

## Web-Based Employee Performance Assessment Application with SMART method: An Agile Approach in the Context of the Smartphone Market

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### ABSTRACT

Employee performance is essential in determining the company's sustainability, so company leaders must pay attention to employee performance. Many subjective factors determine employee performance, so performance evaluations are sometimes unfair. One of the companies developing in Indonesia is a smartphone sales company, CV Jala Kencana. As the company develops and the number of employees increases, problems arise in assessing employee performance that have yet to be measurable. So that employee performance assessments can be more objective, a decision support system application is needed that can help assess employee performance. The Agile SDLC method is used in designing website-based employee performance assessment applications. Then, for the employee performance assessment feature, the Simple Multi-Attribute Rating Technique (SMART) method is used, and SHA512 encryption is applied to the employee performance assessment database, which cannot be manipulated. This research produces a web-based employee performance assessment application with features to assess employee performance objectively based on predetermined criteria.

### Keywords:

Agile, Decision Support System, Employee Performance Assessment, SMART, Web-based

### Kata Kunci:

Agile, Decision Support System, Employee Performance Assessment, SMART, Web-based

### ABSTRAK

Kinerja karyawan berperan penting dalam menentukan keberlangsungan perusahaan, sehingga pimpinan perusahaan harus memperhatikan kinerja karyawan. Banyak faktor subjektif untuk mengetahui kinerja karyawan, sehingga penilaian kinerja terkadang tidak adil. Salah satu perusahaan yang berkembang di Indonesia adalah perusahaan penjualan *smartphone* yaitu CV Jala Kencana. Seiring dengan perkembangan perusahaan dan jumlah karyawan yang semakin bertambah, timbul permasalahan dalam penilaian kinerja karyawan yang belum terukur. Agar penilaian kinerja karyawan dapat lebih objektif maka diperlukan suatu aplikasi sistem pendukung keputusan yang dapat membantu menilai kinerja karyawan. Metode *Agile* SDLC digunakan dalam perancangan aplikasi penilaian kinerja karyawan berbasis website. Kemudian, untuk fitur penilaian kinerja karyawan digunakan metode *Simple Multi-Attribute Rating Technique* (SMART), dan penerapan enkripsi SHA512 pada database penilaian kinerja karyawan yang tidak dapat dimanipulasi. Penelitian ini menghasilkan aplikasi penilaian kinerja karyawan berbasis *web* dengan fitur untuk menilai kinerja karyawan secara objektif berdasarkan kriteria yang telah ditentukan.

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## INTRODUCTION

Employee performance is essential in determining the success of a company or agency (Helal, 2022). For this reason, companies need to strive to improve employee performance by using a reward system for employees with good performance, such as salary increases, promotions and so on (Asriani et al., 2020). Even so, problems often occur in the performance appraisal process, especially when the appraisal does not occur correctly due to significant quantity problems or favouritism from higher-ups (subjective). This can cause a risk of decreasing morale for other employees and can be dangerous for the company (Wilson, 2019). Performance appraisals must be accompanied by appropriate methods to avoid making inappropriate decisions with more human factors or subjectivity than objectivity (Baidawi, 2018). In overcoming this, it is necessary to have a decision support system in assessing employee performance (Sadewa, 2017; Suryasari et al., 2022).

CV Jala Kencana is a company that runs a sales business in the field of cellphone sales with hundreds of employees spread across several stores with five divisions, one of which is the sales division, which will be the focus of this research. Until now, CV Jala Kencana itself has used assessments based on presence and other subjective factors. This subjectivity in employee assessments can lead to risks on the performance appraisal side, especially as the company continues to grow and may increase the number of employees (da Silva et al., 2021; Lillis et al., 2021). Subjective employee assessments have the potential to be a problem for company development, especially in the field of Human Resources. Therefore, this research will focus on the scope of employee assessment to make it more objective through an employment assessment application.

Previous studies have produced computer-based decision support systems for employee performance assessment (Ramadhan et al., 2023). In this research, the Simple Multi-Attribute Rating Technique (SMART) method is used for assessment based on predetermined criteria and weights. Then, SHA512 encryption increases security in Database Management Systems (DBMS). In the final stage of this research, testing was carried out on the web-based application using the User Acceptance Test (UAT) method to test the application's functionality (Afrianto et al., 2021).

