

# Analysis of Access and Monitoring Systems Implementation on Human Resources to Improve the Shipbuilding Industry Performance

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**Abstract:** In Indonesian shipyard, Access and monitoring of human resources still use conventional system. The objective of this research is to analyse the application of access and monitoring system in the shipyard industry to improve human resource performance. Firstly, observation of access and monitoring of human resources in the shipyard was taken in PT. Dok dan Perkapalan Surabaya (Persero). Secondly, analysed technical and economic aspect of each alternative system, then conducted a system selection by using matrix pairwise comparison. Finally, analysed the implementation of human resource access and monitoring system to improve ship industry performance. The Access system that will be applied is Nchecked Biometric Attendance system with CCTV and Radio Frequency Identification (RFID) card for extra features. The initial investment cost of this system is approximately Rp464.512.000, and is feasible to apply based on 2,03 of Benefit Cost Ratio or in other words, we can get profit 200% from initial investment. Implementation of the access and monitoring system will be applied to work zones, among others office work area, workshop, and open yard. In conclusion, before applying the systems, the employee performance was 57,95%, after applying the system access and monitoring the employee performance can increase by 84,05% of the total parameters.

## 1 INTRODUCTION

NEEDS to reach the highest level of work. This has become a separate development in the shipping industry. A SMART Shipyard can improve its effective and efficient performance. One of the famous concepts to use is the concept of S.M.A.R.T (Specific, Measurable, Achievable, Realistic and Timely). The advancement of information technology is now one of the tools to improve employee supervision in the work area .

The Information Technology referred to is a computer-based access and monitoring system, the access and monitoring system for employee activities is in addition to being accessed by a computer, the system also utilizes face biometric technology to facilitate operations into the employee access and monitoring system to be more easily visited with features that prioritize information accuracy and access speed (Rotenberg, 1974).

Basically, the objectives to be achieved from this research are to observe the access and monitoring

system processes that are implemented in the shipyard. Second, Select and design the access and monitoring systems in the shipyard area. Analyze the application of access and monitoring systems to improve ship industry performance. Therefore, with the access and monitoring system, the ship industry can improve their company performance.

## 2 LITERATURE

### 2.1 Access and Monitoring System

Access is the act of entering or using. In the field of security, access regulation is a selective limitation of a human resource to a place. So, that access arrangements usually refer to the practice of restricting the entrance to a building or work area and only for authorized persons. In accessing a resource must have permission from a system commonly referred to as authorization. In an access system here

will determine who enters a room, building, or work area (Rotenberg, 1974).

The meaning of monitoring itself is an activity that consists of the process of observing or reviewing and studying regularly carried out by the project manager. In previous studies, information systems were designed to monitor activities in production workshops (Pratama & Triwilaswandio, 2017). However, there is no overall monitoring of the work area in the shipyard. In addition there are aspects contained in the monitoring activities:

1. The aspects of project input include human labor, working hours, data, materials or materials, management, etc.
2. Aspects of the process or activity, namely aspects of the project that describe the process of activity, such as research, production processes, and others.
3. The output aspect the results of the is the aspect of a project that relates to or covers process, especially related to quantity (Assauri, 2008).

## 2.2 Performance

Performance is the result or level of success of a person as a whole during a certain period in carrying out tasks compared to various possibilities such as work standards, targets or targets or predetermined criteria agreed upon (Mangkunegara, 2005).

In previous studies, an application analysis was carried out in measuring the performance of shipyard companies. Where in the measurement carried out on all parameters owned by the company (Ari & Triwilaswandio, 2005). So, it is necessary to have research to measure the performance of each individual human resources owned by the company.

The implementation of information systems has been carried out to improve the performance of shipbuilding industry maintenance facilities management (Storch, 1995). Overall, from previous research there needs to be a system that measures individual employee performance for each work area in the shipyard.

