ADI Journal on Recent Innovation (AJRI)
Vol. 5 No. 1 September 2023

p-ISSN : 2685-9106
e-ISSN : 2686-0384

A Model of Critical Success Factors for Agile Information Technology Project in Indonesia Using Analytic Hierarchy Process (AHP)

Teguh Raharjo[1,2]
Computer Science Department, Bina Nusantara University, Jakarta[1], Binus Online Learning, Bina Nusantara University, Jakarta[2]
Indonesia[1,2]
e-mail: teguh.raharjo@binus.ac.id

Author Notification
04 June 2023
Final Revised
01 August 2023
Published
10 August 2023

To cite this document:
Raharjo, T. (2023). A Model of Critical Success Factors for Agile Information Technology Project in Indonesia using Analytic Hierarchy Process (AHP). ADI Journal on Recent Innovation, 5(1Sp), 68–77.
DOI: https://doi.org/10.34306/ajri.v5i1Sp.968

Abstract

The implementation of Agile shows rapid development. For business continuity, organizations apply Agile in building innovative products according to market conditions The implementation of Agile shows rapid development. For business continuity, organizations apply Agile in building innovative products according to market conditions. Agile implementation in Indonesian IT projects faces problems include cultural constraints, lack of education/training, unclear guidelines, limited Agile mindset understanding, and insufficient management support. This study aims to solve these problems by exploring success factors of Agile projects with the analytic hierarchy process (AHP) model to help organizations in making Agile implementation strategies for their projects. A qualitative approach is used as a research method to confirm CSF by experts and practitioners, while a quantitative process is used to perform AHP calculations. The research identified critical success factors for Agile project implementation, including management support, competent project teams, organization-specific guidelines for processes and procedures, adaptive organizational culture, Agile training and coaching for team members, and a clear product roadmap. This research makes significant contributions to both the academic and practical domains. In academia, it serves as a valuable reference for critical success factors (CSFs) in the Agile field. In practical terms, it offers valuable insights for organizations in Indonesia, aiding them in effectively planning and implementing Agile methodologies.

Keywords: *Agile, Analytic Hierarchy Process (AHP), Critical Success Factors, Project Management*

p-ISSN : 2685-9106
e-ISSN : 2686-0384

1. Introduction

The implementation of Agile methodologies is currently experiencing rapid growth, particularly during and after the COVID-19 pandemic. Business and environmental uncertainties have necessitated organizations to adopt an Agile approach to remain competitive in the existing market [1], [2]. These facts are further supported by business surveys conducted by [3] and [4]. These surveys indicate that more organizations are embracing Agile methodologies due to the need for faster, more efficient, and adaptable solutions to address the prevailing uncertain conditions. Agile methodologies prioritize team collaboration and customer engagement, enabling organizations to expedite the introduction of new products and enhance existing ones.

Alongside the significant growth, organizations still face several challenges in implementing Agile methodologies. Surveys conducted by [4] and several literature sources [5], [6] have identified various constraints encountered during Agile implementation, as illustrated in Figure 1. This becomes the research problem in this study.