## RESEARCH METHODS

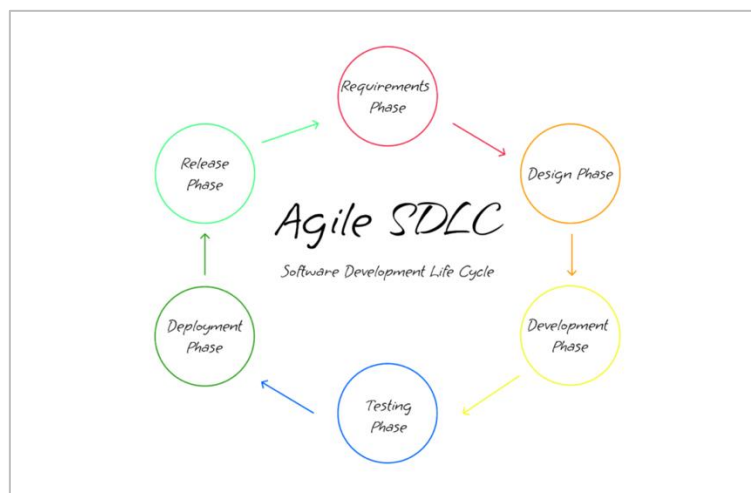


Figure 1. Agile SDLC phase

This research uses the Agile method as a System Development Life Cycle (SDLC). Agile methodology can carry out short-term system development by requiring rapid adaptation from developers to changes in any form (Dennis et al., 2020). Apart from that, this Agile method also provides more involvement to users by asking for feedback from application users, which is in line with the use of decision support systems where the creation of decision support systems depends on the users' needs. The agile method is also continuous, where applications with functionality can be developed over time, with new versions released per iteration according to the needs of

decision support system users (Al-Saqqa et al., 2020). Even so, the Agile method as an SDLC does not have a testing or application testing section, so to test the application, Black Box Testing will be used as a testing method after the application is finished being built (Lestari, 2019). Application users, namely Supervisors, will use Black Box Testing to see whether the application is running according to the company's needs without knowing the inside of the application (T. & Hidayat, 2018).

For the employee performance assessment process, the Simple Multi-Attribute Rating Technique (SMART) method will be used using five main assessment criteria: understanding of the material, sales, presence, work discipline and teamwork. The SMART method was chosen as the assessment method because of its simplicity, whereas SMART for the calculation and implementation process is much faster than other methods because it is simpler (Supratman, 2021). Besides, SMART is more suitable for qualitative than quantitative assessments, following research on employee performance assessment, where the criteria are primarily included in qualitative assessments. The calculation model used by the SMART method is as follows (Asegaff et al., 2022):

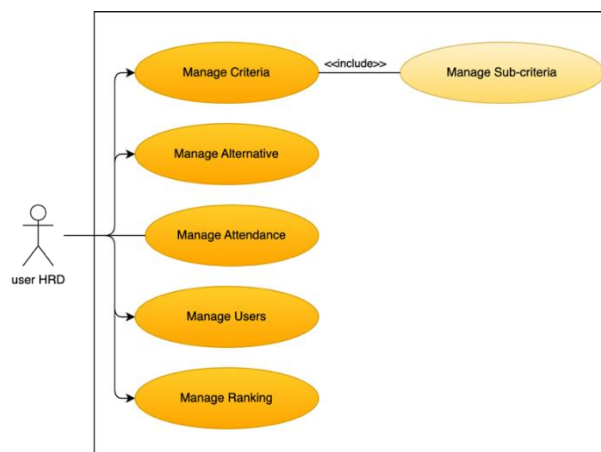
$$U(ai) = \sum_{j=1}^w W_j U_i(ai) \quad (1)$$

The following is a description of each attribute in the calculation model:

- $W_j$  = Weighting value of the  $j$ -th criterion and  $K$ - Criteria  
 $U(ai)$  = Utility value of the 1<sup>st</sup> criterion for the  $i$ <sup>th</sup> criterion  
 $i$  = 1,2, ..... n

From a security perspective, SHA512 will be used to replace the default encryption on the MySQL database used in the research, namely SHA1, where SHA512 can produce a hash value that is longer than SHA1 with a hash length of 512 bits and apart from that, SHA512 is also resistant to collision attacks (Santoso et al., 2019).

