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AGILE REQUIREMENTS MANAGEMENT CHALLENGES AND STRATEGIC RECOMMENDATIONS IN INDONESIA'S NATIONAL SINGLE WINDOW

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Abstract— *Agile methodology is widely adopted by organizations with dynamic user needs, particularly in complex environments involving multiple stakeholders such as ministries and agencies in the public sector. The Indonesia National Single Window Agency (LNSW), which facilitates electronic data exchange for national exports, imports, and logistics, faces this condition. This study aims to identify challenges in requirements management and provide recommendations for LNSW. This study uses three stages: (1) a Systematic Literature Review (SLR) of 15 main articles, (2) validation and categorization of challenges through interviews and questionnaires analyzed using the Content Validity Index (CVI) method (S-CVI/Ave = 1, S-CVI/UA = 1), and (3) development of practical recommendations. This study identifies 12 challenges in the requirements management process at LNSW, which are categorized based on the 4P framework: People (lack of expertise in respective fields, lack of stakeholder problem identification), Process (uncertainty and dynamics of requirements, inability to set requirement priorities, organizational bureaucracy, poor documentation practices), Project (difficulty in estimating time and cost, unrealistic targets, lack of clarity in roles and responsibilities), and Product (lack of product vision, issues in user story development, and technical issues). Based on these challenges, 12 recommendations are proposed, along with operational guidance in the form of an Agile Requirements Playbook tailored for public sector organizations with multi-stakeholder environments. This study contributes to both theory and practice by providing a context-specific Agile Requirements Playbook with validated recommendations to support requirements management in complex public sector environments.*

Keywords: *Agile Requirements Management, Challenges and Recommendations, CVI Method, The Indonesia National Single Window Agency.*

Intisari—*Metodologi Agile banyak diadopsi oleh organisasi dengan kebutuhan pengguna yang dinamis, terutama dalam lingkungan yang kompleks dan melibatkan banyak pemangku kepentingan seperti kementerian dan lembaga di sektor publik. Lembaga National Single Window (LNSW), yang bertugas memfasilitasi pertukaran data elektronik terkait ekspor, impor, dan logistik nasional, menghadapi kondisi serupa. Penelitian ini bertujuan untuk mengidentifikasi tantangan dalam manajemen kebutuhan serta memberikan rekomendasi yang dapat diterapkan pada LNSW. Penelitian ini menggunakan tiga tahapan, yaitu: (1) Systematic Literature Review (SLR) terhadap 15 artikel utama, (2) validasi dan kategorisasi tantangan melalui wawancara dan kuesioner yang dianalisis menggunakan metode Content Validity Index (CVI) (S-CVI/Ave = 1, S-CVI/UA = 1), dan (3) pengembangan rekomendasi praktis. Penelitian ini mengidentifikasi 12 tantangan dalam proses manajemen kebutuhan di LNSW yang dikategorisasi dengan framework 4P yaitu People (kurangnya ekspertis, kurangnya identifikasi masalah pemangku kepentingan), Process (kebutuhan yang dinamis dan tidak pasti, ketidakmampuan menentukan kebutuhan prioritas, birokrasi di organisasi, praktik dokumentasi yang lemah), Project (kesulitan mengestimasi waktu dan biaya, target yang tidak realistis, kurangnya kejelasan peran dan tanggung jawab), dan Product (kurangnya visi*

produk, permasalahan dalam penyusunan user story, dan permasalahan teknis). Berdasarkan tantangan tersebut, diajukan 12 rekomendasi, beserta panduan operasional berupa Agile Requirements Playbook yang disesuaikan untuk organisasi sektor publik dengan lingkungan multi-pemangku kepentingan. Studi ini berkontribusi pada teori dan praktik dengan menyediakan Agile Requirements Playbook yang spesifik konteks dengan rekomendasi yang telah divalidasi untuk mendukung manajemen kebutuhan di lingkungan sektor publik yang kompleks.

Kata Kunci: Agile Requirements Management, Tantangan dan Rekomendasi, Metode CVI, Lembaga National Single Window.

INTRODUCTION

Agile methodology is currently becoming increasingly popular in both the private and public sectors. This methodology offers a flexible and iterative approach to the software development process. Its strengths lie in customer collaboration, continuous delivery, and the ability to adapt to change. These advantages make it well-suited to dynamic environments, especially when user needs are rapidly changing [1], [2].

In recent years, the agile approach to software development has become increasingly widespread. According to the 17th Annual State of Agile Report [3], 71% of organizations reported that they use Agile in their Software Development Life Cycle (SDLC). The Indonesia National Single Window Agency (LNSW) is a government organization that digitizes cross-organizational government services in Indonesia. In carrying out its business processes, LNSW is required to coordinate across organizations and adapt to changing business needs.

This is in line with Recommendation No. 33 of the United Nations Economic Commission for Europe (UNECE), which encourages the establishment of a single window to simplify and harmonize business processes related to exports, imports, and logistics in order to support trade facilitation. A single window is also expected to reduce barriers, streamline regulatory processes, and enhance inter-agency collaboration [4], [5]. LNSW represents a unique and significant case due to its system involves multiple stakeholders, including government institutions, regulatory bodies, and external users [4], [5], leading to high complexity in requirements management. In addition, the system is characterized by frequent changes in requirements driven by evolving regulations and stakeholder needs, making it a suitable context to investigate challenges and strategies in Agile requirements management.

Agile frameworks such as Scrum encourage responsiveness and active stakeholder engagement. In addition, as organizations increasingly need to undergo digital transformation, the practice of implementing requirements management using an agile approach has become not only a technical necessity, but also a strategic imperative for generating value [6], [7], [8].

Although agile methodologies offer many advantages for organizations, the requirements management process remains one of the challenges in system development, especially for public organizations that involve multiple stakeholders such as LNSW. Previous studies have highlighted various problems such as inconsistent stakeholder involvement, unclear or frequently changing requirements, limited documentation, and difficulties in collaboration between internal teams and vendors [9], [10], [11].

These problems become even more complicated when they occur in the public sector [12], [13]. The public sector has complexities such as strict procurement procedures, limited timelines, uneven levels of understanding of agile concepts, and communication barriers between business teams, internal information technology teams, and vendor teams [12], [13], [14]. These conditions often lead to ambiguity in system development requirements [15], [16]. Especially in Indonesia's public sector, These challenges are due to bureaucratic structures, regulatory compliance requirements, and diverse stakeholder interests [12], [17].

It is crucial for public organizations such as LNSW to understand all these challenges. Organizations need to ensure that the agile methodology is not only formally adopted but also effectively implemented [7], [18], [19]. This is especially true for system development projects whose requirements are constantly changing due to the involvement of multiple stakeholders [13].

Despite the growing body of research on agile requirements management, most studies focus on private sector environments or general software development contexts [2], [20]. Limited attention has been given to agile requirements management in public sector, particularly those involving complex regulations and multiple stakeholders coordination.

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Furthermore, there is a lack of empirical studies that examine how agile requirements management is applied in national scale systems such as single window platforms, where requirements are highly dynamic and influenced by policy changes.

The purpose of this study is to identify challenges in the requirements management process faced by LNSW and propose practical recommendations based on empirical interviews with organizational representatives and a literature review on system development using agile methodologies. This study uses a mixed-method approach, namely a Systematic Literature Review (SLR) and semi-structured interviews with relevant stakeholders at LNSW, including developers, product owners, and project managers. The challenges identified will be categorized using the 4P framework, namely People, Process, Project, and Product [21]. Furthermore, the research results will be validated by experts using the Content Validity Index (CVI) methodology [22], [23], [24].

Unlike prior studies that focus on general Agile adoption or isolated aspects of requirements management, this study provides a context-specific operational perspective for national scale public systems. It integrates findings from a systematic literature review and empirical interviews to develop a structured Agile Requirements Playbook consisting of roles, artifacts, timelines, and KPIs tailored to the LNSW environment.

Based on the results of literature synthesis and interview data, this study will answer the following research questions:

RQ1: What are the challenges in the requirements management process in agile-based system development projects faced by LNSW?

RQ2: What recommendations can be applied to overcome these challenges at LNSW?

This study is expected to make the following main contributions:

Contribution 1 – Contextual Synthesis. A synthesis of agile requirements management in the government sector based on the 4P perspective (people, process, project, and product).

Contribution 2 – Validated Recommendations. Twelve recommendations validated using the CVI methodology with universal agreement from four experts. These recommendations are intended for public organization projects involving multiple stakeholders.

Contribution 3 – Operational Guidance. A structured agile requirement playbook (owners, artifacts, timeline, and KPIs) that can be implemented in similar organizations.

MATERIALS AND METHODS

Materials

A. Agile Development in the Public Sector

The agile development methodology was originally designed for the private sector, but is now increasingly being applied to software projects in the public sector. Key agile principles such as frequent delivery, continuous stakeholder involvement, and responsiveness to change are aligned with the growing need for government agencies to create adaptive, transparent, and citizen-oriented services [2]. Unlike traditional methodologies such as waterfall, agile methodologies allow organizations to receive rapid feedback and make incremental improvements. This is particularly beneficial in the public sector, where user needs and regulations often change throughout the system development cycle [1], [25]. These characteristics of agile can help public sector organizations manage the complexity of system development projects, improve their response to changing needs caused by policy changes, ensure compliance, and meet evolving user expectations [2].

