10

Creating the Requirements Management Plan and Requirements Traceability Matrix

Introduction

When Does One Write the RMP and the RTM?

The requirements management plan (RMP) is a document that describes how requirements will be analyzed, documented, and managed throughout the project. It is frequently published in conjunction with the requirements traceability matrix (RTM). Both the RMP and RTM are supposed to be created along with the requirements specifications, and all three documents act as key inputs in the creation of the project plan document.

On smaller and medium-size projects, a shortened RMP can be incorporated either into the requirements specifications document or into the project plan. The RTM is usually included in the appendix of the requirements documentation. Having said that, on larger, more sophisticated ventures, it is a good idea to have these documents as separate, stand-alone artifacts.

RMP Benefits

There are several benefits of the RMP. First, it outlines how the requirements were collected and what methodologies have been used to elicit requirements from the users, customers, documentation, and all other potential sources. Second, it describes the requirements tracking and reporting methodologies, explaining how the

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

K24187_Book.indb 203 10/17/14 1:12 PM

requirements will be managed and how the changes to them will be communicated to all the project stakeholders. Third, it outlines the key steps in initiating the changes, assessing the impact of the requested changes, and the mechanism for either accepting or rejecting the changes.

What Is Traceability?

Requirements tracing is the process of documenting the links between the user requirements for the product or service you're building and the work components developed to implement and verify those requirements (see Figure 10.1). Those products may include business problems or requirements, features, or technical requirements (i.e., detailed, functional, and nonfunctional requirements as well as functions and attributes).

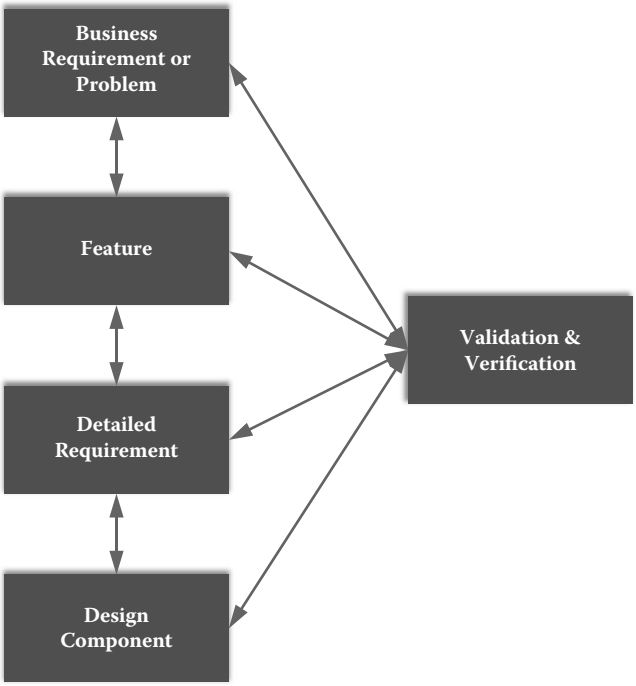

Figure 10.1 Requirements traceability.

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

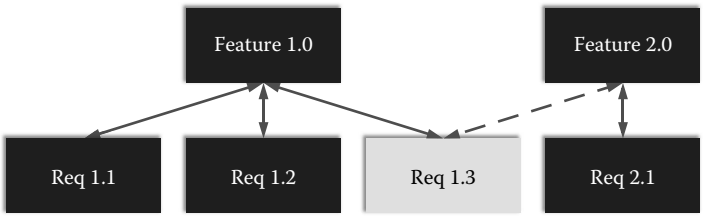

Figure 10.2 Requirements interdependency.

What Are the RTM Benefits?

There are many benefits to creating the RTM. One of those moments arrives when a change request is made and the technical team needs to identify the primary requirement (or feature, or design component) that needs to be changed. However, what frequently happens is that one scope component might have multiple relationships with either its "children" (i.e., design components) or its "parents" (i.e., features in our case) and changing one requirement could affect several features (see Figure 10.2).

Imagine the following simplified scenario. A company is designing a new baby stroller. Among multiple other scope components, the product scope contains the following features:

- F 3.0 Stroller Weight
  - Req 3.1 The new stroller weight shall be less than 35 pounds (≈16 kilogram).
- F4.0 Child Weight
  - Req 4.1 The new stroller shall support the child weighing up to 40 pounds (≈18 kilogram).
- F 5.0 Stroller Price
  - Req 5.1 The retail price of the stroller shall be less than $450.

