completing the document than it is on ensuring the completeness and consistency of the requirements prior to development. Attempting to manage requirements through a document can be very time-consuming based on the volatility of change, and in some cases, attempting to keep the document up to date can be an impossible task.

Instead of collecting requirements into documents, imagine what would happen if each requirement were treated as an object with specific attributes and behaviors. Treating requirements as objects gives them numerous valuable properties:

- ◆ **Visibility** – Requirements can be viewed, sorted and filtered on an individual basis as opposed to being buried in a document. This approach provides a mechanism for clearer elicitation, analysis and communication of requirements.
- ◆ **Reusability** – Requirements can be shared and re-used from one project to the next so that each project does not have to start from scratch.

- ◆ **Testability** – Each requirement can have its own verification and validation criteria defined. This provides a high level of quality for each requirement that is propagated across the entire system development process. More importantly, it allows the testing process to be initiated earlier in the software development lifecycle than is typically done.
- ◆ **Traceability and Replaceability** – Each requirement can be traced from its inception to its deployment in the delivered system. Each stakeholder requirement can be traced to its related system requirement(s), test requirement(s), designs, and program or component module. This allows impact analysis to be conducted easily any time a change to a requirement is identified or anticipated. Once the impact of the change has been evaluated, stakeholders immediately know which components that are related to the changed requirement might need to be changed or replaced.
- ◆ **Maintainability and Security** – Each requirement can have its own change history and level of security. This provides an individual record of changes, identification of who made each change and the reason for it, rather than forcing stakeholders to review a specification document annotated with change bars to identify modifications.
- ◆ **Full Characterization** – Several pieces of information of various data types can be stored for each requirement. In addition to a basic textual description, each requirement can be further defined with rich text, tabular information and linked to other objects such as graphical process models, use cases, spreadsheets, documents and test cases.

This new way of acting and thinking about requirements is supported by HP Quality Center.

## Setting up HP Quality Center to do Requirements Engineering

This section describes the best practices associated with setting up and configuring HP Quality Center to be used on an enterprise-wide basis. It is highly recommended that you start here and follow these guidelines as you begin to roll out HP Quality Center to your organization.

ID	Guideline	RE Applicability
1.0	<a href="#">Setup Guidelines</a>	Setup & Configuration
1.1	<a href="#">Project Strategy</a>	Setup & Configuration
1.2	<a href="#">User Groups/Security Profiles Strategy</a>	Setup & Configuration
1.3	<a href="#">Email Notification Strategy</a>	Setup & Configuration
1.4	<a href="#">Requirement Type Strategy</a>	Setup & Configuration
1.5	<a href="#">Custom Fields Strategy</a>	Setup & Configuration
1.6	<a href="#">Requirement Priority Strategy</a>	Setup & Configuration
1.7	<a href="#">Requirement Status Strategy</a>	Setup & Configuration
1.8	<a href="#">Requirements Traceability Hierarchy Strategy</a>	Setup & Configuration
1.9	<a href="#">Attachment Strategy</a>	Setup & Configuration

### 1.0 Setup Guidelines

This section addresses the following setup guidelines:

- ◆ Project Strategy
- ◆ User Groups/Security Profiles Strategy
- ◆ Email Notification Strategy
- ◆ Requirement Type Strategy
- ◆ Custom Fields Strategy
- ◆ Requirement Priority Strategy
- ◆ Requirement Status Strategy
- ◆ Requirements Traceability Hierarchy Strategy
- ◆ Attachment Strategy

Each is described below.

## 1.1 Project Strategy

Define a strategy to determine how projects will be represented, named and organized in HP Quality Center.

### Considerations

A project in HP Quality Center can represent any piece of work that needs to be managed. Projects can represent:

- ◆ an enterprise initiative that consists of a master project and subprojects
- ◆ a system or application

### Naming Conventions

Project names in HP Quality Center can be up to 30 characters in length. They are displayed in the Project drop-down list in alphabetical order.

## 1.2 User Group/Security Profile Strategy

User groups in HP Quality Center are used to organize a number of users who have similar responsibilities and possibly security access rights. Individual users can be assigned to one or many user groups. User groups also are used to grant security rights, allowing users to create, modify, view, and delete various items and attributes.

### Considerations

User groups in HP Quality Center typically coincide with the roles of the project stakeholders or match the roles defined for a system development lifecycle. These roles generally are allowed to perform specific actions with requirements and other items and their attributes. Some examples include:

- ◆ Project Manager
- ◆ Business Analyst
- ◆ End User
- ◆ Developer
- ◆ Tester
- ◆ Trainer
- ◆ Reviewer
- ◆ Product Owner
- ◆ SCRUM Master
- ◆ SCRUM Team

To minimize the administration of user groups, it is recommended not to organize user groups around job titles, since users typically play multiple roles within a HP Quality Center project. User groups can also be thought of as “security profiles” since all members of the group receive the same access rights.