## 2.3 Shipyard Industry

The shipyard is a place to build ships and launch ships, so a shipyard company must own land for the construction of ships and coastlines. The shipyard has two types of activities, namely new buildings and ship repair. To build a new ship, the shipyard must have one of the following basic facilities, Building Berth, Building Dock, and Lifting Dock (Yanuar & Triwilaswandio, 2013).

In addition to basic facilities, shipyards must equip supporting facilities. Supporting facilities needed by a shipyard.

The office is a place for administrative activities to take place that are not directly related to the construction or ship repair activities. The sections that work here are for example marketing and finance. The main function of the warehouse is to maintain material inventory and be able to provide on time according to production needs. Design facility, the design section is in charge of carrying out all activities related to calculations and drawings related to material requirements up to work drawings for ship production purposes. The plate workshop is a place where ship construction starts from the process of marking, cutting, forming, to assembly depending on the capacity of the workshop. Meanwhile, pipe workshop is responsible for the production of pipes needed in the ship building process.

In each production process in the shipyard research has been carried out to determine the size of the process sigma. So that monitoring of the work activity process to improve the company's performance has been done (Albab & Triwilaswandio, 2016). For this reason, there needs to be more supervision for every individual who works in the shipyard.

Research on the quality of ship repair services that have been carried out to improve shipyard services is based on the assessment of ship owners (Nurwanti & Triwilaswandio, 2016). The research, there was no improvement in the quality of service per ship to guests. So, there needs to be an additional system to improve shipyard service.

In the process of quality management in shipyards research has been carried out on the design of computer-based applications in the construction of new ships (Putra & Triwilaswandio, 2016). The research, it has helped the implementation of quality management in the construction of new, better ships. However, it has not been able to measure the performance of each individual who carries out quality management.

## 2.4 Some Access and Monitoring System

The NChecked system is a biometric system for its users that functions to monitor one's presence automatically. This system is perfect for a company that needs an access system to monitor its employees and help employees when starting work (Chon, 2005).

And secondly, a Radio Frequency Identification (RFID) technology can be combined with a navigation system to improve the accuracy of a position. Which is where the main function of the RFID system is to retrieve identity information from a tag that is already equipped or also commonly called a transponder. This tag will be pasted or used by users or goods. So it is very possible to know the position of the user or item (Finkenzeller, 2010).

The last system is Ultra Wide Band (UWB) system. Where this system utilizes a mobile station that will be installed on each employee, provide electromagnetic waves to the UWB fixed station. Furthermore, in every corner of the room is installed UWB fixed station as a wave receiver which will be read by the station and the results will be sent to the admin server that is connected to the internet network. So that the data that can be seen on the monitor screen is the distance of the coordinates of the employee's presence while in the room (Nguyen & Jae-Young, 2015).

### 3 METHODOLOGY

In the research methodology, the procedure research work is provided starting from identifying problems by doing observation to analyzing data and build research conclusions.

#### 3.1 Observation

Observation is a method of collecting data by direct observation and systematic recording of objects to be examined. Observations made by researchers regarding the current condition of HR access and monitoring systems in shipyard companies.

#### 3.2 Questioner

The questionnaire in this study was designed into two parts. The first part contains the purpose of making a questionnaire, general data of the respondent, and general filling instructions. In the second part contains an explanation of each questionnaire points.

#### 3.3 Interview

Interviews were conducted with the management of PT Dok dan Perkapalan Surabaya which ran an access and monitoring system. The interview in this study was conducted to find out the response of the company management to the implementation of the learning that had been carried out.

### 3.4 Data Processing

Data processing is carried out by referring to the initial conditions of the system and data collection. This stage is to group data based on the work area contained in the shipyard and the database of workers' expertise that is in the shipyard which will be used as parameters in the system.

### 3.5 System Implementation

Implementation is done by online system to ensure that the HR access and monitoring system can be used and running properly. The Online test use an internet connection which is connected to the server. The system is tested by analyses the ability of the selected system in processing data that has been entered into the system. From processing the data, the application can provide information to users related to access and monitoring.