However, implementing Agile methodology in a government environment is not without challenges. Public institutions generally have characteristics such as rigid procurement procedures, hierarchical decision-making structures, and a tendency to avoid ambiguity in requirements specification. These characteristics have the potential to conflict with the main principles of Agile methodology, especially those related to flexibility in accepting changes in requirements [12], [17]. Currently, various Agile frameworks such as Scrum and SAFe have been adopted in the public sector. However, a number of empirical studies show that organizations still face various challenges in implementing Agile practices, including inconsistent stakeholder involvement, low levels of understanding of Agile methodology, and structural resistance to the iterative approach that characterizes Agile [11], [20], [26]. In addition, several studies also show that organizations need to make methodological adaptations, accompanied by organizational cultural changes and strong commitment from leaders, so that Agile implementation can be aligned with institutional goals and characteristics [12], [16].

B. Requirements Management in Agile Projects

In the system development process, requirements management is a fundamental activity that includes identification, documentation, prioritization of development, validation, and

control of system requirements throughout the project life cycle. In an Agile environment, requirements management is dynamic and iterative, as system requirements may change based on user feedback and business needs. Agile teams will compile development requirements through a short cycle of backlog refinement, sprint planning, sprint review, and gathering input from users [9], [10]. For example, Li [9] emphasizes the importance of Agile teams having a continuously changing understanding of user requirements through an iterative process, while Farooq [10] highlights the ability of Agile methodologies to validate requirements early and determine the priority of requirements to be developed. This is in line with findings in the industry that support the flexibility of Agile in defining user requirements. Based on the 17th Annual State of Agile Report, nearly three-quarters of Agile teams routinely incorporate requests for changes in user requirements during the development process. This further confirms that requirements are compiled naturally through an iterative process [3].

C. Common Challenges in Agile Requirements Management

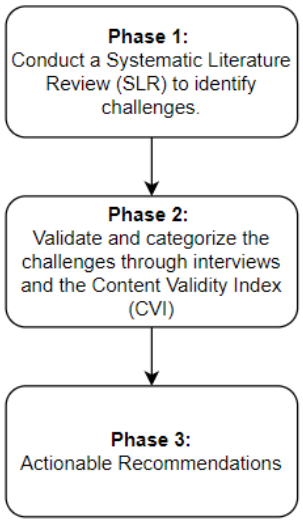
Although agile has advantages in terms of flexibility and stakeholder involvement, many studies show that organizations also face challenges in the requirements management process that can impact project outcomes. Examples from the people dimension include challenges such as low stakeholder involvement, lack of domain knowledge, and weak coordination between team members [15], [16]. Singh [26] highlights human-related issues, such as a lack of an Agile mindset, unclear role definitions, and resistance to change. These challenges make requirements gathering increasingly difficult. These challenges become even more intense in the public sector context, where hierarchical structures and bureaucracy hinder team flexibility in decision-making.

In terms of process, project, and product dimensions, requirements management in agile methodology faces many challenges, such as changing and ambiguous user requirements, inadequate documentation, and weak recording of each change [25], [27]. Behutiye [11] states that non-functional requirements (NFRs) such as security, compliance, and scalability are often overlooked by teams and not clearly defined in the agile process. This can pose a risk to the quality of the resulting system. In addition, there are also challenges in the project dimension, such as weaknesses in project planning [1], [20], scope creep [12], [17], and difficulties in estimating time and costs [2], [12], [20]. Meanwhile, challenges in the product dimension include poorly defined product backlogs [11], [12], [20], [28], technical difficulties in accommodating backlog requirements [2], [27], and frequent technical debt [10], [20].

These challenges in requirements management also arise in the public sector, especially those involving many stakeholders such as LNSW.

Methods

The study proceeded in three phases: (1) a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-guided SLR to identify candidate challenges; (2) validation and categorization through semi-structured interviews and the CVI method; and (3) development of actionable recommendations. Figure 1 summarizes the phases. The SLR followed PRISMA 2020 (identification, screening, inclusion) and its checklist/flow diagram [29], [30].



Source : (Research Results, 2025)

Figure 1 The Research phase

a. Phase 1 – Systematic Literature Review

1) Database

Searches were conducted in five major scholarly databases—Scopus, ScienceDirect, IEEE Xplore, SAGE Journals, and Taylor & Francis—covering January 2020 to April 2025 (last updated on 16 May 2025. The selection of sources was intended to balance coverage across software engineering and management/public administration outlets and to capture peer-reviewed literature relevant to Agile requirements practices in government contexts.

2) Keyword

A Boolean strategy was applied using the following core query: ("factors" OR "challenges" OR

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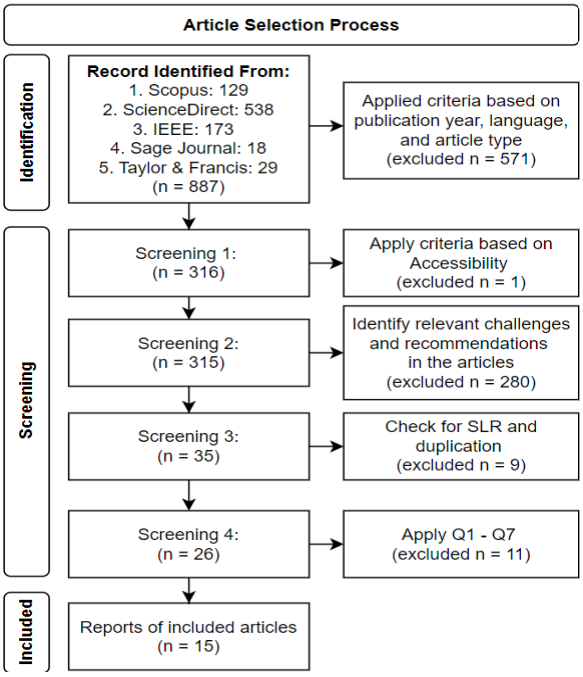
"barriers" OR "recommendations") AND ("requirements management" OR "requirements engineering") AND ("agile development" OR "agile project"). Synonyms and sector terms were incorporated when supported by the database (e.g., requirements change/ volatility, user stories, backlog, public sector/government) to improve recall and context fit. Where available, field qualifiers and proximity operators were used (e.g., Scopus: TITLE-ABS-KEY; others: All fields). Complete per-database strings are provided in Table 1. Appendix A.



Source : (Research Results, 2025)

Figure 2. Article Selection Process

Table 1. Appendix A - Boolean Search Strings for Each Database

Database	Boolean Query	Field
Scopus	TITLE-ABS-KEY(("factors" OR "challenges" OR "barriers" OR "recommendations") AND ("requirements management" OR "requirements engineering") AND ("agile development" OR "agile project"))	Title, Abstract, Keywords
ScienceDirect	(("factors" OR "challenges" OR "barriers" OR "recommendations") AND ("requirements management" OR "requirements engineering") AND ("agile development" OR "agile project"))	All fields
IEEEXplore	(("factors" OR "challenges" OR "barriers" OR "recommendations") AND ("requirements management" OR "requirements engineering") AND ("agile development" OR "agile project"))	All Metadata
Sage Journal	(("factors" OR "challenges" OR "barriers" OR "recommendations") AND ("requirements management" OR "requirements engineering") AND ("agile development" OR "agile project"))	All fields
Taylor & Francis	(("factors" OR "challenges" OR "barriers" OR "recommendations") AND ("requirements management" OR "requirements engineering") AND ("agile development" OR "agile project"))	Anywhere

Source : (Research Results, 2025)

3) Screening

Screening followed PRISMA 2020 procedures, comprising identification, screening, and inclusion. Figure 2 illustrates the detailed process. At the identification stage, 887 records were retrieved using the predefined query. Stage 1 screening applied bibliographic filters, publication year (January 2020–April 2025), language (English), and document type (journal or conference), yielding 316 records. Stage 2 screening assessed full-text accessibility; records without accessible full text were removed, leaving 315 articles. Stage 3 screening examined titles and abstracts to cover challenges and recommendations in requirements management, resulting in 35 candidate articles. Stage 4 screening excluded systematic reviews and duplicates, producing 26 primary studies that met all criteria.

4) Quality Criteria

The 26 studies were appraised against seven checklist criteria (Table 2). Based on this appraisal, 15 studies met the quality threshold and were retained for synthesis. These 15 studies were then analyzed to identify challenges and practice-oriented recommendations in requirements management. Details of the included studies are provided in Table 3. Appendix B.

To further ensure a structured analysis, a thematic coding approach was applied to the selected studies. Key findings related to challenges and recommendations were systematically extracted and categorized using the 4P framework (People, Process, Project, and Product). A predefined coding scheme was used to guide the classification process, ensuring consistency in mapping evidence from each study to the

corresponding categories and reducing subjectivity in interpretation. The synthesis process focused on identifying patterns and relationships within each article. The findings were then consolidated into a 4P framework for better structure and understanding.