The HP Quality Center Requirements Module provides default groups and security settings that can be modified by a project administrator. Additional groups and security settings that you may want to establish include:

- ◆ Full Access (read, create, update, delete) – team leads, managers
- ◆ Limited Access (read, create, update) – testers, business analysts (BAs)
- ◆ Read Access (read only) – reviewers

Security profiles also can be combined with workflow rules to provide and/or restrict visibility of custom fields based on a workflow status.

Strict security should be applied after the initial project activities have stabilized and the project manager sees the need to invoke security restrictions. To simplify administration, the group list related to the Requirements Module should be limited to no more than three to five groups.

### Naming Conventions

User groups should be aligned with the role names used for your development lifecycle process. Security profile names should reflect the level of access that is granted in the security profile (e.g., full access, read only, etc.).

### 1.3 Email Notification Strategy

HP Quality Center provides a way to receive email notification of a requirement modification or deletion. The Author (the user whose name is currently set as “Author”) of the requirement is notified.

#### Considerations

Email notification is an optional capability. If used, it should be turned on only after the project requirements have been “stabilized.” This approach minimizes “spamming” and emphasizes the importance of a given modification.

### 1.4 Requirement Type Strategy

Requirement types are used to organize requirements within the requirements tree. A set of default requirement types are provided. Default types can be modified and new requirement types can be created. Custom fields are specific to each requirement type. Requirement types are specific to a project, but can be pulled from a template project.

#### Considerations

- ◆ An HP Quality Center project contains at least the default requirement types: Folder, Group, Undefined, Business, Functional and Testing.
  - ◆ Folder and Group are special cases of requirement types used for organization and grouping of requirements. Folders are the highest level within a requirements tree. Folders should make it easy for the user to find a specific group or items within the requirements tree.
  - ◆ Groups are used within a folder as a way to categorize and sub-categorize the requirements within a folder. Groups are an optional feature. When a folder contains a large number of requirements, groups should be used to categorize the requirements within the folder.
  - ◆ Undefined is the default if no other type is specified.
- ◆ The number of requirement types in a project is dependent upon your software development methodology, the scope of the application, and the security requirements of the project. Generally, five to nine requirement types per project is a good rule of thumb. A basic set of requirement types for a project might include:
  - ◆ Business Requirements – answer the question “Why is this product or system being built?”
  - ◆ User Requirements – answer the question “What tasks must the user perform with the help of the system?” (Sometimes referred to as a Use Case or User Story).
  - ◆ Functional Requirements – answer the question “What features and functions must be contained in the product or system?”
  - ◆ Nonfunctional Requirement – describe the environment or quality of the product or system.

#### Naming Conventions

Folders can be named for the expected types of requirements contained in them or by some other organizing method. The name should be consistent with the types of requirements identified in the software development lifecycle methodology.

### 1.5 Custom Fields Strategy

Custom fields are optional. Custom fields are specific to a project, but can be pulled from a template project. They are selectively associated with the various requirement types, meaning that some custom fields may apply to some requirement types and not to others.

#### Considerations

The custom fields selected are usually driven by reporting requirements or for sorting and filtering requirements. Custom fields are usually the differentiator between requirement types. If two requirement types have exactly the same custom fields, it may be an indication of a redundant requirement type. It is usually best to start out with a limited number of custom fields and add others as the need arises.

#### Naming Conventions

Standard naming conventions should be developed for custom fields. Each custom field should have an agreed-upon definition.

## 1.6 Requirement Priority Strategy

The Requirement Priority field is a user-configurable system attribute. Lookup List attributes in HP Quality Center are tied to a list that is global to the project. The default list used by Requirement Priority is the same one used by Defects.

### Considerations

Prioritizing requirements provides a way of determining what needs to be worked on first. If all requirements have the same priority, it becomes difficult to determine what requirements may need to be excluded when project time lines are constrained. An agreed-upon priority scheme should be developed to determine which requirements are more critical than others. A priority scheme should be defined and agreed upon by all stakeholders

### Naming Conventions

In order to limit confusion with the Lookup List for Defects, it is recommended that a new Lookup List called Requirement Priority be created and tied to the requirement priority. This also can be done in a template project for use across numerous projects.

There are numerous priority schemes. The most common is “High–Medium–Low” (which is the default in HP Quality Center). Unfortunately, without a definition of each priority, assignment can be very subjective. Karl Wieggers suggests thinking of priority in terms of the two dimensions of importance and urgency. High priority requirements are both important and urgent – they must be included in the next release. Medium priority requirements are important but not urgent – the user needs the capability, but can wait if necessary for a later release. Low priority requirements would provide value, but they are neither important nor urgent – we can live without the capability, perhaps forever!

Another definitive scheme is “Essential–Useful–Desirable.” Essential means that the product/system cannot be shipped without it. Useful means that the requirement would make the product/system more useful if it were present. Desirable means that if we have the time, this requirement would be nice to have in the product/system.

It is also recommended that “unassigned” be the default value as a requirement is added. This assists in knowing whether a priority has actually been assigned to a requirement. If multiple priority schemes are needed for different stakeholders, it is suggested that they be added as user-defined attributes.