### 3.6 Analysis and Discussion

The system that has been made, a system comparison test is conducted between the system being developed and the existing shipyard system, the performance improvement test when the HR access and monitoring system is implemented, and a verification test is conducted to ensure that the HR access and monitoring system can be used and know response from respondents to the system based on the results of the questionnaire.

## 4 ACCESS AND MONITORING SYSTEM IN SHIPYARD

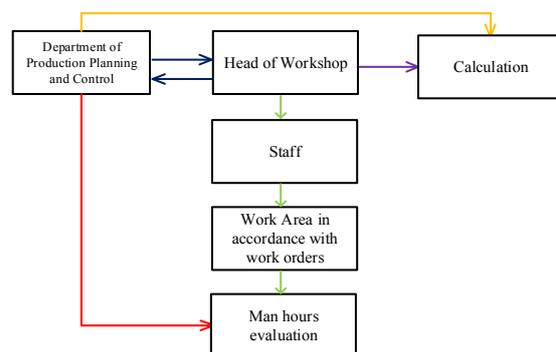


Figure 1: Workflow Diagram.

In Figure 1, it can be seen that currently the access of workers entering the work area that is determined is

only supervised by the local workshop head and information on the labor needs used is reported verbally and handwritten to PPC. After getting the workforce data used to carry out the activity at that time, the evaluation and analysis division will evaluate each work progress carried out according to the Daily Activity that has been determined. From the evaluation and analysis division, it will check the amount of labor used according to the conditions in the field and compared to the needs of the workforce in accordance with the planning at the beginning. Someone will go to the field to ensure that the workforce is used in the field in accordance with the initial planning.



Figure 2: Employee Access Card.

In Figure 2, you can see an employee card that is their access to a work area. The card is used as a sign that they are in a work area that is in accordance with work orders (Daily Activity). So after the head of the workshop gave the names of employees who worked according to the Daily Activity to the PPC department. Then the name will be recapitulated by the PPC department and entered into the system for reporting the hours of people in the work area. So at this time to monitor the presence of employees in the work area by understanding their position is by looking at the employee card on the progress board.

## 5 IMPLEMENTATION OF ACCESS AND MONITORING SYSTEM

### 5.1 Nchecked Bio Attendance

The application of the system begins by analyzing the three existing systems, namely the Nchecked Bio Attendance system, the RFID positioning system, and the Ultra Wide Band System. In weighting which has the biggest weight is the economic aspect which is equal to 0.4718. From the results of the matrix pairways comparison table, it is found that the system chosen as the access and monitoring system for human resources in the ship industry is a Nchecked Biometric Attendance System (Nguyen & Jae-Young, 2015). This can be seen because the weighting value for the Nchecked Biometric Attendance system is greater than the other two systems. The application of the access system in the office work area will connect four important elements in the process of access activities including, HR or employees, the Nchecked Biometric Attendance system, the WiFi module, and the management.



Figure 3: Display Data Nchecked Biometric Attendance.

In each section, Nchecked Biometric Attendance system is provided for employee access to the work area. So, that is the activity of going out and entering employees will be monitored. Moreover, using the Nchecked feature can facilitate management in reporting the performance of each employee. After the scan is successful, it will show a screen like Figure 3 in the form of the status of successfully checking in, hours of entry, and the amount of work time on one day, weekly and monthly (Nguyen & Jae-Young, 2015).

## 5.2 Implementation of Access and Monitoring System on Office

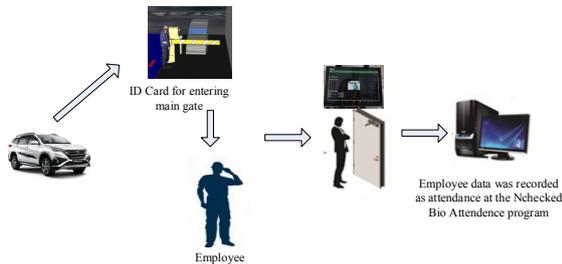


Figure 4: Employee Attendance System when Accessing Rooms.