Table 2. Quality Criteria

Checklists Criteria	Checklist Statement
Q1	Does the article clearly state the research objectives and scope?
Q2	Does the article clearly discuss the problem or solution?
Q3	Does the article discuss the requirements or project scope?
Q4	Does the article discuss the challenges in the requirements process within Agile development?
Q5	Does the article discuss recommendations for the requirement process within the Agile development context?
Q6	Are the research results clearly explained?
Q7	Do the conclusions answer the research questions?

Source : (Research Results, 2025)

Table 3. Appendix B - 15 Selected Articles

No	Data base	Type of Articles	Year	Title	Author	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Total	Pass/ Fail
1	SCOPUS	CONF	2023	A Critical Analysis of Requirement Management in Agile Development	Asad, K.	1	0,5	1	1	0	1	1	5,5	PASS
2	SCOPUS	CONF	2022	Defining Requirements Strategies in Agile: A Design Science Research Study	Muhammad, A.P.	1	0,5	1	1	1	1	1	6,5	PASS
3	Science Direct	JOUR	2021	Requirements engineering challenges and practices in large-scale agile system development	Kasauli, Rashidah	1	1	1	1	1	1	1	7	PASS
4	IEEE	CONF	2020	Survey on Differences of Requirements Engineering for Traditional and Agile Development Processes	A. Alhazmi	1	1	1	1	0	1	1	6	PASS
5	IEEE	CONF	2024	Agile Requirements Engineering in a Distributed Environment: Experiences from the Software Industry During Unprecedented Global Challenges	Y. Li	1	1	1	1	0	1	1	6	PASS
6	IEEE	JOUR	2022	A Survey on Blockchain Acquainted Software Requirements Engineering: Model, Opportunities, Challenges, and Future Directions	M. S. Farooq	1	1	1	1	0	1	1	6	PASS
7	IEEE	CONF	2024	Assessing Requirements Engineering Practices' Impact on Electronic Government Solution Sustainability	A. Alzayed	1	1	0,5	1	0	1	1	5,5	PASS
8	IEEE	JOUR	2022	Using Conceptual Models in Agile Software Development: A Possible Solution to Requirements Engineering Challenges in Agile Projects	A. Gupta	1	1	1	1	0	1	1	6	PASS
9	IEEE	CONF	2024	Requirements Engineering Challenges for Blockchain Rollups	J. Gorzny	1	1	1	1	0	1	0,5	5,5	PASS
10	IEEE	CONF	2024	Requirements Engineering for Research Software: A Vision	A. Bajraktari	1	1	1	1	0	1	1	6	PASS
11	IEEE	CONF	2022	Stakeholder Identification Overview and Challenges in Requirements Engineering Prospective	D. A. Elneel	1	1	0,5	0,5	0,5	1	1	5,5	PASS
12	IEEE	CONF	2021	A survey on security and human-related challenges in agile software deployment	N. Singh	1	1	0,5	1	0,5	1	1	6	PASS
13	IEEE	CONF	2020	Agile-Based Requirement Challenges of Government	K. Rizkiyah	1	1	1	1	1	1	1	7	PASS

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No	Data base	Type of Articles	Year	Title	Author	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Total	Pass/ Fail
				Outsourcing Project: A Case Study										
14	IEEE	CONF	2020	Human-Related Challenges in Agile Software Development of a Government Outsourcing Project	A. K. Nisyak	1	1	1	1	1	1	1	7	PASS
15	IEEE	JOUR	2022	Quality Requirement Documentation Guidelines for Agile Software Development	W. Behutiye	1	1	1	0,5	0	1	1	5,5	PASS

Source : (Research Results, 2025)

b. Phase 2 – Validation Challenges and Categorizations

In this phase, the challenges and categorizations analyzed at the SLR stage will be validated through semi-structured interviews with the LNSW technical team. The purpose of these interviews was to confirm the actual challenges encountered in the organization's Agile system development process. The study employed a purposive sampling strategy, selecting respondents based on their direct involvement and roles in requirements engineering and Agile project execution. The interviews were conducted with representatives from the LNSW technical team, including five members from the System Development Team (DEV), three from the Project Management Office Team (PMO), and two from the Product Owner Team (PO). This composition was considered sufficient to represent key perspectives across development, project governance, and product ownership functions within LNSW. Although all respondents were internal stakeholders, they were chosen due to their hands-on experience and critical roles in the system development lifecycle. Table 4 lists the respondents interviewed in this study.

Table 4. List of respondents

Respondent Code	Roles	Experiences In Years
DEV1	Development Team	10
DEV2	Development Team	6
DEV3	Development Team	10
DEV4	Development Team	10
DEV5	Development Team	7
PMO1	Project Management Team	7
PMO2	Project Management Team	5
PMO3	Project Management Team	5
PO1	Product Owner	5
PO2	Product Owner	5

Source : (Research Results, 2025)

Interviews were conducted by compiling a list of questions as a guide and the collected data was analyzed using thematic coding to identify patterns and categorize challenges. The interview process continued until thematic saturation was achieved, indicating that no new insights or themes emerged from additional data collection.

The results of the interviews consist of a list of challenges at LNSW and recommendations for each challenge. These findings will be validated by a team of experts who deeply understand the LNSW system's development conditions. This team of experts has expertise in system development, project management, and business processes. The list of experts is shown in Table 5.

Table 5. List of experts

Expert Code	Job Title/Roles	Experiences In Years
EXP1	Head of the System Development/ Development Team	6
EXP2	Senior System Analyst/ Development Team	10
EXP3	Project Manager/ Project Management Team	5
EXP4	Head of information System Planning Sub-directorate/ Product Owner	5

Source : (Research Results, 2025)

A team of experts conducted the validation process using the CVI method. The CVI method assesses the content validity of an instrument using expert judgment [24]. In this study, the CVI method was applied to assess content agreement rather than to establish the absolute validity of measurement instruments. Specifically, it was used to evaluate the level of expert agreement on the relevance and clarity of the identified challenges and the proposed recommendations.

In this study, the validation process was conducted by four experts representing diverse roles, including system development, project management, and business process domains, in order to reduce potential bias and ensure multiple perspectives. The CVI instrument employed a 1-4 Likert scale. Subsequently, the ratings were converted to binary scores to calculate the CVI. Referring to the provisions of Polit and Beck (2006),

the Item-Level Content Validity Index (I-CVI) value must be one if the number of experts used ranges from three to five [22], [23]. However, this approach may lead to high agreement scores. Therefore, the results are interpreted cautiously and complemented with qualitative insights from the interview findings.

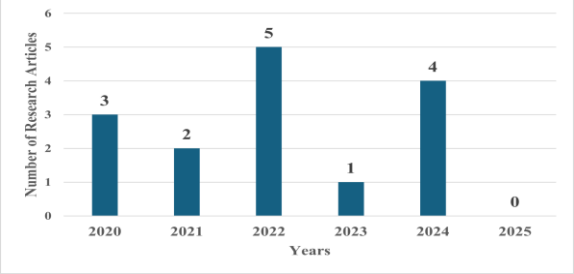
c. Phase 3 – Proposed Recommendations

The recommendations aim to provide practical solutions to the challenges organizations face in developing system requirements. These recommendations were developed by analyzing the challenges identified at LNSW, based on interview results validated by a team of experts in the previous phase. Subsequently, a coding process is conducted to map the solutions to ensure they are consistent with previous studies' findings.

RESULTS AND DISCUSSION

A. Results of The SLR

From the 15 research articles selected through the SLR process, the author presents the distribution of articles by year of publication in a graphical form, as shown in Figure 3.



Source : (Research Results, 2025)

Figure 3. Distribution of articles in the study

The figure shows the distribution of research articles on challenges and recommendations in requirements management over the last five years. The data show that the most research articles were published in 2022, whereas none were published from January to April 2025. Based on the SLR results, 32 challenges were identified and grouped into the 4P framework. The details of these challenges are presented in Table 6.

Table 6. Challenges identified in requirements management based on SLR

Category	ID	Challenges	References
People	1a	Lack of Team Involvement and Motivation	[1], [12], [16], [20], [26], [31]
	1b	Lack of Communication and Coordination	[9], [10], [12], [16], [17], [20], [26], [27], [31]
	1c	Lack of Management Involvement	[12], [20], [31]
	1d	Customer Inability and Disagreement	[2], [9], [12], [16], [20], [25], [26], [31]
	1e	Lack of Domain and Application Knowledge	[1], [9], [12], [16], [20]
	1f	Lack of Scaling Agile Awareness	[17], [26]
	1g	Lack of Management Commitment	[26]
	1h	Lack of knowledge Sharing	[1], [9], [10], [20], [26], [31]
	1i	Lack of Agile Expertise or Experience	[11], [16], [17], [26]
	1j	Lack of Training	[16], [26]
	1k	Stakeholder Identification Problems	[9], [10], [15], [17]
Process	2a	No Requirement Standard	[1], [17], [27]
	2b	Unclear Requirement	[2], [12], [16], [17], [20], [27], [31]
	2c	Requirement Volatility	[2], [16], [20], [27], [31]
	2d	Requirement Changing	[1], [2], [9], [12], [16], [17], [25], [27], [31]
	2e	Prioritizing Requirement	[1], [2], [9], [11], [12], [20], [25], [32]
	2f	Inadequate Requirement Verification	[20], [27]
	2g	Minimal Documentation	[2], [11], [20], [25], [27], [31]
	2h	Lack of Agile Understanding	[1], [16]
Project	3a	Lack of Vision in Planning	[1], [20]
	3b	Difficulty in Estimating Time and Cost	[2], [11], [12], [20], [25], [27]
	3c	Scope Issues	[12], [17]
	3d	Ineffective stakeholder alignment	[16]
	3e	Lack of Roles and Responsibilities	[11], [16], [26]
	3f	Hard to Manage Team Member	[20]
Product	4a	Emphasis on the component over the system goal	[1]
	4b	Lack of a product quality definition	[17][25]
	4c	Technical complexity	[2], [27]
	4d	Product Backlog Not Well Defined	[9], [11], [12], [20], [25]

