Application Development of Automation Job Assignments

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ABSTRACT

Accuracy and suitability in the division of employee tasks have an important role in the division of employee tasks, in order to get list criteria that are in accordance with the abilities of employees in one division. Ppart of the task carried out in "PT. ASIP" is still manual by supervisors/managers by sorting tasks based on features, applications, divisions, and employees that will be done by employees. The sorting process requires a long time in the process of distributing employee tasks, one of the factors is that supervisors / managers must sort out tasks based on features, applications in order to be able to determine the division and employees who work on the task according to the division and employee abilities. The prototyping method was used in this study for the development of an automatic *task sharing system by applying the Multinomial Naïve Bayes Clasiffier algorithm as a determinant of employee task division. The system development method uses UML which is tested using the blackbx testing method. The division of employee tasks is based on tasks that have been done by previous employees, so that the system can carry out the appropriate task sharing that is used as a datatraining a total of 400 data. The test results of systems developed using a blackbox to test the main functions of the application do not show errors. The application can see similarities between tasks using the Multinomial Naïve Bayes method as a consideration for determining divisions and employees who work with accuracy values of 92.5% and 82.5%. The biased/uneven distribution of datatraning turns out to have an effect on the level of accuracy.*

Keyword : automation, job assignment, software development, bias dataset

INTRODUCTION

Job Assignment is one of the jobs in operations management that is often problematic in an organization. According to Wang et al [1],this has long been researched by Karp and Riedel starting in 1990. The job planner manages several types of work that must be optimally assigned to employees that have the potential to be completed in an effort to minimize costs or maximize income and not exceed the capabilities of the employees. Other problems are the uncertainty of the arrival of work, the availability of employees to complete work, the suitability of employee competencies in completing work, job completion requires employees with different abilities, and other problems.

Since the Covid-19 pandemic, which has forced a reduction in interaction between employees, the implementation of traditional job assignments, usually in the form of *morning briefing* activities , has begun tochange. The changes that have occurred in the form of communication by utilizing online media, this is in line with the increase in internet use during the pandemic. Another change also occurred in the business model of services provided to customers in the use of internet media, namely the use of email in online service

requests. The use of email in service requests is most common in the information technology industry, other fields also occur such as trade, services, manufacturing, logistics, and even in the aviation sector also allows utilizing email media in service submissions or job assignments.

Online services have raised new problems including an increase in the number and variety of service requests received without time limits, requests for service completion in a fast time. [1] The problem ofjob management until now is still a problem in the field of operations management that is widely studied [2], the alignment between the work to be done and the availability of employees, the competence of employees to complete work that is unevenly addressing the demand for labor needs. The problem of job assignment does not only occur in the manufacturing industry, even in the field of education, [3] namely the assignment as a final project supervisor is also a problem that is also researched to get the right solution.

The problem with lainnya is that if there are many task requests sent by customers, the manual assignment process that is usually done by the supervisor / manager will experience problems, namely it takes longer , for example in the field of information technology [4], because the supervisor / manager must read the task request email before the assignment process is carried out to the division / employee. Problem solving efforts with a mathematical approach [4] [2] have been carried out , but the task category of work is first done manually.

Information extraction is an attempt to obtain structured information from unstructured data. Unstructured data such as words or sentences contained in emails that cannot be immediately understood by the computer must be an effort to process the unstructured data so that it can be processed by the computer. One common approach is text mining by applying certain algorithms, such as those carried out in the 5W1H information extraction research from online news in Indonesian. [5]. The use of algorithms in information extraction has been widely practiced, for example using the Multinomial naïve bayes algorithm [6] to classify online news automatically using the *Document Frequency Thresholding* (DFT) feature. Another research to detect hoax news in Indonesian [7] by using the *Term Frequency* (TF) selection feature.

METHOD

1. Research Methods

The research method used is the prototyping method [8] which is already widely used in software development [9]research. This method allows interaction directly between the developer and the user of the software. The flow of the prototyping model is depicted inFigure 1. The research was conducted at "PT. ASIP" a software development company founded in 2000.

This model consists of five stages, namely the first stage *of Communication,* at this stage it aims to identify problems, find out the needs (*functionality*) of the user for the software to be developed. This stage is the first stage of the prototyping model, fromwhich it is used as study material for the next stage.
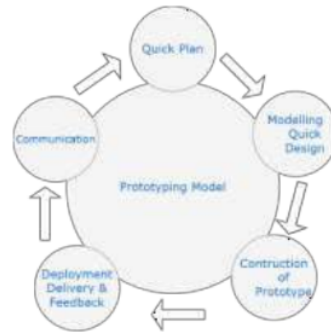
Figure 1. Prototyping Model *[8]*

The second stage is the *Quick Plan*, and this stage is carried out by designing the software interface based on the results of the previous stage, this design aims to provide users with a visual overview of the software development plan. At this stage, it aims to ensure the design of the software according to the needs of the user both *in terms of functionality* and *usability*.

