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Challenges and Best Practices Solution of Agile Project Management in Public Sector: A Systematic Literature Review

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Abstract—Applying Agile methodologies in the public sector is nothing new. In recent years, governments worldwide have moved towards Agile development, especially with the Pandemic that requires governments to move and make decisions quickly. However, the difference between the government system and the private sector, such as holding the principle of a hierarchy of authority, still challenges Agile application. This study aims to explore challenges and provide solutions for applying Agile project management in the public sector by conducting a systematic literature review (SLR) using the PRISMA method. The literature used in the SLR was obtained from four paper databases, namely Scopus, IEEE Xplore, ACM, and Emerald Insight. Five hundred ninety-five papers were found, and 18 suitable papers were obtained, which were then analyzed and obtained a total of 43 challenging issues. Each of these issues is grouped based on eight project performance domains of PMBOK 7th edition, and the solution for each challenge is obtained from the mapping results from the SLR papers and PMBOK 7th edition Guide. The results showed that the most issues were in the Development Approach and Lifecycle and Project Work domain categories, with 8 issues each. Followed by Team with 7 issues, Stakeholder with 6 issues, Delivery with 5 issues, Measurement with 4 issues, Planning with 3 issues, and Uncertainty with 2 issues. This research can be useful for academics or practitioners as a reference in facing the challenges of implementing Agile project management in the public sector.

Keywords— Agile; project management; public sector; challenges; best practices; systematic literature review.

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I. INTRODUCTION

The COVID-19 pandemic has highlighted the need for fast, flexible, mission-centered governance. The government must be able to make timely decisions and move quickly or Agile [1]. Response and recovery to COVID-19 show that the application of Agile principles is in a national and global crisis. To overcome this condition, Agile principles must be built consciously at all levels of government and across government projects and programs [2].

DeSeve [2] identified indicators of the global need for Agile to be greater since public trust in government is near historical lows. In the Trust Barometer in January 2020, the Edelman Organization found that governments are not trusted in 17 of 28 markets worldwide. Agile governance can overcome this disappointment by making the public the focus of every action and the measure of any impact [2].

In the previous two decades, there have been three key waves of Agile adoption [3]. Software development approaches such as XP, Scrum, and others were prevalent in

the first wave (2001-2007). In the second wave, Agile is connected with project management and process improvement, including integration with Lean principles (2008-2014). A focus on continuous development and integration, such as DevOps adoption, distinguishes the third wave (starting in 2015).

The Agile paradigm has evolved beyond software development over the last two decades to include project management, policymaking, human resources, and procurement [3]. The scope of agile project management has grown, and agile methodologies are used for software development projects to general project management [3]. Government agencies around the world have been moving towards Agile development for decades. In 2017, 80 percent of US federal IT projects were categorized as Agile or iterative, compared to only 10 percent in 2002 of federal IT projects classified as Agile [1].

In working on IT projects, whether using Agile or waterfall, vendors and public officials want the project to succeed with the same end goal, namely software that works on time and at

a reasonable cost [4]. According to CHAOS Standish Group, Agile initiatives have a greater success rate than linear waterfall projects, which are more likely to go over budget and fail to deliver software that works for consumers [4].

However, behind it all, Agile processes do not naturally match the processes in government [4]. Many studies analyze that the public sector still faces challenges adapting and implementing Agile [5]. In addition to the technological factors, which are less important in using Agile in the government sector, social and human aspects have become key barriers [5].

In a previous study, Nuottila, Aaltonen, and Kujala [6] found that because the public sector is unfamiliar with Agile techniques, several providers find it challenging to apply Agile methodologies when working for the government. The high turnover rate in government offices is also a challenge in using Agile methods efficiently. In addition, public organizations have several characteristics, such as the legal environment regulating software procurement activities, making it more challenging than private companies [6], [7].

With some of the conditions mentioned earlier, it shows that the government's need for Agile implementation in project management is getting bigger, but the practice of Agile itself still has discrepancies within the government environment. The objectives of this research will be achieved by completing the research questions as follows:

- RQ1: What are the challenges of applying Agile project management in government?
- RQ2: What is the best practice solution for overcoming problems in government while applying Agile project management?