## 1.7 Requirement Status Strategy

The Requirement Status field does not exist as a system field in HP Quality Center. A custom Lookup List attribute can be created for this purpose. Lookup List attributes in HP Quality Center are tied to a list that is global to the project. A list should be created specifically for the requirement status. It is recommended to name the list “Requirement Status” and tie it to the Requirement Status custom field. This can also be done in a template project and will be available to all projects that use the template.

### Considerations

The status of a requirement typically represents the different “states” of the requirement in relationship to the system development lifecycle. A status schema should be established and agreed upon by all stakeholders.

### Naming Conventions

A recommended status schema is “Draft–Accepted–In Review–Approved–Rejected–Deferred.”

- ◆ Draft – the default value when adding a requirement.
- ◆ Accepted – the requirement is being analyzed.
- ◆ In Review – the requirement is ready for a review.
- ◆ Approved – the requirement is valid and ready for assignment to a release.
- ◆ Deferred – the requirement will be considered for implementation at a later time.
- ◆ Rejected – the requirement was not accepted for inclusion in the product.

### 1.8 Requirements Traceability Hierarchy Strategy

Traceability refers to the relationships between requirements and other development objects (e.g. tests, defects, etc.). The relationship could be a parent-child relationship and/or a dependency relationship. HP Quality Center automatically keeps track of parent-child relationships. Domain experts for the requirement are the best resource to specify dependency relationships.

#### Considerations

A traceability hierarchy should be identified that will be used to show dependencies or relationships among requirements and other development objects. It is suggested that the initial hierarchy be kept simple, and then expanded as the needs of the project dictate additional traceability. The traceability hierarchy must show "traces to" and "traces from" for all selected objects. Within HP Quality Center, when a user creates a trace-to link, HP Quality Center automatically creates a complementary trace-from link.

A basic traceability hierarchy may include:

- ◆ Business Requirements trace to User Requirements
- ◆ User Requirements trace from Business Requirements
- ◆ User Requirements trace to Functional Requirements
- ◆ Functional Requirements trace from User Requirements
- ◆ Non-Functional Requirements trace to Functional Requirements
- ◆ Functional Requirements trace to Tests
- ◆ User Stories trace to a Release or Sprint
- ◆ Tests trace to User Stories

Traceability links should only be created after the requirements have been stabilized to minimize the maintenance of the links. Domain experts for each requirement type should be responsible for creating traces. For example: when creating a user requirement, the user should be responsible for tracing it back to the business requirement(s) that caused the user requirement to be created.

HP Quality Center maintains the concept of indirect traces, so it is not necessary to trace a requirement to every other downstream requirement. For instance, if Requirement A traces to Requirement B, and Requirement B traces to Requirement C, the indirect trace of A to C is viewable in HP Quality Center.

### 1.9 Attachment Strategy

HP Quality Center allows attachments to be pinned to Requirements to support further definition of a requirement.

#### Considerations

Attachments to requirements can include:

- ◆ Documents
- ◆ Graphs and graphical models
- ◆ Screen shots
- ◆ Video files
- ◆ Links to web pages

Attachments should serve the purpose of further clarifying the requirement, or explaining its origin. It is possible to pin as many attachments to a requirement as needed. Keep in mind that attachments are stored in the repository and a duplication exists if the same file is attached to multiple requirements (therefore using more space. If the Version Control option is selected for the project, attachments are also version controlled.

## Requirements Development Using HP Quality Center

This section provides guidelines and suggestions for using HP Quality Center during the requirements development stage of your project. Depending on the type of project, you may use all, some or none of these guidelines/suggestions.

ID	Guideline	RE Applicability
2.1.0	<a href="#">Requirements Elicitation</a>	Requirements Elicitation
2.1.1	<a href="#">Import from Microsoft Excel</a>	Requirements Elicitation
2.1.2	<a href="#">Import from Microsoft Word</a>	Requirements Elicitation
2.1.3	<a href="#">Adding, Modifying and Deleting Requirements</a>	Requirements Elicitation
2.1.4	<a href="#">Managing Use Cases</a>	Requirements Elicitation
2.1.5	<a href="#">Managing User Stories for SCRUM</a>	Requirements Elicitation
2.1.6	<a href="#">Requirements Collaboration</a>	Requirements Elicitation
2.2.0	<a href="#">Requirements Analysis</a>	Requirements Analysis
2.2.1	<a href="#">Requirements Decomposition</a>	Requirements Analysis
2.2.2	<a href="#">Requirements Prioritization and Trade-Off Analysis</a>	Requirements Analysis
2.2.3	<a href="#">Requirements Traceability</a>	Requirements Analysis
2.2.4	<a href="#">Commenting on Requirements</a>	Requirements Analysis
2.2.5	<a href="#">Requirements Reporting</a>	Requirements Analysis
2.3.0	<a href="#">Requirements Specification</a>	Requirements Specification
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2.4.0	<a href="#">Requirements Verification</a>	Requirements Verification
2.4.1	<a href="#">Validation Specification</a>	Requirements Verification
2.4.2	<a href="#">Requirement Reviews</a>	Requirements Verification
2.4.3	<a href="#">Managing Test Cases</a>	Requirements Verification

### 2.1.0 Requirements Elicitation

HP Quality Center supports requirements elicitation in the following ways:

- ◆ Import from Microsoft Excel
- ◆ Import from Microsoft Word
- ◆ Adding, modifying and deleting requirements
- ◆ Managing Use Cases (as requirements)
- ◆ Managing User Stories for SCRUM (as requirements)

Each is described below.

