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Best Agile method selection approach at workplace

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Article Info

ABSTRACT

Selecting the most suitable agile software development method is a challenging task due to the variety of available methods, each with its strengths and weaknesses. To achieve project goals effectively, factors such as project needs, team size, complexity, and customer involvement should be carefully evaluated. Choosing the appropriate agile method is crucial for achieving high client satisfaction and effective team management, but it can be a challenging task for project managers and higher-level management officials. This paper presents a solution aiming to help them in selecting the most suitable software development method for their project. In this regard, this solution includes a pre-project management approach model and a decision tree that considers the unique requirements of the project. In the proposed solution results, Scrum was found to be suitable for both small and large projects, on the condition that roles and responsibilities are clearly defined and that the approach is people-centric. Furthermore, high-risk mitigation measures should be added for small projects. To facilitate the use of our model, a software application has been developed which implements the decision-making tree.

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1. INTRODUCTION

Agile software development is a philosophy to manage a project and solve failures caused by conventional approaches. It was declared as an approach in 2001 at a convention named "Manifesto" defining the 4 values and 12 principles and including a set of methods [1], [2]. Agile methods, Viz, Scrum, eXtreme programming (XP), feature driven development (FDD), and others [3]-[7], are based on a development cycle that is customer-focused and involves the realization of the project from the beginning to the end. Thanks to agile methods, the client got better visibility of the work than in the case of traditional methods [8]. The involvement of the client in the process allows the team to make the necessary changes directly as and when the user is requesting the results. These agile methods aim to accelerate the development of software [9], [10], [11]. The principle consists of offering a minimal version of the software and integrating additional functionalities to this base, through an iterative and incremental approach [12]-[14].

Every project has intrinsic properties (i.e., project size, complexity, roles, and responsibilities) that can be used to choose the method to be followed at all stages of its implementation. The project's success depends on the correct choice and the understanding of the method.

The choice of a project management method is a very important step in managing software development [15]. In fact, there are methods based on the same concept, but due to their varying nature and

particularities, not all can be applied in all situations [16]. Furthermore, at the implementation level, each method proposes its practices with a more or less strong degree of client involvement.

Selecting the appropriate project management method is a crucial challenge in ensuring project success. Various studies have attempted to achieve this goal, each utilizing different methods and criteria. Comparative studies for agile development are presented in Table 1. According to the annual report for agile presented in [17] shows that in 2020, 95% of survey respondents reported using agile development methods, with 44% of teams being less than half agile, 33% more than half agile, 18% all agile, and 5% none agile. The most used agile methods were Scrum (58%), followed by Scrumban (10%), Kanban (7%), and XP (1%). Top agile practices included iteration planning (79%), daily standup (85%), retrospectives (81%), iteration reviews (77%), and short iterations (64%). In 2021, the survey found that Scrum was the most used agile method at 66%, followed by Scrumban (9%), Kanban (6%), and Scrum/XP Hybrid (6%). Other methods, including XP and Lean Startup, were used less frequently. The top four agile practices in use were iteration planning (83%), daily standup (87%), retrospectives (83%), and iteration reviews (81%), with short iterations (63%) rounding out the list. The three most widely used Agile planning and delivery tools were Kanban boards (77%), task boards (67%), and spreadsheets (66%). In 2022, most respondents (89%) agreed that high-performing Agile teams have certain key characteristics, such as people-centric values, clear culture, tools, and leadership empowerment. Additionally, almost half of the respondents (49%) reported applying. Agile practices to the entire application delivery lifecycle. While 13% of respondents reported using Agile practices for IT and software development teams, 26% used them for company-wide digital transformation, and 61% used them for both. When it comes to prioritizing work on application development and delivery, respondents reported prioritizing by company goals (54%), end customer satisfaction (43%), and time to deliver (35%). The most used Agile methodologies were Scrum (87%), Kanban (56%), Scrumban (27%), and Iterative (20%). Finally, Scaled Agile Framework (SAFe) was used by 53% of respondents, while Scrum@Scale/Scrum of Scrums was used by 28%, and Lean Management was used by 8%.