The third stage is *Modelling Quick Design*, pthere is this stage ofsystem coding based on the results of the previous two stages. System modeling using *Unified Modelling Language* (UML) is a visual system modeling method developed by *object management group* starting in 1997 [10]. UML has several diagrams that can be used as needed. In this study, the UML diagram used consisted of *a Use Case Diagram*, *Activity Diagram*, *Sequence Diagram* and *Diagaram Class*. After the system modeler is completed, the data modeling process is continued, the model process used consists of the *Conceptual Data Model* (CDM) and Physical Data Model (PDM).

The fourth stage, namely *Construction of Prototype*, pthere is this stage application development begins to be carried out based on the results at the Modelling Quick Design stage. The devices used at this stage are text editors Visual studio Code, Google Chrome browser, PHP Framework Codeigniter programming language, XAMPP webserver, mySQL database server.

The five stage, namely *Deployment Delivery & Feedback* which is the latest stage, pthere is this stage after the prototype has been developed is given to users to get *feedback* on the software that has been developed. The feedback given by the user is used as a basis for improvement to be carried out until it is in accordance with the user's needs.

2. *Dataset Collection*

The dataset spooling is taken from the service request email received by "PT. ASIP"from 2018 to 2021, the data taken is the subject and content of the email. The data collected is in the form of text that is still unstructured, a total of 400 data divided into two parts, namely 320 data that will be used as naïve Bayes Binomial training model data and 80 data used as training data. After the dataset is collected, then data labeling is carried out based on the division responsible for completing the service request received, the labeling results are validated by the supervisor of each division to ensure that the labeling carried out is correct. An example of the results of collecting datasets is seen in table 1.

Table 1 Service Request Dataset *Examples*

No.	Description of Email	Divided
1	For the Monthly Income Statement (3.13.9.2), we requested additional Date Option filters as in the Monthly Balance Sheet Statement (3.13.9.3) so that we can compare the monthly income statement as of a certain date. The current one can only be the moon.'	Support
2	Making the abimart mobile application, there are several menus that must be made, including: 1. Login Menu 2. Turnover Menu 3. Authorization menu for cash transfer application	Mobile
3	In the Mobile Collection digital application, the SMS is not sent when the user activates in core banking. It has been waited for but no SMS has entered on the user's cellphone. In addition, in the Digital Bank Bepede application, the PLN Token only appears in one digit number in the application	Mobile
4	IMPROVEMENTS & ADDITIONS TO THE HRD REPORT MENU 1. Please add to the non-aktip employee report menu to see the non-aktip tlg and display the columns: No, Nip, Name, Position, office of origin, non-aktip date 2. employees who experience changes in position / work position, changes in work offices, changes in work divisions so that they are appeared in the report menu of the work history list 3. To make it easier to read the report on the menu, several things must be corrected: in the position column in the word change so that the sub-position becomes a change of position column before swapping places with current column change column is deleted only in the change/mutation date column so that the sub in the position column contains: the column before, present, date of change, term of office	Support

Source: "PT. ASIP"

3. System Design

Use case diagrams are useful for describing the active/business process in a system in general. This system consists of two levels of users (*actors*), namely HRD and employees, to use the main system users must pass the use case login by entering a username and password, there are additional use cases that support the main use of employee task sharing using naïve bayes, namely use case tasks, homepages, customers, employees and profiles. The designed use case diagram is seen in Figure 2.
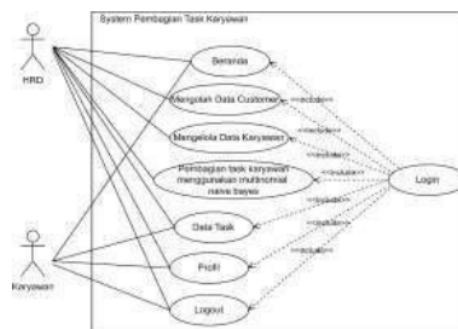

