



An Analysis of Requirement Engineering and Techniques: A Literature Review

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Abstract. This research explores the essentiality of software requirements engineering in cycles software development. The focus lies on three main techniques, namely Functional Requirement, Non-Functional Requirement, Viewpoint Orientation Requirement Definition (VORD), and analysis through USECASE (Use Case Diagram and Use Case Scenario). Through a review systematic literature, ten relevant articles have been comprehensively reviewed in order to understand these techniques. The research results show that functional and non-functional needs have a role central to software development. Functional requirements describe what is should be carried out by the system, while non-functional requirements include aspects such as performance and security aspects. The VORD approach is proven to be efficient in understanding various angles views involved in system requirements, through the steps of identification, structure, documentation, and system point of view mapping. Besides that, the USECASE method helps describe user interactions with the internal system real-world situations, providing deep insight into user needs. This research make significant contributions to understanding the nature of software requirements engineering, and provide an important foundation for future research and practice.

Keywords: Software Requirements Engineering, Functional Requirements, Non-Requirements, Functional, Viewpoint Orientation Requirement Definition (VORD), Use Case, Literature Review Systematic.

1. Introduction

Software requirements engineering is a very crucial stage in the process software development or in the software development life cycle (SDLC). This stage aims to articulate customer ideas that may be unstructured and not yet complete into formal and accurate specifications. This document has great significance great because it serves as a link between customers, users, and the development team. Therefore, the importance of software requirements engineering is prominent in the efforts efficient and effective software product development [1].

Software requirements engineering is a combination of six activities, namely collecting, analyze, design, document, validate, and control requirements. Each activity, in pairs, consists of a series of steps and tasks that have been tested and developed over many years. The main

goal is to produce products that according to user demand and also in accordance with the target market. Although it's still their potential for error, following these steps will increase the likelihood project success [2].

Software is generally developed within a project framework and development cycle. In certain cases, requirements engineering is usually carried out after project initiation and before the project stage system planning. However, requirements engineering can also be implemented in stages and iteratively through the various stages of the software development cycle, and the outcomes of the process Requirements engineering can be used for planning purposes as well as for determining continuation of the project. Requirement's engineering involves more than just fact gathering, but rather includes all project life cycle activities related to understanding the needs and attributes required by a system [3].

2. Method

In this research, a systematic approach was used by conducting a review of several literature sources that discuss three techniques and analysis in requirements engineering. These three techniques include Functional Requirements and Non Functional Requirements, Viewpoint Orientation Requirement Definition (VORD), as well as analysis using USECASE, such as Use Case Diagrams and Use Case Scenarios. Data used in this research obtained from various sources covering the period 2022 to 2023. Data sources that used in this literature review comes from the internet, with Google Scholar and ResearchGate as the main information provider.

Systematic Literature Review studies are designed to find relevant primary research, obtain the necessary data, and analyze and synthesize these findings to gain a better understanding of the research topic.

Following are the steps taken by the author:

2.1. Selection of Literary Source

Scientific articles discussing requirements engineering techniques and application design.

2.2. Data Collection

Relevant data was taken from ResearchGate using search keywords:

- a) Requirement Engineering
- b) Requirement Engineering Technique
- c) VORD Engineering Requirements
- d) Application Design
- e) Application Design
- f) USECASE application

Relevant data from selected literature sources was collected. Information taken includes title, author, year of publication as well as description and requirements engineering techniques used.

2.3. Data Extraction

Data collected from reviewed scientific articles includes descriptions and requirements techniques engineering and its components.

2.4. Data Synthesis

10 articles were obtained that were reviewed and analyzed; data collected from this article, as well the main findings, analyzed and arranged in Table 1.

Table 1. Technique/Method Requirement Engineering.

| Article | Year | Technique/Method |
|---------|------|---|
| [5] | 2023 | Functional and Non-functional Requirements |
| [6] | 2023 | Functional and Non-functional Requirements |
| [7] | 2022 | Viewpoint Orientation Requirement Definition (VORD) |
| [8] | 2022 | Viewpoint Orientation Requirement Definition (VORD) |
| [9] | 2023 | Viewpoint Orientation Requirement Definition (VORD) |
| [10] | 2022 | USECASE |
| [11] | 2023 | USECASE |
| [12] | 2023 | USECASE |
| [13] | 2021 | USECASE |
| [14] | 2023 | USECASE |

3. Results and Discussion

From the results of the article collection, ten articles were found that discussed research relevant. Each article that has been selected has been studied comprehensively, from beginning to end. Finally, to explore information related to three analysis techniques in requirements engineering, namely Functional Requirements and Non-Functional Requirements, Viewpoint Orientation Requirements Definition (VORD), as well as analysis using USECASE, such as Use Case Diagrams and Use Cases Scenarios. From the results of observations of these articles, the following information was found.