#### 2.1.1 Import from Microsoft Excel

Prior to using HP Quality Center, if you have chosen to manage requirements in Microsoft Excel, it is possible to import requirement names, descriptions, requirement types and custom fields directly into HP Quality Center using the MS Excel Add-In. The add-in allows you to map fields in an existing MS Excel file to custom fields in HP Quality Center. This is the recommended method for importing existing requirements when you need to import data in addition to the Requirement Name and Requirement Description.

#### Guidelines & Suggestions

- ◆ Prior to using the MS Excel Add-In, it is imperative that a backup of the HP Quality Center repository be created. It is also recommended that an Orasi consultant be available to help with sizable data migration planning and execution.
- ◆ Prior to the using the MS Excel Add-In, it is necessary to create the requirement types and custom fields in the HP Quality Center project that is the target of the import. Large file imports should be scheduled for off-peak periods as the import consumes server resources during the import.

- ◆ Once the requirements are imported from MS Excel they should be maintained in HP Quality Center. It is recommended that the MS Excel file be archived for historical purposes. If you anticipate that you will continue to receive requirements in an MS Excel file format, it is suggested that you provide a spreadsheet template that will allow you to quickly import the delimited file.

### 2.1.2 Import from Microsoft Word

Since many organizations have traditionally used a document-based approach for managing requirements, HP Quality Center provides a capability to import requirements from an MS Word document. The import from MS Word capability actually parses a document based on tags. An add-on is added to MS-Word and a toolbar appears that enables you to highlight and tag various elements of your requirements (i.e. name, description, requirement type, hierarchy, etc.). For large documents this can be a very tedious and time-consuming exercise. A second option is to set up style sheets in MS Word to be used for writing/collecting requirements and use the supplied Word macro to create your own custom macro to identify the styles you are using. Use of the custom Word macro is also suggested if requirements are to be imported on a recurring basis.

#### Guidelines & Suggestions

- ◆ Prior to importing the document, it is suggested that you perform an analysis of the document to determine what formatting styles were used.
  - ◆ If the document contains multiple requirement types, it is recommended that the document be separated into multiple documents to minimize import time.
  - ◆ If formatting styles were not used in the document, apply a style for the requirement name and another style for the requirement description.
  - ◆ If the document contains graphics or tables that support the definition of the requirement, these sections can be imported to the rich text portion of the requirement or optionally, each of these should be saved as a separate document and then be linked to the corresponding requirement using the Attachments tab.
- ◆ After importing the document, it is recommended that the original document be placed in your version control system as an initial artifact of the project. All changes to the requirements should now be done using HP Quality Center.
- ◆ If you anticipate that you will continue to receive requirements in Microsoft Word format, it is suggested that you define a Microsoft Word template with preformatted styles that will allow you to quickly import the requirements.
- ◆ A Requirement Type column can be created to identify which requirement type each requirement is to be imported as. Names must be exact.
- ◆ Hierarchy can be established by specifying a “path” column containing a string that has the folder or parent requirement names above the requirement all the way to the top level (separated with a back slash – like a path).

### 2.1.3 Adding, Modifying and Deleting Requirements

Requirements can be added, modified and deleted using HP Quality Center’s user interfaces.

#### Guidelines & Suggestions

- ◆ The use of requirement types provides a way of categorizing the types of requirements that you desire to capture. Folders or groups are special cases of a requirement type that help provide an additional level of organization within the requirements tree.
- ◆ A folder should be named for the items that it contains. For example, if you plan to capture business requirements, you should create a folder called “Business Requirements.” Each requirement that is contained within the Business Requirements folder should have a Type of Business Requirements.
- ◆ If you have a large number of items in a folder, you can use the Group requirement type to categorize and sub-categorize the items that are contained in the folder. For example, you may want to categorize business requirements into: Business Opportunity, Business Objectives, Major Features, Assumptions, Customer Profiles, Project Priorities, and Product Success Factors.
- ◆ Most requirements start out as a high-level statement of what is needed. It is suggested that this high-level description be captured with the expectation that it will be decomposed into lower levels of detail and the elicitation and analysis steps are reiterated.
- ◆ To indicate that the statement is truly a requirement, it is suggested that a requirements statement use the word “must” as an action verb. For example, “the system must check the spelling of words” would be a way of

phrasing a high-level requirement for a word processing system.

