

Quality Requirements Framework For Resolution of IT Requirement Management Challenges

Humaira Naz¹ and Muhammad Ilyas²

¹SZABIST, Islamabad

²University of Sargodha

humayra.naz@gmail.com, m.ilyas@uos.edu.pk

Abstract

Primary reason for IT project failures remains ineffective requirements specification. The “code-only” mindset is greatly to be blamed. Requirement Management has its own dimensions even though its primary existence remains intertwined within the Software lifecycle. As it is a novel management discipline it faces and suffers from issues and challenges. In this research a Quality Requirements Framework and prototype has been proposed to address contemporary challenges.

Keywords: *Requirements Management, Project Management, Software Quality Assurance*

1. Introduction

Sound Requirements Management depends upon an organization’s ability to steer their ship in open waters and to “keep pace” with the fluctuating tides of complexity and challenges. To ensure optimal project and change management leading to quality requirements which then leads to a quality product is a major challenge. In the contemporary world of IT Project Management, many organizations outsource most of their activities for the sake of gaining more productivity, saving money and time, but this is easier said than done. The task of outsourcing is not considered feasible by many even today, but if the organization have little or no resources at hand then it is a preferable and advisable approach as long as risks etc. are managed.

Until the 1980s, Project Management role was limited to resource and schedule management [1]. Today the scope of Project Management is much broader and evolving by the minute. The evolved version of Project Management is gaining rapid recognition in different organizations and industries worldwide. With the increased use of computing hardware, software and novel process strategies Project Management is becoming more manageable and interesting [2].

The pros and cons attached with the novel methodologies which have now become a necessity have been studied, analyzed and discussed to comply with the need of quality requirements to ensure reduction of risk and uncertainty. The Quality Requirements Framework, proposed has been developed based on extensive research ensured to encompass the critical aspects identified by the authors in their previous publications. A software solution has also been developed to automate the QRM framework which is available free of cost to

students and organizations worldwide who previously overlooked Requirements Management formalities for any reason.

The QRM framework makes sure that the use of automation and technology doesn't handicap the innovation and ideas brainstormed by either of the stakeholders involved in the Requirements Management phase. It provides a better view of all the requirements and full details required to take management level decisions, QRM Framework enables its users to do effective strategy making for the later phases of the software as well as better planning.

1.1 Spurring Growth factor

For this reason we have witnessed how the significance of Project Managers has rapidly grown within organizations, especially in Globalized Projects executing from multiple outsourced destinations on the Globe [1]. In the past, there was just a company and client to manage. Now there are teams in different countries with different time zones, cultures, work practices, languages and mindsets; in other words its diversity at its peak and quality product demand on the rise [3]. It is nothing less than a management-science to get a correct finite set of requirements from the clients, make them abide to it and get the best of work out of the team situated in different geographies.

1.2 The Pressing Deficiencies

A requirements elicitation worldwide survey of the major public organizations whose core business relies on the nature of their processes and automation; it was found through a hundred and thirty responses that Modelling Languages, Business Process Management tools and software integration capabilities are critically and urgently required [4].

2. Literature Review

Comprehensive requirements specification is much more than a list of functional requirements. It is a creative document which addresses the project needs, both functional and non-functional within the scales of quality attributes and performance expectations. Project environment in the contemporary times is all about pace, adaptability, optimal costs, complexity, risks and a bunch of other factors [5]. All of these provide a daunting challenge to the Project Manager [5].

2.1 IT Project Management Challenges

Following are some of the challenges faced in the area of IT Project Management, particularly in third world countries [6]:

1. Duration, finance management, optimal utilization of resources and change management.
2. Finding the right person to do the job, and this does not just apply to the project manager.

3. Defining business needs and priorities.
4. Stakeholder analysis.
5. Context and groundwork.
6. Requirements elicitation.
7. Wishful thinking syndrome – both from client side and management side.
8. Creating awareness how things other than “Coding” are also important.
9. Achieving smooth communication.
10. Practicing the art of collaboration.
11. Keeping stakeholders within the “Reality framework”.
12. Educating and remembering the “Human Factor”.
13. Project sign off – getting the client to agree to the agreed upon requirements.

2.2 Contemporary Requirements Management Challenges

Following are some of the key challenges in managing Requirements phase [6]:

1. Achieving correctness, completeness, consistency, modifiability and traceability.
2. Determining whether if the project requirement is actually feasible?
3. Is there a necessity for the requirement?
4. Optimal prioritization of requirements.
5. Clarity of description and Verifiability.