3.1. Functional Requirements and Non-Functional Requirements

Phishing aggressors abuse a extend of social designing strategies, as explained [7], [10]. By preying on feelings such as believe, fear, or direness, these aggressors make scenarios that provoke people to act quickly without due investigation. A more profound comprehension of these strategies is basic for people and organizations to recognize and stand up to control endeavors.

Functional requirements are explanations of actions or functions that must be performed by a system or software to meet the needs of users or parties interested. Functional requirements describe the way the system behaves within carry out certain operations, functions, or actions, and are usually conveyed in form a statement that is concise and measurable.

The following are the results of a literature review of functional and non-functional requirements analysis techniques arranged in table 2.

Table 2. Functional Requirements and Non-Functional Requirements

| Article | Result |
|---------|--|
| [5] | <p>In this article the author analyzes and designs a GoMontir-based information system website. The author conducted interviews with workshop owners, and also with workshop customers. Apart from that, the author also made internal observations create system requirements.</p> <p>The functional requirements of the GoMontir web application include:</p> <ol style="list-style-type: none"> 1. User Registration: Users must be able to create an account with provide their personal information. 2. User Login: Registered users should be able to log in to their accounts using their credentials. 3. Service Ordering: Users should be able to order services with provide relevant details such as type of service required, location, and desired time. 4. Emergency Call: Users should have the option to make a call emergency for immediate assistance. |

| Article | Result |
|---------|---|
| | <p>5. Payment Process: The application must provide a payment gateway it is safe for users to make payments for the services obtained.</p> |
| | <p>6. Service Information: The application must provide detailed information about services offered by GoMontir.</p> |
| | <p>7. Service Reports: The application should generate reports on service details customers, transaction history, and emergency calls.</p> |
| | <p>8. User Profile Management: Users must be able to manage profile information them, including updating personal details and viewing service history previously.</p> |
| | <p>9. Notifications: The application should send notifications to the user regarding service status, updates and promotions.</p> |
| | <p>10. Security: The application must ensure the security of user data and transactions by implementing appropriate security measures and security testing routinely.</p> |
| | <p>Non-functional requirements of the GoMontir web application include:</p> |
| | <p>1. Performance: The application must be able to handle a large number of users simultaneously and provide fast response times for orders services and other functions.</p> |
| | <p>2. Sustainability: Applications must be consistently accessible and usable without any significant system disruption or failure.</p> |
| | <p>3. Security: Applications must implement strong security measures to protect user data and ensure secure transactions. This includes encryption of sensitive information and secure storage of user credentials.</p> |
| | <p>4. Scalability: The application must be able to cope with the increasing number of users and service requests without sacrificing performance or functionality.</p> |
| | <p>5. Compatibility: The application must be compatible with various web browsers and devices to ensure accessibility for a wide range of users.</p> |
| | <p>6. Usability: The application should have an easy to use and interface Intuitive navigation to ensure ease of use for all user.</p> |

| Article | Result |
|---------|---|
| | <p>7. Maintenance: Applications should be easy to maintain and update, with code clear and good documentation to facilitate upgrades or improvements bugs in the future.</p> <p>8. Accessibility: Applications must be accessible to users with disabilities, follows accessibility guidelines and provides features such as reader compatibility screen and navigation using the keyboard.</p> <p>[6] In this article, the author analyzes and designs the KlikEAT! electronic canteen application. In the system requirements analysis, the author made observations at the canteen located in Sebelas Maret University. The observations made included the purchasing process food and drinks, payment processing, and so on. Results of Functional and Non-Functional requirements obtained using techniques Functional and Non Functional requirements, namely</p> <p>The functional requirements of this e-canteen application are:</p> <ol style="list-style-type: none">1. Make it easier for the canteen to carry out the process of selling food and drinks without creating long queues thereby creating more organized.2. Can save all user data entered using databases.3. Displays the available canteen menu.4. Allows users to order food and drinks.5. Display menu prices.6. Has an order checkout feature. <p>The non-functional requirements of this e-canteen application are:</p> <ol style="list-style-type: none">1. Good performance: The application should be able to handle multiple users simultaneously simultaneously without experiencing a significant decrease in performance.2. Security: The application must have adequate security mechanisms for protect user data, such as data encryption and protection against attacks cyber.3. User-friendly: The user interface should be easy to use and intuitive, so users can easily interact with the application. |