- ◆ It is recommended that requirements not be deleted. They sometimes tend to reappear due to a change in project team members. The use of a Deleted status is one way to maintain requirements that have been deleted.
- ◆ Another method of maintaining deleted requirements is to create a requirement type called “Deleted Requirements” or “Trash Can.” If this method is used, the requirement type must contain all custom fields that are used in the project, since multiple requirement types can be moved to the Deleted requirement type. If this is not done, you may lose data when the requirement is moved.

### 2.1.4 Managing Use Cases

Many organizations have found use cases to be an excellent way of eliciting requirements from stakeholders. Instead of asking the stakeholder “what do you want or need,” the use case asks the question “what tasks do you need to perform using the system?” It also allows the elicitation process to be more focused on specific use cases as opposed to randomly eliciting individual functional requirements.

#### Guidelines & Suggestions

- ◆ There are numerous methods and tools for documenting use case models and use cases. Many organizations use a combination of MS Word, MS Excel and MS Visio diagrams to support their use case process. HP Quality Center can be used to document use cases by setting up user-defined attributes that map to a use case template. However, HP Quality Center is better suited to managing the use cases by providing the status, an author/owner and traceability from business requirements and traceability to functional requirements.
- ◆ Instead of writing the use case using user-defined attributes in HP Quality Center, use an MS Word template or an MS Excel spreadsheet. Also, the use of modeling and simulation tools can provide more sophisticated methods of documenting use cases.
- ◆ If Microsoft Word, Excel and/or Visio are used to document the use case, use the Attachment tab or the Rich Content tab to associate the use case with the user requirement. HP Quality Center also supports linking to files from most of the popular modeling tools.
- ◆ The Requirement Grid view is an excellent method for managing the status, author/ownership, and priority of the use cases. Creating a favorite view of the requirements grid filtered on User Requirements facilitates this activity.
- ◆ A quick report of all use cases can be created using the Standard Requirement Report (one of the standard HP Quality Center reports) filtered on User Requirements.
- ◆ The Document Generator can be used to create a formal User Requirements Specification.
- ◆ A Requirement Grid view filtered on Business Requirements Tracing to User Requirements provides a way of identifying coverage of business requirements. Business requirements that do not have at least one user requirement associated with them are a sign of incompleteness. User requirements that do not trace to at least one business requirement may be out of project scope.
- ◆ A Requirement Grid view filtered on User Requirements Tracing to Functional Requirements provides a way of identifying coverage of user requirements. User requirements that do not have at least one functional requirement associated to them are an indication of incompleteness. Functional requirements that do not trace to at least one user requirement can be an indication of functional requirements that may be out of scope.

### 2.1.5 Managing User Stories for SCRUM

Many organizations are using user stories as they apply Agile software development practices. User stories are central to the SCRUM framework. A user story is a software system requirement formulated as one or two sentences in the everyday language of the user. HP Quality Center can be configured to support SCRUM and user stories.

#### Guidelines & Suggestions

- ◆ There are numerous tools for documenting user stories, including 3 x 5 cards, MS Word and MS Excel. Unfortunately, these tools do not have a direct integration with requirement management, test management and defect management. HP Quality Center provides this single tool integration.
- ◆ HP Quality Center’s trace from and trace to functionality allows the association of user stories with product planning requirements. This ensures that all of the documented user stories are within product scope, as well as provides a mechanism for assessing the impact of changes to product scope.
- ◆ Requirements in HP Quality Center can have a project-defined requirement type associated with it. These requirement types are created by a project administrator and can support the SCRUM methodology. These would

include the requirement types: Folder, User Story and Task. Each requirement type can have custom fields created that support user story and task management.

- ◆ The SCRUM methodology calls for a product backlog, release backlog, and sprint backlog. These can be created with a requirement type of Folder. User stories are children of the sprint they are assigned to. A suggested hierarchy supporting SCRUM and user stories is:

Product Backlog Folder  
 Release Backlog Folder  
 Sprint Backlog Folder  
 User Story Requirement Type

- ◆ Requirements with the type of Task can be created and organized as children of a user story. These tasks represent the “how” for the user story’s “what.” Custom fields for these tasks would include:
  - ◆ **Current Estimated Effort:** best guess as of now
  - ◆ **Actual Spent Effort:** time already spent by development
  - ◆ **Remaining Effort:** Calculated value, Current Estimate minus Actual Spent
  - ◆ **Percentage Completed:** Calculated value, Actual Spent divided by Current Estimate

Note: the calculated values require customized programming.