2.3 Outsourcing Requirements Management Challenges

In today’s world of project management, many organizations outsource their activities for the sake of gaining more productivity, saving money and time. The task of outsourcing is not considered acceptable by many still, but if the company and the organization have little or no resources as well as skills then it is preferable to outsource some of the activities that are under the product or project manager [7]. It is very crucial to outsource an activity when the company is already having an uncertain time. But whenever the company is under pressure and does not have enough resources then it is better to outsource these activities [8]. Outsourcing is a relatively new concept which is also going through a process of evolution. Just as it has its advantages, the arena faces certain challenges some are as followed [9]:

1. Post-Contract processes and decision-rights comprehension
2. Little or no support from client leaders receiving the services
3. Poor mutual understanding of the contract
4. The client retained Team Not in place or Too Small

5. The client retained Team Lacks required Skills
6. Transfer with poor knowledge and talent waste
7. Inability to Meet Pent-Up demand for Service
8. End-user resistance to Adopting New Methods
9. Clash of Culture Between the Client and Service Provider
10. The changes don't Last

3. The Quality Requirements (QRM) Framework

Business Process Maturity in an SDLC can only be achieved by means of substantial use of dedicated automation [4]. Unfortunately, software companies today lack greatly in this area. One of the main reasons for this is that the current automation and software packages available off the shelf do not adequately address the variety of business needs portfolio in the contemporary software times.

Requirements Gathering and Management there is always a lot that is going on with the team members which makes it difficult for all the team members to keep up with each other and know what is going on at which end. It also makes the job difficult for the management to keep a track of where things are going.

3.1 Innovation and Ideas

It is important at all stages of the SDLC to organize ideas and information. Without organization the most valuable of information loses its true value. When all the tasks and goals are elaborately mapped, the business operations are done in a better manner, thereby leading to desired results. Such a software application would enable the project team to capture all the relevant content, present it in a better manner and allow innovative thinking and brainstorming within a realistic and highly practical frame set.

3.2 Strategic thinking and planning

It will help to anticipate tomorrow's problems and opportunities with a broader picture in the eye. This enables the Management to take better decisions in the present time which would be rightly connected with the next steps of the prevailing strategy in future. For this reason it's useful that the software application should gather all the critical information from the client and better present it visually. This would add to its comprehension and eliminate the difference of vocabularies. This lets us have a transparent vision of all that is happening and take better strategic decisions that would

3.3 Product Benchmark Criteria

Every person has a different perception of right and wrong, the project team and the client itself being a combination of several people can lead to confusion over the fact whether if the requirement gathered is adequately perceived, comprehended, elaborated and managed. For

this a criteria depending on the nature of the project is required which should act as a touchstone to determine the acceptance level of the requirement at hand. It may be a list of several clauses which when adequately satisfied should let the requirement to actually be a part of the software requirements specification. The criteria need brainstorming sessions of the top management heads leading the different phases of the SDLC. A thorough analysis in this respect would lead to a more effective design of criteria which will minimize the troubles such as leakage of defects and blindness of the errors initiated from the requirements gathering phase activities.

3.4 Product Acceptance criteria

It is of utmost importance that when the broader picture is clear and all the requirements have been finalized then the product acceptance criteria which would be designed through the software application... is signed off by the client and the Project Manager at the time of the settlement of the finalized requirements. This would enable us to avoid scope creep and changing the system specifications when the clock strikes 12. There is going to be a definitive end of the project and a client would be bound to a specific cushion of customization which he may or may not utilize.

4. Quality Requirements Framework

The QRM Framework has been designed to make sure that it encompasses all the critical aspects discussed in previous studies and a literature review of the artifact at hand. On a broader scope, it makes sure that the use of automation and technology doesn't handicap the innovation and ideas brainstormed by either of the stakeholders involved in the Requirements Management phase. For this, the software facilitates its users to communicate via notes to every single requirement before the baseline is determined and even afterwards.

With a better view of all the requirements and full details required to take Management level decisions, QRM Framework enables its users to do effective strategy making for the later phases of the software as well as better planning. It marks out criteria for every single requirement, thereby giving you exact details about where your requirement actually stands in terms of quality and priority.

Most importantly, The QRM Framework enables all stakeholders to monitor and discuss full requirements information in a logical fashion. This makes sure that a realistic and un-evolving product acceptance criterion is agreed upon and the software reaches its actual completion instead of scope creep issues.