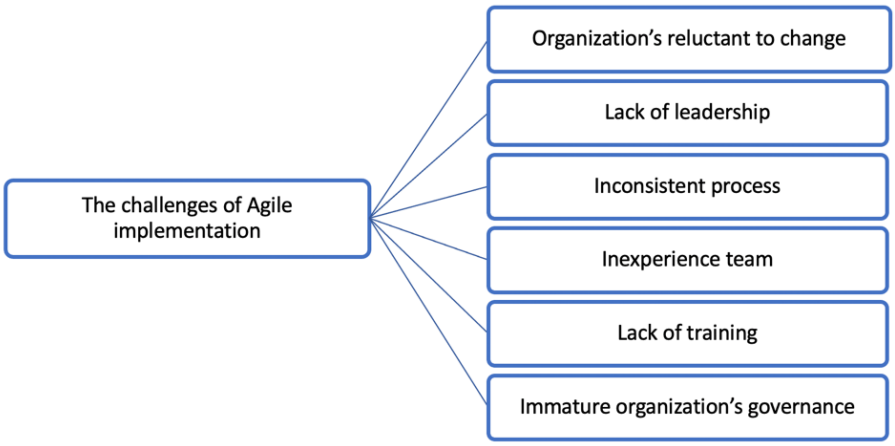

Figure 1. Challenges of Agile implementation

The challenges in implementing Agile projects in Indonesia have been identified through surveys, observations, and insights from project management and Agile communities, as well as experts and practitioners. These challenges include organizational cultural constraints, inadequate education and training on Agile concepts and practices, a lack of clear implementation guidelines, limited understanding of the Agile mindset at management and team levels, and insufficient support and commitment from management. Based on the above analysis, this research aims to overcome these obstacles by formulating the success factors for implementing Agile in Indonesia. These success factors are depicted using the Analytic Hierarchy Process (AHP) model to facilitate decision-makers, management, and teams in determining the priority of implementing these factors. There have been previous studies on the examination of critical success factors in other countries [1], while this research focuses on examining critical success factors in Indonesia.

The contributions of this research can be divided into academic and practical areas. In the academic field, it can provide further documentation on the success factors of Agile-based projects in the field of information technology. In the practical sense, it can assist organizations in determining implementation strategies for Agile projects based on factors and criteria for Agile project success. According to our research, there are no scientific articles that address the success factors of projects described with AHP using case studies of information technology projects in Indonesia and This can be considered as a new point of this study.

2. Research Method

This study uses qualitative methods [7], [8], [9] to identify Agile success factors. We have collected Material-based Agile Project Success Factors or Critical Success Factors (CSFs) including academic textbooks and scientific articles. Figure 2 illustrates the research process stages. The draft of CSFs was derived from a comprehensive literature review. To validate the draft CSFs, a verification process involving expert judgment was conducted, with participation

p-ISSN : 2685-9106
e-ISSN : 2686-0384

from experts possessing competence and experience in agile project implementation. This validation process led to the refinement and finalization of the CSFs. T The next step involves the development of an Analytic Hierarchy Process (AHP) model based on the identified CSFs, allowing a systematic assessment of their relative importance and impact in the context of research scene.

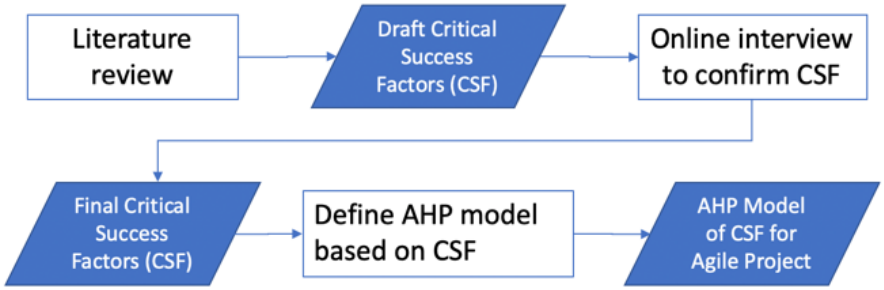

Figure 2. Research process stages for defining CSFs

2.1 Agile-based Project Management

Project is a one time temporary effort made to achieve specific goals within defined time, budget and scope whereas project management is the application of knowledge, skills and technology to carry out the project [10]. Projects involve human resources, budgeting, and risks in their execution. Project management can be performed using waterfall, Agile, or hybrid methods [11]. The choice of method depends on the appropriate conditions. The waterfall method is suitable when customer requirements can be fully determined upfront, while Agile is more suitable for dynamic projects where requirements and technology have uncertainties and cannot be fully determined upfront [12]. This research focuses on Agile-based project management [13], [14], [15].

2.2 Agile Project Success Factors

Project success factors or critical success factors (CSFs) are variables that affect the success of a project based on its objectives. This includes planning, resource management, effective communication, risk management, and many other factors. Project success should at least encompass parameters such as scope, quality, cost, schedule, and customer satisfaction [10]. Identifying and understanding these factors is crucial for project success as they help project managers manage risks and ensure that the project stays on track. Agile project management essentially follows general project management principles, with a few specific characteristics of Agile implementation.