- ◆ Through customized programming, task efforts can be aggregated to the same custom attributes at the user story level and then to parent folder levels. Progress can be seen directly on all levels via the Percentage Complete field.
- ◆ SCRUM burn-up and burn-down charts can be created from the aggregated values using the Dashboard functionality of HP Quality Center.
- ◆ Use the Attachment tab or the Rich Content tab to associate additional user story information.
- ◆ The Requirement Grid view is an excellent method for managing the status, author/ownership, and priority of the user stories. Creating a favorite view of the requirements grid filtered on User Story facilitates this activity.
- ◆ A quick report of all user stories can be created using the Standard Requirement Report (one of the standard HP Quality Center reports) filtered on User Story.
- ◆ The Document Generator can be used to create a formal User Story Specification.
- ◆ User stories can be associated with tests in the Test Plan. This provides the ability to show test coverage of user stories.
- ◆ Releases can be created in the Management Module. These releases coincide with the product release strategy in SCRUM planning.
- ◆ Test cycles also can be created and associated with a release. They can be named for SCRUM sprints. The user stories and tasks then can be associated with SCRUM Sprint Test Cycles. This allows association of requirements and test set folders in the test lab to SCRUM Sprint Test Cycles that are associated with a product release. This provides the ability to quickly see testing progress of releases and SCRUM Sprint Test Cycles.

### 2.1.6 Requirements Collaboration

Effective requirements development and management are based on communication and collaboration among all stakeholders. The Comments tab provides a means to facilitate discussions at the requirement level. Unlike email threads that are maintained at the personal level and can disappear entirely, comments are associated with their associated requirements and are maintained permanently within HP Quality Center.

#### Guidelines & Suggestions

- ◆ Project Managers should encourage the use of the Comments tab as an efficient means of providing communication and collaboration among project stakeholders.
- ◆ Since the Comments tab is available for all items in the requirements tree, they also can be used to provide guidance on what should be contained in a specific folder or the meaning of group.

## 2.2.0 Requirements Analysis

HP Quality Center supports requirements analysis in the following ways:

- ◆ Requirements Decomposition
- ◆ Requirements Prioritization and Trade-Off Analysis
- ◆ Requirements Traceability
- ◆ Discussion Topics
- ◆ Requirements Reporting

Each is described below.

### 2.2.1 Requirements Decomposition

Requirements decomposition is a method of taking a high-level statement and drilling down to the details of what composes the requirement. HP Quality Center allows requirements to be decomposed to numerous levels, typically referred to as a hierarchy with parent-child relationships.

#### Guidelines & Suggestions

- ◆ Requirements that are decomposed beyond five levels may indicate a very complex requirement or possibly more than one requirement.
- ◆ It is suggested that requirements be decomposed to the atomic level to allow portions of requirements to be delivered at different stages or releases. For instance, a high level requirement stating that “the system must maintain customer information” could be decomposed into three child requirements:
  - The user must be able to add customer information
  - The user must be able to modify customer information
  - The user must be able to delete customer information

This allows the capability to deliver the “add” and “modify” requirements in phase one of the project and the “delete” requirement in a later phase.

### 2.2.2 Requirements Prioritization and Trade-Off Analysis

As the requirements begin to stabilize, they should be prioritized. Since almost all projects are resource-constrained, prioritization of requirements facilitates better scheduling and allocation of work to the project team. However, basing the priority on multiple factors—such as risk, business criticality, cost, and complexity—can enhance prioritization.

#### Guidelines & Suggestions

- ◆ Whatever priority scheme is decided upon by the stakeholders, it must be defined and used consistently.
- ◆ If multiple factors are used to determine priority, the Requirements Grid is a good way of sorting and filtering the set of requirements when trade-off analysis is being conducted. A saved view of the Requirement Grid that is filtered on the requirement type and multiple custom fields facilitates the process. The Requirements Grid provides an easy method of doing mass updates to a set of requirements.

### 2.2.3 Requirements Traceability

Traceability provides another method of requirements analysis, specifically completeness and coverage.

#### Guidelines & Suggestions

- ◆ A Requirement Grid view filtered on Traceability should be developed for all items that compose your project’s traceability hierarchy. During analysis of the traceability grids you generate, you can identify missing and/or questionable traces. Resolution of questionable traces and missing traces should be done during this stage of the project.
- ◆ Besides making traces among requirements, links to other development objects, such as supporting documents and tests, provides a means of providing additional details of requirements and the ability to do impact analysis when a change occurs. It is recommended that links to other objects be done only after the requirements have been stabilized to minimize the time required for maintaining the links.

## 2.2.4 Commenting on Requirements

Effective requirements development and management are based on communication and collaboration among all stakeholders. The Comments tab provides a means to facilitate discussions at the requirement type and requirement levels.

### Guidelines & Suggestions

During requirements analysis, the Comments tab can be used to provide feedback and position questions related to the requirements. This is especially helpful during requirement reviews and when providing answers related to the decomposition of specific requirements.

## 2.2.5 Requirements Reporting

HP Quality Center provides a number of standard reports and graphs for analyzing requirements at different stages of the lifecycle. Any of the standard reports and graphs can be modified to meet specific user requirements. All reports and graphs are automatically version controlled and can be saved as “public” or “private” to control access.

### Guidelines & Suggestions

It is suggested that a minimum number of reports be identified to support requirements analysis. HP Quality Center provides the following reports for requirements analysis:

- ◆ Standard Requirements Report –provides a detailed list of all requirements
- ◆ Tabular Report
- ◆ Requirements with Coverage Tests
- ◆ Requirements with Coverage Tests and Steps
- ◆ Requirements with Linked Defects
- ◆ Requirements with Traceability
- ◆ Report Select—provides a report of selected requirements
- ◆ Report Selected with Children—provides a report of selected requirements and their child requirements.

