MANTECH Publications

Journal of Software Engineering & Software Testing
Volume 7 Issue 1
ISSN: 2457-0516 (Online)

Using the Periortization Method for Efficient Software Requirement Analysis

V. Laxmi[1], A.R. Venkateshwar[2]

Professor

Department of Computer Science

SVPCET

Corresponding Author's Email:- *vlaxmi00054@gmail.com*

Abstract

Software engineering is a broad and challenging field. The average efficient software requirement analysis for a software engineer is more sophisticated and vast. This study focuses on resolving the analysis problem's complexity with various priority strategies that use both formal (functional) and informal (non-functional) requirements to aid in more effective software requirement analysis. In this work, we explore the literature on how to undertake effective requirements analysis. This aids in more precise software development in order to meet customer expectations. A important part of today's software industry is efficient software requirement creation that reduces time costs and improves objectivity. As a result, we employ several prioritisation approaches, which we will explain further in this work.

Keywords: *Software engineering, Software requirement, Software development, Agile methodology*

INTRODUCTION

Every project's requirements serve as its foundation. Client statements are what requirements are. Prioritization of requirements is usually one of the most difficult issues in the software industry. Building an efficient solution that fully satisfies the wishes of all stakeholders is difficult in every project. When we only have a limited amount of time and money. So, if you ask your stakeholders to rank their requirements on their own, you'll most likely hear that everything is critical. However, this is not easily practicable

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

since clients or stakeholders have too much ambiguity in their minds about which criteria are core and which are not at the start of every software project. Because not all requirements provide the same level of value to stakeholders, it's critical to identify the ones that do. As a result, we'll have to make some difficult choices regarding which requirements will be included in the product. We must prioritise the project requirements that are required, and there are other criteria that would be wonderful to have if resources allowed, but are not required to be included in the software project. These kinds of demands can be deferred. There are numerous approaches to prioritising needs in order to improve overall project efficiency. Requirements are always linked to some strategic goals. The very first purpose of all requirements is to see if they meet the needs of the user. The next step is to prioritise the requirements and determine whether or not they meet the business aim. Is it in line with one of their declared objectives or goals? You can increase the effectiveness of your software by using various software models, which will vary depending on the needs criteria of your programme, such as the waterfall model, agile methodology, and so on.

LITERATURE REVIEW

Requirement analysis is not an easy task. The analyst faces a number of challenges, including:

- Communication with a large number of stakeholders
- Clients and developers are considering both conventional and contemporary process systems.
- Clients are unaware of the advanced system.
- There isn't enough time to assess the demands of users.
- Present the client's requirements in a clear and concise manner.

In this work, the researcher explains how to address these issues by using appropriate methodologies. Researchers have identified four processes for addressing and resolving such issues.

1. **Information gathering:** To begin, acquire information about your client's background. The following methods were used:

User analysis: - It is beneficial to be aware of the demands of all parties involved in this process. Users' groups

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

supervisors, and maintainers, to name a few.

Market research: - It includes published research sources such as study reports, articles, and demographical data. It provides a list of potential market users.

Context of use analysis: - it is used when a product is developed.

- **Task analysis: -** It depicts what a user is expected to do in terms of action and job completion. It can be done in a variety of ways. Another method is to use a flow chart, which depicts the sequence of human activities as well as their associated inputs and outputs.

- **Rich picture:-** This technique generates a live series of sketches to demonstrate how people and systems interact. They may show people's activities, power structures, and communications, among other things.

- **Field study and observational methods:-** The analytical team records and watches an investigator taking notes and doing a task.

- **Diary keeping: -** It keeps track of user activity over a period of time.

- **Video recording:-** It can be used to gather data and install a camera in a client's office or another location.

2. **User needs identification: -** When a developer or analyst gathered the information then they can start to be identified a client / user needs. By adopted following methods:

- **User survey:-** questionnaire used as a sample population of users.it can help to understand the needs of users.

- **Focus group:-** a cross section of clients in a discussion group format.

- **Interviewing:-** interview for the client about knowing his needs and requirements.

- **Scenarios and use cases:-** this method can help identify use-ability targets and example of future use as an idea to understand.

- **Future workshops:-** in this segment design asked the questions for users such as (what do you want to be 10 years from now)

- **Evaluating:-** measure of new systems effectiveness, efficiency and satisfaction baseline.

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

3. **Envisioning and Evaluation:** client's feedback can be obtained in this section by the prototype to verify and refine the client's requirements.

- **Brainstorm:-** designers and task experts create new ideas, suggestions to meet user's needs.

- **Card sorting:-** this is also used for instance to work out the organization of a website.