All the features and requirements listed above appear to be unrelated, at least in the way they were documented. Let us assume that all these requirements were possible, but at some point the marketing department, after additional focus group studies, requested to decrease the weight of the stroller from 35 pounds to, say 25 pounds.

There are generally speaking two possible approaches to accommodating this change. One would be to use lighter components in

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

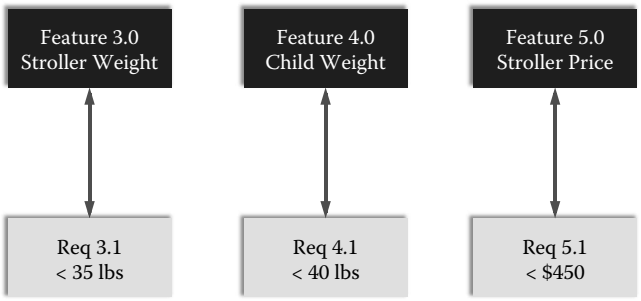

Figure 10.3 Stroller requirements: before.

the construction of the stroller, for example, tubes with thinner walls, or tubes of smaller diameter. This will most likely affect the stroller weight problem, but there is no guarantee the device will support the weight of 40 pounds. In other words, the change to requirement 3.1 will also affect requirement 4.1.

Another way of addressing this issue would be to use more durable materials in the construction of the stroller. For example, the aluminum parts can be replaced by titanium components. But this modification will most likely increase the price of the stroller to more than the $450 outlined in requirement 5.1.

Therefore, although it was assumed that the initial requirements structure looked like that shown in Figure 10.3, the actual RTM looks like that shown in Figure 10.4. The RTM can also be used to track the current status of the requirements on the project and find missing scope components. Project managers can also use traceability

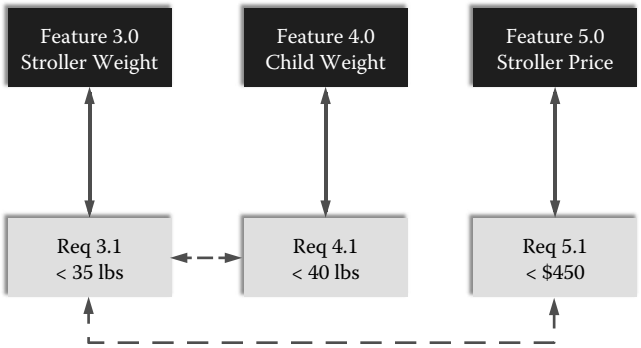

Figure 10.4 Stroller requirements: after.

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

to help them in assessing the progress of the project. As requirements are traced to design components and later to verification and validation tasks, management can estimate the project completion status based on how many requirements have been traced to artifacts created later in the planning.

Furthermore, the RTM provides the project team with an improved process visibility. The project manager or an analyst can determine where a requirement came from, its importance, how it was implemented, and how it was tested.

There are five RMP and RTM documents on the Taylor & Francis Group/CRC Press website http://www.crcpress.com/product/isbn/9781482259483 under the Downloads tab. In this chapter, we analyze several excerpts from a couple of them, but readers of the book are encouraged to study and analyze them all.

RMP and RTM Analysis

Introduction

Purpose The "Purpose" section is supposed to describe to the readers the purpose of the document and provide the project stakeholder with a high-level list of topics to be covered in this document. It could be a good idea for the author of such documents to have a well-written standard paragraph that can be reused from project to project. In our case, we started all our RMP and RTM documents with the following:

> The purpose of this plan is to establish and document a systematic approach to organizing and documenting the requirements of the product. This plan also establishes the process to maintain agreement between the customer and the project team on the evolving and changing requirements of the product.

Scope Again, as in the previous section, it could be a good idea to have a prepared "static" statement that can be reused from document to document:

> This plan provides guidelines for the management of requirements for a typical multidisciplinary project at ABC Port Authority.

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

Table 10.1 Glossary

TERM	EXPLANATION
Product Feature	A product feature is a capability or characteristic of a system that directly fulfills a stakeholder need, which is documented in a project's Vision document. A feature is a summary of an entire set of behaviors but does not describe those behaviors.
Stakeholder	A stakeholder is defined as anyone who is materially affected by the outcome of the project. Effectively solving any complex problem involves satisfying the needs of a diverse group of stakeholders. Stakeholders will typically have different perspectives on the problem and different needs that must be addressed by the solution.
Stakeholder Need	The stakeholder need is a business or operational problem (or opportunity) that must be fulfilled to justify purchase or use. This is the highest level of requirement, also known as a "need."
Baseline	The baseline is a reviewed and approved release of artifacts that constitutes an agreed basis for further evolution or development and that can be changed only through a formal procedure, such as change management and configuration control.