Several studies [5], [6], [8], [9], [10] have looked at the problems of implementing Agile in the public sector from various angles. Nuottila, Aaltonen, and Kujala [6] describe the challenges and categorizations in implementing Agile in the public sector but do not focus on project management practices required in Agile methods. Then, Raharjo and Purwandari [11] identify the challenges of implementing Agile project management in general by doing a mapping based on the knowledge area of PMBOK 6th edition.

This research will explain in more detail the challenges of applying Agile methodologies in the public sector from a project management point of view. The challenges obtained will be mapped based on the project performance domain of PMBOK 7th edition, the latest edition. This research provides an overview of the challenges that will be faced in implementing Agile in the public sector with a focus on project management.

This research is divided into five parts. Part 1 is an introduction to the study, which contains the background and research questions. Part 2 is a theory that is relevant to the research. Section 3 describes the methodology used. Section 4 describes the results and discussion of the research results. Finally, section 5 contains the conclusions and limitations of the research conducted, as well as suggestions for further research.

II. MATERIALS AND METHOD

The following is the literature material from this research.

A. Project Management

According to PRINCE2 (Projects in Controlled Environment), a project is a tool used to introduce change with many required skills [12]. According to the PMBOK guide [13], a project is a short-term project to develop a one-of-a-kind product, service, or outcome. Project management refers to the actions in directing project activity to achieve the desired outcomes. Project teams can use a variety of ways to get results, including predictive, hybrid, and adaptive approaches.

In project management, several project methodologies can be used [13]. Agile, for example, is a project management methodology that emphasizes flow-based scheduling rather than life cycles or phase. It aims to reduce time and resource waste while increasing process efficiency and output [13]. The agile project methodology is frequently adapted from Kanban scheduling and used in lean and just-in-time scheduling techniques [13].

B. Agile Project Management

At a meeting in 2001, a group of IT experts produced the Agile Manifesto and twelve principles to explain how teams can transition to Agile [14]. Initially, the Agile Manifesto was written for software development, but these ideas have spread back to other industries focusing on product development [14]. According to Schwalbe [15], Agile is a project management methodology that explains how to manage projects. Agile and the Scrum framework can be considered ways to break down large projects into smaller tasks.

Agile is a new and challenging idea in project management that is especially suitable for managing innovation and technology projects, especially software projects with high complexity [16]. What can be guaranteed when Agile methodologies are used in project management is that the project will still be completed on schedule and with very high-quality product outputs [16].

The goal to add value at every level of execution in a creative and new way is the fundamental idea of Agile management, which sets it apart from traditional management [8]. However, no approach works in all situations [14], including Agile methods [16]. There are some different ways of doing a project that can be customized based on methods, tools, and processes [14]. Agile only works if the environment and management mindset can commit to the project [16].

C. Agile Project Management in Public Sector

Goodpasture and Safari [16] explained that public sector projects are part of the administration and have little expectation from the public. On the other hand, there are also public sector projects that attract public attention and may collide with the concept of Agile methods and, therefore, must be considered in the transition plan [16].

Agile methods were first used in small teams, projects, and enterprises. However, in recent years its use has increased in the construction of larger systems [6]. Except for some high-tech research firms, government institutions have been sluggish in adopting Agile techniques [6].

Although the business or private sector is more open to change, one can be adopted by the public sector in the framework of new public management [8]. This adoption will help the administration's organizational culture, attitudes, and

behavior to become more modern and inventive in response to community demands [8].

D. PMBOK Guide 7th Edition

PMBOK, or Project Management Body of Knowledge, contains a set of project management terminologies and recommendations issued by the Project Management Institute (PMI). Like previous editions, the seventh edition of PMBOK, published in 2021, recognizes that the project management landscape constantly evolves and adapts [13]. PMBOK Guide 7th Edition has two parts, the Standard for Project Management and A Guide to the Project Management Body of Knowledge. The first section explains the introduction, value delivery system, and 12 project management principles. The second section covers eight project performance domains, tailoring, as well as models, methods, and artifacts [13]. In this study, the challenges found were grouped based on eight project performance domains, as shown in Figure 1.

