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The key to the Requirements Management hole

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Abstract

The key to the Requirements Management hole!

Customer satisfaction or meeting client expectations successfully is directly proportional to the actual quality of the end product or the value delivered to the client over the cost of the product. Having said that, would it now be safe to say that:

Requirements Satisfaction = Customer Satisfaction?

Well, the answer is both – Yes and No!

This is because there is only a thin line of efficient or inefficient Requirements Management process that separates a quality product from an average or poor product which, in turn, separates a satisfied customer from an irate customer. Capturing customer requirements is not as big a challenge as opposed to adapting to the constantly changing requirements & maintaining and tracking those changes efficiently.

Research has proven time and again that:

- About 70-85% of project defects are introduced during the requirements phase
- Cost of fixing a requirement defect after the product delivery is 100 times the cost of fixing it during the requirements or design phase
- Missed or poorly defined requirements accounts for one of the top 3 reasons for project failure

The above highlight the importance of tracking & managing requirements and how it directly affects the overall success of a project. Bearing these facts in mind, this paper will focus on finding the key to the Requirements Management hole & the points of discussion will be centered around:

- Why do we care about Requirements Management? (Guess we already answered that!)
- Requirements Management myth busters
- Types of Requirements & the metrics involved
- Who is affected – stakeholders & their involvement?
- What are the typical Requirements Management deliverables?
- Phases and strategy of a recommended Requirements Management approach

Audience:

- Testing beginners and veterans,
- Testers,
- Developers,
- Customers (End users),
- Business Analysts
- Managers

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1.0 Introduction

The fundamental definition of Requirements Management (RM) states that it is a collaborative process of gathering business requirements from the key stakeholders involved and translating those requirements to build the desired software.

Given the above definition we'd possibly want to relate Requirement satisfaction to Customer satisfaction in direct proportion, correct? Well, the reasoning seems perfectly logical provided we understand that there is a very thin line of an efficient Requirements Management process which separates a quality product from an average or poor product.

And yet, research attributes the following as one of the top ten reasons for most project breakdowns:

- Minimal stakeholder involvement during and after the requirements definition phase leading to incomplete or inaccurate requirements getting percolated into the system & no checkpoint to catch them at the right time
- Poor Requirements Change Management process to effectively manage constantly changing business needs
- Underestimating the power of Requirements Traceability which in turn impacts effective estimation for change requests

From all the above, it is evident that Requirements Management forms the crux of any successful project delivery and utilizing stakeholder involvement to its optimum limit is one of the key factors for consideration.

Thus, the focus of this paper will be on identifying:

- Efficient mechanisms of stakeholder involvement
- Types of requirements, the metrics involved & the typical RM deliverables
- Phases and strategy of a recommended Requirements Management approach

But before we move on to discussing the above, let's quickly burst a few Requirements Management myths because unless we understand what we shouldn't follow, we just might end up believing them to be true!

2.0 Requirements Management Myth Busters

2.1 Myth 1 on Requirements Management Tools

Myth: We are currently using "Requirement Super Pro" tool on our project & therefore, it is safe to believe that the project follows a well-defined requirements management process.

Myth Buster: If it were that easy, wouldn't all organizations absolutely mandate every project to use one of the many RM tools? The reality is that although RM tools will help define & streamline relevant processes for successful requirements management, it is practically useless unless the importance and discipline of adopting requirements management as a collaborative process is accepted not only by the Test Lead or the Project Manager, but by everyone on the team. A tool after all can only automate & generate data based on what you manually feed to it & the better the input; the more advanced and meaningful will be the output.

2.2 Myth 2 on Requirements Specification document

Myth: Very often just the creation of a requirements specification document is considered as meeting the process of requirements management.

Myth Buster: A requirement specification document can only be part of the requirements management process and not the process as a whole because requirements management is more than simply getting all the requirements documented in a central accessible location (which may or may not be accessed ever again). It is about storing and managing these requirements such that they are easily traceable for assessing the impact of changes to requirements and the fact that these changes actually get communicated to the teams working on them.