Definitions, Acronyms, and Abbreviations This section should contain a glossary of all technical terms, acronyms, and abbreviations used in the document. It may be a good idea to organize these terms in a tabular form for ease of use and understanding, as shown in Table 10.1.

References Section The references part of the document should list all the relevant project documentation that contains the information discussed in the RMP. The "usual suspects" in this case are the requirements specifications document and the project plan. But it is up to the project manager or a requirements analyst (whoever happens to author this document) as to which other references to include here.

Applicable references are

- "Energy Efficient House" Project Plan
- "Energy Efficient House" Requirements Specification

Overview This is yet another section of the document where a prefabricated statement could be useful and can be transferred from one RMP to another. In our "Port Upgrade" project, the "Overview" paragraph looked like this:

> This document contains specific details and strategies for managing the requirements of design and multidisciplinary projects at ABC Port Authority. The document details how requirements are organized and

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

> administrated within a project. It also describes how requirements will be identified, assigned attributes, traced, and modified.
>
> The document also describes the change management processes for requirements, including the workflows and activities associated with maintaining control of project requirements.

Requirements

Requirements Planning The requirements planning section is one of the most important in the document. Here, the author should outline the methodology that was used to collect the requirements in the first place as well as identify the key requirements providers. For example, in the case of the "Energy Efficient House" project, the project manager listed the following facts:

> The requirements elicitation was conducted by analyzing "Effective Insulation," "High-Performance Windows," "Efficient Heating and Cooling Equipment," "Lighting and Appliances," and "Third-Party Verification" published by ENERGY STAR (a joint program of the US Environmental Protection Agency and the US Department of Energy).
>
> Also, marketing surveys and focus group studies were conducted to obtain size, square footage, and the style of the house to be built.
>
> Please refer to the "Energy Efficient House" Requirements Specification for more information.

Requirements Tracking In the requirements tracking part of the document, the author should mention the methodology that will be used to track the requirements as the project evolves from the planning to the closeout phases. Here are a couple of examples from the "Port Upgrade" and the "Energy Efficient House" projects, respectively:

> Requirements are and will be tracked using XYZ requirements management software by the project manager.
>
> Requirements are and will be tracked manually by the project manager. No special software shall be used.

Requirements Reporting In the requirements reporting section, the project manager or the analyst should describe the ways of updating

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

the stakeholders about the changes and progress of the requirements on the project. It is also possible to direct the reader to a specific section of another project management or requirements document:

> Any significant changes to the requirements shall be communicated to the project stakeholders via weekly Status Reports. For more information, please see the "Communications Management" section of the Project Plan.

Configuration Management

Change Initiation This is also a very important section of the document that describes how the changes will be handled on the project. In my experience, this is a very important "conversation" to initiate with all the project stakeholders to prevent the potential dreaded scope creep that has contributed to the failure of many projects.

It is generally a good idea to state that once the requirements documentation and the project plan have been baselined, all future changes would have to go through the change control process, and each one of them would have to be thoroughly assessed from all possible angles, including, obviously, its impact on the cost and the duration of the project.

> After the Requirements Specifications and the Project Plan are baselined, all scope changes must go through the change management process (see Figure 10.5).

Change Impact Analysis The change impact analysis is another important section of the document that describes what factors will be considered when assessing the potential changes on the project.

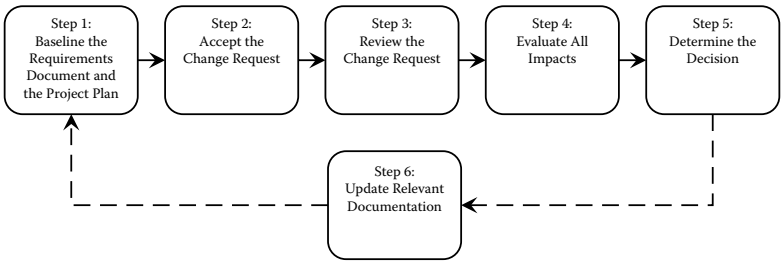

Figure 10.5 How to manage requirements.