Figure 2Use Case Diagram Design

The design of the diagram class in Figure 3 illustrates the explanation of the system in more detail, in the diagram class the explanation related to attributes / data items and the main functions in each class is displayed. Relationships between classes in this draft are also added. This design will later be used as a reference when the program development process is carried out by programmers.
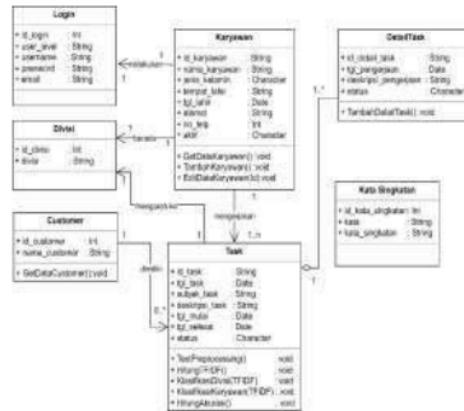

Figure 3 Class Diagram Design

Sometimes the design of the diagram class cannot describe a complex system, in this application the process of dividing tasks using naïve bayes is the most complex process. It is necessary to design using an activity diagram to illustrate the system design as shown in Figure 4. In this subsystem involves other subsystems that are also complexes that contain algorithms, for example in the Text processing subsystem, TF-IDF weighting, classification using naïve bayes.
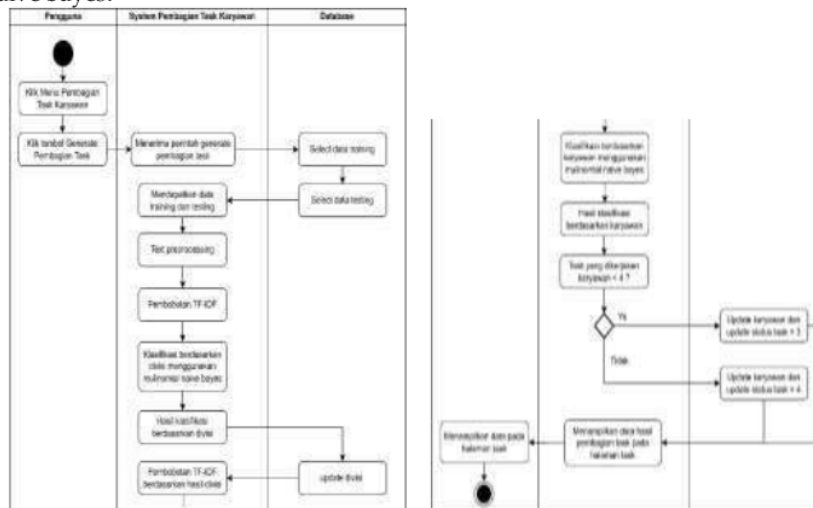

Figure 4 Activity Diagram

Designing a Conceptual Data Model (CDM) to provide a detailed overview of the database structure created in the software development process. At this design stage, entities and their relationships are depicted in the form of a database structure, the CDM era of this application is seen in figure Figure 5.
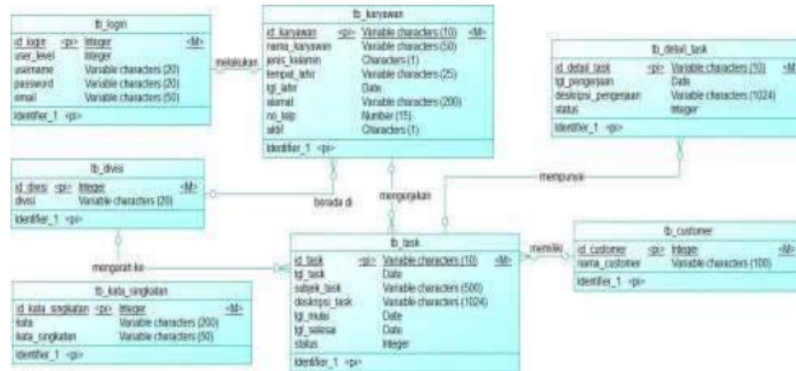

Figure 5 Conceptual Data Model (CDM)

RESULTS AND DISCUSSION

1. Login Page Display Results

When the application is run, the system will redirect the user to the login form page. Users who have the right to use this system are identified based on the appropriate username and password fields and are registered with the system. If the login process is successfully carried out, the system will redirect to the main page based on access rights as HRD or Employee. Login page view of the developed system as shown inFigure 6.