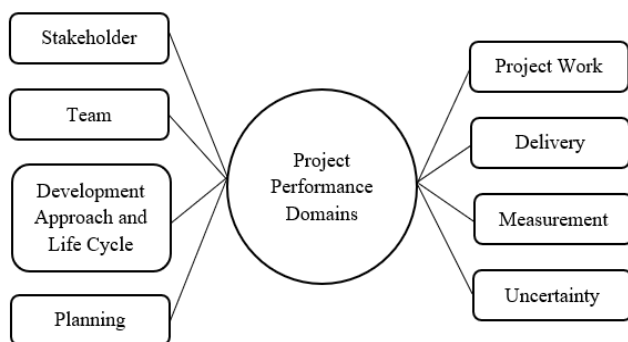


Fig. 1 PMBOK Project Performance Domains

A project performance domain is a collection of interconnected activities that are essential to the project's success. The project performance domain is interactive and interconnected with each other to achieve the desired project results [10]. The explanation of each domain is as follows.

First, Stakeholder is a domain that discusses activities and functions related to stakeholders. Team is a domain that covers the actions and functions of the individuals who are in charge of delivering project deliverables. Development Approach and Lifecycle is a domain related to the development approach, rhythm, and phases of the project life cycle. Planning is a domain related to the organization's beginning, continuation, and development and the coordination needed to deliver project deliverables and outcomes. Project Work is a domain that discusses matters related to establishing project processes, managing physical resources, and fostering a learning environment. Domain Delivery is focused on meeting the project's goals in terms of scope and quality. Measurement is an area concerned with assessing project performance and taking the required steps to sustain it. Finally, uncertainty is a domain that discusses risk and uncertainty.

The methods used in this research are a Systematic Literature Review (SLR) to identify, assess, and interpret findings linked to the issues that government organizations experience in implementing Agile project management and the best practices that can be used. According to Kitchenham and Charters [17], SLR is locating, evaluating, and

interpreting all available research evidence to respond to specific research questions.

In this study, SLR is used with an approach is known as the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) method. According to Liberati et al. [18], the PRISMA method can help researchers summarize existing evidence based on explicit, rigorous, and transparent processes and steps. Four stages are used in conducting a systematic review using PRISMA [18]: identification, screening, eligibility, and inclusion. The following are detailed explanations and results of each SLR stage using PRISMA.

A. Identification

The literature search process is carried out through a digital library which is accessed through the remote lib of the University of Indonesia, namely Scopus, IEEE Xplore, ACM, and Emerald Insight. The keywords used in the search process must be related to the research question in this study, namely:

((("CHALLENGE" OR "ISSUE" OR "PROBLEM" OR "LIMITATION" OR "OBSTACLE" OR "BENEFIT" OR "SUCCESS FACTOR" OR "ADVANTAGE" OR "BEST PRACTICE") AND "AGILE PROJECT MANAGEMENT" AND ("PUBLIC SECTOR" OR "GOVERNMENT" OR "PUBLIC ORGANIZATION")))

Subsequently, the inclusion criteria were determined, the criteria used, and the exclusion criteria were excluded. The specified inclusion criteria are (a) related to research questions (b) published within the last five years (2017-2021) (c) in the form of journals or proceedings (d) in English. The specified exclusion criteria are (1) the literature is unrelated to the discussion of applying Agile in the government organization.

B. Screening

In the screening process, duplication checks, and literature screening were carried out based on titles, abstracts, and keywords. In this process, literature that cannot be accessed in the full text does not pass the screening stage. Furthermore, the literature that has successfully passed this stage will be forwarded to the stage of the feasibility assessment process.

C. Eligibility

This stage is carried out by reading the entire literature that has passed the screening stage to obtain eligibility according to the research question. The selected literature will be a reference candidate to be used as a reference in research.

D. Included

The last process of the PRISMA method is the determination of the literature that is included and can be used as a reference in research according to the results of the previous stages.

The results of the workflow using the PRISMA method in this study can be seen in Figure 2. Figure 2 explains the identification process based on the search string and the inclusion criteria used, then obtained 595 records with library details, namely 397 Scopus, 155 ACM, 39 Emerald, and 4 IEEE. Furthermore, 579 works of literature were obtained after checking for duplication.