HP Quality Center also provides a set of standard graphs that can be used for requirements analysis that includes:

- ◆ Requirement Summary – Grouped by “Priority”
- ◆ Requirements Progress – Grouped by “Direct Coverage Status”
- ◆ Requirements Trend – Grouped by “Direct Coverage Status”
- ◆ Requirements Coverage Graph – shows test coverage

## 2.3.0 Requirements Specification

HP Quality Center supports requirements specification in the following ways:

- ◆ Specification Generation
- ◆ Online Reporting
- ◆ Reporting from the Relational Database

Each is described below.

### 2.3.1 Specification Generation

Document Generator is the primary method of generating hard-copy requirements specifications and reports. The Document Generator Wizard allows configuration of many options for specifications and reports required for your project.

### Guidelines & Suggestions

- ◆ Running Document Generator consumes server resources so it is best to run it for larger projects during off peak periods of operations.
- ◆ Since Document Generator creates an MS Word document, the document can be saved as HTML and posted to a web site. This minimizes document distribution and allows non-HP Quality Center users access to the requirements.

### 2.3.2 Online Reporting

The Requirement Grid is the primary method of generating ad-hoc online reports within a project. The Requirement Grid provides an easy way to filter and sort requirements. The Requirements Grid also provides the capability to navigate the requirements tree. HP Quality Center also provides a set of semi-customizable standard online reports that can also be printed.

#### Guidelines & Suggestions

- ◆ If a set of standard online reports is needed for the project, set these up as saved Favorite views of the Requirement Grid, which can be either saved as either private or public.
- ◆ Data in the Requirements Grid also can be saved as an HTML or MHTML file.
- ◆ Requirements data also can be used to create charts.

### 2.3.3 Using the Dashboard for Reporting

All data in a HP Quality Center project is stored in MS-SQL or Oracle. The data is generally not addressed directly, but HP Quality Center's built-in Excel Reporting Module uses SQL and Excel macros to help you to do reporting and analysis, or export for use with various query and analysis tools.

#### Guidelines & Suggestions

- ◆ Dashboard reports are dynamic, so any time you open a dashboard report the data reported is real time.
- ◆ All reports reside in the Dashboard Module; however, standard reports and graphs can be initially created in the Requirements Module Analysis tab. Any reports or graphs you create from the Analysis tab can be customized or modified in the Dashboard Module.
- ◆ Reports and graphs can be saved as either public or private.
- ◆ Security can be added to a custom report via workflow.
- ◆ The Dashboard Module allows you to create dashboards that contain up to four graphs.
- ◆ Dashboard reports are not version controlled, so if it is important to you to have a specific time snapshot of a dashboard, it should be saved as a separate report.

### 2.4.0 Requirements Verification

HP Quality Center supports requirements verification in the following ways:

- ◆ Validation Specification
- ◆ Requirement Reviews
- ◆ Managing Test Cases

Each is described below.

#### 2.4.1 Validation Specification

A method for ensuring that requirements are met is to develop verification and validation steps that will prove the functionality of the system. The earlier in the lifecycle that testing is considered the better. HP Quality Center can be customized to have a Validation tab containing a Validation custom attribute as a place to record how the requirement will be verified and validated.

#### Guidelines & Suggestions

- ◆ As requirements become stabilized, it is suggested that QA analysts analyze each requirement and record a suggested method for testing the requirement. This approach allows test planning to begin earlier in the software development lifecycle.
- ◆ QA Analysts also can make use of the Comments tab to pose questions to other stakeholders to gain a better understanding of the requirement.

### 2.4.2 Requirement Reviews

It is recommended that requirement reviews be conducted early and often. A requirement review is a method for ensuring that all stakeholders understand the requirement. Resolution of all ambiguities is an initial sign that the requirement is beginning to stabilize. Multiple stakeholders should be invited to ambiguity reviews, as each stakeholder approaches the review from a different perspective.

#### Guidelines & Suggestions

- ◆ To be effective and to ensure that the review is conducted in a consistent manner, each reviewer should be provided a formal checklist. Karl Wiegers suggests that a requirement have the following qualities:
  - ◆ Unambiguous
  - ◆ Complete
  - ◆ Consistent
  - ◆ Correct
  - ◆ Feasible
  - ◆ Modifiable
  - ◆ Necessary
  - ◆ Prioritized
  - ◆ Traceable
  - ◆ Verifiable
- ◆ HP Quality Center supports the online recording of requirement reviews by using a combination of a custom tab and the Comments. The custom tab may include the following user-defined attributes and data types:
  - ◆ Review by: (multiple selection list)
  - ◆ Revised Description: (multi-line text box)
  - ◆ Number of Ambiguities Found: (text box)
- ◆ Each reviewer should initialize his review on the Comments tab and post specific questions related to the review. Other reviewers can post replies to the questions.