4.1 QRM Functional Design

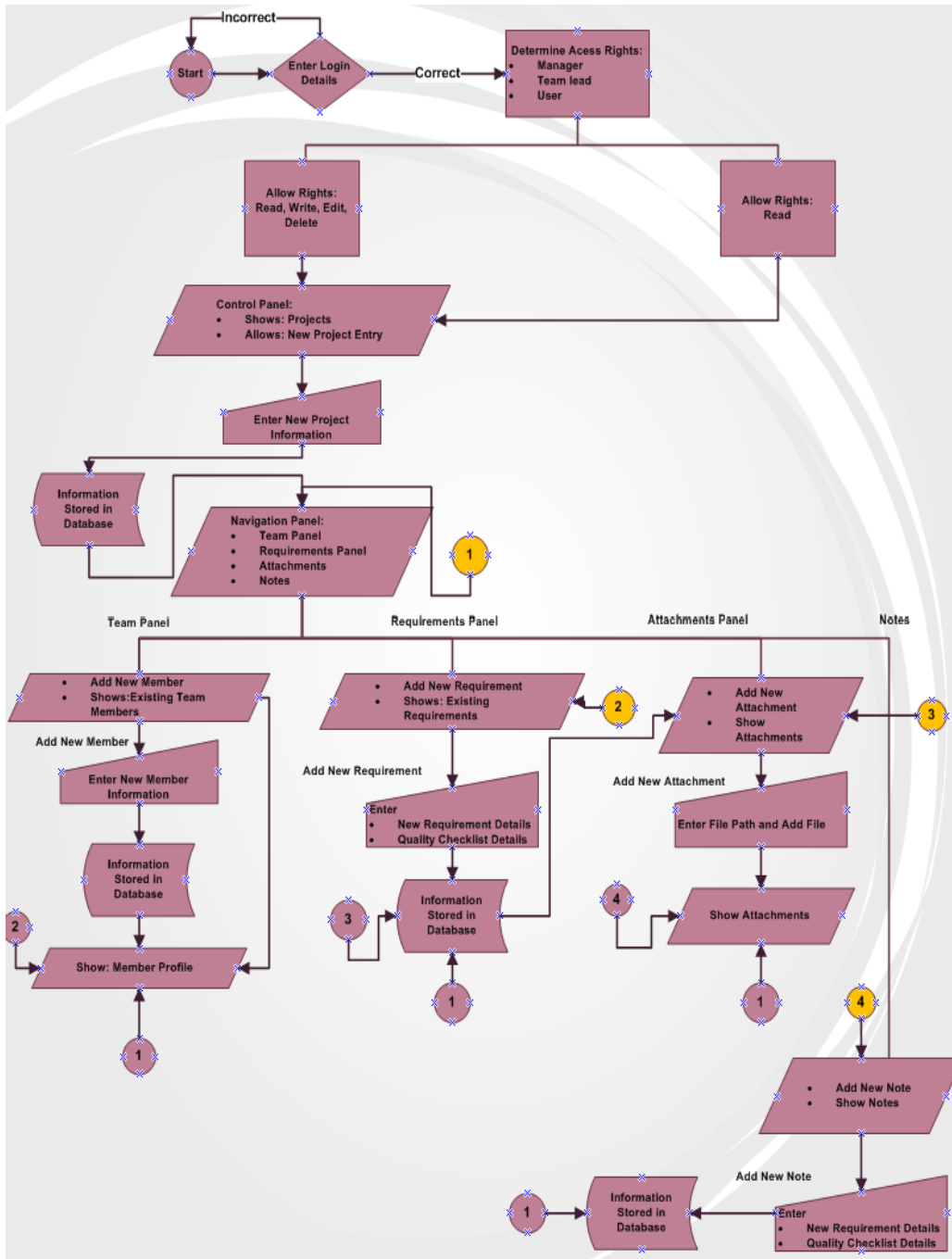


Figure 1. The QRM Framework Functional Design

4.2 Modules and features of the QRM Framework

Following is the description of the different modules and features of the QRM Framework:

4.2.1 Login Module: The flow of the system starts from the Login information step. Here the user enters his name and password. This information is matched with the access level to grant in the Database. As per role, rights are allocated and the user is routed to the control panel.

4.2.1 Access Rights Module: Based on the access rights decided by the top management and the project manager some users are allowed just to read the information whereas others are allowed to read and make changes to it.

4.2.2 Project Control Panel: The Project control panel is the main dashboard which gives a list of the Projects undergoing at the specific time period. It allows the user to create a new project by entering its information. This information is stored in the Database. Once the project is successfully created the user is routed towards the application panels.

4.2.3 RM Elicitation Attachments: The user is able to attach the following to the Project Information: Questionnaires, Surveys, Interviews, Analysis of existing documentation, Organizational charts, Process models or standards and User Manuals.

