

# **APPLICATION OF 360-DEGREE EMPLOYEE ASSESSMENT SYSTEM**

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## **ABSTRACT**

360-degree assessment system is a method to evaluate employee's performance based on the observation from his or her supervisor, peers, and subordinates. Implementations of 360-degree appraisal systems are often difficult from technical standpoint as it involves the gathering and processing a large amount of data. A computer software to assist this process would benefits organizations to implement 360-degree appraisal without being burdened by its complexities.

A 360-degree software should properly translate a conventional 360-degree assessment process into a computerized process. This application should be able to maintain data history integrity, assure evaluator's confidentiality, and output accurate reports.

Points covered in this paper include methods for freezing historic data, weighting evaluations, and assuring evaluator's confidentiality. This application was developed on web platform using PHP, MySQL, and patTemplate.

Keywords: Computerized 360-Degree Assessment, Web-Based Application, Historical Data Freezing, PIN Based Login, PHP, MySQL

## **1. Preface**

Performance appraisal is a periodic process conducted by organizations to evaluate employee's performance. Information obtained during this process is used to provide feedbacks and career development for their employees. It is also used as the basis to set organizational targets and standards.

360-degree assessment, also known as multi-rater feedback, is conducted by gathering feedbacks of employees' behaviors based on the evaluations provided by their supervisor, peers, and subordinates. The large magnitude of data to be gathered and evaluated in this process often hindered the implementation of 360-degree assessment in organizations. Thus, a computer software is needed to reduce the difficulties of gathering and managing feedback data.

This software is designed and developed by adapting the common business process under the supervision of CV. Celos Indonesia. After the completion of this 360-degree

assessment software, a more widespread usage of this system would improve employees' effectiveness as well as higher work satisfaction.

## **2. Literature Review**

A known method for multi rater feedback that has recently gained attentions is the 360-degree assessments, where every individual who are related to an employee contributed to his/her evaluation. This may include supervisor, upper management, coworker, internal customer, external customer, supplier, etc. The purpose of this approach is to evaluate employee's performance based on multiple observation obtained from parties who have directly observed his or her performance and behavior.

According to Bernardin and Russel (1998), a 360-degree evaluation offers some advantageous benefits. The method enables managers to obtain employees' behavioral information from many viewpoints, which would be impossible to be acquired from own observation. This provides a wider range of performance and behavior information to the managers.

Evaluations from multiple viewpoints would help to simplify and reduce organization's structure, because it assists managers to lead greater number of employees. The multi rater system will also lessen managers' task to gather employees' performance and behavior. This approach is compatible with the recent trend to build market-oriented business, which suggests the participation of external and internal customer to assess employee's performance.

This method is also beneficial for the employees because the evaluation is relevant to the work needs, and the feedbacks could be used directly as the basis for self-development and target setting.

Bernardin and Russel (1998) suggest that this method would be disadvantageous due to its proneness to mistakes during the evaluation process, which will result in contradictory result. The large amount of data and its complex nature could be very laborious and costly to conduct. This would burden the manager to observe the result as well as analyzing it to produce desirable report.

360-degree have been applied in major companies, such as FedEx, Verizon, Daimler-Chrysler, DuPont, Levi Strauss, Hasbro, and UPS.

### **3. Design**

#### **3.1. Flow Design**

An observation of assessments carried out by Celos deduced that a manually conducted 360-degrees assessment consists of the following steps:

1. Preparation Stage
  - a. Designing questionnaires' instruments
  - b. Producing a list of employees to be assessed
  - c. Creating questionnaires
  - d. Printing questionnaires
  - e. Reproducing questionnaires
  - f. Determining evaluator for each employees
2. Evaluation Stage
  - a. Distributing questionnaires
  - b. Collecting questionnaires
  - c. Reviewing responses' validity
3. Reporting Stage
  - a. Calculating scored for every question, from every reviewer of every employee.
  - b. Producing reports

Since a computerized assessment will replace Celos' manual process, a 360-degrees assessment software should translate the manual process entirely and at the same time improve its efficiency by transferring its complexity to computers.