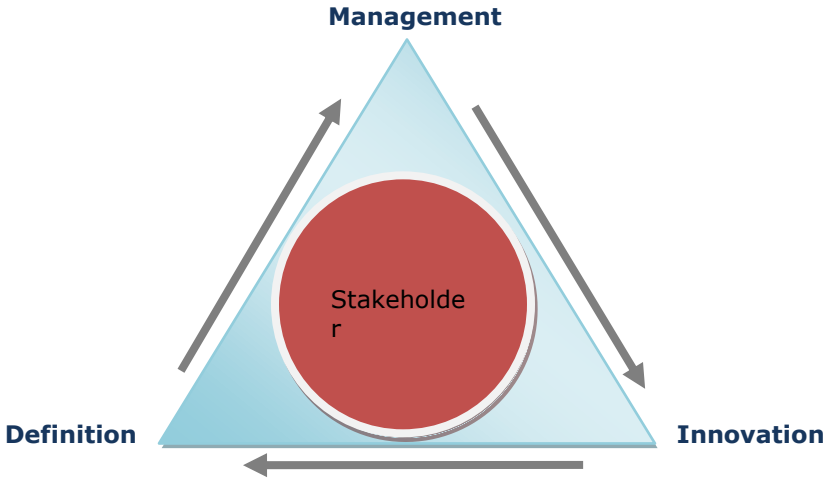
2.3 Myth 3 on the timing of introducing RM process

Myth: Requirements Management process is only useful if implemented during the Requirements gathering phase.

Myth Buster: Incorrect. Though technically speaking, it makes most sense to introduce requirements management process at the inception of the requirements gathering phase, it is never too late to introduce the process. The sooner the process is implemented, the faster we can realize it's benefits in terms of spotting duplicated or redundant requirements based on baselined requirements, effectively communicating changes within the team members and planning for future requirements.

3.0 Requirements Definition, Management & Innovation (RDMI)

Requirements Definition, Management and Innovation (RDMI) process focuses on collecting, documenting and efficiently managing those requirements with a conscious effort and drive towards innovation in the overall process with the stakeholder lying at the epicenter of the RDMI process.



In order to understand how we can leverage the 3 core aspects of this process – definition, management and innovation, it is important to first understand the types of requirements and the various sources they can be derived from.

3.1 Types of Requirements & Requirements Source derivation

3.1.1 Business Mission:
Business Mission or Business Objective can be defined as the goals and guidelines laid out by the business for the project. This is the most fundamental requirement that the project will be based on & can be derived from the Management or existing company documentation available.

3.1.2 Business Requirements:
Business or Stakeholder requirements are those requirements that are directly tangible to constraints such as cost, resources, schedule etc. This can be derived from various sources viz. Business Stakeholders, Legacy Systems, External Sources, Standards and Regulatory Sources.

3.1.3 System Requirements:
System Requirements is the category parallel to Business Requirements in the "technical" world i.e. these requirements focus on identifying the technical requirements of the desired system. They can be further classified into Operating System (OS) and Database Requirements. Quantitative requirements centered on expected volumes, expected response time from

the application also fall in this category. These are derived from the analysis of Business Mission and Business Requirements.

3.1.4 Software Requirements:
Also, commonly referred to as "Functional Requirements", software requirements are the GUI specific requirements which drive the functionality of the application to be developed. These are usually derived from Domain Experts, Subject Matter Experts (SME's), IT and support staff.

3.1.5 End-User Requirements:
End-User requirements are complex requirements around documentation and user interface and are usually the most commonly misinterpreted requirements. A common source for this category of requirements anyone and everyone who will directly or indirectly interact with the system.