| Article | Result |
|---------|---|
| | 4. Availability: The application must be available and accessible to every user time, without any prolonged downtime. |
| | 5. Scalability: Applications should be able to be easily upgraded or expanded according to user growth and business needs. |
| | 6. Compatibility: The application must be compatible with various devices and platforms, such as computers, tablets, and smartphones, as well as various operating systems such as Windows, iOS, and Android. |

Table 3. Final Clarification Output

| FINAL CLARIFICATION OUTPUT | | | | | | | | | |
|----------------------------|-----|---------|-----|---------|-----|---------|-----|---------|-----|
| Day N°1 | | Day N°2 | | Day N°3 | | Day N°4 | | Day N°5 | |
| COD | COD | COD | COD | COD | COD | COD | COD | COD | COD |
| mg/ | mg/ | mg/ | mg/ | mg/ | mg/ | mg/ | mg/ | mg/ | mg/ |
| 130 | 36 | 162 | 44 | 153 | 28 | 160 | 32 | 167 | 39 |

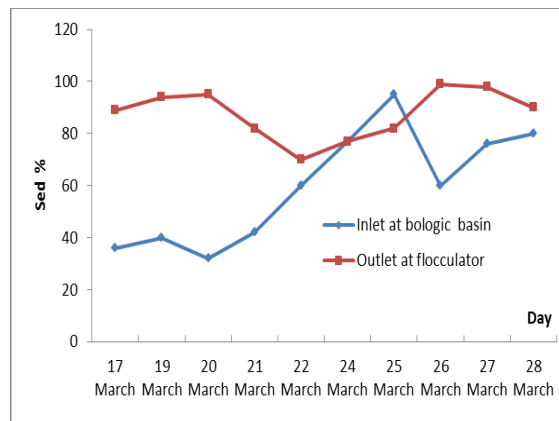


Fig. 4. Diagram analysis

Table 4. Table of A Process Flow Diagram for the Manufacture of Magnesium Oxide Nanoparticles.

| No | Symbol | Information |
|----|--------|-------------|
| 1 | R-1 | Reaktor-1 |
| 2 | R-2 | Reaktor-2 |
| 3 | PU-1 | Pump-1 |

| No | Symbol | Information |
|----|--------|-------------|
| 4 | PU-2 | Pump-2 |
| 5 | FI-1 | Filtrasi-1 |

3.2. Viewpoint Orientation Requirement Definition (VORD)

VORD (Viewpoint-Oriented Requirements Definition) is an approach to Analyze system requirements by utilizing the point of view method. The following are the results of a literature review of the Viewpoint Orientation Requirement Definition (VORD) technique in table 5.

Table 5. VORD

| Article | Result |
|---------|--|
| [7] | <p>In this article the author creates an information system regarding searching for a boarding house using VORD method</p> <p>The analysis results are as follows:</p> <ol style="list-style-type: none"> a. Viewpoint Identification: <ul style="list-style-type: none"> - admin: there are 6 viewpoints - visitors: there are 4 viewpoints - boarding house search: 6 viewpoints - boarding house owner: 6 viewpoints b. Viewpoint Structuring <p>In the Point of View Development stage (Viewpoint Structuring), the system involves corners interactive view consisting of 4 actors, angles indirect view involving 1 stakeholders, as well as points of view domain that includes 4 boundaries effect on the system.</p> <ol style="list-style-type: none"> c. Viewpoint Documentation <p>in the Point of View Documentation stage (Viewpoint Documentation), an explanation is carried out regarding the services provided by each interactive viewpoint, non-interactive viewpoint direct, and domain point of view.</p> <ol style="list-style-type: none"> d. At the Viewpoint System Mapping stage <p>(Viewpoint System Mapping), analysis is changed be an object-based design that will implemented in display form website.</p> |
| [8] | <p>In this article, the author analyzes and creates Hoki employee payroll information system</p> <p>Waterboom uses the VORD method. The results of the analysis using the VORD method are:</p> |