A primary requirement for this software is evaluator's weighting. This requirement is apparent as some organizations would prefer that evaluations from employee's supervisors to have more influence than evaluations from his or her subordinates. For example, scores from a supervisor weighs three times more than scores from subordinates. The diverse variety of weighting policies on most organization requires 360-degree assessment system to be easily customized. Our 360-assessment system stores weighting values on assessment forms for every role, namely supervisor, peer, and subordinate.

Another notable requirement acquired during analysis is the ability to maintain historical data, which includes employee's reviewers, evaluation weights, and questionnaire contents of every assessment that was conducted in the past. A solution for this requirement is by storing data from every assessment stages (preparation, evaluation, reporting) into separate

chambers. This ensures that any change of data on one stage does not affect the other stage, as they are located on different chambers.

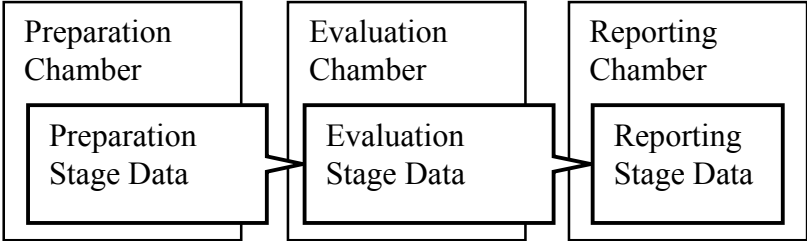


Figure 1. Separation of data in chambers

Ward (1995) suggests that during 360-degree assessment, employees may feel uncomfortable evaluating their colleagues’ behavior because the fear of receiving negative reaction if their evaluation were unexpectedly divulged. Thus, to ensure evaluator’s confidentiality, the software implemented number based login identification, which will be referred as PIN or personal identification number.

PIN identification consists of series of numbers, which is regenerated on every new evaluation session. This will guarantee a unique new identification in every evaluation and thus improve evaluator’s confidentiality.

The last step in this process requires the software to process evaluation data into reports. Employee’s score is calculated by averaging weighted score of every response. The following formula was used to calculate scores:

$$SP = \frac{\sum_{i=1}^n s_i \times b_i}{\sum_{i=1}^n b_i}$$

- SP : employee evaluation score
- s : score
- b : evaluator score’s weight
- n : number of evaluators

The software is also required to generate yearly report which sums several session score reports into one report.

### 3.2. Software Roles

During software analysis, three roles which will take part in the 360-degree assessment system was identified as follows: operator, evaluator, and executive. Operator is the human resource staff in the destined organization responsible for managing and supervising assessment process. Evaluator is any employee, who will provide evaluations of their colleagues. Executive is the organization's top management, which will utilize assessment reports.

Our observation concluded that that every role does not share the same business process, and therefore the software is divided into three sub-systems with distinct objectives. These sub-systems are named after their corresponding roles: Operator, Evaluator, and Executive sub-systems.

### 3.3. Operator's Workflow

Before conducting a 360-assessment, employee's names, position, and divisions are required to be inserted into the software. After this process is completed, operator continues to insert assessment instruments (consist of the question, options, and option's weights), which will be placed on a questionnaire. Then, the operator will copy the questionnaire to match the number of employees' relations. On common circumstances, three questionnaire copies are sufficient for supervisor, peer, and subordinate roles. Afterwards, operator needs to assign which employees will rate specific employee as well as assigning their relationship, whether he or she is the supervisor, peer, or subordinate.

Upon the completion of preparations steps, operator may start the assessment session and generate new PIN as login identification. Operator will need to print these PINs and distribute them to the evaluators in the organization. The progress of responses received during session's run could be observed through the monitor page (Figure 2).



**Figure 2. Assessment Session Management**

After the required responses have been collected to the software, the operator will stop the session to disable any further input. Then the operator may generate evaluation report for

further assessment. An option for exporting to Microsoft Excel format is available to enable analysis on third party software.

### 3.4. Evaluator’s Workflow

Any evaluator will start the process by logging in to the system by entering PIN provided by the operator (Figure 3).