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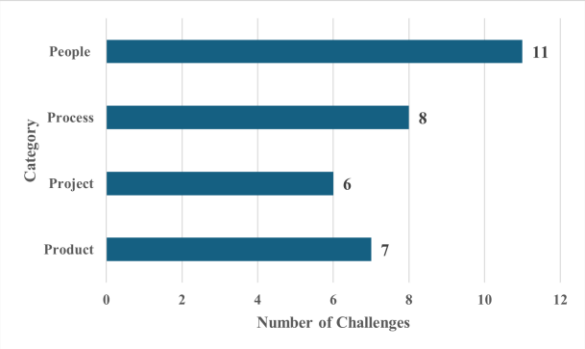
Category	ID	Challenges	References
	4e	Incomplete Product Definition	[2]
	4f	Technical Debt	[11], [27]
	4g	User Stories Issues	[20]

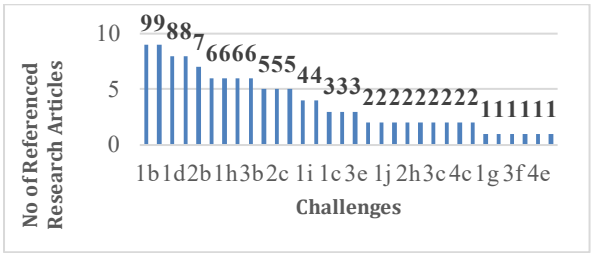
Source : (Research Results, 2025)

Based on the list of challenges in Table 6, 32 are related to requirements management in agile system development. The people category has the highest number of challenges, with 11, followed by the process category, with eight. Meanwhile, the product and project categories have seven and six challenges, respectively. Figure 4 shows the distribution of the number of challenges.



Source : (Research Results, 2025)
Figure 4. Distribution of the number of challenges

Table 6 or Appendix C (Figure 5.) shows that the lack of communication and coordination (1b) and the requirement Change (2d) are the most frequently discussed challenges in research articles on requirements management, each discussed in 9 articles. Customer Inability and Disagreement (1d) and Prioritizing Requirement (2e) are the second-most-discussed challenges, appearing in eight articles. Unclear Requirement (2b) ranks third in terms of the number of discussions across seven research articles.



Source : (Research Results, 2025)
Figure 5. Challenges in requirements management

B. Validation of Results Using the CVI Method

Ten representatives from LNSW identified 12 challenges and recommendations related to requirements management in system development. Then, the challenges and recommendations were validated by four experts with expertise in business processes related to export, import, and logistics, system development, and project management, as well as an understanding of system development conditions at LNSW. The team of experts then validated the challenges and recommendations through a prepared questionnaire. The questionnaire data was analyzed using the CVI Method.

The questionnaire contained a 1-4 Likert scale, where 1 indicated “not relevant” and 4 indicated “very relevant.” The assessment results were then converted to a binary scale, with 0 for responses of one or two, and 1 for responses of three or four. In addition, this study calculated the I-CVI value for each item based on feedback from experts, then continued by calculating the S-CVI value using two approaches, namely the Average method (S-CVI/Ave) and the Universal Agreement method (S-CVI/UA). These two approaches were used to validate the challenges and recommendations developed in the study. Detailed results of the I-CVI calculations are shown in Table 7. Appendix D.

Table 7. Appendix D - CVI Results for Challenges and Recommendations Validation

No		Question	Likert Scale				Binary Scale				Expert in Agreement	I-CVI	UA
			EXP1	EXP2	EXP3	EXP4	EXP1	EXP2	EXP3	EXP4			
Challenges Validation (C)	1	C1	3	3	4	4	1	1	1	1	4	1	1
	2	C2	3	3	4	4	1	1	1	1	4	1	1
	3	C3	4	4	4	4	1	1	1	1	4	1	1
	4	C4	4	4	3	4	1	1	1	1	4	1	1
	5	C5	4	4	4	4	1	1	1	1	4	1	1
	6	C6	4	4	3	4	1	1	1	1	4	1	1
	7	C7	4	4	4	4	1	1	1	1	4	1	1
	8	C8	3	4	3	4	1	1	1	1	4	1	1
	9	C9	3	4	3	4	1	1	1	1	4	1	1
	10	C10	4	4	3	4	1	1	1	1	4	1	1
	11	C11	4	4	3	4	1	1	1	1	4	1	1
	12	C12	4	3	3	4	1	1	1	1	4	1	1

No	Question	Likert Scale				Binary Scale				Expert in Agreement	I-CVI	UA
		EXP1	EXP2	EXP3	EXP4	EXP1	EXP2	EXP3	EXP4			
										S-CVI/Ave Challenges Validation	1	
										S-CVI/UA Challenges Validation		1

No		Question	Likert Scale				Binary Scale				Expert in Agreement	I-CVI	UA
			EXP1	EXP2	EXP3	EXP4	EXP1	EXP2	EXP3	EXP4			
Recommendation Validation (R)	1	R1	4	4	3	4	1	1	1	1	4	1	1
	2	R2	4	4	4	4	1	1	1	1	4	1	1
	3	R3	4	4	4	4	1	1	1	1	4	1	1
	4	R4	4	4	3	4	1	1	1	1	4	1	1
	5	R5	4	4	4	4	1	1	1	1	4	1	1
	6	R6	4	4	3	4	1	1	1	1	4	1	1
	7	R7	4	4	4	4	1	1	1	1	4	1	1
	8	R8	4	4	3	4	1	1	1	1	4	1	1
	9	R9	4	4	3	4	1	1	1	1	4	1	1
	10	R10	4	4	3	4	1	1	1	1	4	1	1
	11	R11	4	4	3	4	1	1	1	1	4	1	1
	12	R12	4	4	3	4	1	1	1	1	4	1	1
											S-CVI/Ave Recommendation Validation	1	
											S-CVI/UA Recommendation Validation		1

Source : (Research Results, 2025)

In the CVI method involving four experts, the CVI value should be 1.00 to be considered valid [22], [23], [24]. Table 8 shows the validity index results for each challenge and recommendation in LNSW.

Table 8. Content validity index for challenges (C) and recommendations (R) at LNSW

Item	Validation of Challenges (C)	Recommendation Validation (R)
S-CVI/Ave	1,00	1,00
S-CVI/UA	1,00	1,00

Source : (Research Results, 2025)

Table 8 shows that all validity index values for challenges (C) and recommendations (R) reached 1.00 on both indicators, namely S-CVI/Ave and S-CVI/UA. This indicates that experts consider all challenges and recommendations compiled highly relevant.

C. Challenges in Requirements Management (Answering RQ1)

Ten representatives from LNSW identified 12 challenges in the requirements management process during system development. Table 9 presents a list of challenges validated by experts.

Table 9. Validated challenges at LNSW by experts

Category	CH's ID	Challenges
People	C1	Lack of expertise in the respective fields
	C2	Lack of identification of the stakeholder Problem
Process	C3	Uncertainty and dynamics of the requirements
	C4	Inability to set priority requirements
	C5	Organizational bureaucracy
	C6	Poor documentation practices
	C7	Difficulty in estimating time and cost
Project	C8	Unrealistic targets
	C9	Lack of clarity in the roles and responsibilities
Product	C10	Lack of product vision
	C11	User story development issues
	C12	Technical issues

Source : (Research Results, 2025)

1) People

a. Lack of Expertise in The Respective Fields (C1)

Limited competence in key Agile roles, such as Scrum Master, Product Owner, and Developer, remains a significant challenge. This issue is often caused by limited training and role ambiguity in Agile and requirements engineering practices [2], [12], [16]. From an Agile perspective, clearly defined roles and competent, cross-functional teams are essential to ensure effective requirement elicitation and backlog refinement [19] [6]. However, insufficient expertise in these roles can hinder stakeholder engagement and reduce the quality of requirement exploration. As a result, this limitation may lead to unclear requirements, poorly defined user stories, and misalignment with stakeholder needs [2].

b. Lack of Identification of Stakeholder Problem (C2)

The lack of identification of the problems stakeholders face is one of the main obstacles to the requirements-gathering process in LNSW. This

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challenge is caused by the constantly changing dynamics of business processes, primarily driven by regulatory adjustments issued by various Ministries and Institutions. As an institution that facilitates export, import, and logistics processes, LNSW must perform effective stakeholder identification to ensure that all relevant needs are properly captured [15], [17] From a requirements engineering perspective, effective stakeholder identification and continuous involvement are critical to ensure alignment with evolving requirements [19]. Failure to ensure adequate stakeholder involvement may lead to incomplete or inaccurate requirements, increasing the risk of rework and misalignment with stakeholder needs [15].