Table 1. Some comparative studies

Title	Year	The goal
Agile methodologies: comparative study and future direction [18]	2014	This article focuses on a hybrid model to increase the software industry's flow. This model is composed of the best assets of XP, Scrum, and RUP.
Comparative analysis of different agile methodologies [19]	2015	This article provides an overview of the different agile methodologies.
A comparative study of agile method: towards a new model-based method [20]	2017	This article aims to offer a comparative study of the available agile methods.
Comparative study within Scrum, Kanban, XP focused on their practices [21]	2019	This article determines the core variables to ruminate on when determining Scrum, XP, and Kanban methods. It presents a strategy for performing inspections on agile approaches, with a view to an arrangement of highlights and important characteristics.

The literature study allowed us to highlight the following difficulties: a lack of decision-making tools that enable the choice of the right project management method; there are many different management methods, which makes it difficult to choose the best among them; choosing a most adapted management method is time-consuming. Moreover, despite the diversity of these studies, until now, no tool has been proposed to facilitate the choice of an agile method to implement for software project management.

In order to improve the quality of the service rendered and to save time, it is first necessary to ensure the right choice of method to adopt and then to guarantee a better implementation of this project. With this in mind, this paper proposes a decision-making tool to choose the most suitable method for the specifications and constraints of a software project. Indeed, a set of questions allowing to take into account the environment, the constraints, and the requirements of this project are asked. Then, the rule-based system proposes to the user the best technique, allowing him to save time and to take into account the constraints and requirements of his project.

The rest of the paper is structured as follows: section 2 presents the overall research method which allows the user to grab the right choice of method. Section 3 presents the result and analysis of the application, starting with the proposal of a methodological approach for a project, followed by the proposal of a decision-making tree for the choice of the method to adopt, and finally, the proposed decision-making tool is presented. Section 4 presents the conclusion and perspectives of the research work.

2. RESEARCH METHOD

This section presents the research methodology employed in the development of a decision-making tool for agile methods. To accomplish this, four major steps were followed, as illustrated in Figure 1. This

process included the comparative study and the identification of criteria, proposing a pre-project approach, creating a decision-making tree, and ultimately developing the decision-making tool.

− Comparative study and criteria identification: the process began with preprocessing the downloaded works related to agile methods for conducting a state-of-the-art study. This study aims to gain a comprehensive understanding of each method's functioning and the similarities and differences between them. Afterward, a set of criteria was identified to detect each method's properties and characteristics, enabling us to evaluate and compare them. These characteristics are crucial factors that project managers consider when selecting a method, including project and team size, iteration length, risk mitigation, among others [22].

− Proposed pre-project approach: after conducting a literature review, we developed a business process that assists project teams in evaluating the criteria's value to select the most appropriate project management method.

− The decision-making tree: this tree is based on an ordered set of criteria obtained from analyzing the comparative study table and follows a predefined set of rules to guide the selection of the most appropriate method.

− The decision-making tool: this tool is based on the criteria used in the decision-making tree in order to offer a tool to help company employees especially project managers to choose the agile method to adopt for their project by answering a set of questions.
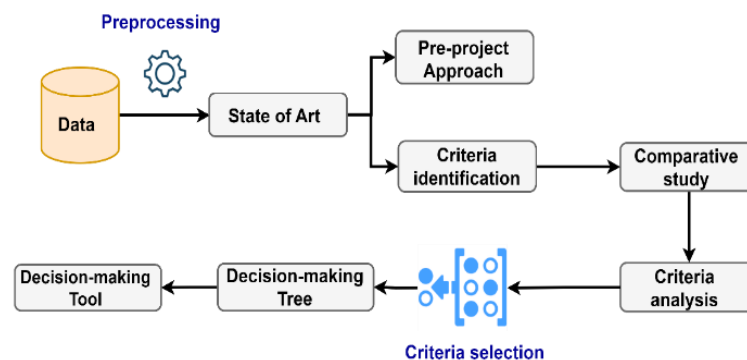