The attachment panel is used for managing the deliverables attached to the messages to ensure documentation recording of stakeholder communication, lack of which was identified as a major cause of inefficient requirements earlier.

It allows the user to create a new attachment, which will presumably be a document whose extension is compatible with the intended audience. It also shows the current attachments, if any. The process of attaching file is the same as modern email systems, locate the file on its path and then attach. Once the attachment is done, a list of entire attachments should show.

4.2.4 Notes Manager Module: With every Requirements Entry, user can add notes with the first time entry as well as future changes made after once the baseline is established. The Notes are also recorded in the application database. All the team members can enter notes in their own area of business. Only when a suggestion is put up, it will be subject to approval by the Management and then added to the main RM Project Information. The Notes Manager adds notes from team members to the project. Attachments are assumed to be more refined finalized formal deliverables whereas notes may be raw brainchilds and instant thoughts from the team members. These may not be formalized fancy material but is valuable and crucial to the project.

4.2.5 RM Team Panel: The QRM Framework records the information of all the team members which are involved in the Requirements Management Phase. The information includes the following things: Name of member, Personal Information: age, gender, nationality Technical Expertise, Professional Expertise, Department, Overall Experience and Role in Project.

This information ensures that the right people with the right expertise and right background are involved in the Requirements Management phase.

4.2.6 RM Requirements Entry: Every requirement related to the Project may be entered into the software. The information is stored in the database and retrieved as and when required by

the QRM Framework. Following are the entries which must be filled for every single requirement entry:

1. Requirement Title – States the title of the requirement
2. Description – Gives the requirement details
3. Dependencies (if any)

4.2.7 RM Quality Checklist: For every requirement entry, there is a “Quality checklist” which must be marked by the Manager/ reviewer. This gives a realistic and logical picture of the prioritized standing of the requirement. Following are the items included in the list:

1. Correctness
2. Feasibility
3. Necessity for Project
4. Priority
5. Clearly Described
6. Verifiability
7. Completeness
8. Consistency

5. Anticipated Outcomes’ Ideology

It is not necessary that everyone in a team has the same ideas and way of thinking. One might be thinking about something else, other is thinking about something else so this may lead to misunderstanding and various different perspectives about the functional and non-functional requirements of the project. They might doubt that the requirements are vague and not well defined. In order to avoid this problem there should be a criteria on which all the problems should be catered. Several clauses could be a criterion on which the requirements could be checked.

6. The Design Comprehension

The QRM Framework has been designed to make sure that it encompasses all the critical aspects aforementioned in the first study and the second one. On a broader scope, it made sure that the use of automation and technology doesn’t handicap the innovation and ideas brainstormed by either of the stakeholders involved in the Requirements Management phase. For this, the software facilitated its users to add notes to every single requirement before the baseline is determined and even afterwards. With a better view of all the requirements and full details required to take Management level decisions, QRM Framework enabled its users to do effective strategy making for the later phases of the software as well as better planning.

It marked out the criteria for every single requirement, thereby giving you exact details about where your requirement actually stands in terms of quality and priority. Most importantly, The QRM Framework enabled all stakeholders to monitor and discuss full requirements information in a logical fashion. This made sure that a realistic and un-evolving product acceptance criterion was agreed upon and the software reaches its actual completion instead of scope creep issues.

7. The Accountability Criteria

The criteria on which the requirements could be checked has to be some very important and technical like it should be done through the brainstorming session with all the team members and project managers. This may then lead to various phases of the software development life cycle. If the criteria are developed after good analyzes and processing then this will help to cater any future problems. There would be fewer problems in the future. There would also be less or no errors in the requirements gathering phases.

8. The Acceptance Criteria

There should be acceptance criteria for the project. When all the requirements of the project are clear and there are no vague requirements in the project then the document should be signed by the client, project sponsors and the project manager. This is a very good practice because this helps in avoiding the scope creep. Scope creep means when more things are added to the project scope which were not decided at the start of the project. This creates a lot of problems for the project manager to handle things.

On a broader scope, it made sure that the use of automation and technology doesn't handicap the innovation and ideas brainstormed by either of the stakeholders involved in the Requirements Management phase. For this, the software facilitated its users to add notes to every single requirement before the baseline is determined and even afterwards. With a better view of all the requirements and full details required to take Management level decisions, QRM Framework enabled its users to do effective strategy making for the later phases of the software as well as better planning.

It marked out the criteria for every single requirement, thereby giving you exact details about where your requirement actually stands in terms of quality and priority. Most importantly, The QRM Framework enabled all stakeholders to monitor and discuss full requirements information in a logical fashion. This made sure that a realistic and un-evolving product acceptance criterion was agreed upon and the software reaches its actual completion instead of scope creep issues.

9. Future Research Implications and Proposals

This research artifact was carefully crafted to discuss and resolve in stages which yielded organized, objective and useful information which would help the industry professionals to improve the quality of their Requirements Management phase thereby enabling quality assurance of the final product including client satisfaction.

It was observed that the RM area requires much research effort from the new researchers who want to pursue the challenging task of paving the way in a realm which is yet partially touched. Therefore, within the resources at hand a humble effort was done, by the grace of Allah Almighty to lay down the foundation stone for those who want to build and progress in the same direction.

9.1 The QRM App

The QRM Framework is a fundamental framework which draws out a basic solution to all the common factors creating problems in the RM phase therefore, for custom needs the organization can study the requirements at hand and add those to the proposed framework.

The QRM framework for now addresses just the RM challenges but the issues found to be of similar origin in the Quality Assurance & Testing activities make us believe that

potentially a similar framework partially modified as per the process strategy of the SDLC phase at hand can make use of such a framework. Therefore, the scope of the QRM effectiveness can evolve and grow as it is subjected to more and more research. A prototype of the QRM app has been developed and is available free of cost (on request from the Author) for students and organizations.

9.2 Mobile App

With wires becoming stone age, and the Smartphone revolution; everyone has a smart phone or at least one which has access to the Wifi or mobile data services. For stakeholders with this privilege, a mobile app can potentially be designed and developed with which great benefits can be achieved.

A team member won't have to wait for his next day's office shift to begin for him to record a fresh idea, instead he can just add a note from home and all the others can view it on their own devices. This will also come in handy for the top management etc. who have to frequently interact with the client, as all the details, discussions and ideas etc will be recorded in the QRM app already.

9.3 QRM As a Case Study

For students pursuing future research or organizations which are skeptical about the efficiency of this framework, it is advised that the QRM example may be used in a case study to resolve some previously failed cases whether those are internationally known ones or some confidential in-house failures. This should provide solid grounds to the pursuer in making the right decision.

Acknowledgements

In the name of Allah, most Gracious, most Compassionate. I am thankful to Allah Almighty who is merciful, also I will like to thank the MS Computer Science Coordinator of Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology, Mr. Muhammad Nadeem Khokhar for providing me an opportunity to pursue my MS and Research work.

References

- [1] K. Schwalbe, "Information Technology: Project Management", Cengage Learning, (2010).
- [2] S. Azzopardi, "The Evolution of Project Management", (2013), <http://www.projectsmart.co.uk/evolution-of-project-management.html>.
- [3] Itonews.eu, "The Top 10 Problems With Outsourcing Implementation (And How To Overcome Them)", (2008).
- [4] S. Patig, V. Casanova-Brito and B. Vögeli, "IT Requirements of Business Process Management in Practice – An Empirical Study", Business Process Management, (2010).
- [5] R. K. Wysocki, "Effective Project Management: Traditional, Agile, Extreme", John Wiley & Sons, (2011).
- [6] H. Naz and M. N. Khokhar, "Issues caused due to current Software Requirements Engineering routines being followed in Pakistan, and their Practical Solutions", SZABIST, Islamabad, (2007).
- [7] PMI, "Project Management Journal", (2013) February.
- [8] A. Martínez-Noya and E. García-Canal, "Technological capabilities and the decision to outsource/offshore R&D services", International Business Review, (2011).
- [9] A. Drinkwater, "Empowered Outsourcing", (2013), <http://www.projectsmart.co.uk/empowered-outsourcing.html>.

Authors



Humaira Naz

Humaira Naz received her Bachelors degree in Software Engineering in 2006 from Shaheed Zulfiqar Ali Bhutto institute of Science and Technology and currently a student of Master degree in Computer Science in Shaheed Zulfiqar Ali Bhutto institute of Science and Technology. Her research interests include Project Management, Outsourcing Management and Software Engineering. She is currently private Software Project Management and Software Design Consultant.



Muhammad Ilyas

Muhammad Ilyas received a Master degree in Software Project Management in 2004 from National University of Computer and Emerging Sciences, Lahore and a Doctor of Informatics from Johannes Kepler University, Linz Austria in 2010. His research interests include Software Engineering, Design Pattern and knowledge base systems. He is currently an assistant professor in the Department of Computer Science and Information Technology at the University of Sargodha, Pakistan.