2) Process

a. Uncertainty and Dynamics of The Requirements (C3)

One of the most common challenges is the uncertainty and dynamics of requirements. In the early stages, the requirements collected and analyzed by the development team are often volatile and unclear [2], [12]. Changes in requirements can be caused by changes in regulations, business process dynamics, shifts in business priorities, and inaccuracies on the part of the technical team in understanding the needs conveyed by the business process team [17], [20] . To address this situation, LNSW has developed a change request procedure [6], [19], but this procedure cannot fully accommodate the dynamics of change within the organization.

b. Inability to Set Priority Requirement (C4)

The Inability to Set Requirement Priorities challenge reflects the inability to set priority scales for requirements in the system development process [2], [12]. In practice, all business process requirements are often considered equally important; therefore, the Product Owner cannot explicitly determine which requirements should be prioritized. Additionally, the interrelated nature of requirements, which form an integrated process, means that their development cannot be separated and must be carried out simultaneously within a single development phase. In certain situations, priority determination is conducted collaboratively between the Product Owner and development teams. However, there are no standardized procedures at the organizational level that can serve as a reference for systematically determining development priorities. This condition will reduce requirements management effectiveness, causing inefficient prioritization, delivery delays, rework, and misalignment with business priorities [6], [7], [19].

c. Organizational Bureaucracy (C5)

The organization's bureaucracy is also a challenge for the LNSW requirements management process [12], [13]. Requirements must be submitted in a tiered and formal manner through User Requirements (UR) documents that are not fully standardized. The description of user needs is not structured as user stories, as is common in Agile practices, but is compiled in the document as long narratives. This condition limits the flexibility of Scrum event implementation, as LNSW, being a government organization, must adhere to hierarchical and procedural structures, which is not aligned with Agile principles that emphasize flexibility [6], [7].

d. Poor Documentation Practices (C6)

Challenges related to poor documentation practices refer to inconsistencies in documents and a lack of standardization in the documents used to explain system development requirements [2], [12], [13], [20]. In practice, some documents provide only general descriptions of requirements, while others present more detailed and specific requirements. This condition is caused by the absence of standardized technical documentation to guide the development process, as well as the involvement of multiple stakeholders from different ministries and institutions, each with varying interests and documentation formats. This condition is not aligned with Agile principles, which emphasize clear, consistent, and sufficiently structured documentation to support iterative development and collaboration [6], [7].

3) Project

a. Difficulty in Estimating Time and Cost (C7)

From an Agile perspective, time and cost estimation is expected to be iterative and adaptive, following the evolving nature of requirements (C3) [6], [19]. However, the rigid budget planning in government organizations creates a mismatch with Agile principles, limiting flexibility in adjusting estimates and increasing the risk of schedule delays and cost inefficiencies [12], [13] Inaccurate time and cost estimates will result in suboptimal allocation of development team resources and increase the risk of cost overruns [12]. In the case of LNSW, as a government agency, the flexibility to add budget allocations during the fiscal year is very difficult because the budget allocation for system development is determined at the beginning of the year.

b. Unrealistic Targets (C8)

Another challenge faced in the system development project at LNSW was the setting of

unrealistic targets for system implementation. From an Agile perspective, setting realistic and achievable targets is essential to maintain sustainable development and ensure adequate requirement refinement [6], [19]. However, the urgency of government programs may conflict with these principles [12], [13]. Stakeholders set unrealistic targets due to the demands of government programs that had to be implemented immediately. These unrealistic targets led to the preparation of superficial requirements, resulting in a lack of detailed information from the business team to the development team [13]. This led the development team to design the system based on invalid assumptions.

c. Lack of clarity in the roles and responsibilities (C9)

Another challenge identified from interviews with LNSW representatives is the organization's lack of roles and responsibilities. One of the issues at LNSW is the inappropriate user story development process. According to the Scrum Guide [33], user stories should be developed by the product owner based on the results of gathering requirements with relevant stakeholders. However, in practice, user stories are developed by system analysts. This practice can lead to an information gap because the system analyst's understanding differs from what the product owner conveyed at the beginning [12]. In addition, LNSW does not have a dedicated scrum master role to support the system development process. The role of scrum master is replaced by system analysts on a rotating basis depending on the feature being developed. This practice is inappropriate, as the role of the scrum master is very important in facilitating and managing scrum events so that they are carried out consistently [6], [19], [33]. The absence of the scrum master role can result in suboptimal scrum events within an organization.

4) Product

a. Lack of Product Vision (C10)

In the requirements management process, product owners sometimes fail to provide comprehensive information about the vision of the product, such as the direction of future product development and the user problems to be addressed. The lack of a clear product vision at LNSW is caused by limited stakeholder alignment and insufficient exploration of user needs. This condition can lead to inconsistencies in system design, misalignment of the product backlog, and increased rework during development [2]. According to Scrum and CMMI [6], [19], product design should be aligned with long-term product development to be more efficient and avoid rework in the future. With a more comprehensive picture of the product vision, the development team can provide more relevant technical input [6].

b. User Story Development Issues (C11)

In the requirements management process at LNSW, the business team first prepares a user requirement document and formally submits it to the development team. The development team then translates the user requirement document into user stories and uses them as a basis for compiling a task list or backlog. However, the development team uses its own interpretation in compiling user stories based on the information from the document received. According to the Scrum Guide [19], [33] user stories should be collaboratively developed through direct interaction between the Product Owner and development team to ensure shared understanding of requirements.

At LNSW, To ensure the accuracy of the user stories developed, there is a verification mechanism between the development team and the business team. However, based on the interview results, there are still gaps that cause inaccurate requirements compilation. As a result, this condition may lead to inaccurate user stories, reduced backlog quality, and increased rework during development [2].

c. Technical Issues (C12)

Another finding that emerged during the interview was the technical challenges in the requirement gathering process. These technical challenges took the form of technical debt, a condition where the development team had to devise temporary solutions to keep the system running, requiring code adjustments in the future [11], [27]. Technical debt occurred due to the complexity of business logic, changes in business logic during the development period that had to be accommodated by the system, and time constraints. As a result, technical debt may accumulate and negatively impact system maintainability, increase development complexity, and reduce the effectiveness of requirements implementation [11], [27]. According to CMMI [6], [19] technical debt is expected to be managed through continuous refactoring and backlog prioritization.

D. Recommendations for Addressing Requirements Management Challenges (Answering RQ2)

The recommendations were compiled based on 12 challenges that had been identified at LNSW. The recommendations were compiled based on a literature review that had been conducted

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previously. The recommendations were then validated by four experts through a questionnaire. The questionnaire results were analyzed using the CVI method. The analysis produced 12 recommendations that are applicable and can be implemented by LNSW in order to improve the effectiveness of requirements management in the organization. Although this study is conducted within a single institution, the recommendations are potentially applicable to other government organizations that operate in complex, multi-stakeholder environments with dynamic and evolving requirements. Table 10 explains the recommendations that have been compiled in accordance with the challenges faced by LNSW.

Table 10. List of recommendations

Ch's ID	Rec's ID	Recommendation
C1	R1	1. Implement training to improve team capability and reduce scope creep [2] [34] 2. Invest in continuous learning and knowledge sharing (e.g., cross-team guilds, communities of practice) [2], [12] 3. Develop a capability-building roadmap combining technical and communication skills [15]
C2	R2	1. Improve stakeholder collaboration through demos, involvement, and visualized requirements [2], [12] [20] 2. Conduct stakeholder identification systematically and review it regularly [12], [15] 3. Use suitable stakeholder identification methods based on project characteristics [15]
C3	R3	1. Identify uncertainties early and analyze potential scope changes [11] 2. Applying flexible change management and backlog grooming [34] 3. Design simple change request forms to manage evolving requirements [2] 4. Conduct regular review sessions [16]
C4	R4	1. Prioritize development based on the cost of the story [12] 2. Make explicit trade-offs among stakeholders [2] 3. Understand stakeholder roles and influence prioritization [15]
C5	R5	1. Aligning teams and organizations on a shared Agile workflow before the project starts [2] 2. Establishing a common understanding of Agile to overcome hierarchical barriers [13] 3. Alignment of leadership and development practices to adapt to Agile within hierarchical organizations [2] 4. Simplify approval processes and delegate authority to speed up decisions [12]
C6	R6	1. Shared artifacts and system-level models are used for a consistent understanding [2] 2. Maintain up-to-date documentation tailored to the needs of stakeholders [12] 3. Assign clear documentation roles and integrate them into sprint planning [16] 4. Use structured templates and enforce documentation checkpoints [15] 5. Adopting conceptual models to reduce ambiguity in requirement documents [20] 6. Combine lightweight documentation with structured templates [11]
C7	R7	1. Set realistic goals through an early scope and resource analysis [13] 2. Use estimation techniques and regularly verify targets [13] 3. Add buffer time and regularly review estimates based on changes in requirements [12] 4. Use phased estimation that evolves as project details become clearer [16]
C8	R8	1. Define scope clearly and continuously verify with users [12] 2. Functional and contextual details are included in the requirement docs [16] 3. Use stakeholder analysis to define scope early [15] 4. Use conceptual models (goal models, process models, and use cases) to clarify the scope of the requirement [20]
C9	R9	1. Form cross-functional teams and assign clear Agile roles [2] 2. Hire consultants to fill resource or skill gaps in Agile teams [13] 3. Use role-responsibility matrices (e.g., RACI) and align roles with the architecture [2]
C10	R10	1. Create a shared Agile Requirements Playbook to define quality goals and align them with the product vision [11] 2. Clear the product vision and connect it to team tasks using backlog and system thinking [2] 3. Establishment of system-level alignment mechanisms [2] 4. Promotes understanding of shared products through regular collaboration [2]
C11	R11	1. Use peer reviews and communities of practice to improve the quality and consistency [2] 2. Conduct collaborative domain modelling workshops to refine story content and context [2] 3. Involve both the client and developer in the iterative review of story quality [12]
C12	R12	1. Aligning technical and architectural decisions early through cross-team collaboration [2] 2. Establishing platform standards and shared infrastructure to reduce technical fragmentation [2] 3. Enhance vendor technical capability through continuous assessment and targeted training [12] 4. Promote early technical validation and prototyping to identify risks [16]