Figure 1. Steps of the process followed for the proposal

By following the process illustrated in Figure 1, the choice of agile methods is clearly defined according to project- and personnel-specific criteria. The agile methods considered in this study include Scrum, eXtreme programming (XP), dynamic systems development method (DSDM), FDD, Kanban, Crystal Family, lean software development (LSD), and adaptive software development (ASD). The next section will present the pre-project approach, followed by the decision-making tree model with a detailed analysis.

3. RESULTS AND ANALYSIS

To ensure the most effective project management method is selected, it is crucial to compare and evaluate different methods based on specific criteria. To do this effectively, we put forward a methodological approach for a pre-project and a decision-making tree as a sub-process. Our approach involves answering a set of questions and moving through various criteria to determine the most suitable method for a pre-project. This method allows stakeholders to make informed decisions based on the criteria that are most important for a project's success. both of these propositions were based on the business process model and notation (BPMN) Standard [23]-[25] to facilitate this process. The tree guides stakeholders through the decision-making process by using a series of questions and criteria to determine the most appropriate method to be adopted.

3.1. Methodological approach to managing a pre-project

The three main components of any project are resources (human, financial, hardware, or software), costs (money or expense), and deadlines. Implementation of a new project process begins with stakeholder meetings where members answer questions about what and why. Objectives and purposes are identified and ranked by importance, and a project outline is created and named. The project team is then determined to

carry out the project based on specifications. This team initiates by conducting a meeting to collect and analyze the project's needs, followed by a requirement gathering meeting with the client representative in the software development life cycle. These two aspects come together to form a series of steps that involve taking inventory, creating a provisional budget, formalizing the project, studying the local context (political and economic), determining the project's complexity level, reviewing previous management methods and team experience, and visualizing the team's skills and homogeneity. If a known method is available, it is applied; otherwise, a method is chosen. Figure 2 illustrates the steps involved in managing a pre-project phase to gain a comprehensive understanding of the project context and its characteristics.
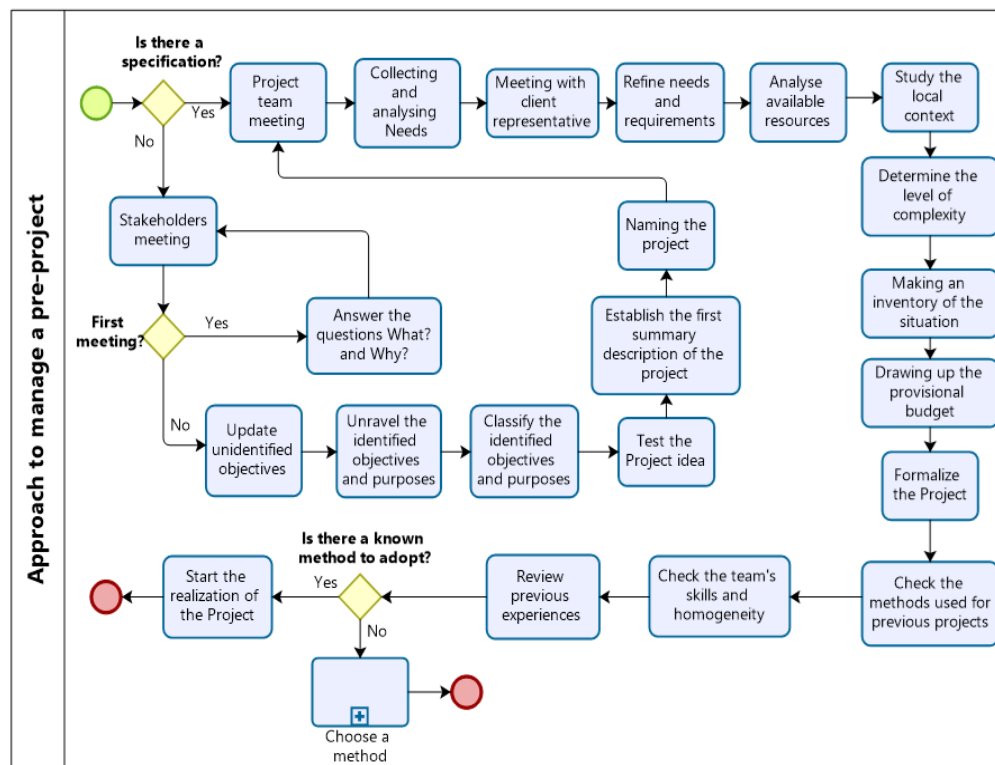
Figure 2. Pre-project management approach