- **Affinity diagrams:-** make diagrams, sticky notes and then organize these notes by grouping them.

- **Story board:-** a story board which contain a Manu images like menu, dialogue boxes and window etc.

- **Prototypes:-** designer create a paper software based of users interface elements like (menu button, icons, window etc.) And play this system and the response of user or comments are recorded.

- **Allocation of function:-** it's mean to allocate that which task performed by human and which performed by technology.

- **Design instructions:-** designers also designs the guidelines and standard for users.

- **Requirements specification:-** the techniques and methods to support client's organizations requirements specification are following such as Task mapping: - specifies the system functions that each user will require for the different tasks that they perform.

- **Requirement categories:-** user requirement (include a summary , descriptions of the system, task and functions that will support them)

- Usability requirement (effectiveness , goals , efficiency and acceptability of system)

- Organizational requirement (an understanding and support of management structure)

- Prioritization: - the method of DSDM development uses to control risks in the system and allow to meet the user needs more closely.

- Criteria setting: - it is a settled criteria which helps to decide whether the

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

client needs and requirements have been achieved or not.

- According to (William Brace, Vincent cheutet., 2013) et.al [2] this paper presents a checklist oriented requirement CORA framework to analyzed and modifies the required prioritization . The checklist approach is very useful in finding the requirement prioritization analysis. CORA provide a systematic way as checklist ,collecting data , analyzing results and information .the complexity level increased of clients requirements due to increase in product complexity and development . There is a need to handle such complexities with more cost- effective way. To fulfilled clients and environment desire or needs. Here researcher discuss the existing concepts of requirements analysis:-

- **General principles:-** the process of R.S is just like the transformation of an input to a demanded output. The input is an informal expression in the other hand demanded output is a specific requirements. Many tools and process have been used for this transformation.

- **R.A engineering design phase:-** requirement engineering give a several number of techniques for analyzing requirements there are 2 phases. Researcher discussed for requirement engineering design.

In the first design, data is gathered and recorded. In the second step, generate special method for requirement specification .when measuring the quality in the refinement process requirements are presented with specifically qualitative and quantitative forms.

An alternative phase is a checklist based approach.

- R.A in other domain: - in this much pressure placed on functional and nonfunctional requirements. It has resulted in the tools development and support the procedure and methods of generating the requirements.

- R.A framework: - the document driven process in the engii design phase is checked more closely from a system perspective. Hard system and soft system are two alternative paradigms. That are exist for system thinking.

(Scenario) in the requirement analysis framework, firstly requirements presented in the requirement engineering .these are following as:-

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

- One line statement or a short sentences.
- give a brief detail with text, picture or graphs etc...

An overview of the CORA framework and a closer look of it CORA have including – checklist

- Requirement information management

- Specification drivers
- Functional and non-functional
- Criteria network and analysis

i. **Checklist: -** the checklist support a structural analysis process and managing data.

ii. **Requirement information management:-** A checklist provides a structure for storing and managing information to aid decision-making. There are two types of sources for this information.

- Human: clients, stakeholders, designers etc.
- Artefacts: design and user guidelines etc.

iii. Specification drivers: - The specification drivers are described as abstract representations of real-world designs. The specification driver is a fundamental tool for negotiating and settling the context of the requirement and design phases at an early stage.

4. Functional and nonfunctional analysis: - Checklist arranging sub functions according to priority and rationally analysing this arrangement. A FAST approach (function analysis system technique) is used to investigate functional requirements. Nonfunctional requirements are usually unbounded; they make relative statements that are difficult to verify.

5. Criteria network and analysis: - Criteria are linked together in a network. This aids in the management of criteria relationships and the identification of criteria. It can also be found in a variety of requirements.

CORA's disadvantage is that its structure can be used rigidly and in ineffective ways, wasting time and money for the organisation.

The goal of this study, according to phipip achimugu et al. [3,] is to rank the requirements in order of specialised to broad implementation and to analyse the existing prioritisation strategies. Programming is similar to software

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

engineering. Prioritization is a time-consuming decision-making process for implementing a client's primary requirements. Due to the difficulties associated with software development, such as a limited budget, a lack of resources, and incompetent developers, prioritisation of requirements is critical. The software strategy, time, cost, schedule, or quality all benefit from priority needs.

Conventional literature reviews are divided into two categories: traditional literature reviews and systematic literature reviews. SLR is based on prior research, while TLR is based on current research. The extracted data was acquired using both quantitative and qualitative methods in these synchronised selected studies. The following findings were discovered as a result of the literature review: relative necessary prioritisation needs. Requirements for negotiations, release or execution, and a preliminary financial schedule Existing prioritisation techniques have the following limitations: scalability requirements, practically more time consuming techniques, rank update prioritisation requirements, communication gap between stakeholders and software developers, dependent requirement, existing prioritisation techniques are insufficient, no implementation in real life. As a result, it has been demonstrated that while there have been numerous advances in prioritisation algorithms, there is still room for improvement.