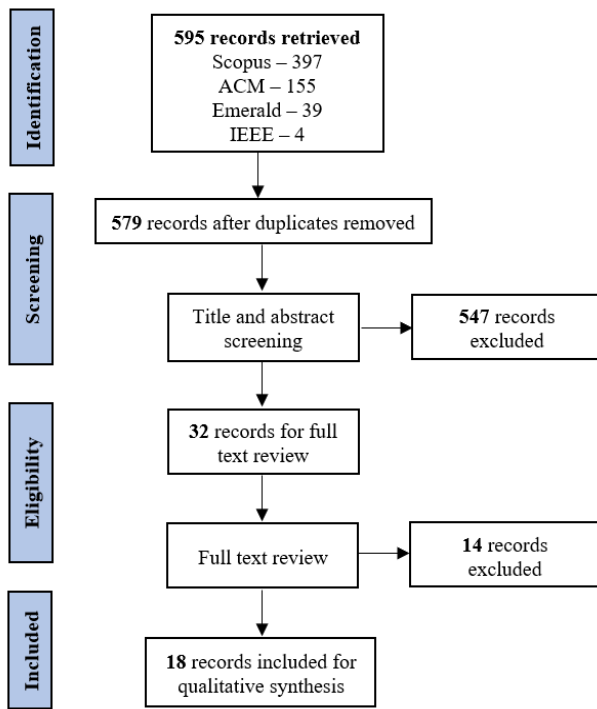


Fig. 2 SLR Workflow Based on PRISMA

The screening process was continued with title and abstract screening, with thirty-two studies that were continued at the

next stage and five hundred and forty-seven studies that did not pass the screening. The next stage is a feasibility test by conducting a full-text review of thirty-two studies, fourteen studies were excluded, and eighteen studies were included in the qualitative synthesis of this study.

TABLE I
DISTRIBUTION OF STUDY PER YEAR

Year	Frequency	Percentage (%)
2017	4	22
2018	2	11
2019	1	6
2020	8	44
2021	3	17
Total	18	100

Table I shows the distribution of relevant papers by year from 2017 to 2021. Year of 2020 is the year with the most distribution of relevant papers, with a percentage of 44%. Then followed by 2017 at 22%, 2021 at 17%, 2018 at 11%, and 2019 at 6%. This shows that 2020 is a time of many papers discussing agile implementation in the public sector.

Furthermore, Table II is detailed information from the 18 papers that have been selected, consisting of the year, digital library source, title, citation, and code.

TABLE II
DETAILED PAPERS

No	Year	Source	Title	Citation
1	2020	ACM	Agility in Public Sector IT Projects	[17]
2	2017	IEEE	What Contributes to the Success of IT Projects? Success Factors, Challenges and Lessons Learned from an Empirical Study of Software Projects in the Norwegian Public Sector	[18]
3	2018	SCOPUS	Acceptance of an agile methodology in the public sector	[7]
4	2018	ACM	Contracting Agile Developments for Mission Critical Systems in the Public Sector	[19]
5	2020	SCOPUS	Development of a hybrid agile management model in local self-government units	[20]
6	2020	ACM	Scaling Agile Software Development Approach in Government Organization in New Zealand	[21]
7	2020	SCOPUS	When Doesn't Formal Planning Enhance The Performance Of Government Projects?	[22]
8	2017	ACM	Coordination in the large: A research design	[23]
9	2020	IEEE	Human Related Challenges in Agile Software Development of Government Outsourcing Project	[24]
10	2020	IEEE	Agile-Based Requirement Challenges of Government Outsourcing Project: A Case Study	[25]
11	2020	SCOPUS	Exploratory analysis of cultural influences on requirements engineering activities based on stakeholders' profile	[26]
12	2021	SCOPUS	Incorporating agile practices in public sector IT management: A nudge toward adaptive governance	[27]
13	2017	ACM	Analysis of DILRMP Project: Identifying the Applicability of Agile Project Management for Digital Transformation Projects in Government and Public Sector	[28]
14	2020	SCOPUS	Project management and sustainability: Playing trick or treat with the planet	[29]
15	2019	EMERALD	Project governance and portfolio management in government digitalization	[30]
16	2021	SCOPUS	Organizational issues in embracing Agile methods: an empirical assessment	[31]
17	2017	SCOPUS	Lifecycle management in government-driven opensource projects - practical framework	[32]
18	2021	SCOPUS	How to Outsource Agile Projects Effectively: Suppliers and client advisors need to work closely with client organizations to ensure key enablers are in place to increase success when outsourcing Agile projects	[33]

III. RESULTS AND DISCUSSION

This section discusses the results of a systematic literature review in detail on 18 selected studies by categorizing challenges, and next is to map the challenges found with best

practice solutions to solve each challenge. Each of these processes is described in more detail in the following subsections.