3.2. The business process for choosing the management method

Selecting the most appropriate management method is crucial for efficient project management and the delivery of a high-quality product/service. To achieve this, a project should start with a succession of steps to extract the needs, requirements, available resources, and at the same understand the project context and its characteristics and evaluate the criteria's value that allow the best choice of the method to be implemented. These activities are described in detail in the previous subsection and illustrated in Figure 2. The basic criteria for the choice of management method are taken from a state-of-the-art study on agile methods conducted in [22]. Both tables in this work are built based on project size. We found methods that are suitable for any project size and others that are specific to small or large projects, regardless of team size or iteration length. Some methods define roles and responsibilities, while others do not, and they can be categorized into those that focus on the process and those that focus on the person. Additionally, we found methods that are based on medium-risk mitigation and others based on high-risk mitigation. Finally, we found that some methods define daily meetings, while others do not.

Based on the literature reviewed so far and the analysis carried out, we obtained the most important criteria for choosing the method. These criteria include project size, the definition of roles and responsibilities, process-centric, people-centric, risk mitigation, and daily meetings. Based on all these parameters, we defined some questions as listed below:
− What is the size of your project?
− Do you want to define roles and responsibilities?
− Do you want to focus on the process?

− Do you want to focus on the person?
− What level of risk mitigation do you want?
− Do you want to define daily meetings?