Source : (Research Results, 2025)

The first recommendation (R1) concerns the team's competence in the Scrum process at LNSW, particularly for the development team and the Product Owner (C1). The challenges of C1 can be overcome by developing a roadmap to improve the capacity of the human resources involved in the

Scrum process [2], [15], followed by developing technical competencies and communication skills [15]. In addition, regular knowledge-sharing within the team is necessary [2], [12].

The second recommendation (R2) addresses the lack of identification of problems that arise during the requirements-gathering process (C2). To address this, it is recommended to increase collaboration with stakeholders through demonstrations and requirements visualization [2], [12], [20]. Furthermore, stakeholder needs identification needs to be carried out regularly and systematically[12], [15]. Finally, the identification process must consider the characteristics of each project, given that LNSW has many stakeholders with different backgrounds and needs[15].

The third recommendation (R3) focuses on scope changes triggered by uncertainty and business process dynamics (C3). The third recommendation is carried out by identifying potential scope changes as early as possible and implementing a flexible and straightforward change request mechanism [2], [11], [34]. Currently, the existing change request mechanism is not considered to be running optimally. In addition, the development team can also run sprints with shorter cycles to focus on working on a clear scope and hold regular meetings with the business team and stakeholders during the ongoing sprint to reconfirm requirement changes [16]. This stage needs to be carried out to strengthen collaboration with stakeholders in line with recommendation R2.

The fourth recommendation (R4) relates to the organization's inability to prioritize the requirement (C4). Priorities can be determined based on the story cost agreed upon between the Product Owner and the Development Team during refinement and sprint planning [12]. During discussions, the Product Owner must be able to convey the trade-offs for each priority decision to provide understanding to relevant stakeholders and foster transparency within the team [2]. Finally, the Product Owner must understand the responsibilities and influence of each relevant stakeholder in the organization's business processes [15]. This is used as the basis for decision-making when determining development priorities.

The fifth recommendation (R5) relates to bureaucracy in organizations (C5). In government organizations, raising awareness of Agile system development is advisable so that every member shares the same mindset, helping simplify bureaucracy that can hinder the system development process [13]. Furthermore, leaders must take the lead in demonstrating that the organization can adapt to support agile system development [2] and in organizing the project structure in line with the main tasks of the existing organizational structure [2]. Finally, leaders in the organization must simplify the decision-making process during the project period by delegating tasks to the team according to their respective responsibilities [12].

The sixth recommendation (R6) focuses on the challenge of poor documentation practices (C6). This challenge can be addressed in several ways, including ensuring that documents are always updated and tailored to the needs of the technical team as users [12]. This ensures that documentation remains relevant and easy to understand, especially for system development and operational processes. Furthermore, all teams involved must use the same artifacts to ensure that each individual has the same perspective when using the documents[2]. Another recommendation is that there should be dedicated roles that combine documentation and integrate it into scrum events[16]. Finally, there must be mutually agreed document standards to make it easier for technical teams to read and understand the documents [11], [15].

The seventh recommendation (R7) relates to the challenge of estimating the time and cost of system development projects at LNSW(C7). The recommendation for this issue is that the organization sets realistic goals through an initial analysis of the project scope and resource availability [13]. Furthermore, use appropriate time and scope measurement techniques and periodically verify targets with the business team and stakeholders [13]. Another recommendation is to add buffer time and periodically review changes in requirements. This can minimize the risk of additional time and costs for system development projects [12]. Finally, Estimates should be developed in phases and refined as more details of the project are clarified [16].

Setting unrealistic targets (C8) is one of the challenges faced by LNSW. There are several ways to overcome this challenge (R8), namely by clearly defining the scope of development at the beginning of the project. This aims to provide an overview in determining more realistic targets. In addition, continuously verify with the business team and stakeholders to ensure that the scope remains aligned with actual needs [12], [16]. Next, the team needs to conduct a stakeholder analysis to confirm the expected scope and determine priorities in line with stakeholder expectations [15]. Finally, communicate the scope of requirements to stakeholders through a conceptual model to make it easier to understand [20].

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The ninth recommendation (R9) relates to the lack of clarity in roles and responsibilities that occurs at LNSW (C9). This challenge arises because user story development is not carried out by the right team and there are no dedicated scrum master roles in the organization. A possible solution is to implement cross-functional teams, where a programmer can also act as a scrum master in other teams [2]. In addition, the organization must also compile a matrix containing roles and responsibilities that have been tailored to the needs of LNSW, and communicate this to all parties involved. This will be used as a reference in running scrum events [2]. Another alternative step is for the organization to hire external professionals to fill vacant roles such as Scrum Master roles [13].

The tenth recommendation (R10) relates to the lack of product vision (C10). The product owner does not provide comprehensive information regarding the future vision of the product, even though this information is important for system analysts to design long-term technical solutions. This challenge can be resolved by establishing regular collaboration between the product owner and the system analyst team to discuss the future vision of the product [2]. This collaboration is expected to make it easier for the scrum team to understand the product vision and align the proposed technical solutions [2]. Furthermore, the outcome of this activity is a documentation of the agile requirement playbook, which the entire scrum team can directly access as a reference in the scrum event process.

The eleventh recommendation (R11) relates to the user story development process at LNSW (C11). Currently, user story development is carried out by the development team based on requirement documents received from the business team. This process can be misleading because the development team makes assumptions that may differ from the actual requirements. To overcome this challenge, it is highly recommended to conduct iterative reviews between the business team and the development team to ensure understanding of the actual requirements [2], [12]. In addition, user stories should also be created collaboratively through workshops or special meetings specifically discussing requirements [2]. Finally, conduct peer reviews of the user stories that have been compiled to improve the quality and consistency of the resulting documents [2].

The twelfth recommendation (R12) relates to technical issues in the system development process (C12). The main technical problem is technical debt arising from complex business logic. This challenge can be resolved by developing a system architecture and simple technical solution that is aligned with business needs [2]. In addition, it is necessary to develop a prototype that reflects the actual business logic and perform technical validation to minimize the risk of operational risks when the system is running [16]. Finally, the capacity of the technical team and vendors involved must be improved through assessment and scheduled training programs [12].

After compiling recommendations for each challenge identified at LNSW, the next step is to design an Agile Requirements Playbook to assist the organization in implementing the recommendations. Table 11 presents the Agile Requirements Playbook containing each recommendation. Each recommendation will be mapped into a column containing information on who the responsible owners are, the artifacts produced, the time horizon, and success indicators. The purpose of this playbook is to provide a structured and easy-to-follow guide for organizations. This will enable LNSW to implement each recommendation effectively, focusing on requirements management, measurable outcomes, and alignment with agile principles. Unlike generic Agile best practices, this playbook is contextualized to the government environment at LNSW, characterized by multi-stakeholder coordination, regulatory-driven changes, and bureaucratic processes. It is derived from synthesized challenges and recommendations from the literature and operationalized into actionable artifacts, roles, and metrics based on practitioner insights, ensuring relevance to real-world public sector Agile requirement management.

Based on the identified challenges, proposed recommendations, and the developed Agile Requirements Playbook, this study offers several contributions to both research and practice in Agile requirements management within the public sector. First, it provides a contextual synthesis of challenges using the 4P perspective (people, process, project, and product), tailored to a national-scale government system. Second, it presents a set of validated recommendations derived from a combination of systematic literature review and empirical interviews, and evaluated using the CVI method. Third, it translates these insights into a structured Agile Requirements Playbook consisting of roles, artifacts, timelines, and KPIs, offering practical and operational guidance for organizations operating in complex, multi-stakeholder environments.