TABLE III
LIST OF CATEGORIZATION CHALLENGES

No	Domain Category	Issues	Citation
1	Stakeholder	Low stakeholder involvement, competence and transparency Top management is not interested in Agile development methods There are laws that prevent sharing of information with stakeholders Lack of coordination, communication and control between stakeholders There is a negative influence from stakeholders on requirements Stakeholders have various conflicts of interest such as different perspectives	[18], [21] [19], [31], [33] [21] [24] [26] [28], [32]
2	Team	There is a division of labor with command dominance from the leader/supervisor There is resistance to change and lack of adaptability Lack of empowerment of employee skills so that employees find it difficult to understand new roles Difficulty organizing an Agile team remotely Human related problems such as lack of coordination and trust between teams Lack of team performance evaluation and rewards There are incompetent managers and developers	[17] [7], [27], [22] [21], [27], [31], [32] [21] [18], [23], [24], [27], [33] [31] [31]
3	Development Approach & Lyfecycle	Public organizations have a hierarchical principle of authority that is difficult to adapt to the Agile way Public organizations use a dominant rule-based (regulation) approach The public sector has a formal communication-oriented documentation compliance principle The public sector's agile innovation and development is slower than the private sector's During the project, the project team will be given a new set of information Agile nature with iteration can be burdensome and does not fit into large and rigid government organizational structures Public organizational structure unfamiliar with Agile practices Public organizations do not have the skills or culture to support Agile development	[17], [7] [17], [7], [23], [27] [17], [7], [21] [7], [28] [28] [20], [31] [21], [27] [31], [33]
4	Planning	Problems in project planning and management Difficulty in being ready to apply Agile methodologies and achieving the ideal balance in order to master new skills Unclear about the effectiveness of project planning in the public sector	[18], [28] [21] [22]
5	Project Work	There are technical problems in Agile implementation Project contract issues that need flexibility A priori implementation (knowledge that exists before meeting experience) in the public sector Difficulty in integration into legacy systems Troubled in project management and project processes Communication challenges in Agile processes Long implementation of change management and long execution Lack of knowledge and skills towards sustainable project management and acquisition	[18], [31] [19], [30], [33] [20] [21] [24] [25], [26], [28] [28] [29], [31]
6	Delivery	Product delivery transition issues to user organizations Requirement problems such as changing requirements, etc Scope problems such as overscooping, etc Pressure on government to ensure rapid implementation while maintaining quality standards Poor service provision in Agile delivery	[18] [24], [25] [25], [29], [31] [28] [33]
7	Measurement	Project is having problems with over budget (cost) or deficit Project takes (schedule) longer than planned Challenges in validating and measuring project results against predetermined targets Lack of detailed cost evaluation	[28], [32] [28] [30] [31]
8	Uncertainty	Poor risk management in the public sector Ensuring the long-term sustainability of the project	[22] [32]

A. Mapping the Challenges and the Categorizations

This section outlines the challenges based on related research and for answering RQ1: what are the challenges of applying Agile project management in government. The SLR

findings revealed challenges in implementing Agile in the public sector are categorized based on the project performance domain of PMBOK 7th edition.

After analyzing and categorizing by domain, 43 challenges linked to Agile adoption in the public sector were discovered

as shown in Table III. The category mapping process results found that the Development Approach and Lifecycle domain and Project Work had the most issues, with 8 issues. Then followed by the Team domain with 7 issues, Stakeholder domain with 6 issues, Delivery domain with 5 issues, Measurement domain with 4 issues, Planning domain with 3 issues, and Uncertainty domain with 2 issues.