The employee access system can function as a system of attendance for each employee. The attendance process of each employee can be seen in Figure 4 so that each employee will record their attendance in real time starting from the hour of work until the hour of work (PT Dok dan Perkapalan, 2017). The employee attendance system uses the Nchecked Biometric Attendance program. Thus, every employee cannot cheat on attendance. It can be linked to a performance allowance system for each employee. Where their work time report data during daily, weekly and monthly can be seen clearly in the Nchecked Biometric Attendance system.

## 5.3 Implementation of Access and Monitoring System on Workshop

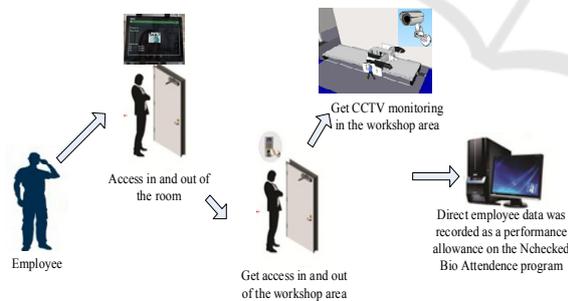


Figure 5: Access from the Office Work Area to the workshop.

The access to be applied can only be used by employees who have access to work in the office and workshop area as showed in Figure 5. so that employees who have office or room work areas will get door access that has been integrated by the RFID card they have. This access will be very easy to monitor employees who often go in and out of offices, workshops and open fields. Like Engineering and marketing employees who are employees who are

very often in and out of office (PT Dok dan Perkapalan, 2017).

## 5.4 Implementation of Access and Monitoring System on Yards

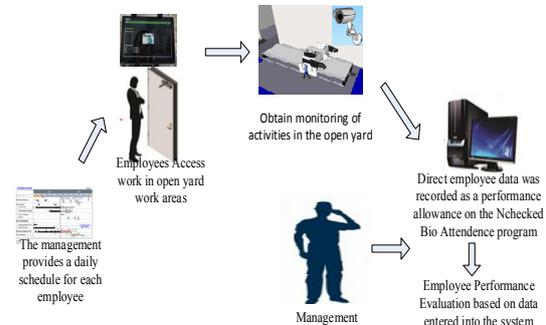


Figure 6: Access to Yards Work Areas.

Figure 6 is the flow of each employee to get access to work before carrying out their respective work. Each employee will use their ID card to get access to work in accordance with the work orders they receive from the management (PT Dok dan Perkapalan, 2017). Every ID card received by employees in an open field work area can only access the work area in accordance with the orders they get. With that, every employee cannot leave their work area before completing the work orders they get. Access to work that they do will help management get performance data for each employee in the form of employee work time while carrying out the work process, the presence of their position during working hours, and their activities while the work process is in progress.

## 5.5 Implementation of CCTV System on Work Area

The implementation of the monitoring system in the shipyard company will be made mutually integrated with the employee access system. Thus, the data obtained by management will be more detailed in monitoring employees while carrying out their work activities. Figure 7 is a network topology that will be applied to work areas in shipyard companies.



Figure 7: CCTV System Network Topology.

In Figure 7 shows a display of the results of computer activity that is being used at that time. LastActivityView is a tool for Windows operating systems that collects information from various sources on a running system, and displays logs of actions made by users and events that occur on this computer. So that it can be when employees who use computers are monitored clearly and precisely. The results of data from each employee activity will be used as an indicator to improve company performance based on the level of employee compliance in complying with work procedures.