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

In many cases, having a standard paragraph that can be reused from project to project can be quite helpful and make the life of the project manager or an analyst a little bit easier. In our sample documents, we reused the same statement that looked something like this:

> The following factors shall be considered and analyzed when assessing the change requests:
>
> - Impact on blueprints, bills of materials, technical drawings, design documents, project documents
> - Technical work to be done by engineers, construction crew, developers, architects, and so on
> - Management work to be done (project manager's time)
> - Documentation to be updated
> - Meetings you need to conduct (everyone involved)
> - Impacts on the sequence, dependencies, effort, and duration of all the tasks in the project plan
> - Impact on budget
> - Impacts on areas such as marketing, public relations, customer support, and training, among others
> - Impacts on all other areas of project management, including quality, communications, and the like
> - Cost of assessing the change request (will be charged to the customer regardless of whether the change request has been approved or rejected)

Change Tracing, Tracking, and Reporting In this section, the author of the document should indicate how and what media will be used to communicate all the updates to the project stakeholders:

> All change requests shall be communicated to the project stakeholders via weekly Status Reports. For more information, please see the "Communications Management" section of the Project Plan.
> Also, all affected documents, including Requirements Specification and the Project Plan, shall be updated accordingly.

Change Authorization Levels The change authorization levels are yet another very important section of the document that lists all the senior stakeholders whose approval is needed for the implementation of the changes on the project:

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

All change requests have to be approved by the directors of the departments whose requirements are affected by the requested modifications.

- Guy Ruggeri—Federal Government, Representative
- Christian Goranson—State Government, Representative
- Darryl Lass—Municipal Government, Representative
- Allan Minier—President and CEO
- Clayton Tilford— Director, Engineering
- Chris Agan— Director, IT
- Erik Baldon— Director, Logistics
- Roxie Manhart— Director, Legal
- Louisa Basquez— Director, PR
- Karina McMasters— Director, Sales and Marketing

Requirements Prioritization Process

Here, the author of the document needs to describe the mechanism that was used to generate the requirements priorities. In most cases, it is recommended to go with a "Must Have," "Should Have," and "Nice to Have" model for the requirements prioritization because it is fairly easy, straightforward, and easily understood by the stakeholders:

All requirements have been prioritized based on the following model:

- *Must Have:* Means that failure to implement the requirement will result in the failure of the entire project
- *Should Have:* Important requirements, but failure to implement the requirement does not automatically imply failure of the project
- *Nice to Have:* A desirable but not extremely important requirement

Requirements Traceability Matrix

Finally, we arrive at the last section of the document, the RTM. As mentioned earlier, the RTM is supposed to show the relationship between all the high-level features, requirements (i.e., detailed requirements, functional and nonfunctional requirements, functions, and attributes), and the related scope components.

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

One of the ways of showing these relationships is graphical, similar to that depicted in Figure 10.4. It is more user friendly and easier to read and understand. However, maintenance of a separate Vision file and constant copying and pasting of an updated diagram as the requirements change and evolve could become a cumbersome task.

Hence, the easier way of creating the RTM is the tabular approach, where all the features and related requirements are listed in one table to show all the "parent–child" relationships (see Table 10.2 for an example for the RTM from the "Port Upgrade" project).

Table 10.2 Sample Requirements Traceability Matrix

FEATURE ID	REQ ID
F 1.0	R 1.1
	R 1.2
F 2.0	R 2.1
	R 2.2
	R 2.3
	R 2.4
F 3.0	R 3.1
	R 3.2
	R 3.3
	R 3.4
	R 3.5
	R 3.6
	R 3.7
F 4.0	R 4.1
	R 4.2
	R 4.3
	R 4.4
F 5.0	R 5.1
	R 5.2
	R 5.3
	R 5.4
	R 5.5
F 6.0	R 5.1–5.5
	R 7.1
	R 9.1–9.3
	R 10.1–10.3
F 7.0	R 7.1

(continued)

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.

Table 10.2 Sample Requirements Traceability Matrix (Continued)

FEATURE ID	REQ ID
F 8.0	R 8.1
	R 8.2
	R 8.3
	R 8.4
F 9.0	R 9.1
	R 9.2
	R 9.3
F 10.0	R 10.1
	R 10.2
	R 10.3

Click here to buy "Project Scope Management: A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects"
© 2015 by Tay lor & Francis Group, LLC. ISBN 978-1-4822-5948-3.