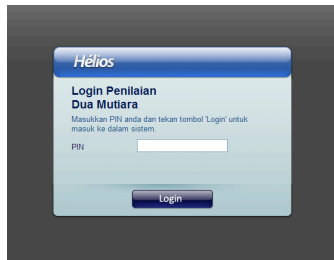


Figure 3. Login page

After the evaluator has been logged into the system, the evaluator will be asked to agree or disagree on the evaluation agreement. If the evaluator pressed the “Agree” button, he or she will be directed to the guide page. Evaluators need to press the “Start” button to begin the assessment process.

On the evaluation page, evaluators start entering his or her observation of the behavior of employees he or she needs to assess. On the left side is the list of employees that needs to be evaluated, and on the right side shows the assessment indicator (Figure 4). While the number of instrument that may be used is unlimited, Celos normally use 4 to 6 instruments.

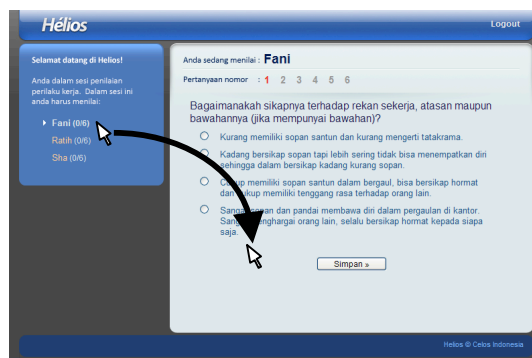


Figure 4. Evaluation Page

To enter his or her evaluation, evaluator clicks the most suitable option, and click “Save” to store his input and proceed to the next instrument. This process is repeated until the evaluator reached the final instrument from the last employee. Commonly, an evaluators are only required to evaluate 3-6 employees.

Evaluators may log out the system at any time, and logged back by using the given PIN.

When the evaluator reached the final page and pressed “Save”, he or she will be directed to the confirmation page. The software will check whether the evaluator has responded every instrument. If the evaluator missed one or more instrument, the software will ask the evaluator to recheck his or her responses. If the evaluator has responded all instruments, the software will be directed to the finalization page.

At the finalization page, the evaluator needs to press the “Finalize” button to close his assessment. After this, the evaluator’s PIN will be reset and he or she will be unable to log in to the system until a new session is started.

### 3.5. Executive Workflow

Managers start accessing the software by logging into the executive system. This system offers two kinds of reports, session reports and yearly reports.

NO	NAMA	NIP	#14	#16	#18	#20	#22	#24	TOTAL	PERSENTASE
1	Fani Manajer, ..	1	3.50	3.00	4.00	4.00	4.00	3.00	21.50	89.58%
2	Rath Staf, Administrasi dan Keuangan, Administrasi	5	3.40	3.60	4.00	3.60	3.00	3.00	20.60	85.83%
3	Sha Staf, Administrasi dan Keuangan, Administrasi	6	3.00	3.00	3.00	3.00	3.00	3.40	18.40	76.67%
4	Wahyu Kadiv, Administrasi dan Keuangan, Administrasi	2	3.29	3.00	3.43	3.86	3.57	3.43	20.58	85.75%

Figure 5. Session Report page

In the “Session Report Page” (Figure 5) managers will be able to access employees’ scores as well as exporting the scores to Microsoft Excel format. A session report consists of employee’s scores for every instrument, as well as the total score. The “Yearly Reports” offers the sum of employees’ total scores for every assessment conducted during the year.

## 4. Development

The application was developed based on the analysis and design that have been conducted. Programming technologies, such as MySQL relational database, PHP, and patTemplate was utilized for the 360-degree assessment system.

MySQL is an open source relational database management system (RDBMS) owned by Oracle Corporation released under GPL (GNU Public License). It offers multi-threaded and

multi-user database system and have been used by well known websites such as Facebook<sup>1</sup>, Google, and YouTube<sup>2</sup>.

PHP (*PHP: Hypertext Preprocessor*), is an popular open source scripting language. It has been installed on 20 million domains and 1 million web server. In terms of syntax, PHP shares most similarity to C, Java, and Perl.

patTemplate is a PHP templating engine developed by Stephan Schmidt. Templating engine allows the separation of HTML code with PHP code thus enable better code management.