In the application of access systems in every work area in the shipyard aims to know directly or real time the presence of employees while in the work area. It is a display of the Nchecked system for monitoring employees when accessing work areas in real time. This view can be seen clearly in the number of employees who have absenteeism and those who have not been absent. The admin can monitor employees who are accessing the work area directly.

Every employee will get the data automatically in the system. The management is very easy to do attendance data from all employees. Beside that, the parties can do an evaluation every month by comparing each attendance data with the data of the position and activity of the monitoring system which is showed in Figure 8. The system has automatically carried out reports or reports of employee entry and exit hours. and for the management to get the right to see the results of the report automatically and can also download the results of the results of the data in excel and PDF.



Figure 8: Monitoring the presence of employees in real time.

In the implementation of the access and monitoring system, a division of the work area will be created. This is intended for each employee to have access to the appropriate workplace. In the division of the work area zone is divided into three zones, including Zone A, Zone B, and Zone C as presented in Figure 9.



Figure 9: Access Layout in Shipyard.

## 6 ANALYSIS OF ACCESS AND MONITORING SYSTEM

### 6.1 System Comparison Analysis

Table 1: System Comparison Analysis.

| No. | Activity Analysis                    | Access                  |                   | Monitoring     |           | Keterangan      |                 |
|-----|--------------------------------------|-------------------------|-------------------|----------------|-----------|-----------------|-----------------|
|     |                                      | Manual                  | Sistem            | Manual         | Sistem    | Manual          | Sistem          |
| 1   | Attendance report                    | Inaccessible            | Accessible        |                |           |                 |                 |
| 2   | Employee monitoring in the Work Area |                         |                   | Not Applicable | Real time |                 |                 |
| 3   | Employee access                      | Don't have restrictions | Have restrictions |                |           |                 |                 |
| 4   | Performance indicator                |                         |                   |                |           | Less measurable | More measurable |
| 5   | Employee activity Control            |                         |                   |                |           | Indirect        | Real Time       |
| 6   | Employee Performance Evaluation      |                         |                   |                |           | Indirect        | Real Time       |

It can be seen in Table 1 clearly that in terms of reporting and supervision if using an access and monitoring system will be very helpful in time efficiency. This is because in the system the user gets integrated access while in the work area and is very easily monitored by the system. Thus, the delivery of information regarding aspects of employee performance measurement can be received as quickly as possible.

When viewed in terms of the use of access using a manual system, it will be very ineffective and not very functional when placing it. Whereas using this access and monitoring system will be very integrated, starting from employees getting access to the main gate to going to their work area and being monitored in detail with each of their activities while working. Using an access and monitoring system, the employee performance can be easily measured. As well as in this system there is also information that can be used as an indicator of performance measurement when making a decision.

### 6.2 Analysis of Performance Increase

To find out the improvement in performance when implementing an access and monitoring system, a simulation of the performance value that has been done previously in the measurement of workforce performance during existing conditions is carried out.

Table 2: Analysis of Performance Improve.

| KPI criteria are based on the perspective of the workforce | KPI      |              | Quality  | Parameter   | Quality      | Score | percentage |
|--|----------|--------------|----------|-------------|--------------|-------|------------|
|  |          |              |          |             |              |       |            |
| Number of welfare budget allocations                       | 0,122    | A1           | 0,286    | 8,0         | 2,80         |       |            |
|  |          | A2           | 0,140    | 8,0         | 1,37         |       |            |
|  |          | A3           | 0,574    | 8,0         | 5,60         |       |            |
| Increased career path                                      | 0,283    | B1           | 0,333    | 9,0         | 8,48         |       |            |
|  |          | B2           | 0,667    | 9,0         | 16,96        |       |            |
| Decrease in the number of work accidents                   | 0,122    | C1           | 0,750    | 9,0         | 8,24         |       |            |
|  |          | C2           | 0,250    | 9,0         | 2,75         |       |            |
| Delay rate   | 0,473    | D1           | 0,500    | 8,0         | 18,93        |       |            |
|  |          | D2           | 0,500    | 8,0         | 18,93        |       |            |
| <b>Total</b>   | <b>1</b> | <b>Total</b> | <b>4</b> | <b>76,0</b> | <b>84,05</b> |       |            |