## RESULTS AND DISCUSSION



**Figure 2. Use case diagram of Web-based Employee Assessment application.**

In the first stage (requirements phase) of designing a website-based employee assessment application, an interview was conducted with the Human Resource Development Manager of CV, Jala Kencana, as a resource person to obtain information regarding the obstacles faced in the employee performance assessment process. Next, from the results of processing the constraint information, proceed to the second stage, namely the design phase using UML to produce a use case diagram, which helps know the primary function of the application to be created.

There are five use cases in the use case diagram shown in Figure 2, namely managing criteria, managing alternatives, managing attendance, managing users, and managing ranking. The employee assessment application users are the HRD Manager of CV Jala Kencana. To

determine the criteria, users can set them through the "manage sub-criteria" feature, which is included in the "manage criteria" use case. Next, in the development phase, the third stage in the Agile SDLC method, the SMART method, is implemented, which functions to produce employee assessment calculations using the criteria to be determined. The following is Table 1, which displays the data used in the research in tabular form for calculations using the SMART method to determine the best alternative:

**Table 1. Weight and criteria on SMART implementation**

No	Criteria	Weight score	Weight normalization
1	Product knowledge (C1)	15%	0.15
2	Sales achievement (C2)	25%	0.25
3	Attendance (C3)	25%	0.25
4	Work discipline (C4)	20%	0.20
5	Teamwork (C5)	15%	0.15

**Table 2. Table Sub-criteria score**

No	Sub-criteria	Score
1	5 (Very good)	100
2	4 (Good)	80
3	3 (Enough)	60
4	2 (Poor)	40
5	1 (Very poor)	20

**Table 3. Sub-criteria definition**

Criteria	Sub-criteria	Score
Product knowledge (C1)	Do not understand at all	1
	Difficulty in explaining	2
	Understand the basics	3
	Understands well and can answer questions	4
	Understand the whole and explain the advantages of the product	5
Sales achievement (C2)	<=10 per month	1
	20-30 per month	2
	40-50 per month	3
	60-70 per month	4
	>100 per month	5
Attendance (C3)	<17 days	1
	17-19 days	2
	20	3
	21-23	4
	24	5
Work discipline (C4)	Never on time	1
	Rarely on time	2
	Arrive on time	3
	Arrive on time and leave on time	4
	Arrive on time, rest on time, and leave on time	5
Teamwork (C5)	Does not coordinate with other employees	1
	Lack of coordination with other employees	2
	Just coordinate with other employees	3
	Coordinate well	4
	Coordinated very well without any problems	5

**Table 4. Properness score**

No	Grade	Total Score
1	Very worthy	>= 80
2	Worthy	>= 55
3	In Consideration	>= 35
4	Not worthy	< 35

Table 1 shows the weights and criteria applied using the SMART method. There are five criteria, namely: Product knowledge (C1), Sales achievement (C2), Attendance (C3), Work discipline (C4), and Teamwork (C5), with weights that have been determined according to their portions in Table 1. Next, Table 2 and Table 3 explained the sub-criteria score and definition to clarify the score for each existing sub-criteria. Then, in Table 4, the appropriateness score for employee assessment is described. In the development phase, apart from implementing the Simple Multi-Attribute Rating Technique (SMART) method in a website-based application, a website user interface was also designed, which can be used to input employee assessment criteria, determine criteria, sub-criteria, weights, and a dashboard of employee assessment results. The following are several views of the website-based application user interface that has been created:

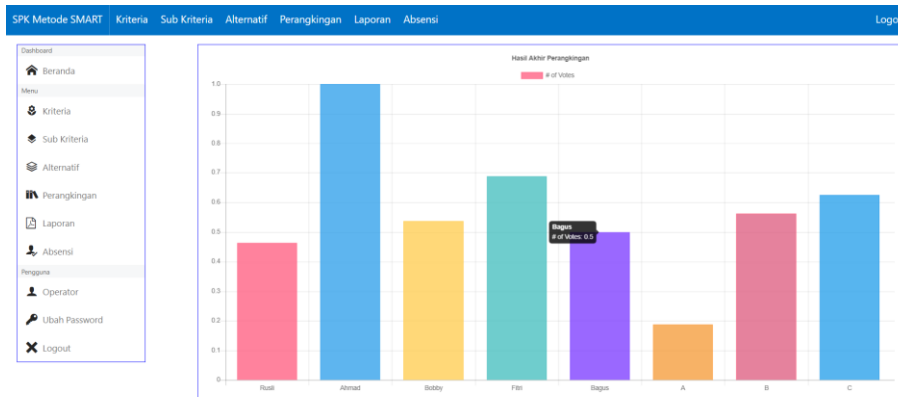


Figure 3. User interface dashboard

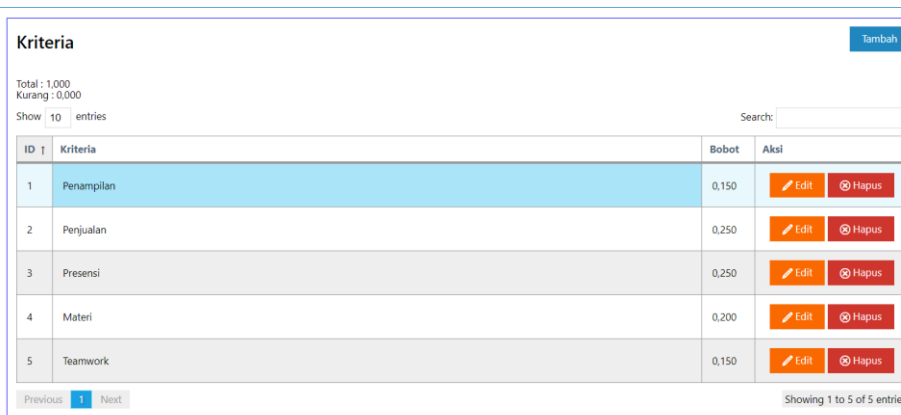


Figure 4. Manage criteria user interface.

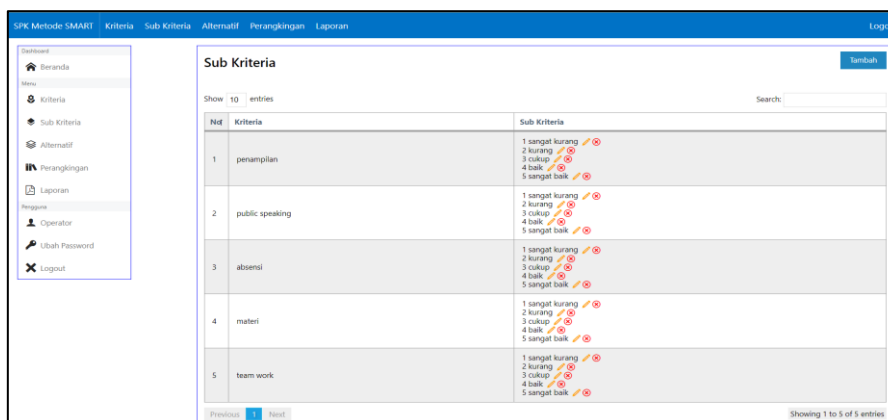


Figure 5. Manage sub-criteria user interface.

The dashboard user interface in Figure 3 shows the ranking results of employees who work at CV Jala Kencana. The ranking is displayed using a bar chart as a visualization to make it easier

to see employee performance rankings. Apart from that, Figures 4-9 also show several user interfaces that users can use to manage Criteria, Sub-criteria, Attendance, and Ranking. The user interface designed in this website-based application uses buttons with contrasting colors to make it easier for users to use. This user interface can be accessed on a limited basis via localhost.

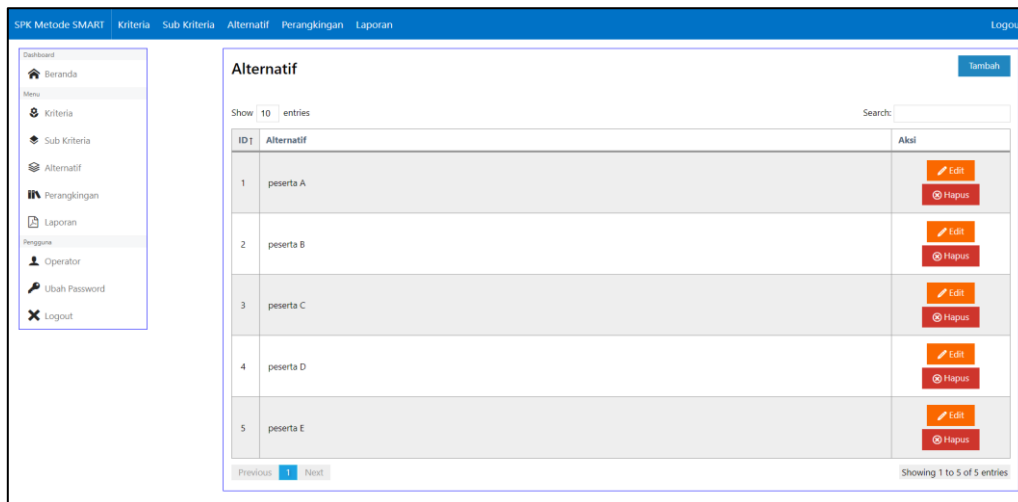


Figure 6. Manage alternative user interface.