From 43 issues, several challenges are mentioned in more than 3 research literatures. First, human-related issues such as lack of coordination and trust between teams are the most common challenges mentioned [9], [19], [20], [21], [22]. Second, the lack of empowerment of employee skills so that employees find it difficult to understand new roles is a challenge that is also widely mentioned [23], [21], [24], [25]. Third, public organizations use a dominant rule-based (regulation) approach [26], [7], [19], [21].

Furthermore, several challenges are mentioned in 3 research literatures, such as top management, which are not interested in Agile development methods. Thus it results in without support [10], [24], [22], resistance to change and lack of adaptability from the team [7], [21], [27]. Also, it results in the public sector has the principle of compliance with documentation oriented to formal communication [26], [7], [23], and project contract issues need flexibility [10], [28], [22]. However, it results in the existence of a communication challenge in Agile processes [29], [30], [31], and scope problems such as over scooping [29], [32], [24].

Several other issues are found in implementing Agile in the public sector. In the stakeholder domain, namely the existence of low stakeholder involvement, competence, and transparency [9], [23], laws that prevent information sharing with stakeholders [23], lack of coordination, communication, and control between stakeholders [20], there is a negative influence of stakeholders on project requirements [30], and stakeholders have various conflicts of interest [31], [25]. In the team domain, there is a division of labor with command dominance from the leadership [26], difficulties in organizing an Agile team remotely [23], and lack of evaluation and performance awards by the team [24], and incompetent managers and developers [24].

In the Development Approach and Lifecycle domain, there are challenges for public organizations with a hierarchy of authority principles, making it difficult to adapt to the Agile method [26], [7]. The public sector's agile innovation and development is slower than the private sector's [7], [31]. A collection of new information is provided to the project team during the project [31]. The nature of Agile with iterations that do not conform to rigid government organizational structures [33], [24]. Public organizational structures are unfamiliar with Agile practices [23], [21] and do not have the skills or culture to support Agile development [24], [22].

In the Planning domain, there are problems in project planning and management [9], [31], difficulties in being prepared to apply Agile method and achieving the ideal balance to master new skills [23], lack of clarity on the

effectiveness of project planning in the public sector [27], and technical problems in Agile implementation [9], [24].

In the Project Work domain, there are technical problems in Agile implementation [9], [24], a prior implementation (knowledge that exists before meeting experience) in the public sector [33], difficulties in integration into old systems [23], problems with management and processes projects [20], change management implementation and long execution [31], and lack of knowledge and skills towards sustainable project management and acquisitions [32], [24].

Furthermore, in the Delivery domain, there are problems with the transition of product delivery to user organizations [9], requirements problems such as changing requirements [20], [29], pressure on the government to ensure fast project implementation by maintaining quality standards [31], and service provision. poor in Agile delivery [22].

In the measurement domain, there are challenges for projects that have problems with exceeding budget (costs) or deficits [31], [25], projects taking longer (schedule) than planned [31], challenges in validating and measuring project results against the targets set been determined [28], and the lack of a detailed cost evaluation [24]. Finally, the challenges in the uncertainty domain are poor risk management in the public sector [27] and challenges in ensuring the project's long-term sustainability [25].

B. Mapping of Best Practices Solution

This section is done to answer RQ2: what is the best practice solution for overcoming problems in government while applying Agile project management? The best practices solutions for each identified challenge were obtained from 18 extracted literature and PMBOK 7th edition Guide. Each best practice solution mapped to the issue in each category is the result of an analysis tailored to the problems found. Multiple solutions can be provided in more than one issue in each category.

For example, in the Stakeholder domain, the application of Agile methodologies that can help better engage stakeholders [31] can be implemented on two issues, namely top management is not interested in Agile development methods [10], [24], [22] and lack of coordination, communication, and control between stakeholders [20]. Small-scale trials will be used to introduce Agile to the public sector [21] is a solution that can be applied to problems of public organizational structure unfamiliar with Agile practices [23], [21] and public organizations do not have the skills or culture to support Agile development [24], [22]. Furthermore, implement a governance structure that is adapted to the approach or type of project used, such as the Agile model [28], which can be applied to overcome the challenges in validating and measuring project results against predetermined targets [28] and lack of detailed cost evaluation [24]. Table IV and Table V present a complete mapping of best practice solutions for each challenge in Agile implementation in the public sector.