After extracting the criteria such as project size, roles and responsibilities, risk mitigation, and formulating them as questions, the next step is to answer these questions. The answers are also derived from the literature review. The process of evaluating potential methods based on criteria and ultimately selecting the most suitable method is translated into a business process illustrated in Figure 3. By following this process, project managers can ensure the successful completion of projects within defined timelines and budgets, utilizing appropriate methods such as Scrum, XP, DSDM, KANBAN, LSD, ASD, FDD, or crystal family, based on the specific project requirements.
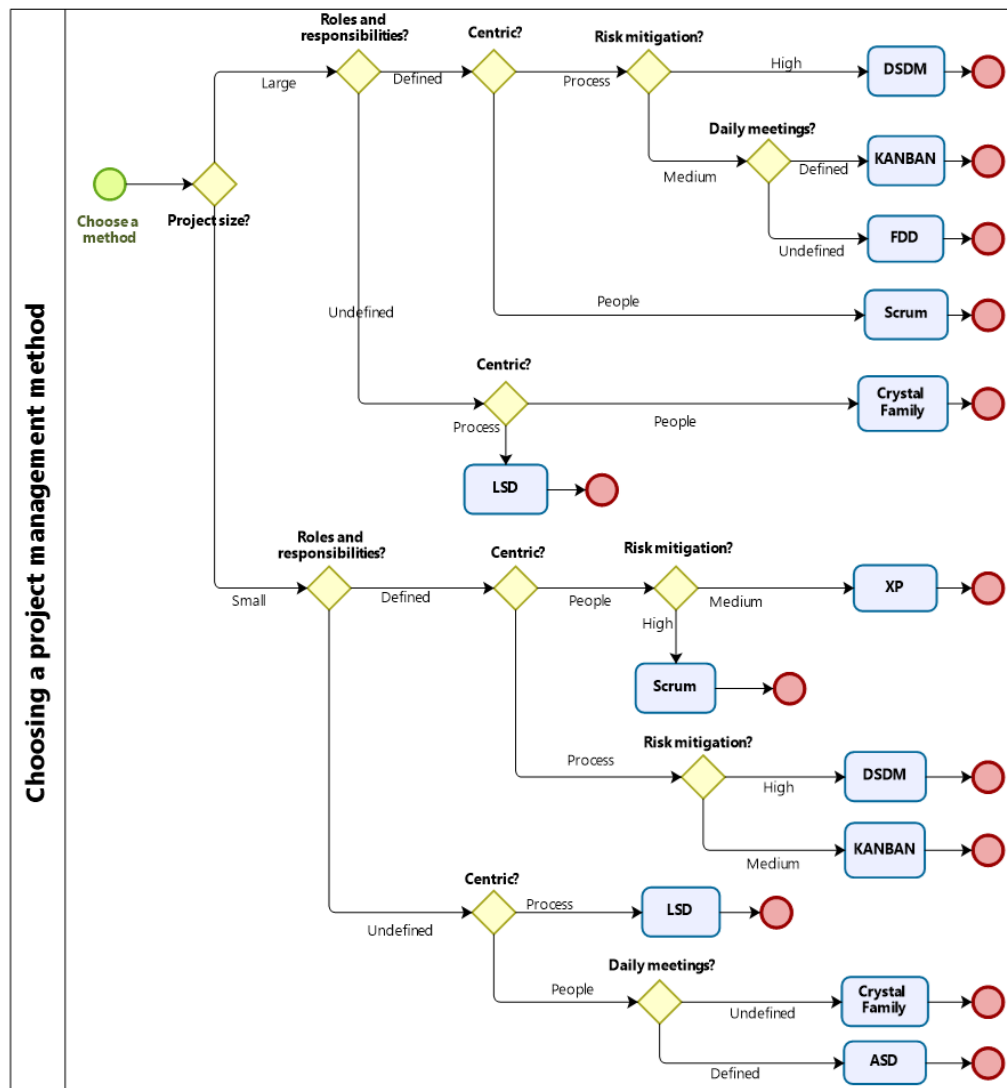
Figure 3. The decision tree as a business process for choosing a management agile method to adopt

Through this business project, 13 rules can be extracted for choosing a suitable Agile software method according to project criteria. For example, for small projects where roles and responsibilities are defined, and if it is people-centric with high-risk mitigation, Scrum is the recommended method. On the other hand, for large projects where roles and responsibilities are defined, if it is process-centric, and if there is medium risk mitigation with daily meetings not defined, FDD is the most suitable method.

3.3. Development of a decision-making tool

A decision-making tool has been developed in this section to help individuals choose a suitable method for managing their projects. This tool is based on the questions established in the previous section, along with our proposed BPMN models and comparative studies. The tool operates effectively and helps users make informed decisions about project management methods.