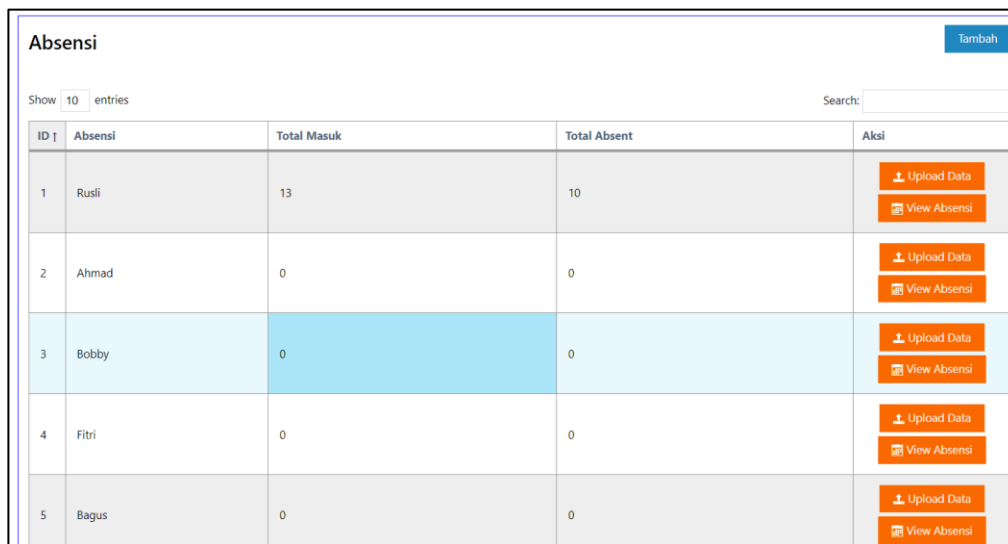


Figure 7. Manage attendance of employee.

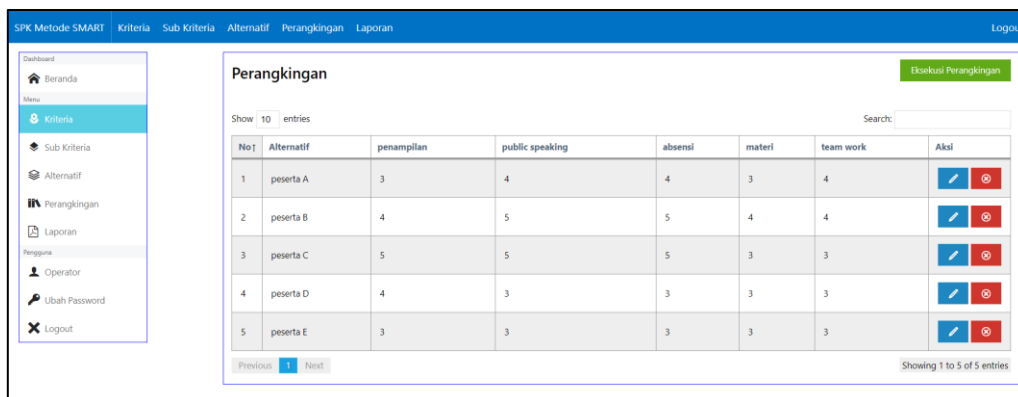


Figure 8. Ranking of the employee

The user interface in Figures 8 and 9 displays the results of employee performance rankings using the SMART method in website-based applications. After the third phase (development phase) was successfully carried out, the application was tested using the User Acceptance Test (UAT) method in the testing phase, the fourth phase of implementing Agile SDLC. Testing is

carried out on several features (Criteria testing, alternative testing, attendance testing, and raking testing) to ensure their function runs according to the requirements that have been created. The following tables from Table 5-8 are the test results carried out by users (HRD Managers and staff) for each feature in the application.