Based on a literature review [1], [6], [11], [12], [16], [17], [18] conducted by the author, the following Agile project success factors were identified: 1) Management support in implementing Agile projects, 2) A competent team capable of carrying out project activities, 3) Well-defined processes, methods, and procedures as project implementation guidelines, 4) An organizational culture that is adaptable to Agile implementation, 5) Agile training and coaching for team members, and 6) A clear product roadmap. These factors play crucial roles in ensuring the success of Agile projects and can significantly impact project outcomes and team performance.

The qualitative approach in this study was conducted through online interviews by distributing a questionnaire to confirm the list of CSFs based on the literature to experts and practitioners in Agile implementation in organizations in Indonesia. The respondents consisted of 20 individuals, mostly from organizations that have implemented Agile and hold certifications in the field of information technology in Indonesia. They were also asked for their opinions on other CSFs based on their experiences or understanding in working on Agile projects. A Likert scale with options ranging from (1) Strongly Disagree to (5) Strongly Agree was used for each CSF. Table 1 explains the components of each CSF using the Likert scale. Respondents were asked to indicate their opinion by choosing the appropriate Likert scale. The interview process was conducted online through the distribution of a Google Form to the respondents.

Table 1. List of CSF with Likert scales

No	Critical Success Factor (CSF)	Skala Likert
CSF1	Management support in implementing Agile projects	1. Strongly Disagree 2. Disagree 3. Netral 4. Agree 5. Strongly Agree
CSF 2	A team competent in carrying out project activities	1. Strongly Disagree 2. Disagree 3. Netral 4. Agree 5. Strongly Agree
CSF 3	Processes, methods, and procedures that the organization possesses as project implementation guidelines	1. Strongly Disagree 2. Disagree 3. Netral 4. Agree 5. Strongly Agree
CSF 4	Organizational culture in adapting to Agile implementation	1. Strongly Disagree 2. Disagree 3. Netral 4. Agree 5. Strongly Agree
CSF 5	Agile training and coaching for team members	1. Strongly Disagree 2. Disagree 3. Netral 4. Agree 5. Strongly Agree
CSF 6	Clear product roadmap	1. Strongly Disagree 2. Disagree 3. Netral 4. Agree 5. Strongly Agree

2.3 Analytic Hierarchy Process (AHP)

This research utilizes AHP [19] as a model shown in figure 3, to describe the CSF model based on the characteristics of the CSFs themselves, which can prioritize implementation. The selection of AHP is also based on previous research [20], [21], [22], [23], [24]. The AHP model, which provides criteria and alternatives, allows management to determine priorities based on existing criteria and alternatives. The criteria are determined by the Agile project success criteria, while the alternatives represent supporting success factors. In the AHP (Analytical Hierarchical Process) model, criteria and alternatives are interconnected factors that play an important role in the decision-making process. Criteria represent the different aspects or attributes that need to be considered when evaluating and comparing the alternatives. They serve as the evaluation dimensions to assess the performance of each alternative.

p-ISSN : 2685-9106
e-ISSN : 2686-0384

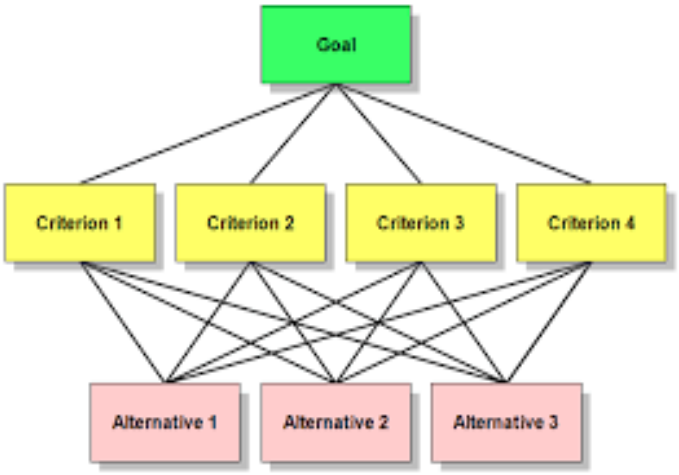

Figure 3. AHP model with criteria and alternative used for CSF

3. Findings

In this section, the author presents research results, including analysis and discussion of success factors when implementing project management.

3.1 Agile Project Success Factors

From the online interviews conducted through Google Forms, the respondents expressed agreement with all the provided CSFs, with varying responses around values of 4 and 5 on the Likert scale. The author also performed data analysis on the approval selection of CSFs, as shown in Figure 4 This data processing represents an estimation based on the involved respondents and provides a summary of the selections made by the respondents.

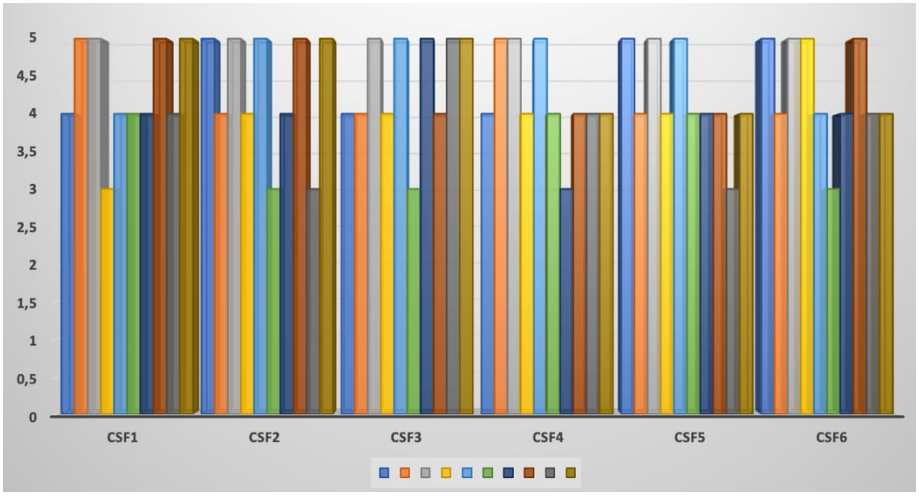

Figure 4. Data analysis of Likert Scales for CSF

Based on the results of the online interviews, it can be inferred that the majority of respondents agreed on the Critical Success Factors (CSFs) for Agile projects in Indonesia. The respondents provided insights and comments that further enrich the understanding of these success factors. For instance, they emphasized the significance of management support during the initial adoption of Agile, as well as the importance of a competent team. The ability of an organization to embrace change was also highlighted as a crucial factor, as some organizations struggle with Agile adoption due to resistance to change. Additionally, respondents emphasized the need to have in-depth knowledge of Agile implementation and the role of each team member

p-ISSN : 2685-9106
e-ISSN : 2686-0384

to maximize success. They also mentioned specific practices, such as assigning a "Buddy" to provide guidance on Agile concepts and technologies. Challenges specific to information security projects were identified, including difficulties in following timeboxing rules and managing dependencies with other stakeholders. Additionally, respondents stressed the importance of team commitment and competency, while acknowledging the need for balanced resource composition within teams. They also mentioned the availability of guidelines but expressed a lack of monitoring and maturity evaluation across different teams. Furthermore, respondents highlighted the influence of organizational culture as a significant CSF, emphasizing that it forms the foundation for Agile implementation in system development. They also emphasized the importance of clear support, including procedures, guidelines, rules, documentation, and Agile-related activities throughout the development process.

3.2 Agile-based Project Success Factors Model with AHP

The AHP chart, as shown in Figure 5, was used to model project success factors derived from the literature review and previous online interviews. The project success criteria were adopted and summarized from various literature sources [10], [11], [12], [25], [26] encompassing factors such as product need, delivery schedule, product quality, consumer satisfaction, and cost. These criteria serve as crucial indicators for assessing the overall success of the project, allowing for a comprehensive evaluation of key aspects that contribute to its achievement

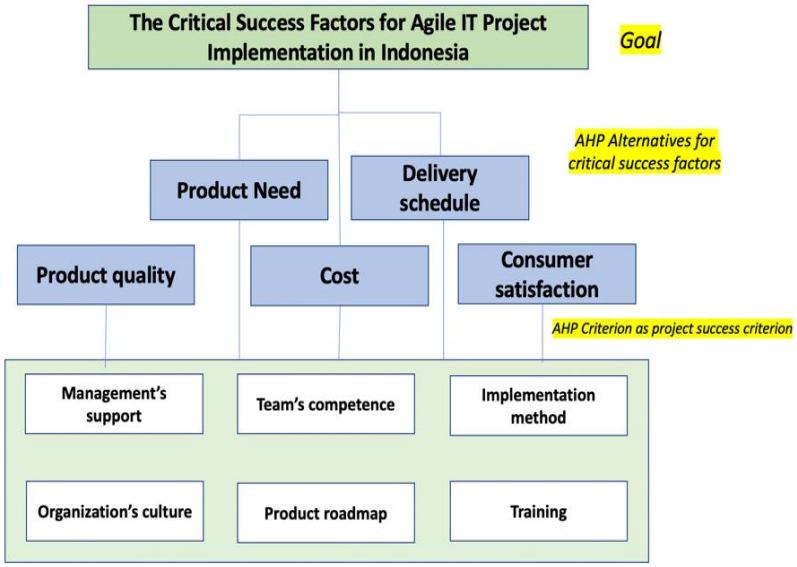

Figure 5. A Model of CSF for Agile project implementation in Indonesia

The AHP model created can assist decision-makers in prioritizing by ranking or assigning values to each criterion or Agile project success factor (CSF). Criteria can be compared through a pairwise comparison process, as exemplified in Table 2. Each criterion is compared one by one with other criteria, and a score is given to indicate the relative importance of one criterion compared to others. This comparison process can be done using supporting tools or manually. The ranking calculation can be performed after the pairwise comparison process for each criterion. The results of the ranking are shown by the weight values, as shown in Table 3, which represents an example ranking in the AHP calculation process. Higher weights indicate a higher ranking compared to other criteria. The results of the AHP calculation obtained from the pairwise comparison process between criteria can generate weights for each criterion. The higher values of these criteria reflect the top-ranking values. In Table 3, the weight values for the delivery schedule are 28.3, product need is 25.2, product quality is 23.3, customer satisfaction is 12.1, while cost is 11.1. These weights are arranged in descending order, indicating that the delivery schedule obtains the highest ranking, followed by product need, product quality, customer satisfaction, and cost.

Table 2. Pairwise comparison for criterions

Comparison	Criteria 1	Criteria 2	Pair-wise comparison ranking
1	Product need	Delivery Schedule	9
2	Product need	Product Quality	5
3	Product need	Cost	3
4	Product need	Consumer satisfaction	7
5	Delivery Schedule	Product Quality	9
6	Delivery Schedule	Cost	5
7	Delivery Schedule	Consumer satisfaction	5
8	Product Quality	Consumer satisfaction	3
9	Product Quality	Consumer satisfaction	5
10	Cost	Consumer satisfaction	7

Table 3. Calculation of weight in AHP

Criteria	Weight	Weight (%)	Rank
Delivery Schedule	0.283	28.3	1
Product need	0.252	25.2	2
Product Quality	0.233	23.3	3
Consumer satisfaction	0.121	12.1	4
Cost	0.111	11.1	5

Based on the AHP diagram in Figure 6, each CSF can also be compared for each criterion. The comparison process for CSFs can be done similarly to the pairwise comparison for criteria. According to the AHP calculation concept [19], rankings of criteria or alternatives (CSFs) can be determined for each existing parameter. The overall ranking based on criteria and CSFs can be calculated using a 4x4 matrix. The calculation process can utilize AHP calculation tools or MS Excel obtained from https://bpmsg.com. With this tool, the process of obtaining weights for comparisons and calculating the Consistency Index (CI) can be obtained. The CI calculation in Analytical Hierarchy Process (AHP) was used to measure the consistency of the pairwise comparison matrix used in the comparison procedure. For CI values less than 10%, this may represent the accuracy of the comparison.

By the above AHP calculation example, organizations have the flexibility to perform AHP calculations tailored to their specific requirements. Calculation of AHP can be done by pairwise comparison against each of the Agile project success criteria or among identified Critical Success Factors (CSFs). This allows organizations to assess the relative importance of various criteria and factors in their decision making. Moreover, the total ranking of CSFs, in conjunction with the existing criteria, can be determined through the AHP model. This enables organizations to prioritize the CSFs based on their significance in contributing to project success. By utilizing the criteria and CSFs identified in this study as a foundation, organizations can tailor them to match their unique organizational needs, goals, and projects.

To collect relevant criteria and CSFs for their particular context, organizations can use different data collection methods such as interviews or focus group discussions (FGD). Through these interactions, input and feedback from key stakeholders, experts, and team members can be gathered. This process fosters a comprehensive understanding of the organization's particular requirements and aids in the identification of the most relevant and impactful CSFs for their Agile projects.

In summary, the AHP methodology provides organizations with a systematic approach to evaluate and prioritize Agile project success criteria and CSFs. By customizing the process according to their needs and engaging in data collection activities, organizations can optimize their decision-making and project management processes, ultimately leading to improved project outcomes and overall success.

4. Conclusion

This study aims to present the Critical Success Factors (CSFs) for the implementation of Agile project management in Indonesia. The identified project success factors are as follows: 1) Management support in Agile project implementation, 2) Competent teams in carrying out project activities, 3) Organizational processes, methods, and procedures as project implementation guidelines, 4) Organizational culture in adapting Agile implementation, 5) Agile training for team members, and 6) Clear product roadmap. To assist organizations in prioritizing the implementation of these CSFs, the AHP model is used to explain and rank them through pairwise comparisons. This approach offers valuable insights for organizations seeking to enhance their Agile project management practices and improve project outcomes.

The main contributions of this research are twofold, including academic and practical aspects. Academically, this study adds value to the existing body of knowledge by presenting a comprehensive review of critical success factors (CSFs) specifically on Agile project implementation. By aggregating information from a variety of reputable sources, this study provides scholars, researchers, and practitioners with a solid background on the key factors that significantly influence success. of Agile projects. On a practical level, the findings of this study provide tangible benefits to organizations by effectively guiding them to prioritize these CSFs. Armed with this knowledge, organizations can make informed decisions and allocate resources strategically, ensuring that critical aspects of Agile project management receive the necessary attention and focus, thereby enhancing the overall success and outcomes of their Agile projects.

This research has limitations in defining critical success factors (CSFs) solely based on literature and expert judgment. While the literature review and expert opinions provide valuable insights and a strong foundation for identifying CSFs, relying solely on these sources may result in overlooking potential CSFs that could be unique to specific organizational contexts. To overcome this limitation, future research could consider incorporating additional data collection methods, such as surveys, interviews with stakeholders, and empirical studies, to gain a more comprehensive understanding of CSFs in diverse settings.

For future research, it is recommended to delve deeper into exploring the relationship between critical success factors (CSFs), organizational strategy, and the adoption of scaled agile projects divert in diverse organizational contexts. This investigation would shed light on how the alignment of CSFs with an organization's strategic objectives can impact the successful implementation of Agile methodologies. Also, check out alternative modeling methods such as ANP (Analytic Network Process), TOPSIS (Order Priority Technique by Similarity to Ideal Solution) and fuzzy logic based AHP that can provide provides a more nuanced and comprehensive understanding of the decision-making processes involved in prioritization.

References

[1] Axelos. (2018). A Guide to AgileSHIFT. TSO (The Stationery Office), part of Williams Le Tag.

[2] McKinsey&Company. (2018). Agile compendium, (October).

[3] PMI. (2017a). PMI's Pulse of the Profession 9TH Global Project Management Survey.

[4] VersionOne. (2019). The 13th annual State of Agile Report - 2018. CollabNe t | VersionOne, 13, 16.

[5] Conboy, K., & Carroll, N. (2019). Implementing Large-Scale Agile Frameworks: Challenges and Recommendations. IEEE Software, 36(2), 44–50. https://doi.org/10.1109/MS.2018.2884865

[6] Dikert, K., Paasivaara, M., & Lassenius, C. (2016). Challenges and success factors for large-scale Agile transformations: A systematic literature review. Journal of Systems and Software, 119, 87–108. https://doi.org/10.1016/j.jss.2016.06.013

[7] Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students. Publisher.