TABLE IV
BEST PRACTICES SOLUTION MAPPING (1/2)

No	Domain	Issues	Best Practices Solution
1	Stakeholder	Low stakeholder involvement, competence and transparency [18], [21] Top management is not interested in Agile development methods [19], [31], [33] There are laws that prevent sharing of information with stakeholders [21] Lack of coordination, communication and control between stakeholders [24] There is a negative influence from stakeholders on requirements [26] Stakeholders have various conflicts of interest such as different perspectives [28], [32]	Have a good dialogue between providers (project team) and stakeholders [18] Application of Agile methodologies can help better engage stakeholders [28] Implementing transparency as a context in Agile in which information should be disclosed to stakeholders [21] Application of Agile methodologies can help better engage stakeholders [28] Good collaboration between organizations and vendors is required to practice Agile methodologies properly [24] Apply alignment of interests [19]
2	Team	There is a division of labor with command dominance from the leader/supervisor [17] There is resistance to change and lack of adaptability [7], [27], [22] Lack of empowerment of employee skills so that employees find it difficult to understand new roles [21], [27], [31], [32] Difficulty organizing an Agile team remotely [21] Human related problems such as lack of coordination and trust between teams [18], [23], [24], [27], [33] Lack of team performance evaluation and rewards [31]	Every leader must understand leadership skills [10] Confidence in the team to perform the tasks assigned by the product owner [21] Empowering employees by establishing a solution office and introducing virtual teams so that consultants and employees can collaborate more efficiently [27] IT departments bend the rules of public sector organizations by creating virtual solutions offices on top of existing structures [27] Applying general aspects of project team development: realizing the project vision and objectives, understanding roles and responsibilities, creating project team operations, establishing guidance, and identifying growth areas [10] A successful Agile development team requires product ownership, both from within the team and within the organization, which understands and supports the iterative nature of the Agile process [21] Hiring consultants to cover resource gaps in the Agile development process is a smart alternative for IT teams [27] Organizations and teams must agree on a shared Agile workflow perception before starting a project [25]
3	Development Approach & Lifecycle	There are incompetent managers and developers [31] Public organizations have a hierarchical principle of authority that is difficult to adapt to the Agile way [17], [7] Public organizations use a dominant rule-based (regulation) approach [17], [7], [23], [27] The public sector has a formal communication-oriented documentation compliance principle [17], [7], [21] Agile innovation and development speed in the public sector is slower than in the private sector [7], [28] There is a new set of information provided to the project team during the project [28] Agile nature with iteration can be burdensome and does not fit into large and rigid government organizational structures [20], [31] Public organizational structure unfamiliar with Agile practices [21], [27] Public organizations do not have the skills or culture to support Agile development [31], [33]	Transforming organizational culture has a big role in the success of agile implementation [27] Bottom-up agile is a suitable way to drive large-scale project transformation in public sector [27] Collaboration is crucial to small-scale Agile progress to help to make the switch to adaptive governance [27] The concept of an iterative method will help learning during iterations in increasing project efficiency [28] Using the Hybrid Agile Model by defining a new flexible management structure for government units [20] Small-scale trials will be used to introduce Agile to the public sector [27] Small-scale trials will be used to introduce Agile to the public sector [27]
4	Planning	Problems in project planning and management [18], [28] Difficulty in being ready to apply Agile methodologies and finding the right balance to learn new skills [21] Unclear about the effectiveness of project planning in the public sector [22]	Using planning strategies and techniques, estimates for projects, and verified [7], [22] Using planning strategies and techniques, estimates for projects, and verified [7], [22] Discuss key challenges in the early stages of project planning and use them as a basis for frequent dialogue during procurement, contract negotiations, and subsequent mobilization [33]

TABLE V
BEST PRACTICES SOLUTION MAPPING (2/2)

No	Domain	Issues	Best Practices Solution
5	Project Work	There are technical problems in Agile implementation [18], [31] Project contract issues that need flexibility [19], [30], [33] A priori implementation (knowledge that exists before meeting experience) in the public sector [20] Difficulty in integration into legacy systems [21] Troubled in project management and project processes [24] Communication challenges in Agile processes [25], [26], [28] Long implementation of change management and long execution [28] Lack of knowledge and skills towards sustainable project management and acquisition [29], [31]	Support project team members as they solve problems and create a culture that fosters trust and collaboration [10] - Establish time and material contracts and involve clients [18] - Manage contracts the Agile way [19] Applying the “Plan-as-you-go” principles of Agile project management will work better for managing projects efficiently due to ignorance of actual scale and reality [28] Agile methods suggest that developers or teams often integrate new software into the underlying software architecture [31] Receiving feedback which refers to providing information about performance and receiving suggestions given on project work [21] Create project communication management plans and communication artifacts [10] Implement effective change management by using a motivational strategy rather than a strong strategy. Engagement and two-way communication can identify valid concerns of disapproving users [10] The successful management of project scope is very important in sustainable project management [29]
6	Delivery	Product delivery transition issues to user organizations [18] Requirement problems such as changing requirements, etc [24], [25] Scope problems such as overscoping, etc [25], [29], [31] Pressure on government to ensure rapid implementation while maintaining quality standards [28] Poor service provision in Agile delivery [33]	Prepare for the adoption and behavioral sustainability of the new and different processes required for the transition process [10] Create the easiest change requirements document to fill out [7] Create flexible project scope and frequent delivery [18] Agile deployments can create products or services that can be deployed more quickly, monitor projects more closely, and increase citizens' trust in government [28] Intervening for the successful delivery of individual projects and as an enabler of wider adoption of Agile, or both [33]
7	Measurement	Project is having problems with over budget (cost) or deficit [28], [32] Project takes (schedule) longer than planned [28] Challenges in validating and measuring project results against predetermined targets [30] Lack of detailed cost evaluation [31]	Carry out budget management practices by calculating budget estimates and developing a cost baseline [10] Implement schedule compression methods [10] Implement a governance structure that is adapted to the approach or type of project used, such as the Agile model [30] Implement a governance structure that is adapted to the approach or type of project used, such as the Agile model [30]
8	Uncertainty	Poor risk management in the public sector [22] Ensuring the long-term sustainability of the project [32]	- The government can use a planning strategy according to the risk level of each project [22] - In the face of high risk, project managers in the public sector are advised to ensure the assignment of appropriate team members for each project activity [22] - Project managers must identify which competencies they need to build in order to manage projects in a long-term manner [29] - Stakeholder engagement can help reduce the amount of uncertainty that exists in the project [10]

C. The Implication of the Study

This study has several implications for academic and practical research. For academic research, this study provides the latest literature on Agile challenges in the public sector from a project management perspective. The new contribution of this research is categorizing the challenges found grouped by project performance domain from the PMBOK 7th edition standard. Then the solution was obtained from the process of mapping the results of the SLR literature and the 7th edition of the PMBOK Guide. This research can provide knowledge and recommendations for relevant case studies for practitioners. Practitioners can learn from the challenges and solutions found in this study for public sector organizations with similar problems.

IV. CONCLUSION

The research was conducted to obtain challenges in the application of Agile project management in the public sector.

Then mapped best practice solutions for these challenges. After the SLR process was carried out, 18 literatures relevant to the research objectives were obtained. SLR results show that there are 43 issues with applying Agile project management in the public sector.

The challenges with the most issues are in the Development Approach and Lifecycle and Project Work domains. Then followed by Team, Stakeholder, Delivery, Measurement, Planning, and Uncertainty domains. Moreover, several challenges are mentioned in more than three research literatures. First, human-related issues such as lack of coordination and trust between teams. Second, the lack of empowerment of employee skills so employees find it difficult to understand new roles. Third, public organizations that use a dominant rule-based (regulation) approach.

Next, we mapped out best practice solutions based on 18 literatures from the extracted papers and PMBOK 7th edition guide. One or more issues can use the mapped solution according to the results of the problem analysis. This study focuses on finding general challenges and solutions to Agile

implementation in the public sector from a project management perspective. Further research needs to be more specific for the challenge method used in this paper. It can be explored more on challenges and solving solutions from specific project performance domain categories so the research results can be more focused on one area and are more in-depth.

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