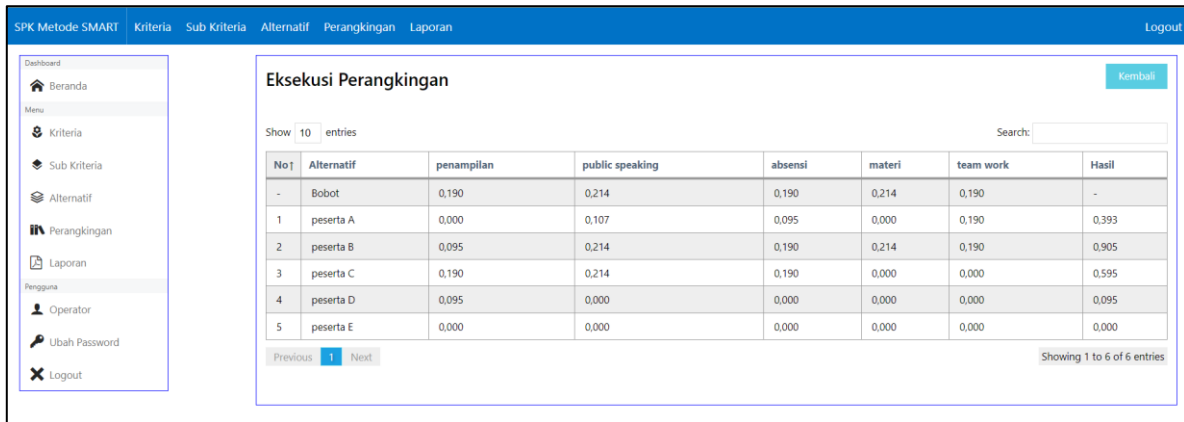


Figure 9. Ranking results of the employee

Table 5 is a criteria test carried out by the HRD Manager to test the criteria management function in the application. It is declared accepted from the input and output results, which means it is in accordance with the HRD Manager's needs. Then, in Table 6, alternative testing is carried out to test several other processes, such as adding alternatives, editing new data, deleting data, and so on. Likewise, Table 7 and Table 8 test employees' attendance features and employees' ranking.

Table 5. Criteria testing

Input	Expected Output	Observed	Conclusion
<i>Criteria testing on valid case</i>			
Add new criteria by entering the correct name and the correct number of weights and not exceeding 100%.	The system has successfully saved the criteria and their new weights.	The process of saving the criteria and weights is successful and displayed on the criteria page and other criteria.	(√) Accepted ( ) Rejected
<i>Criteria testing on invalid test case</i>			
Enter criteria with a weight value that makes the total weight above 100%.	The system will give a popup message that the maximum total weight is 100% and return to the start page without saving the criteria and weight.	The saving process is unsuccessful, and the system displays a popup message regarding the maximum weight.	(√) Accepted ( ) Rejected

Table 6. Alternative testing

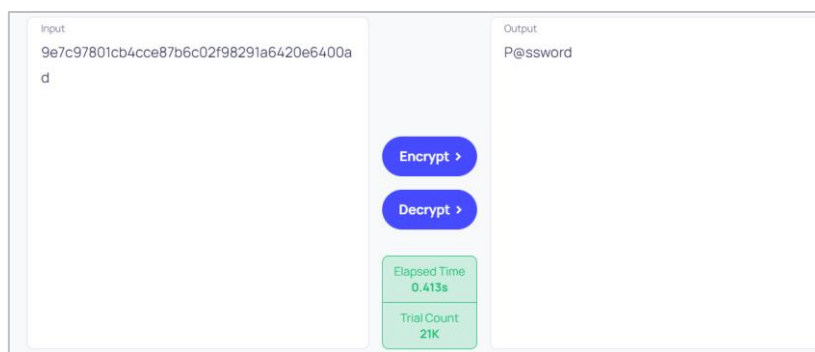
Input	Expected Output	Observed	Conclusion
<i>Alternative testing on correct data</i>			
Add new alternative values, edit the new data, and delete it.	The system can store alternative data, change and save it, and delete it from the database.	The CRUD process runs well until the newly created alternative value is deleted again.	(√) Accepted ( ) Rejected
<i>Alternative testing on incorrect data</i>			
Add a new alternative value with numbers that are not filled in, then immediately press the submit button.	The system will reject saving and return to the initial alternative page.	The saving process is unsuccessful and returns to the alternative page.	(√) Accepted ( ) Rejected