Table 11. Agile Requirements Playbook

Recommendation	Owners	Artifacts	Time Horizon
R1	Scrum Master and Human Resources Division, with support from the Product Owner[33]	- Training Plan and Records of Organizational Training (aligned with government competency framework) - Training Roadmap and Skill Matrix (aligned with role-based for public sector Agile teams) - Training Repository (including regulatory and domain knowledge materials) [19]	Medium Term (3–6 months), aligned with the organization's training plan
R2	Product Owner (Business Process Team), supported by the Scrum Master and System Analyst (IT Team)[33]	- Stakeholder Involvement Plan (cross-ministry coordination) - Records of Stakeholder Involvement (multi-agency participation) - Documented Project Review Results (including inter-agency feedback) - Documented Issues and Recommendations for Resolving Stakeholder Issues[19]	Medium Term (3–6 months), because it requires time to coordinate with multiple stakeholders
R3	Product Owner (Business Process Team) and Developers (Including System Analysts), facilitated by the Scrum Master[33]	- Requirements Traceability Matrix (aligned with regulatory updates) - Change Request Database / Log (aligned with regulatory updates) - Requirements Documentation and Baselines (compliant with government standards) - Minutes of Meeting with stakeholders [19]	Short Term (1–3 months) aligned with the organization's documentation improvement, such as standard operating procedure updates and IT governance audit cycles
R4	Product Owner (Business Process Team), supported by the Project Management Officer[33]	- Requirements impact assessments (aligned with regulatory and multi-agency impact considerations) - Project plan with status earned value reports (aligned with government project monitoring standards) - Business impact analysis (including cross-agency service impact) - Minutes of meeting with stakeholders [19]	Short Term (1–3 months), it can be carried out concurrently with the requirements identification and change scope definition processes
R5	Top Management at LNSW, supported by the Project Management Officer[33]	- Mapping of organizational job descriptions to scrum team roles (aligned with public sector organizational structure) - Formal team assignment letter (based on official government appointment mechanism) - Internal decision-making hierarchy document (reflecting bureaucratic governance structure) - Documented issues and decision records (including inter-agency decision traceability) [19]	Medium Term (3–6 months) aligned with organizational restructuring and governance adaptation cycles
R6	Developers and Product Owner, supported by the Scrum Master[33]	- Template document requirement (aligned with government documentation standards) - Lite requirement document (adapted for regulatory-driven changes) - Tasklist, product backlog, and sprint backlog (including regulatory-driven requirements) - Requirements traceability matrix (including regulatory traceability) [19]	Short Term (1–3 months) aligned with sprint documentation review
R7	Product Owner, Developers, and the Project Management Officer[33]	- Project plan and resource plan (aligned with government budgeting and planning cycles) - Work breakdown structures (WBS) (including regulatory-driven work components) - Project estimates and cost baselines (aligned with government budgeting standards) [19]	Short Term (1–3 months) aligned with project baseline updates and quarterly planning cycles.
R8	Product Owner and Related Stakeholder[33]	- Project charter and project plan (aligned with multi-agency governance structure) - Records of stakeholder involvement (multi-agency stakeholder participation) - Stakeholder analysis document (identifying multi-agency roles and influence) - Stakeholder requirements (including regulatory and cross-agency requirements) [19]	Medium Term (3–6 months) due to it requires time to coordinate with multiple stakeholders

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Recommendation	Owners	Artifacts	Time Horizon
R9	Scrum Master & Top Management at LNSW, supported by the Project Management Officer[33]	- Organizational role descriptions and responsibilities (aligned with public sector governance structure) - Project role assignments and staffing records (based on formal government assignment mechanisms) - Mapping of organizational job descriptions to scrum team roles (aligned with public sector organizational structure) [19] - Agile requirements playbook (contextualized for multi-agency government environment)	Medium Term (3–6 months) aligned with team restructuring, role clarification each semester
R10	Product Owner, supported by the Scrum Master and System Analyst (IT Team)[33]	- Product roadmap (aligned with regulatory priorities and national policies) - System-level design (considering multi-agency integration requirements) - Architecture documentation (aligned with government enterprise architecture standards)[19] - Peer review results and Issue logs (including inter-agency review feedback)	Medium Term (3–6 months) aligned with product goal definition and organizational alignment cycles.
R11	Product Owner, supported by System Analyst (IT Team)[33]	- Use case models and conceptual models (reflecting multi-agency business processes) - Requirement review documents and Requirement issues lists (including regulatory compliance issues) [19] - System and software architecture descriptions (aligned with government interoperability standards)	Short Term (1–3 months) aligned with iterative sprint review and peer learning cycles
R12	Developers and Organizational Technical Leader[33]	- Application integration guidelines (supporting multi-agency system integration) - Vendor capability assessment reports (considering government procurement and compliance requirements) [19]	Medium Term (3–6 months) aligned with architectural review cycles and technical improvement programs.

Source : (Research Results, 2025)

E. Limitation and Validity Considerations

This study has several limitations that need to be considered along with implications for the validity and reliability of the findings. **First**, the scope of the study is still relatively narrow, focusing only on identifying challenges and recommendations in the requirements management process at LNSW. Therefore, the findings of this study do not reflect the diversity of challenges and requirements management practices in other organizations which affects the external validity of the study. **Second**, the number of respondents involved in this study was limited to 10 representatives from LNSW. Although these respondents had different backgrounds and experiences, they did not sufficiently represent the diversity of needs experienced by LNSW which may influence the internal validity of the findings. **Third**, the validation process involved experts from the same organization, which may introduce potential institutional bias despite the diversity of roles represented. In terms of construct validity, this study employed methodological triangulation by combining a SLR, semi-structured interviews, and expert validation using the CVI method to ensure that the identified challenges and recommendations are grounded in both theory and practice. **Fourth**, the use of the CVI in this study was limited to assessing expert agreement rather than establishing absolute validity, and the binary conversion of ratings may reduce the discriminative power of the results which may affect the reliability of the validation outcomes. **Fifth**, this study does not include full scale implementation or pilot testing of the proposed Agile Requirements Playbook. Thus, its effectiveness in real world settings remains unevaluated.

To enhance reliability, consistent data collection and analysis procedures were applied using semi-structured interviews and 4P-based thematic categorization, although some subjectivity may remain. The author suggests that future research should expand the scope and number of respondents, involve external experts, and apply complementary validation methods to enhance generalizability, improve validity, and strengthen the robustness of the findings.

CONCLUSION

In system development practice, requirements management is one of the main

challenges in many organizations, including LNSW. As an organization that facilitates electronic data exchange for export, import, and national logistics, LNSW also faces challenges in the process of compiling requirements involving multiple stakeholders.

Based on these issues, this study identifies challenges in the agile requirements management process carried out by LNSW. Based on the results of the study, there are 12 challenges identified as the main challenges for LNSW. These challenges are grouped into four categories: (1) People, including lack of expertise in their respective fields and lack of identification of stakeholder problems; (2) Process, including uncertainty and dynamics of needs, inability to set requirement priorities, organizational bureaucracy, and poor documentation practices; (3) Project, including difficulty in sstimating time and cost, unrealistic targets, and lack of clarity in roles and responsibilities; and (4) Product, including lack of product vision, issues in user story development, and technical issues. These challenges were identified through SLR and semi-structured interviews with 10 representatives from LNSW in the roles of product owner, developer, and project manager.

This study produced the following recommendations for agile requirements management: improve the technical capacity of the scrum team, strengthening collaboration with stakeholders to improve the requirements identification process, anticipating uncertainty in the early stages of the project,simplifying the change request mechanism, prioritizing development tasks, delegating tasks to teams, implementing documentation practices in accordance with organizational needs, setting realistic targets using project estimation techniques, defining a clearer scope, and conducting regular confirmations, developing a matrix of roles and responsibilities for each team, using the agile requirement playbook as a guide, conducting iterative reviews between the development team and the business team, and preparing a system architecture design that is in line with the technical solution. In addition, this study also developed an agile requirement playbook to help LNSW in implementing the recommendations that had been compiled. The agile requirement playbook contains information about the proposed recommendations, the owners involved, the artifacts produced, the duration, and KPIs as indicators.

The author recommends prioritizing improvements in several key areas: identifying changes earlier and implementing simpler change mechanisms (R3), determining the priority scale of requirements with confirmation from the product owner and relevant stakeholders (R4), implementing documentation practices by regularly updating documentation and tailoring it to the needs of the technical team (R6), setting realistic targets based on the initial analysis of the project (R7), and conducting iterative reviews with shorter time frames to prevent the development of user stories based on assumptions (R11). These recommendations can be used as quick wins within 1 to 3 months. Overall, this study contributes to both theory and practice by classifying challenges using the 4P framework and providing actionable recommendations along with a structured playbook for practical implementation.

However, several limitations should be considered. The case study focuses on a single organization with a limited number of respondents, and the use of internal experts may introduce potential bias. In addition, the use of the CVI method and binary conversion may limit the discriminative power of the results. Furthermore, the proposed Agile Requirements Playbook has not been empirically validated in real world settings.

These limitations may affect the generalizability and robustness of the findings. Therefore, future research with a broader scope, more diverse participants, complementary validation methods, and pilot implementation of the playbook is recommended .

REFERENCE

[1] A. Bajraktari, M. Binder, and A. Vogelsang, “Requirements Engineering for Research Software: A Vision,” in *2024 IEEE 32nd International Requirements Engineering Conference (RE)*, 2024, pp. 423–431. doi: 10.1109/RE59067.2024.00050.

[2] R. Kasauli, E. Knauss, J. Horkoff, G. Liebel, and F. G. de Oliveira Neto, “Requirements engineering challenges and practices in large-scale agile system development,” *Journal of Systems and Software*, vol. 172, p. 110851, 2021, doi: https://doi.org/10.1016/j.jss.2020.110851.