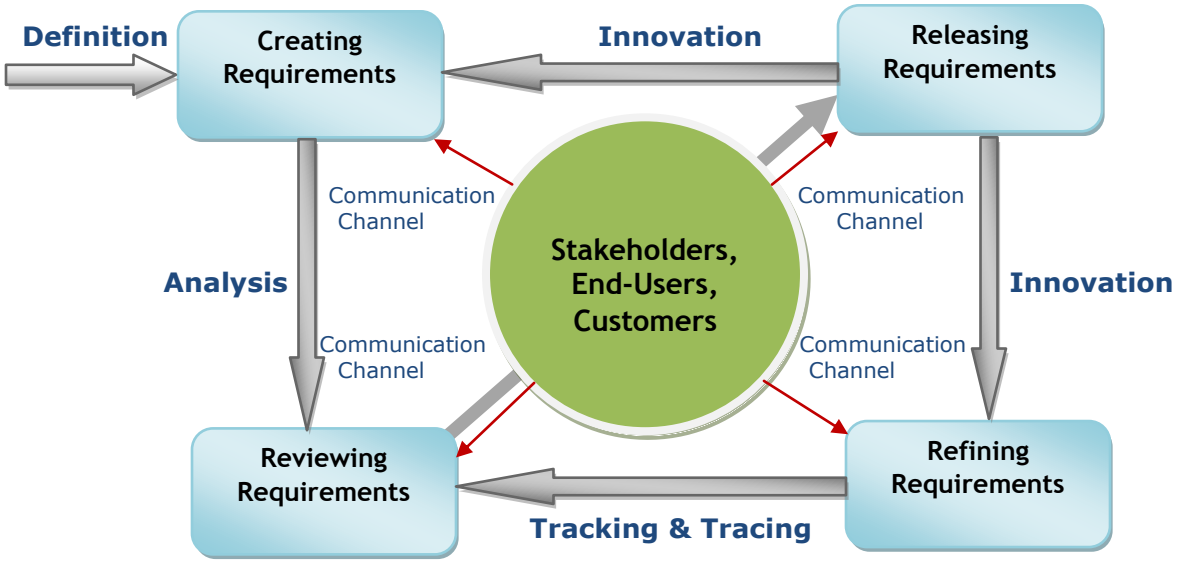
A tabular representation of Requirement Types with the source and implementer is as below:

Requirement Type	***Derived from***	***Implemented by***
Business Mission	Client Management, Company documentation	Vendor Management
Business Requirements (BR)	Business Stakeholders, Legacy Systems, External Sources, Standards and Regulatory Sources	Architect, Project Manager
System Requirements	Business Mission and BR's	Project Manager, Developers, Database Administrators (DBA)
Software Requirements	Domain Experts, Subject Matter Experts (SME's), IT and support staff	Vendor SME, Developers
End-User Requirements	GUI End user – internal & external	Client, System, Architect, UAT team

3.2 RM Phases, RDMI Recommended Strategy and Approach

Now that we have identified the various types of requirements and the different mechanisms to derive them from external and internal stakeholders, let's understand the different phases of a typical RM process and what RDMI proposes as a strategic approach.

The fundamental philosophy of Requirements Definition, Management and Innovation (RDMI) is centered on its Stakeholders and how those stakeholders influence the decisions that need to be incorporated at every phase of RDMI.



Phases of Requirements Management (RM) process:

3.2.1 Define:

Requirements Definition is the primary phase of a Requirements Management process where requirements are collected, elicited and documented bearing the overall project mission or objective in mind. In addition to this, it is imperative to identify the stakeholders, end-users and customers and even more essential is a commitment of their continued support throughout the RM process. This is to ensure that we have the right people to help take immediate and more importantly correct decisions in a timely and collaborative manner.

Defining requirements can be achieved through a variety of elicitation tools and techniques that have proven effective over the years for deriving requirements from different kinds of requirements sources. Following are a few examples for elicitation tools and techniques:

- Questionnaires
- Storyboarding
- Interviews
- Brainstorming sessions
- Research
- Prototypes
- Functional views
- State Transition diagrams
- Class diagrams

The artifacts of Requirements Definition will typically include a variety of documents, notes and other materials that will be refined through analysis and the document is aimed at providing information on the solution overview, assumptions, stakeholder description, their key needs etc.

What RDMI proposes – Strengthen elicitation by bridging the gap between business stakeholders and development groups

Organizations should focus on maturing their existing requirements elicitation process using accelerated elicitation simulation mechanisms. This will in turn contribute towards effective communication and collaboration among varied groups & will also give stakeholders a perspective in terms of taking decisions for prioritizing requirements. The right combination of the value of requirement satisfaction and priority will help in reducing rework from incorrect or incomplete requirements thus bringing maximum value to the table.