#### **4.1. Freezing Historical Data**

To ensure more recent changes affect the past data, the system applied historical data freezing. For an instance, when a session was created, the software will replicate the forms, weights, instruments, instrument response options, and association data in a separate table. The software also create blank table entries to be filled by the evaluators. Separating data from preparation, evaluation, and reporting stages will guarantee that changes in one stage does not affect the other stage.

The software also applies some measures to prevent historical data being compromised. The first measure is disabling the deletion of session data, because once the data is erased from the database it could not be recovered. Second, sessions that have been stopped cannot be re-started because running the wrong session have the potential to damage past data. Third, the software only allows one assessment session to run, because two or more sessions running at the same time would be difficult to manage by the operator. While these measures may reduce software flexibility, it is very important to guarantee that employee' records will not be compromised.

#### **4.2. PIN-Based Identification**

The 360-degree software uses Personal Identification Number (PIN) as the only login credential for the evaluators. This requires the system to ensure each PIN to be unique and at the same time prevent brute force or random PIN to enter the evaluation system.

Luhn algorithm is used to make sure the PIN entered by evaluator is correct. The PIN, which is a six digit number consists of five digit identification number and one check digit.

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<sup>1</sup> Sobel (2007)

<sup>2</sup> Claburn (2007).

### **4.3. Testing**

A comparative testing was conducted to ensure the 360-degree evaluation on computerized system is reliable to retrieve, process, and output scores that is equal to manual assessment.

The testing simulated a manual assessment of an organization with five employees. The scores are then manually calculated. The same assessment is repeated on computerized assessment by inserting the evaluations from manual assessment. After this testing, the scores of computerized assessment were observed to be identical to manual assessment.

### **4.4. Implementation**

Organization who wishes to manage the software in-house needs to have it installed on their server and provide computer terminals to access the evaluation system. Another alternative is to have the system managed by Celos (including data entry). This is done by installing the software on web hosting service that can be accessed over the internet. Then the employees will input their evaluation by accessing <http://celos.ac.id>. This approach is suitable for smaller organization with limited expenditure on server management.

After the software is accessible, the next step is to train the system operators. Operators might feel burdened to enter large amount of employee data, especially on large organizations. However, importing employee data directly through SQL can reduce the burden of this step. It should be noted that load to enter employee data only performed once during the first installation.

Several issues were observed during the implementation of 360-degree assessment software. One notable case occurred on a division where its' employees agreed to give each other top scores. However, with the use of computerized system, this kind of "cheat" can be easily detected. The HRD manager has asked the employees of that division to retake the assessment.

Another observation is the internet speed to the server, which slows down when the system was accessed concurrently by several users. The solution of this issue is to increase web server's capability and increase internet connection speed. Another alternative is to have each division provide evaluation on different time, thus will distribute server's load.

One limitation that the system has yet overcome is the limited data analysis options. However, session scores can be exported to Microsoft Excel format. Then HRD staff can analyze it using third party software.

The advantage of this system is its flexibility in questionnaire creation, strict separation of historical data, and the web based platform. Flexibility in questionnaire created encourage better adoption in organizations. Strict separation of data eliminates the risk of historical data being compromised; this allows organization to implement the software without the need of frequent trouble shootings due human error. Web based platform offers easier deployment because the software does not need to be installed on each computer.

## **5. Conclusions**

After this research it is concluded that:

1. To guarantee that human error will not compromise historical employees records, several measures have been taken. First, by separating data from preparation, evaluation, and reporting stage into separate distinct chambers. Changes in one chamber will not affect changes on other chamber. Second, by not allowing operator delete session data and run several assessment sessions simultaneously.
2. Based on role analysis, the software is divided into three separate systems. They are: Operator, Evaluator, and Executive. Each system have specific functions and objectives.
3. Testing for the 360-degree software is conducted by performing a simulation of manual assessment. The raw data of this assessment are inserted to the software through its' front end. The result of manual and computerized assessment are identical and therefore the system have worked as expected.
4. Any significant issue has not hindered the implementation of the 360-degree assessment system. The use of computerized system allows the detection of cheating on evaluations.

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