3.3.1. Use case diagram

The system has two primary actors namely, the user and the administrator. Figure 4 depicts the use case diagram of the system, illustrating the interactions between the two actors and the system. The administrator's main objective is to manage users, notifications, and information related to the methods. Furthermore, they can also perform additional use cases that are available to the user, such as selecting and visualizing the adopted method.
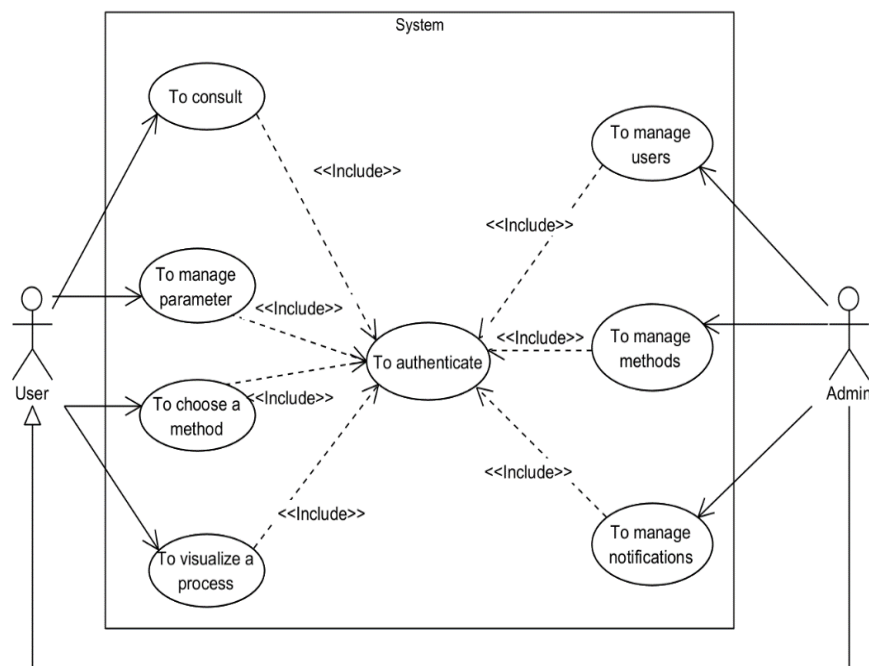
Figure 4. Use case diagram of the decision-making tool for management methods

3.3.2. Implementation of the solution

This section provides a comprehensive demonstration of how to use the system, starting with the authentication page for all users. Users must first register and create their session. This is done by entering their username and password in the fields that appear on the authentication page. Once the user has entered their information, the system checks their presence in the database and verifies their role based on the user ID specified in the form.

Once the user logs in successfully, the system will present a menu bar containing different options such as home, view process, choose method, notification, and contact. To select a method for managing a software project, the user can simply click on the "Choose Method" option in the menu. This option will lead them to the search form.

Figure 5 represents the search form that users can access to choose a management method for their software project. This form provides a user-friendly interface that allows users to search for and select the most appropriate management method for their project. The search form is designed to accommodate various search criteria, such as the project size, roles and responsibilities, process or people centric, and daily meetings. Once users have entered their search criteria, they can click on the "Search" button to retrieve a relevant management method.

Figure 6 displays the outcome of the form-filling process, presenting a summary of the user's responses. This provides users with an overview of the information they have entered and allows them to review their answers before implementing the selected method. The summary presented in Figure 6 can help users ensure that they have provided accurate and complete information for the form.

Figure 5. Form for choosing the method to adopt for a project

Figure 6. Choice results with a summary of completed responses

4.   CONCLUSION

The popularity of agile methods in software development can be attributed to their focus on flexibility, collaboration, and continuous improvement. They facilitate a more efficient development process by allowing teams to swiftly adapt to changing requirements and customer needs. Additionally, agile methods emphasize transparency, communication, teamwork, and high-quality software, making them an attractive option for organizations seeking to optimize their development practices. The success of a project depends on selecting the appropriate method, as each project has unique characteristics that may be better suited for a particular approach. While there are many studies offering criteria and methods to aid in the decision-making process, there is currently no tool available to simplify this task. This paper has proposed the methodological approach for managing pre-projects in software development. The approach involves assessing project criteria through a set of questions to ascertain the most appropriate method to adopt. This decision can be made using the second proposition of the decision-making tree based on BPMN and our states of the art. Finally, a decision-making tool based on the decision-making tree proposal is developed to select the most suitable method based on both project and personnel criteria. Future work will focus on enhancing the tool's intelligence to further optimize the decision-making process.

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