3.2.2 Analyze:

Requirements Analysis is the phase where useful requirements gathered as part of the Requirements Definition phase are extracted and analyzed to identify and resolve conflicts, redundancy among requirements, validate requirements and further derive the software or functional requirements. As and when requirements are analyzed, the need to refine requirements may arise leading to an iterative cycle between the Definition and Analysis phase.

A few techniques for analyzing requirements are listed below:

- Structure
- Clarify
- Identify duplicated, omitted requirements
- Joint Application Development Sessions (JADs)

What RDMI proposes – Collaborate effectively to reduce time-to-market

To reduce the time-to-market factor, vital focus should be on evolving existing requirements analysis processes by implementing a strategy to effectively prioritize requirements during all phases of the project lifecycle. With stakeholder collaboration, this can be further enhanced through accuracy and efficiency increasing techniques which will help organizations estimate better, thus, predicting a more accurate software delivery timeline.

3.2.3 Process Integration and Communication:

The purpose of Communication is to propagate requirements information across the various project entities and help provide feedback to drive the RM process with the sole objective of ensuring consistency in the understanding of requirements among all these entities. And by entities, the focus is not just restricted to the business stakeholders alone, but all the consumers of the requirements such as Quality Assurance (QA) groups, trainers, documentation owners, IT Support staff.

For such a variety of end consumers, the communication mechanism of requirements needs to be based keeping in mind the business interest of those consumers and documentation of those requirements is an important output of this process. Examples of requirements documentation include:

- Conceptual Views
- Use Cases
- Detailed Requirements document
- Functional prototypes

- Repositories for requirement storage with user group specific views
- Spreadsheets

What RDMI proposes – The word is "Process Integration"

Process integration can help nail down communication barriers and breakdowns using a collaborative approach for sharing ideas and requirements across the lifecycle of the product. This in turn encourages increased innovation leading to better products and new enhancements for continually improving the overall product quality.

3.2.4 Tracing and Tracking:

Requirements tracing is a mechanism of proving that the software built does what it was built to do (or not). Requirements undergo change over time and these changes might be in terms of:

- status or current state of the requirement
- what those requirements actually describe
- the overall relevance of the requirement to the project at any given point

It is very important to capture and preserve all these changes in order to plan, assess the overall impact, estimate implementation efforts as well as monitor progress by tracking the requirement status viz. Approved, Proposed, Implemented, Verified, Postponed etc. Tracking requirements is also commonly referenced as requirements tracing or traceability.

Traceability is not just limited to requirements but can also (and should) be extended to designing, coding and testing. Tracing at all these levels helps QA managers to conduct:

- Coverage analysis for ensuring that for every requirement there is at least one test case which maps to that requirement and thus, uncovered requirements can easily be caught and the appropriate action can be taken.
- Impact analysis to determine the number of affected test cases once a requirement undergoes change. This will help in estimating the overall effort for the change request.

What RDMI proposes – Validation of requirements in conjunction with the stakeholders

Through tracing and tracking we constantly validate against the underlying requirements, however validating the requirements themselves is also as important. Engaging the key stakeholders in the process will only add to the overall product quality. RDMI also proposes automating requirements verification and validation (V&V) in order to enforce the discipline for constantly improving quality thereby increasing customer satisfaction and the overall business value.

3.2.5 Innovation:

Innovation is not really a phase of Requirements Management process or for any process for that matter. It is a drive or a philosophy that needs to be constantly enhanced with a continued focus on what the stakeholder is really looking out for. Innovation is not a one-time activity that can begin or end during one phase or the other. It needs to exist throughout the lifecycle of the project.

What RDMI proposes – Reusability of requirements and workflow mechanism for managing changing requirements

Rather than reinventing the wheel, reusability of requirements from past projects is an extremely viable solution. However, by reuse we don't imply just copying the requirements, but instead establish a "reuse" link. This way our existing traceability also remains intact and whenever a change to the original requirement is done, the reusing team is aware of the change and can take the required action towards impact analysis.