[3] Digital.ai, “The 17th State of Agile Report 17th State of Agile | 2,” 2024.

[4] UNECE, *Recommendation and Guidelines on establishing a Single Window to enhance the efficient exchange of information between trade and government : recommendation no. 33*. UN, 2005.

[5] UNECE, “Information Service United Nations Economic Commission for Europe 2020

Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri

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DOI: 10.33480/jitk.v11i4.7818

Edition," 2020. [Online]. Available: http://www.unece.org

[6] CMMI Institute, "A Guide to Scrum and CMMI ® : Improving Agile Performance with CMMI 2," 2016.

[7] ISACA, "CMMI Adoption Guidance," Oct. 2024.

[8] ISACA, "CMMI Model Quick Reference Guide CMMI V3.0 An overview of the Capability Maturity Model Integration (CMMI) ® Model CMMI Performance Solutions 2 | CMMI Model Quick Reference Guide," 2024.

[9] Y. Li, J. Keung, K. E. Bennin, X. Ma, J. Zhang, and Z. Yang, "Agile Requirements Engineering in a Distributed Environment: Experiences from the Software Industry During Unprecedented Global Challenges," in *2024 IEEE 48th Annual Computers, Software, and Applications Conference (COMPSAC)*, 2024, pp. 682–691. doi: 10.1109/COMPSAC61105.2024.00098.

[10] M. S. Farooq, M. Ahmed, and M. Emran, "A Survey on Blockchain Acquainted Software Requirements Engineering: Model, Opportunities, Challenges, and Future Directions," *IEEE Access*, vol. 10, pp. 48193–48228, 2022, doi: 10.1109/ACCESS.2022.3171408.

[11] W. Behutiye, P. Rodríguez, and M. Oivo, "Quality Requirement Documentation Guidelines for Agile Software Development," *IEEE Access*, vol. 10, pp. 70154–70173, 2022, doi: 10.1109/ACCESS.2022.3187106.

[12] K. Rizkiyah, A. K. Nisyak, and T. Raharjo, "Agile-Based Requirement Challenges of Government Outsourcing Project: A Case Study," in *2020 3rd International Conference on Computer and Informatics Engineering (IC2IE)*, 2020, pp. 267–273. doi: 10.1109/IC2IE50715.2020.9274659.

[13] P. Abdullah, T. B. Raharjo, B. Hardian, and T. Simanungkalit, "Challenges and Best Practices Solution of Agile Project Management in Public Sector: A Systematic Literature Review," International Journal on Informatics Visualization, vol. 7, no. 2, pp. 531–539, 2023. doi: https://doi.org/10.30630/joiv.7.2.1098

[14] T. Kamal, Q. Zhang, and M. A. Akbar, "Toward successful agile requirements change management process in global software development: A client-vendor analysis," *IET Software*, vol. 14, no. 3, pp. 265–274, 2020, doi: 10.1049/iet-sen.2019.0128.

[15] D. A. Elneel, A. S. Fakharudin, E. M. Ahmed, H. Kahtan, and M. Abdullateef, "Stakeholder Identification Overview and Challenges in Requirements Engineering Prospective," in *2022 2nd International Conference on Computing and Information Technology (ICCIT)*, 2022, pp. 314–319. doi: 10.1109/ICCIT52419.2022.9711653.

[16] A. K. Nisyak, K. Rizkiyah, and T. Raharjo, "Human Related Challenges in Agile Software Development of Government Outsourcing Project," in *2020 7th International Conference on Electrical Engineering, Computer Sciences and Informatics (EECSI)*, 2020, pp. 222–229. doi: 10.23919/EECSI50503.2020.9251899.

[17] A. Alzayed, "Assessing Requirements Engineering Practices' Impact on Electronic Government Solution Sustainability," in *2024 4th International Conference on Innovative Research in Applied Science, Engineering and Technology (IRASET)*, 2024, pp. 1–8. doi: 10.1109/IRASET60544.2024.10549276.

[18] W. L. Tsai, "The Impact of Project Teams on CMMI Implementations: a Case Study from an Organizational Culture Perspective," *Syst. Pract. Action Res.*, vol. 34, no. 2, pp. 169–185, Apr. 2021, doi: 10.1007/s11213-020-09531-y.

[19] C. Product Team, "CMMI ® for Development, Version 1.3 Improving processes for developing better products and services," 2010. [Online]. Available: http://www.sei.cmu.edu

[20] A. Gupta, G. Poels, and P. Bera, "Using Conceptual Models in Agile Software Development: A Possible Solution to Requirements Engineering Challenges in Agile Projects," *IEEE Access*, vol. 10, pp. 119745–119766, 2022, doi: 10.1109/ACCESS.2022.3221428.

[21] J. A. Khan, S. U. R. Khan, J. Iqbal, and I. U. Rehman, "Empirical Investigation about the Factors Affecting the Cost Estimation in Global Software Development Context," *IEEE Access*, vol. 9, pp. 22274–22294, 2021, doi: 10.1109/ACCESS.2021.3055858.

[22] D. F. Polit and C. T. Beck, "The content validity index: Are you sure you know what's being reported? critique and recommendations," *Res. Nurs. Health*, vol. 29, no. 5, pp. 489–497, Oct. 2006, doi: 10.1002/nur.20147.

[23] D. F. Polit, C. T. Beck, and S. V. Owen, "Is the CVI an acceptable indicator of content validity? Appraisal and recommendations,"

Res. Nurs. Health, vol. 30, no. 4, pp. 459–467, Aug. 2007, doi: 10.1002/nur.20199.

[24] M. S. B. Yusoff, "ABC of Content Validation and Content Validity Index Calculation," *Education in Medicine Journal*, vol. 11, no. 2, pp. 49–54, Jun. 2019, doi: 10.21315/eimj2019.11.2.6.

[25] A. Alhazmi and S. Huang, "Survey on Differences of Requirements Engineering for Traditional and Agile Development Processes," in *2020 SoutheastCon*, 2020, pp. 1–9. doi: 10.1109/SoutheastCon44009.2020.9397492.

[26] N. Singh, P. Patel, and S. Datta, "A survey on security and human-related challenges in agile software deployment," in *2021 International Conference on Computational Science and Computational Intelligence (CSCI)*, 2021, pp. 1976–1982. doi: 10.1109/CSCI54926.2021.00365.

[27] J. Gorzny and M. Derka, "Requirements Engineering Challenges for Blockchain Rollups," in *2024 IEEE 32nd International Requirements Engineering Conference Workshops (REW)*, 2024, pp. 340–347. doi: 10.1109/REW61692.2024.00052.

[28] Z. S. Li, D. Ly, L. Nagel, N. N. Arony, and D. Damian, "'Do you have Time for a Quick Call?': Exploring Remote and Hybrid Requirements Engineering Practices and Challenges in Industry," in *2024 IEEE 32nd International Requirements Engineering Conference (RE)*, 2024, pp. 43–54. doi: 10.1109/RE59067.2024.00015.

[29] D. Moher *et al.*, "Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement," Jul. 01, 2009, *Public Library of Science*. doi: 10.1371/journal.pmed.1000097.

[30] M. J. Page *et al.*, "The PRISMA 2020 statement: An updated guideline for reporting systematic reviews," Mar. 29, 2021, *BMJ Publishing Group*. doi: 10.1136/bmj.n71.

[31] A. P. Muhammad, E. Knauss, O. Batsaikhan, N. E. Haskouri, Y.-C. Lin, and A. Knauss, "Defining Requirements Strategies in Agile: A Design Science Research Study," in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, D. Taibi, M. Kuhrmann, T. Mikkonen, P. Abrahamsson, and J. Klünder, Eds., Springer Science and Business Media Deutschland GmbH, 2022, pp. 73–89. doi: 10.1007/978-3-031-21388-5_6.

[32] K. Asad and M. Muqeem, "A Critical Analysis of Requirement Management in Agile Development," in *Lecture Notes in Networks and Systems*, S. Tiwari, M. C. Trivedi, M. L. Kolhe, and B. K. Singh, Eds., Springer Science and Business Media Deutschland GmbH, 2023, pp. 79–93. doi: 10.1007/978-981-19-5292-0_8.

[33] K. Schwaber and J. Sutherland, "The Scrum Guide The Definitive Guide to Scrum: The Rules of the Game," 2020.

[34] F. Aizaz, S. U. R. Khan, J. A. Khan, Inayat-Ur-Rehman, and A. Akhunzada, "An Empirical Investigation of Factors Causing Scope Creep in Agile Global Software Development Context: A Conceptual Model for Project Managers," *IEEE Access*, vol. 9, pp. 109166–109195, 2021, doi: 10.1109/ACCESS.2021.3100779.

[35] S. Bayona-Oré and M. Hostos, "Metrics for Performance Improvement in Organisations Using Scrum, ITIL and CMMI," 2022, *World Scientific and Engineering Academy and Society*. doi: 10.37394/232017.2022.13.12.

[36] I. Korpivaara, T. Tuunanen, and V. Seppänen, "Performance measurement in scaled Agile organizations," in *Proceedings of the Annual Hawaii International Conference on System Sciences*, University of Hawai'i at Mānoa, Jan. 2021, pp. 6912–6921. doi: 10.24251/hicss.2021.830.

Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri