

Exploring Key Determinants in Implementing Effective Agile Project Management: A Case Study of Indonesian Practices

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Abstract: - This study aims to investigate the perceived importance of customer characteristics, organizational influence, project management methodology, and team challenges on the effectiveness of agile project management implementation in Indonesia. The research employed a survey method involving 300 Agile Project Management practitioners from the Indonesian business sector. Data was collected through questionnaires and analyzed using the Analytical Hierarchy Process (AHP). Research findings indicate that the Team Challenges are the first order of most influential factor in the implementation of Agile Project Management, followed by the Project Management Methodology, Organizational Influence, and Customer Characteristics. This study contributes to the development of research and minimizes the literature gap on Agile Project Management implementation effectiveness in Indonesia. Limitations of this study are the reliance on self-reported data and potential bias in respondents' perceptions. The study found that data consistency was within the acceptable range of <0.3. Its originality lies in its focus on the priority among Customer Characteristics, Organizational Influence, Project Management Methodology (PMM), and Team Challenges in implementing Agile Project Management using AHP. The results contribute to the existing body of knowledge on Agile Project Management and offer insights for future research in this area.

Key-Words: - Agile Project Management, Project Management, Customer Characteristic, Organizational Influence, Project Management Methodology, Team Challenges, Analytical Hierarchy Process.

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1 Introduction

Change occurs continuously and dynamically in the business and organizational environment due to market conditions, technological developments, globalization, the environment, politics, and society, [1]. In today's business world, due to increased disruption, management procedures in organizations and businesses must be fast and agile to address

constantly changing developments and situations, [2]. It leads to dynamic changes in the organization's level as they have to change the strategies, [3]. The development of new technologies generates changes, and organizations must adopt steps such as encouraging agile ways of working, [4]. Agile capabilities provide flexibility to adapt to changes and changing situations, [5].

Agile Project Management (APM) is a methodological framework in project management that was created to deal with uncertainty and change in running projects in various fields and industries, [6]. APM, which tends to be dynamic and agile, has been used in software development projects, [7]. It has had an influence on how to manage projects that have many changes, and are complex and risky, [8]. A study by [9] highlights that internal disputes among project team members or a mismatch between client expectations and project team capabilities are often the causes of obstacles in APM implementation. In addition, businesses often find it difficult to change their structures and procedures to support the collaborative approach driven by APM, [10]. Furthermore, research conducted by [11], shows that the effectiveness of APM depends on a thorough awareness of consumer desires and expectations.

Systematic Literature Review by [12], Related to the effectiveness of agile project management implementation, shows that there are 4 classification categories of factors that affect the effectiveness of agile project management implementation, namely Customer Characteristics, Organizational Influences, Project Management Methodology (PMM), and Team Challenges.

There is still a lack of studies and gaps that can be researched further regarding the challenges and conditions of the Agile Project Management implementation in Indonesia. This paper explores the condition of agile project management practices in various business sectors in Indonesia, based on the gap identification carried out. The study aims to explore the perceived importance of those four categories, namely Customer Characteristics, Organizational Influence, Project Management Methodology (PMM), and Team Challenges, and how those factors influence the effectiveness of agile project management practices in Indonesia's business sector.

2 Literature Review

2.1 Project Management

According to [13], Project management is the application of knowledge, skills, tools, and procedures in a project activity to meet the needs of the project, as stated in the fifth version of the Project Management Body of Knowledge. This means that Project Management includes various methods, principles, and practices for planning, implementing, and supervising projects with the main aim of ensuring success and achieving results

in accordance with predetermined goals, [14].

There are aspects involved in Project Management such as scope management, schedule management, cost management, stakeholder management, and control stakeholder, [15]. There are phases that must be carried out, namely planning, organizing, implementing, monitoring, and closing, [16].

2.2 Agile Project Management

According to [17], Agile Project Management (APM) is an approach to carrying out project management that has the principles of simple, flexible processes and continuous improvement (cost, time, and quality) with a high level of innovation to increase value for clients. "Agile" in this approach can be interpreted as the flexibility to carry out complex and uncertain project management while maintaining high efficiency, [18].

The agile approach encourages iteration and revision in the project cycle in response to changes, [19]. Agile Project Management is a project management method that can provide optimization of Information Technology and Agile Software as a characteristic of the Agile Approach in the Digital Era which is also one of the characteristics that differentiates Traditional Project Management, [20].

In a recent literature review, [12], Analyzes 95 journals about Agile Project Management and the study's findings reveal a total of 677 factors culled from various papers and classified into four distinct categories shows that PMM is a category of factors affecting APM implementation that has the highest point accumulation followed by Team Challenges, Organizational Influence, and Customer Characteristics with point values of 246, 241, 161, and 29 which was also previously stated in a study by [21], Related to the Critical Success Factors category that affects APM.

2.3 Customer Characteristics

The business ecosystem relies on customers, who provide input to ensure product success. By focusing on client demands and preferences, product development projects can be more successful, [22]. For significant user involvement and full-time support in project requirements, [23], Recommend a responsive and rapid method. Agile frameworks encourage change and adaptation, and knowing customer needs improves product development, [24].

Unlike the traditional approach, the agile approach requires continuous customer involvement throughout the project lifecycle, enabling ongoing

feedback, feature prioritization, and development adjustments based on real-time business needs, reducing the risk of incorrect assumptions, [21].

2.4 Organizational Influence

External factors influencing project success include organizational factors from the client's parent company, which affect the project environment and play a crucial role in the project's execution and success, [25]. In a previous study by [26], RBV highlights the need for resource organizational skills to achieve exceptional performance. Organizational performance may also be enhanced by cultivating employees' soft skills and utilizing resilient leadership, [27]. Organizational factors can be related to support from top-level management, organizational culture, project planning level, leadership, vision and mission, monitoring and controlling, as well as change management capabilities in the organization to carry out a project, [21].

The way organizational components are managed greatly influences the success or failure of an initiative, [28]. Organizations should practice working together to learn how to apply both APM and TPM such that the risks associated with using one strategy are offset by using the other, [29]. Leadership, trust, and climate in the organization affect how relationships affect agile project management, [12].

2.5 Project Management Methodology

Project management methodology, project environment, and appropriate project characteristics like technological conditions, development methodology, project complexity, urgency, scale, specification changes, and project criticality all contribute to project success, [21]. Experts argue that the main obstacle to the widespread adoption of Agile is practitioners' ignorance of the methodology, [30]. Traditional project management and agile project management are two project management methodologies that can be described as opposing in character, choosing the right methodology is chosen by adjusting the characteristics and needs of the project being carried out, [31].

Choosing the right project management methodology depends on the business environment or projects' unique characteristics, such as software development projects that require a fast response, which fits the agile project management methodology, [32]. In a study conducted by [12], The PMM category ranks second in Agile Project Management implementation obstacles behind

Customer Characteristics, Organizational Influence, and Team Challenges.

2.6 Team Challenges

Studies by [33], Show that effective teams can create results that far exceed individual capabilities, serving as the foundation for responsive and innovative organizations. Study [34], Found a significant positive relationship between team commitment and agile project success, meaning that in the context of Agile Project Management, team commitment is one of the important pillars for achieving positive results.

High motivation from team members has a positive impact that is in line with Agile principles and values, namely helping to create a work environment that supports the success of Agile development projects, [21]. To achieve Agile Project Management success, it is important to manage conflict within the team because team conflict can cause instability which results in project delays and exceeding the predetermined budget, [35].

3 Methodology

3.1 Introduction

This research was conducted to analyze the relationship between Customer Characteristics, Organizational Influence, Project Management Methodology (PMM), and Team Challenges in Agile Project Management Implementation using the analytical hierarchy process (AHP) method in Indonesia's business sector.

3.2 Analytical Hierarchy Process

Analytical Hierarchy Process (AHP) is a research method discovered by Dr. Thomas Saaty to help make decisions with 3 principles, namely decomposition, comparative judgments, and synthesis of priorities, [36]. This provides a combined or global priority of the element, which in turn is used to weight the local priorities of the elements at the level below compared to each other with that element as the criterion, and so on down to the bottom level, [36].

The use of AHP in this study is to obtain a ratio scale from discrete and continuous pairwise comparisons. The relative importance given to the criteria varies from 1 to 9, Table 1 shows the Saaty relative importance scale.

Table 1. Saaty's of Relative Importance

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored, and its dominance is demonstrated in practice.
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between two adjacent judgments	When compromise is needed

3.3 Research Variable

In this study, the research variables are divided into 2 types of factors, namely first-level factors and second-level sub-factors. Table 2 shows a summary of the factors and sub-factors criteria that become research variables related to Agile project management implementation effectiveness.

Table 2. Criteria indicator of factors and sub-factors

Code	Criteria Indicators	References
C1	Customer Characteristic:	[21], [37], [38], [39]
C2	Organizational Influence	[40], [41], [42], [43], [44], [45]
C3	Project Management Methodology	[21], [29], [30], [37], [41], [43], [44], [45]
C4	Team Challenges	[21], [29], [30], [37], [39], [40], [43], [44], [45]
C11	Customer Involvement	[46], [47]
C12	Customer Satisfaction	[48]
C13	Customer Communicati	[49]
C14	Customer Knowledge	[50]
C21	Culture	[51], [52]
C22	Monitoring and Control	[53], [54]
C23	Structure	[55]
C31	Flexibility	[56]
C32	Development Practice	[57]
C33	Product Ownership	[57]
C34	Teams	[57]
C41	Conflict	[58]
C42	Attitude	[59]
C43	Change	[60]
C44	Time	[61]

Figure 1 shows the basic structure to support the research process using AHP methodology, which is a Hierarchy of Factors Affecting the Effectiveness of Agile Project Management Implementation map that shows the interrelationship of the first level's factors and the second level's sub-factors.

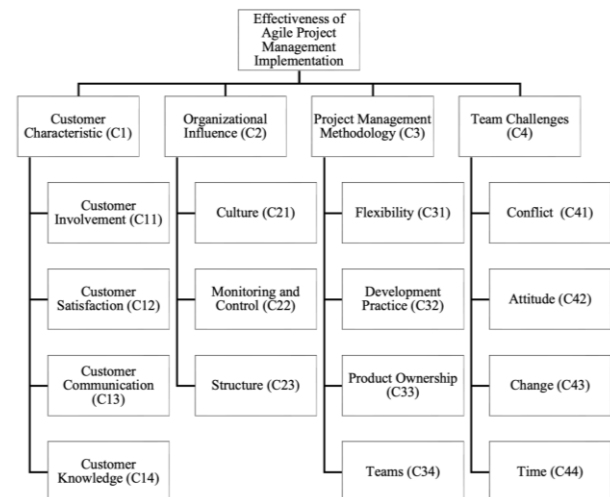


Fig. 1: Hierarchy of factors affecting the Effectiveness of Agile Project Management Implementation

3.4 Respondent Criteria

This survey involved 300 respondents with the criteria of having been involved or currently actively involved in Agile Project Management in the Indonesian business sector.

3.5 Method of Data Collection

Data collection was carried out by distributing questionnaires to 300 practitioners who have experience in Agile Project Management in the Indonesian business sector using online web-based surveys.

3.6 Analysis Method

The analysis used in this research uses the Analytical Hierarchy Process (AHP). The first stage is to conduct pair-wise comparisons for each factor or criterion in each category. In the second stage, the weight of factors or criteria is calculated using the priority aspect matrix of the AHP method to determine the most influential factor according to the heaviest weight in each category. The data is then calculated for consistency using the consistency rate matrix in the third stage to ensure the data is considered consistent and can be used. In this study, the consistency rate used is <0.3 . After obtaining data that is considered consistent from all respondents for each category, the mean value of all consistent data is calculated to determine the final

weighting. Finally, the final weight results are obtained, which show the ranking of the most important criteria or factors that affect the effectiveness of agile project management implementation.

4 Result and Discussion

4.1 Analyzing the Demographic Information

As pointed out in the preceding chapter, 300 respondents took part in the poll, with 140 males and 160 females, for a total of 46.67% male and 53.33% female. Of the 300 respondents, 212 (70.7%) worked full-time, 46 (15.3%) owned a business, and the remaining 42 (14%) worked part-time or freelance. Table 3 shows how the respondents were classified based on their age and job position.

The number of respondents with a consistency rate <0.3 in the first category, namely “Effectiveness of Agile Project Management Implementation” there are 74 consistent respondents, the second category “Customer Characteristics” there are 98 consistent respondents, the third category is “Organizational Influence” there are 136 consistent respondents, the fourth category is “Project Management Methodology” there are 98 consistent respondents, and the fifth category is “Team Challenge” there are 111 consistent respondents.

Table 3. Demographics regarding the age of respondents

Age	18 - 24	25 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	>55
Total	56	101	73	36	24	7	2	1
Percentage	18.7%	33.7%	24.3%	12.0%	8.0%	2.3%	0.7%	0.3%

4.2 Aggregation of AHP Respond

Data from the answers of 300 respondents through questionnaires was then calculated using a pair-wise matrix table in accordance with the factor-level categories in the hierarchy depicted in Figure 1. Table 4 (Appendix) shows a comparison between the first level’s factors (C1-C4), for example in the first row “Customer Characteristics” and in the second column “Organizational Influence” there is the number 7 which shows “Organizational Influence” has a higher priority than “Customer Characteristics”. On the contrary, the “Organizational Influence” row and the “Customer Characteristics” column have a weight of 0.143 which is obtained from $1/7$, indicating that “Customer Characteristics” has a lower priority than

“Organizational Influence”. The value 1 on the diagonal line as shown in the “Customer Characteristics” row and the “Customer Characteristics” column is because they have the same criteria comparison. This calculation method applies to all Pairwise comparison matrices shown of each factor namely the Second level’s sub-factors (Customer Characteristics C11-C14), Second level’s sub-factors (Organizational Influence C21-C23), Second level’s sub-factors (Project Management Methodology C31-C34), and Second level’s sub-factors (Team Challenges C41-C44).

4.3 Calculating the Weights of Factors and Ranking of Factors

After the data is processed with a pairwise matrix, the weights for each category of level 1 factor and level 2 sub-factors are then calculated using the priority aspect matrix. To obtain the priority aspect matrices, each of the values of the pairwise comparison per column is divided by the total of the rows to obtain the normalized value. For example, the normalized value of the cell row “Customer

Characteristics” and column “Customer Characteristics” shown in Table 5 (Appendix) is 0.063 because it is the result of dividing 1 (pairwise comparison value shown in Table 4 in Appendix) by 16 (N: a total of rows. “Customer Characteristics” is shown in Table 4 in Appendix). After the normalized value of each cell is obtained, the weighted average value is calculated by dividing the total normalized values per column by the number of cells per column. For example, the weighting average value of the “Customer Characteristics” columns shown in Table 5 (Appendix) is 0.073 because it is the result of calculating the average of the normalized values in the columns. This calculation method is done in the same way repeatedly to get the weighting average value of each factor namely the Second level’s sub-factors (Customer Characteristics C11-C14), Second level’s sub-factors (Organizational Influence C21-C23), Second level’s sub-factors (Project Management Methodology C31-C34), and Second level’s sub-factors (Team Challenges C41-C44).

4.4 Calculating Consistency Rate

After the normalized value of each cell After collecting the results of computing the weights for each element and sub-factor using the priority aspect matrix, the consistency rate calculation is performed to filter out data that is regarded consistent and suitable for research. To calculate the value of each cell in the consistency rate matrix, multiplication between the factor values in the pair

wise matrix and the weighted average factor value is performed. For example, in Table 7 (Appendix), the value of 0.073 from row "Customer Characteristics" and column "Customer Characteristics" is obtained from multiplying the pair wise value of 1 shown in row "Customer Characteristics" and column "Customer Characteristics" Table 4 (Appendix) with the weighted average value of the Customer Characteristics factor of 0.073. Calculations in the same way are repeated until the matrix is filled in completely. After all the values in the matrix are filled in, the total of each column and the total of each column divided by the weighted average is calculated.

The Maximum Eigen Value (λ_{max}), also known as the eigen value, is calculated by dividing the row sum of the Total/Weighting Average by the number of variables. For example, in Table 7 (Appendix), the λ_{max} value of 4.753 is obtained by dividing the Total/Weighting Average row sum of 19.013 by the number of variables, which is 4. Furthermore, the CI or Consistency Index value is the result of the maximum eigen values the number of variables, then divided by the number of variables minus one.

For example, in Table 7 (Appendix), the CI value of 0.251 is obtained from the λ_{max} value of 4.753 minus the number of variables which is 4, then divided by the variable value minus 1 which is 3. The RI, or Random Index value shown in the Table 6, is also used to quantify consistency. It is the average value of randomly picked corresponding to the number of variables or n as follows:

Table 6. Random Index

n	2	3	4	5	6	7
RI	0	0.58	0.90	1.12	1.24	1.32

The entire calculation process is repeated for all consistency rates of each factor namely the Second level's sub-factors (Customer Characteristics C11-C14), the Second level's sub-factors (Organizational Influence C21-C23), the Second level's sub-factors (Project Management Methodology C31-C34), and Second level's sub-factors (Team Challenges C41-C44).

Furthermore, the CR value, also known as the Consistency Ratio, is a ratio or comparison value of consistent criteria determined by dividing the Consistency Index (CI) by the Random Index Value. The study assesses consistency using $CR < 0.3$. If the CR is less than 0.3, the data hierarchy is consistent and can be used. If the CR is greater than 0.3, the data is considered inconsistent.

4.5 Result of Factors Weight and Ranking Calculation

Figure 2 depicts the hierarchy of factors covered in Chapter 3 (Figure 1), including the weights of all factors and sub-factors. To compute the final weight of each sub-factor, multiply its weight by the weight of its major factor at level 1. For example, the final weight of sub-factor C11 is the weight of C11 multiplied by the weight of C1.

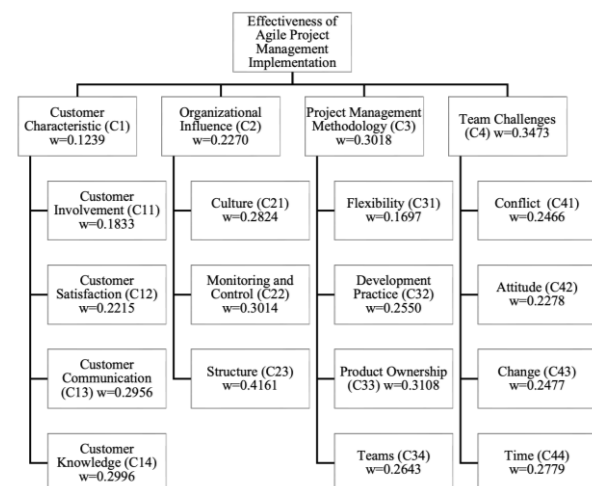


Fig. 2: Hierarchy of factors including their weight

Table 8 (Appendix) shows the average weight value of respondents' consolidated data which is consistent using $CR < 0.3$. The "Factors of Level 1" column shows the names of factors related to the implementation of Agile Project Management. The "Weights of Level 1 Factors" column shows the final weight of each factor at the first level. The "Sub-factors of Level 2" column shows the name of the sub-factors associated with each factor at the first level. The "Local Weight of Second Level Factors" column shows the weight of each sub-factor which is calculated by multiplying the weight of the parent factor by the weight of the sub-factor. The "Final Weight of Second Level Factors" column shows the final weight of each sub-factor which is calculated by multiplying the weight of the sub-factor by the weight of its parent factor.

Table 9 (Appendix) displays the ranking of factors based on their weights, with rank 1 representing the factor with the largest weight and thereafter. The "final weight" column displays the final weight of each of the factors, which is derived by multiplying the sub-factor weight by the parent factor weight at level 1. The "name of the factors" column lists the names of the factors involved in the implementation of agile project management. These factors are ranked in order of weight, with "time" having the most weight and "flexibility" having the

lowest. Table 9 (Appendix) presents the final findings of the prioritization and weighting analysis for every factor that affected the adoption of agile project management.

5 Conclusion

The weight values for each factor and sub-factor in the hierarchy were calculated using the Analytic Hierarchy Process (AHP) approach, and the results are displayed in Figure 2. Based on these findings, the final weight values for Customer Characteristics (C1) are 0.1239, Organizational Influence (C2) is 0.2270, Project Management Methodology (C3) is 0.3018, and Team Challenges (C4) is 0.3473. Therefore, it is known that the Team Challenges (C4) factor is the first-order of most influential factor on the implementation of Agile Project Management, followed by the Project Management Methodology (C3), Organizational Influence (C2), and Customer Characteristic (C1) factors in the following sequence.

Furthermore, the final weight of the level 2 sub-factor is determined by multiplying the local weight of the level 2 factor by the weight of the level 1 factor. As indicated in Table 9 (Appendix), the results are ranked in the order of the criteria with the highest weight, which are thought to be the most significant on the adoption of Agile Project Management. The final weight value of level 2 subfactors indicates which factors have the most weight and are most influential. According to the final weight, the top five factors are Time (C44) at 0.0965, followed by Structure (C23) at 0.0944, Product Ownership (C33) at 0.0938, Change (C48) at 0.0860, and Conflict (C41) at 0.0856. As a result, these five factors have a substantial impact on the implementation of Agile Project Management.

This study has contributed to understanding how various factors such as Customer Characteristics, Organizational Influence, Project Management Methods, and Team Challenges impact the implementation of Agile Project Management (APM) in Indonesia. The research highlights Time, Structure, Product Ownership, Change, and Conflict as the most influential factors in successfully implementing APM. It emphasizes the importance of considering cultural differences and organizational structures in Indonesia when implementing Agile practices.

A limitation of this study is the difficulty in obtaining consistent data from respondents' AHP questionnaire answers. For example, if the respondents mark "Customer Characteristics" as highly important compared to "Organizational

Influence" and "Organizational Influence" as extremely important compared to "PMM", the assessment will be "Customer Characteristics" extremely important rather than "PMM". The questionnaire data from 300 respondents has numerous inconsistent answers, making it challenging to obtain consistent data from respondents with CR <0.1 or <0.2. Therefore, this study employs CR <0.3 to judge data consistency, resulting in more usable data. To enhance the consistency of analysis results using the Analytic Hierarchy Process (AHP) for further research, the study suggests improving the quality of data collected from respondents by providing clear instructions on how to answer AHP-related questions. Additionally, employing other methods like factor analysis is recommended to validate AHP results and enhance result reliability.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the authors used Grammarly in order to improve the readability and language of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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APPENDIX

Table 4. Pair-wise comparison matrices for the first level's factors (C1-C4)

Criteria	Customer Characteristics	Organizational Influence	Project Management Methodology	Team Challenges	Total
Customer Characteristics	1.000	7.000	5.000	3.000	16.000
Organizational Influence	0.143	1.000	5.000	5.000	11.143
Project Management Methodology	0.200	0.200	1.000	1.000	2.400
Team Challenges	0.333	0.200	1.000	1.000	2.533

Table 5. Priority aspect matrices for the first level's factors (C1-C4)

Criteria	Customer Characteristics	Organizational Influence	Project Management Methodology	Team Challenges	Total
Customer Characteristics	0.063	0.438	0.313	0.188	1.000
Organizational Influence	0.013	0.090	0.449	0.449	1.000
Project Management Methodology	0.083	0.083	0.417	0.417	1.000
Team Challenges	0.132	0.079	0.395	0.395	1.000
Weighting Average	0.073	0.172	0.393	0.362	1.000

Table 7. Consistency rate matrices for the first level's factors (C1-C4)

Criteria	Customer Characteristics	Organizational Influence	Project Management Methodology	Team Challenges	
Customer Characteristics	0.073	0.508	0.363	0.218	
Organizational Influence	0.025	0.172	0.862	0.862	
Project Management Methodology	0.079	0.079	0.393	0.393	
Team Challenges	0.121	0.072	0.362	0.362	
Total	0.296	0.831	1.980	1.835	λ_{maks}
Total/Weighting Average	4.086	4.822	5.036	5.069	4.753
Consistency Index	0.251				
Random Index	0.9				
Consistency Rate	0.279				

Table 8. Summarized weights of first and second-level factors

Factors of level 1	Weights of level 1 factors	Sub-factors of level 2	Local weight of second-level factors	Final weight of second-level factors
C1	0.1239	C11	0.1833	0.0227
		C12	0.2215	0.0275
		C13	0.2956	0.0366
		C14	0.2996	0.0371
C2	0.2270	C21	0.2824	0.0641
		C22	0.3014	0.0684
		C23	0.4161	0.0944
C3	0.3018	C31	0.1697	0.0512
		C32	0.2550	0.0770
		C33	0.3109	0.0938
		C34	0.2643	0.0798
C4	0.3473	C41	0.2466	0.0856
		C42	0.2278	0.0791
		C43	0.2477	0.0860
		C44	0.2779	0.0965

Table 9. The final ranking of factors affecting the Effectiveness of Agile Project Management Implementation

Ranking	Label	Final weight	Name of the factors
1	C44	0.0965	Time
2	C23	0.0944	Structure
3	C33	0.0938	Product Ownership
4	C43	0.0860	Change
5	C41	0.0856	Conflict
6	C34	0.0798	Teams
7	C42	0.0791	Attitude
8	C32	0.0770	Development practice
9	C22	0.0684	Monitoring and Control
10	C21	0.0641	Culture
11	C31	0.0512	Flexibility
12	C14	0.0371	Customer Knowledge
13	C13	0.0366	Customer Communication
14	C12	0.0275	Customer Satisfaction
15	C11	0.0227	Customer Knowledge