According to Michael Lang et al. [4,] communication is a technique for conveying your message to others. Without efficient communication, the system will fail due to misdirection or miscommunication. A development process is made easier by well-managed communication between the client and the developers.

A set of requirement tools was gathered by the researcher for cooperating on software requirements management. The terms "necessary," "optional," and "preferred" are used to describe such requirements. Following that, the researcher evaluates which existing technologies are accessible for 'meeting the requirements.' Tools that did not match the mandatory requirements were rejected. The data for the case study was acquired using both qualitative and quantitative methodologies. In the collaborative development of a system, developers must be able to obtain a thorough grasp of how users operate, and developers must have access to solutions if the user's needs are not met. Maintain

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

descriptions for needs, define requirements, tractability, assignment validation for user requirements, support and cooperative, support comprehensive data, and maintain documents are some of the criteria of a tool for collaborative RM.

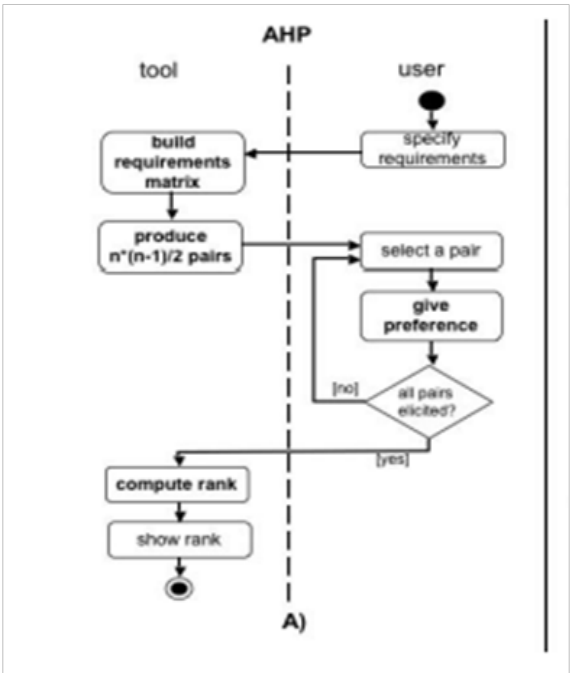
To determine which RM tool is capable of meeting the requirements, it was used in the creation of a software system over a five-month period, collecting user input and opinions before, during, and after the process. According to this study, improving client-developer communication leads to more advances and improvements in productivity and quality.

Collaborative tools, on the other hand, are unable to manage the complex social process system on their own, necessitating personal human interaction. [6]The goal of requirements engineering or requirements management principles is to introduce the highest levels as well as the processes or procedures that can affect requirements engineering. The researcher should also explain how the software application can help the RE reach its goals and objectives. The goal of this paper is to describe the three terms that are categorised as requirements. It has been observed that the key reasons for project failure include inappropriate knowledge of users, non-valid scope, and shifting needs. RE and RM: targeted groups, face-to-face conversation, procedure analysis, verifying existing users at work, talking between problem reporters and future users, and so on are some methods for obtaining requirements. There are two ways to illustrate a need expression: first, a simple UML diagram, and second, a typical set of user stories. Decomposition of requirements and relationships between many to one one too many, and one to one. The change configuration management (CM) tool is used to manage the changes. A single modification can have a significant impact on a system. Reusing requirements allows you to save time, money, and effort. Six frequent RE issues include avoiding the scope, doing more than is required, not allowing users to scrutinise the work of the team, unidentifiable clients, and the RE administration position failing to provide proper framing.

Analytical Hierarchy Process Technique

We can rank and set the priority of each need using the analytical hierarchy process technique.

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved



AHP follows a method that takes requirements from several stack holders (users, developers, and software owners) and assigns a number to each need based on its intensity/importance. These figures are used to calculate the complexity of a software requirement period.

It's similar to the rank-based system. This rating system could be based on a ratio scale, a numerical system, or any other ranking scale.

Table 1. Scale for Pairwise Comparison in AHP [16]

Intensity	DEFINITION	Explanation
1	of equal value	Two requirements are of equal value
2	Slightly more value	Experience slightly favors one requirement over another
5	Essential or strong value	Experience strongly favors one requirement over another
7	Very strong value	A requirement is strongly favored and its dominance is demonstrated in practice
9	Extreme value	The evidence favoring one over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between adjacent judgments	When compromise is needed

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

RESEARCH METHOD

Numeral Assignment Technique

We use the numeral assignment technique to assign a number to our demand on a scale of one to five to signify its relevance. The following is the meaning of the number.