### 2.4.3 Managing Test Cases

At a minimum, test cases for all functional requirements should be documented. Since we are working with HP Quality Center already, this is done in the Test Management Modules of HP Quality Center. Requirements also can be traced to test cases to indicate their coverage of the related functional requirements.

#### Guidelines & Suggestions

- ◆ Test cases can be automatically created from requirements in the Requirements Module.
- ◆ When test cases are automatically created from the Requirements Module, a link between the requirement and the test case is also created. This allows you to report on requirement-to-test case coverage.

## Requirements Management Using HP Quality Center

This section provides guidelines and suggestions for using the HP Quality Center Requirements Module during the requirements management stage of your project. Depending on the type of project, you may use all, some or none of these guidelines/suggestions.

ID	Guideline	RE Applicability
2.5.0	<a href="#">Requirements Management</a>	Requirements Management
2.5.1	<a href="#">Requirements Versioning</a>	Requirements Management
2.5.2	<a href="#">Baselining Requirements</a>	Requirements Management
2.5.3	<a href="#">Impact Analysis</a>	Requirements Management
2.5.4	<a href="#">Managing Change Requests</a>	Requirements Management

## 2.5.0 Requirements Management

HP Quality Center supports requirements management in the following ways:

- ◆ Requirements Versioning
- ◆ Requirement history (selected attributes)
- ◆ Baselining Requirements
- ◆ Impact Analysis
- ◆ Managing Change Requests

Each is described below.

### 2.5.1 Requirements Versioning

Since HP Quality Center manages requirements at the object level, it can version each requirement every time a change is made. Requirements can be viewed at any version, rolled back to any version, and versions can be compared. Additionally, it creates an audit trail that records who, what, when and why the change was made. Note: Versioning can be turned on or off for a project.

#### Guidelines & Suggestions

- ◆ Versioning of requirements in HP Quality Center must be enabled for each project, but is automatic thereafter. You can control whether the change is recorded as a major or minor change. Users also are required to check individual requirements out to work on them and check them back in when finished.
- ◆ The requirement version number is used for two purposes:
  - ◆ To see previous versions of the requirement in a read-only mode.
  - ◆ To roll back to a previous version of a requirement.

### 2.5.2 Baselining Requirements

Baselining of requirements is supported in HP Quality Center. A baseline is considered a snapshot of a set of requirements as they existed at a certain point in time. A project may have multiple baselines.

#### Guidelines & Suggestions

- ◆ Baselines are usually associated with significant milestones of the software development lifecycle. Each time a major review/approval of a set of requirements is completed, a baseline should be recorded. For example, when all of the business requirements have been reviewed and approved, a baseline should be taken. This provides a means of comparing which business requirements have been added, modified, or deleted after the baseline has been taken.
- ◆ A baseline also can be used in conjunction with report generation to produce a specification or report based on a specific filtered set of requirements. It is recommended that as soon as a baseline is taken, a baseline report should be generated for historical purposes.
- ◆ When naming a baseline, it is suggested that the name contain the type and date of the baseline (e.g., “Business Requirements 5/2/10”).

### 2.5.3 Impact Analysis

One of the major values of using HP Quality Center is the ability to do impact analysis when someone recommends that a requirement be changed. The Traceability tab can be used to depict all traceable objects that trace to and trace from the specific requirement under consideration.

#### Guidelines & Suggestions

- ◆ When a suggested change is submitted, the analyst should use the Traceability tab to review the initial impact of the change.
- ◆ Additional analysis can be done using the grid view and filtering by traceability.

### 2.5.4 Managing Change Requests

HP Quality Center can be used to manage change requests. To clarify a common misconception, change requests are *not* requirements. Change requests can cause the addition of new requirements, the modification of existing requirements, or the deletion of existing requirements. Due to the close nature of change requests to requirements, some users have chosen to manage their change requests in HP Quality Center.

#### Guidelines & Suggestions

- ◆ Change requests can be managed in HP Quality Center in two ways:
  - ◆ If the change requests only affect a specific project, a Change Request requirement type can be included in the single project.
  - ◆ The Defect Module of HP Quality Center can be used for change requests, where a Defect = a Change Request. The defects/change requests can be linked to requirements.
- ◆ When a separate Change Request project is maintained, it is suggested that the following requirement types be set up:
  - ◆ Submitted Change Requests
  - ◆ Accepted Change Requests
  - ◆ Approved Change Requests
  - ◆ Disapproved Change Requests

This structure allows a workflow method for managing the change requests. Security can be set so any user can create a Submitted change request. After review of the change request, an approved analyst can move the change request from Submitted to Accepted. After completion of analysis of the accepted change request, a Change Control Board (CCB) can move the change request from Accepted to Approved or Disapproved. Email notification also can be employed to notify affected parties of the status of the change request.

## Summary

This is considered a “living” document based on lessons learned from using the HP Quality Center Requirements Module in a real world experience. Recommended changes to this document should be submitted to [steven.davis@orasi.com](mailto:steven.davis@orasi.com).