Based on the results of the performance calculations shown in the Table 2, implementation of the HR access and monitoring system in the ship industry get a performance value of 8.405 from a scale of 10 or it can be interpreted that the value of work performance based on perfection is 84.05%. the management cannot directly monitor the presence and arrival of employees when accessing the work area. so there is often an employee disobedience when carrying out their duties such as skipping work and not being disciplined about work time. The results stated that implementing an HR access and monitoring system in the ship industry would improve employee compliance and discipline towards their working hours. After the overall accumulated performance value of the existing condition with the application of an access and monitoring system, there was a performance improvement from 57.95% to 84.05% for workforce perfection.

### 6.3 Cost Benefit Analysis

The above shows that the investment time for the implementation of access and monitoring systems in the shipyard industry is back in 2021, in the third year with a net present value of Rp. 394,800,861 and Return On Investment of Rp. 107,072,634.

Table 3: Investment Return Analysis.

| No | Description       | Value           |
|----|-------------------|-----------------|
| 1  | Procurement Costs | Rp. 464.511.980 |
| 2  | Operating Costs   | Rp. 134.976.080 |

|   |              |                 |
|---|--------------|-----------------|
| 3 | Benefit Cost | Rp. 344.220.000 |
| 4 | Inflation    | 3,12%           |
| 5 | NPV          | Rp. 394.800.861 |
| 6 | BCR          | 2,03            |
| 7 | ROI          | Rp. 107.072.634 |

Based on Table 3, it can be seen that the value of Benefit Cost Ratio (BCR) is 2.03 indicating that the value of benefits is more dominant than the cost generated and the application of access and monitoring systems will benefit about 200% of the total investment. Based on the above calculation, the investment in the application of access and monitoring systems is feasible in the shipyard industry.

## 7 CONCLUSION

In this last chapter contains the things that consist of the results of the conclusions and the whole process of designing a system for the needs of access and monitoring of the shipyard. The conclusions that can be drawn in this final project, namely:

1. The system related to employee access to the work area and monitoring the presence of employees while in the work area currently has several weaknesses, including unlimited access to anyone to go to the work area, the reporting process regarding the assessment of non-specific employee performance such as not being able to know the hours of entry employees when in the work area, the presence of employees while in the work area, and activities carried out by employees while in the work area so that the assessment of performance is only based on results that do not know how the process when the work takes place.
2. The access and monitoring system that will be implemented is a Nchecked Biometric Attendance system with the addition of CCTV and RFID features and an initial investment cost of Rp.464,511,980.00. The application is carried out in each work area that has been divided according to the work area zone. The management will be more to measure the performance of each employee by looking at the process of employee activities every day, employees will get access restrictions according to needs, and the application of this

access system will replace the attendance system so that measurement of performance will be more detailed according to work time and activities done by employees.

3. In determining the parameters to improve performance by providing an access and monitoring system to employees is by reducing the level of employee delay, reducing the level of workplace accidents, increasing career levels, and employee welfare allocation. From each of these parameters the most influential weight when implementing this system is the level of employee delay with a value of 0.473 from a scale of 1, based on the performance value obtained an assessment of the performance of the employee's perfection when the existing condition is 57.95% of the total parameters, while after applying the access system and monitoring of performance appraisers increases to 84.05% of the total parameters, and based on the results of cost benefit analysis (CBA) the application of an appropriate access and monitoring system with the Benefit cost ratio is 2.03 or more profitable 200% of the total investment in the procurement of access systems and monitoring. The value of the Net Present Value is approximately Rp. 394,800,861 with a Return On Investment value of Rp. 107,072,634 or approximately 37.00% of the value of the investment issued.

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