4.0 Metrics that matter

We all have at some point or the other had to cater to the demanding needs of our managers or stakeholders to create some sort of a dashboard which reports the important project metrics. These factors help the management to constantly monitor the overall health of the project in terms of progress, frequency of change and take corrective action for the "pain points" quickly. For instance, if the amount of rework in implementing a particular requirement change is large, it could be attributed to a poorly written requirement at the start. Such trends need to be captured and added to the firm's knowledge base.

Let's now go over a few metrics that matter based on the RM phases we discussed above.

4.1 Definition Measures

- Level of effort (LOE)
- Number of new requirements over a given period
- Priority distribution of requirements

4.2 Analysis Measures

- Level of effort (LOE)
- Number of requirement change requests due to defects over a given period
- Number of requirement change requests as a % of the number of original requirements
- Priority distribution of requirements
- Frequency of change in the total requirements suite

4.3 Communication Measures

- Level of effort (LOE)
- % of Stakeholder acceptance / rejection
- Stakeholder approval cycle time
- Time for document update

4.4 Tracing & Tracking Measures

- Level of effort (LOE)
- Number of requirements covered by a test case
- Number of test cases covered by a requirement

In addition to the phase-wise metrics described above, following management level metrics can also be considered for measurement:

4.5 Measures for the project manager

- Number of requirements by owner
- Number of requirements by status and as a % of total number of requirements
- Number of requirements by type (functional, system etc.)
- Requirements missing traceability

5.0 Conclusion

Requirements management is not just a process to be followed during the requirements gathering phase. Rather, it is a discipline extending throughout the development lifecycle with phases such as requirements gathering, requirements elicitation, requirements analysis & structuring, requirements traceability, requirements review, managing requirements change & requirements validation with a constant focus of delivering only the best to our stakeholders.

An efficient RM process is like a "real-time" repository containing a wealth of information of the application requirements with their associated attributes and links. When done right, requirements management can yield fruitful results and help improve the overall return on investment (ROI).

The most important measure of an efficiently implemented requirements management process is the Stakeholder and this measure cannot be studied in isolation. It is imperative to constantly seek feedback, suggestions, and inputs from stakeholders and plug them into the system thus giving way to a quality management process that can be adjusted and self-regulated to current market conditions.

The effective implementation of RDMI will pave the way for effectively managing requirements change, delivering higher quality products, and boost stakeholder and customer confidence and overall satisfaction level by increasing responsiveness, and delivering the right software at the right time and within budget to maximize the overall business impact.

6.0 Acronyms, Abbreviations and Definitions

Acronym	*Definition*
RM	Requirements Management refers to the collection of activities undertaken by the product managers, project managers, business analysts, in order to gather, store, track, prioritize and implement requirements.
RDMI	Requirements Definition, Management & Innovation is process focuses on collecting, documenting and efficiently managing those requirements with a conscious effort and drive towards innovation in the overall process with the stakeholder lying at the epicenter of the RDMI process.
SME	Subject Matter Expert is a person whose up to date experience and knowledge exceed that of the rest of the project team or organization.
ROI	Return on Investment is a performance measure used to evaluate the efficiency of an investment
BR	Business Requirements are those requirements that are directly tangible to constraints such as cost, resources, schedule etc.
UAT	User Acceptance Test is a process to ensure that the system meets the needs of the organization and the end user/customer.
JAD	Joint Application Development (JAD) is a process used in the Systems Development Life Cycle (SDLC) to collect business requirements while developing new information systems for a company.
V&V	Verification and Validation is the process of checking that a product, service, or system meets specifications and that it fulfills its intended purpose.
LOE	Level of effort is a support type project activity which must be done to support other work activities or the entire project effort.

7.0 References

Item	*Source*
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8.0 About the Author

Aradhna Kapoor is a Bachelor of Engineering (B.E.) graduate in Computer Science from Mumbai University and has over 5 years of work experience. She is a Software Development professional offering solid technical knowledge and experience in Quality Assurance specializing in Functional Manual and Automation Testing. Her technical abilities are complemented by sound analytical skills, good communication skills, discipline, responsibility and resilience and a strong commitment towards Customer Satisfaction. She is also extremely quality orientated and focused on SEI CMM Level 5 processes. Her professional credentials are also backed by ISTQB foundation level certification.