**Table 7. Attendance testing**

Input	Expected Output	Observed	Conclusion
<i>Attendance testing on correct data</i>			
Uploading attendance data files in the correct format.	The system calculates the number of attendance and absences based on the data in the file and displays them in green and red on the calendar.	Uploading the file is successful, and the system displays the number of attendance and absences from the alternatives for which the data is entered. The calendar also displays precise data.	(√) Accepted ( ) Rejected
<i>Attendance testing on incorrect data</i>			
Uploading a file in a different format to the example provided by the application.	The system will still accept it, but the results will not be displayed because it cannot detect the data in the file.	The upload process is successful, but the total attendance, presence columns, and calendar remain the same.	(√) Accepted ( ) Rejected

**Table 8. Ranking testing**

Input	Expected Output	Observed	Conclusion
<i>Ranking testing on correct data</i>			
Enter sub-criteria for each existing criterion for the two alternatives. The first alternative with all sub-criteria values is 1, and the second is 2.	The system can calculate employee performance scores based on the input sub-criteria, and the final score for alternative 2 is more significant than alternative 1.	The system has succeeded in calculating the final score for employee performance, and the performance score for Alternative 2 is more significant than Alternative 1.	(√) Accepted ( ) Rejected
<i>Ranking testing on incorrect data</i>			
Do not set a sub-criteria value for the newly created alternative and immediately press execution ranking.	The system will provide a default sub-criteria value of 1 for each criterion, and the ranking execution can continue.	Ranking execution continues, filling the alternative with a default value of 1 for each criterion.	(√) Accepted ( ) Rejected

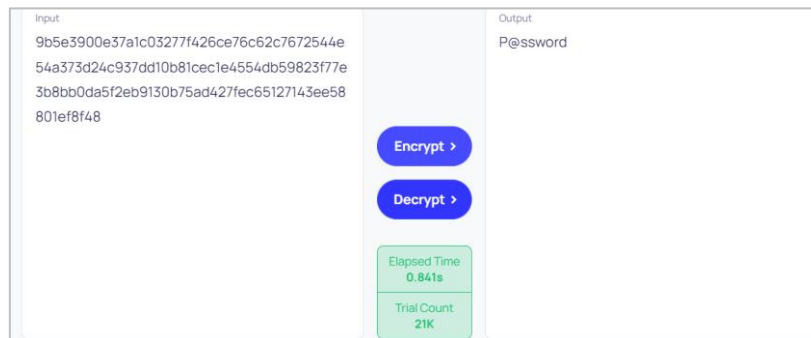


**Figure 10. Decrypt time processing using SHA-1**

Apart from testing application functionality using the UAT method, comparative testing of SHA-512 and SHA1 hashing on user passwords was also carried out. SHA-512 hashing in the DBMS is done to increase user password security. Time comparisons were made for the decrypt activity of passwords using SHA512 hash encryption and the default hash encryption for MySQL, namely SHA1 hash encryption. The tool used is from the website <https://10015.io/tools/> where



the time required to decrypt the two encryptions will be compared. The following are the results obtained in the decrypt process using the decrypt tool on the website (the password value for both cases is the same) in Figure 10.



**Figure 11. Decrypt time processing using SHA-512**

Based on the decrypt time test shown in Figures 10 and 11, it was found that the decryption process for the two SHA-1 and SHA-512 hashes had different time differences. SHA-1 takes 0.413 seconds, while SHA-512 takes longer, namely 0.841 seconds. The decrypt process on SHA-512 takes almost twice as long as SHA-1 for simple text. This comparison of decryption based on time proves that SHA-512 requires a slower time, so it is relatively better at maintaining data security in the database than SHA-1, which is faster to decrypt.

## CONCLUSION

### Conclusion

This research has produced a website-based application to assess employee performance using the Agile SDLC method. The user can set weights and criteria, and assessments using the SMART method are running correctly in the application to make employee performance assessment results more objective. The implementation of SHA512 in the DBMS resulted in better data encryption performance than the default encryption in the DBMS. Based on the UAT testing results, all the application features can run according to user needs.

### Recommendation

Even though a website-based application for assessing employee performance has been successfully created and used, there are still several limitations in this research, which provide suggestions for future research. It is recommended that application development be hosted, and domains be accessed online anywhere and anytime. Then, develop the User Interface to make it more user-friendly and improve the User Experience.

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