[8] Creswell, J. W. (2017). Research Design_ Qualitative, Quantitative, and Mixed Method Approaches. SAGE Publications.

[9] Sugiyono. (2015). Metode Penelitian Manajemen Pendekatan Kuantitatif Kualitatif Kombinasi Penelitian Tindakan dan Penelitian Evaluasi. Bandung, Indonesia: Penerbit Alfabeta.

[10] PMI. (2017b). A Guide to the Project Management Body of Knowledge, Project Management Institute, Inc.

[11] Axelos. (2018b). Prince2 Agile. United Kingdom for The Stationery Office: The Stationery Office Ltd. Kindle Edition. Retrieved from axelos.com

[12] PMI. (2017c). Agile Practice Guide. Project Management Institute, Inc.

[13] Agilemanifesto.org. (2001). Manifesto for Agile Software Development. Retrieved from https://Agilemanifesto.org/

[14] Scrum.org. (2018). Online Nexus Guide. Retrieved from https://www.scrum.org/resources/online-nexus-guide

[15] Sliger, M. (2011). Agile project management with Scrum. Paper presented at PMI® Global Congress 2011—North America, Dallas, TX. Newtown Square, PA: Project Management Institute.

[16] Aldahmash, A., Gravell, A. M., & Howard, Y. (2017). A Review on the Critical Success Factors of Agile Software Development. In Communications in Computer and Information Science (Vol. 748). Springer.

[17] Misra, S. C., Kumar, V., & Kumar, U. (2010). Identifying some important success factors in adopting Agile software development practices. Journal of Information Technology Management, 21(1), 1-13.

[18] Dudhat, A., & Ali Abbasi, M. . (2021). Discussion of Agile Software Development Methodology and its Relevance to Software Engineering. ADI Journal on Recent Innovation, 3(1), 105–114. https://doi.org/10.34306/ajri.v3i1.536

[19] Saaty, T.L., & Vargas, L.G., (2012) Models, Methods, Concepts & Applications of the Analytic Hierarchy Process Second Edition, Springer.

[20] Raharjo, T., & Purwandari, B., "Critical success factors for project management office: An insight from Indonesia", Third International Conference on Informatics and Computing (ICIC), 2018

[21] Guntur, M., Purwandari, B., Raharjo, T., Solichah, I., and Kumaralalita, L. 2018. Critical success factors for information systems development: A case study in e-government. In ACM International Conference Proceeding Series. DOI= https/doi.org/10.1145/3278252.3278288

[22] Gumay, L, A. B. Purwandi, T. Raharjo, A. Wahyudi, and M. Purwaningsih, Identifying Critical Success Factors for Information Technology Projects with an Analytic Hierarchy Process: A Case of A Telco Company in Indonesia, Asia Pacific Information Technology Conference, 2020.

[23] Wiwin, N., Sunarya, P. A., Azizah, N., Henderi, Arayoga Saka, D., & Ardi. (2023). A Model for Determine Upgrades for MSMEs using Analytical Hierarchy Process. ADI Journal on Recent Innovation, 5(1Sp), 20–32. https://doi.org/10.34306/ajri.v5i1Sp.913

[24] Wiguna, G. G., Darkun, K., & Sulistyadi, K. (2020). SAST & AHP in Determining The Best Strategy of Office Ergonomics Program Improvement to Prevent Risk of Musculoskeletal Disorders At XYZ Company Qatar. ADI Journal on Recent Innovation, 2(1), 7–15. https://doi.org/10.34306/ajri.v2i1.28

[25] Axelos. (2017). Managing Successful Projects with PRINCE2 (6th ed.). London: The Stationery Office.

[26] Dikert, K., Paasivaara, M., & Lassenius, C. (2016). Challenges and success factors for large-scale agile transformations: A systematic literature review. Journal of Systems and Software, 119, 87–108. https://doi.org/10.1016/j.jss.2016.06.013