1. Does not matter
2. Not important
3. Rather important
4. Very important
5. Mandatory

As a result, each stakeholder's requirement will be prioritised, and an average outcome will be calculated.

Planning Game

We prioritise user stories in the planning game based on their features. There will be three key divisions in this technique. The first is "those who are required for the system to work." The second category is "those that are less important but have significant business value," and the third category is "those that would be wonderful to have."

100-Point Method

It is a voting technique that is used in favor for stakeholder to prioritize the particular requirement. 100 points will be given to every stakeholders. Suppose there are 5 requirements which stake holder wants to prioritize then he can assign 20 20 to each requirement or he can assign his total 100 points to only 1 requirement. By giving total points to only one requirement means that particular requirement is the most important requirement for the particular stake holder so that they can give high priority to the particular requirement.

Pair sampling

To keep a perioty list of software requirements, pair sampling is utilised to rank requirements from all stackholders. This perioty list is kept up to date with current requirements.

Charactristics of AHP Prioritization Method Using Scale

Evaluation Criteria	Simple Ranking	MoScoW	100 dollar	AHP
Ratio Scale Information			Yes	Yes
High Confidence from User	Yes	Yes	Yes	
Consistent	Yes	Yes	Yes	Yes
Low difficulty	Yes	Yes	Yes	
Low effort	Yes	Yes	Yes	
Able to handle large number of alternatives		Yes		

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

RESULTS AND CONCLUSION

Assume that every requirement has been prioritised, yet the software is still inefficient. The following are the factors that define this issue.

Team efficiency: By removing barriers, we can boost team efficiency. There will be some habits among team members that act as a roadblock. Alternatively, there may be a lack of training or expertise, in which case you will need to assist them in overcoming the obstacle. The second step is to recognise and reward team members. It aids those who must execute time-sensitive tasks. Set specific dates and follow up on the third point. You can seek for and listen for places where your team members may be stuck by following up with them. If there is any difficulty in clarifying a demand, engage the customer by conducting interviews to obtain a clear image of the requirement.

The uncertainty that emerges when we apply these prioritisation approaches can be solved with the help of these techniques. All stakeholders are on the same page, and they know what the intended outcome will be, just as he knows what the most critical requirements are. Because we can follow the criteria of priority, we can conduct an efficient analysis of needs, which aids in the development of software. The main effect is that when we precisely prioritise the requirements, the mismanagement is entirely resolved, and the documentation and prototypes that are seen by the stakeholders are produced.

REFRENCES

1. Martin Maguire & Nigel Bevan, “User requirements analysis a review of supporting methods”, Research School in Ergonomics and Human Factors Loughborough, UK, 2002.
2. William Brace & Vincent cheutet, “A framework to support requirements analysis in engineering design”, 2013.
3. Philip Achimugu, Ali Selamat, Roliana Ibrahim, Mohd Nzri Mahrin, “A Systematic Literature Review of Software Requirements Prioritization Research”, Faculty of Computing, Universiti Teknologi Malaysia, 811310 UTM Skudai, Johar, Malaysia, 11 Feb 2014.
4. Michael Lang, Jim Duggan, “A Tool to Support Collaborative Software Requirements Management”, Department of

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved

Accounting and Finance, National University of Ireland, Galway, Ireland.

5. Karlsson, J., "Software requirements prioritizing. Proceedings" Second International Conference on Requirements Engineering, 2002.

6. Nancy Meade, "Requirements Prioritization Introduction", Carnegie Mellon University, 2006.

7. Ronneby, Sweden, "An experimental comparison of five prioritization methods investigating ease of use, accuracy and scalability" Blekinge Institute of Technology, May 2012.

8. S. Hatton, M.K Jean-Luchainaut, Elke A. Rundensteiner Ed., Berlin Heidelberg, "Early prioritization of goals", , 2007.

9. Karlsson, J., & Ryan, K,." A cost-value approach for prioritizing requirements" IEEE Software, 1997.

10. R Razali, F Anwar, "Selecting the right stakeholders for requirements elicitation: a systematic approach",2011.

11. Inflectra, "Principles of Requirements Engineering or Requirements Management 101", March 1, 2018.

12. Sara Nilsson, Mattias Lindahl, "A Literature Review to Understand the Requirements Specification's Role when Development Integrated Product Services Offerings", LinkSpring University, Linkspring 581 83, Sweden.

Page 36-47 © MANTECH PUBLICATIONS 2022. All Rights Reserved