| Article | Result |
|------------|---|
| | <p>a. Viewpoint Identification</p> <ul style="list-style-type: none"> - Operator - Admin - Leader <p>b. Identify viewpoints and services viewpoint</p> <ul style="list-style-type: none"> - Admin: Login, Master, Salary Calculation, Reports and change the password and log out - Leadership: Login, Employee Reports, Salary Reports per period, Logout <p>c. Identify the services allocated to identify the point of view of the previous stage</p> <ul style="list-style-type: none"> - admin: Login, User, Gapok Employees, Benefits, Position, salary calculation, employee reports, salary report per period, log out - Leadership: login, employee reports, salary reports per period, log out <p>d. Data control information</p> <ul style="list-style-type: none"> - Control input: login, main menu, menu employee, gapok master, position master, master allowance, print report - data input: employee data, position data, salary data |
| <p>[9]</p> | <p>Evaluation results using Viewpoint Oriented Requirement Definition (VORD) includes:</p> <ul style="list-style-type: none"> a. In the Point of View Identification stage, There are two points of view contained in it approach system. b. In the Viewpoint Structure phase (Viewpoint Structuring), the system involves a point of view consisting of two actors, no point of view directly involving regulations and environment, as well as the domain point of view includes four influencing constraints system. c. At the Point of View Documentation stage, In this step, is used to elaborate each viewpoint and service. The goal is to explain needs system from every point of view. d. In the implementation phase, the system will explains user interface design. |

3.3. USECASE: Use Case Diagram and Use Case Scenario)

Use Case is a method used in requirements engineering and design software. The goal is to describe how interactions occur between users (including humans and other systems) with the system being developed. With a narrative approach, Use Cases help in deeper understanding about user needs and how users interact with the system, well in the context of real world situations. It serves as a useful tool for understanding requirements and user interaction with the system. The following are the results of a literature review of the Usecase technique in Table 6.

Table 6. Use Case.

| Article | Result |
|---------|--|
| [10] | In this article the author designs a menu ordering application for a fresh restaurant website based. Results of system requirements analysis created using techniques usecases obtained: admin usecase, owner usecase, cashier usecase, waiter usecase, and kitchen usecase. |
| [11] | In designing the district craft UKM profile application. Android-based Bantul, author uses use case techniques to define system requirements, namely: admin usecase and community usecase |
| [12] | In this article, the author creates AR-based mathematics learning media. By using the usecase method, the needs are obtained, namely: teacher usecase and student usecase. |
| [13] | In designing exam applications using the question item analysis method, the author use use case techniques to define system requirements. Got it usecase as follows: admin usecase, teacher usecase, principal usecase, examinee usecase |
| [14] | In this article, the author analyzes and designs an information system lecturer monitoring using RFID. Analysis results using usecase, author uses 3 usecases, namely: admin usecase, lecturer usecase, and student usecase |

4. Conclusion

The conclusion of this research is that the three software requirements engineering techniques, namely Functional Requirements and Non Functional Requirements, Viewpoint Orientation Requirements Definition (VORD), and analysis using USECASE, including Use Case Diagrams

and Use Cases Scenarios play an important role in articulating and understanding system requirements. In the systematic literature review analysis, ten relevant articles were found, and the results provide valuable insights.

Functional and non-functional requirements have proven important in device development soft, with functional requirements explaining the actions or functions that must be carried out by system, while non-functional requirements involve aspects such as performance, security, and usability that impacts user experience. VORD approach, with steps such as viewpoint identification, angle structure viewpoint, viewpoint documentation, and viewpoint system mapping, effective in understand the diverse viewpoints involved in system requirements. USECASE methods, including Use Case Diagrams and Use Case Scenarios, help illustrate interaction between the user and the system, providing a deeper understanding of how users interact with systems in real-world contexts.

Suggestions for further research include empirical research, comparison of techniques, expansion coverage, and development of practical guidance to support software developers. Thus, this research helps understand the importance of device requirements engineering software in successful development as well as providing a solid foundation for research and practice in the future.

ACKNOWLEDGEMENT

I would like to thank my family who have always provided support and motivation in every step of my life, including in writing this article. I would also like to thank Mrs. Ema Utami for assisting in the data analysis process and providing valuable input.

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