Figure 6 Login Page View

2. Main Page View Results

If the user with access rights as HRD has done the login process, he will be directed to the main menu page of the HRD level as shown in Figure 7. On the main menu page, the HRD level consists of three modules that can be accessed, namely the Customer, Employee and Task Modules modules. The Task module consists of three submodules used to manage tasks, namely the Import Data Task module which is used to pull data on service requests that have just entered the email, the next submodule is the task division which is used to automatically divide tasks to employees / divisions and the last submodule, namely Task which functions to see the list of tasks that have been received and the status of the work.
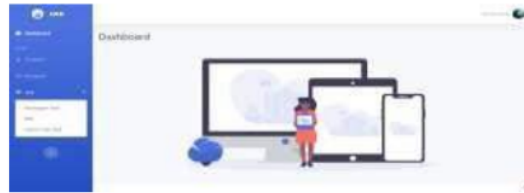
Figure 7 HRD Main Page View

If the user with access rights as an employee successfully performs the login process on the system will be directed to the main employee page as shown in Figure 8. On this page, there is only one module, namely the Task module, the module can be accessed by each employee who has been registered with the system.
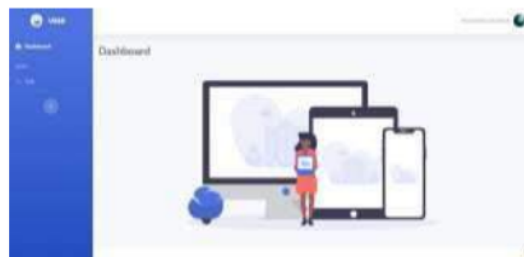

Figure 8 Employee Main Page View

3. **HRD User Task** Page Display Results

The HRD user task page can be accessed by HRD level users. This page contains a list of tasks received by "PT. ASIP" along with information on employee assignments in each division and the status of their work as shown in Figure 9. The task work status consists of waiting, on progress, process, pending, and finish. Waiting status if the employee is still working on more than 4 tasks. Status on progress if the task is in the process of being worked on next, status process if the task is still in the process of being worked on, status pending if the task where the task is temporarily delayed to work on other tasks. If the task has been completed, the task status becomes finish and the task that was previously waiting will change to on progress. The detailed information of each task can be seen on the HRD user Task detail page as shown in Figure 10.

Figure 9 HRD User Task Page View

Pada the HRD user task detail page contains detailed information of each task, on this menu the user can read the detailed information of the task received, such as task description, job details, start date of work and completion target. Other information is the progress of the work being done by employees. The detailed halam view of the HRD user's task looks like in Figure 10.
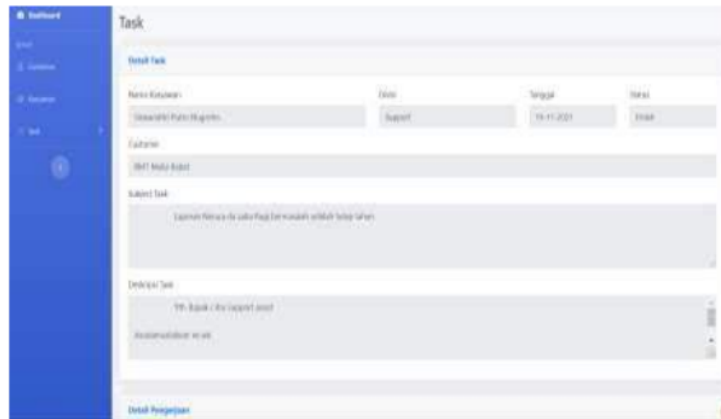

Figure 10 HRD User Task Detail Page View

4. *Employee Task* Page Display Results

On the Employee Task page, each employee can see a list of tasks assigned to be completed immediately. P'sexisting page contains only brief task information, such as a brief description and work status as shown in Figure 11. The detailed information of each task can be seen by employees by pressing the detail button of each task as shown in Figure 12.

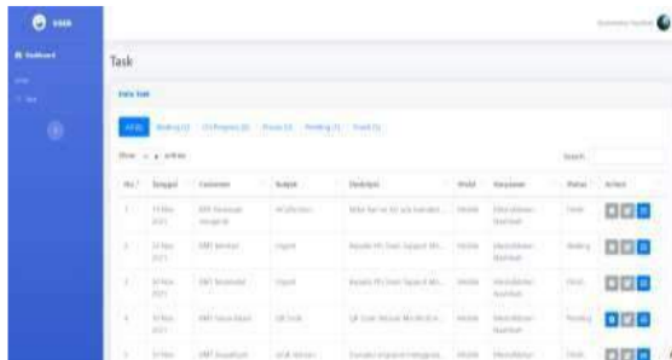Figure 11 Employee Task Page View

On the page report proses pengerjaan task karyawan, each karywan can see detailed information of the job assignment received. Employees can also update information on the progress of the work being done, if the task work is completed, employees can update the status of the work. The appearance of this page can be seen in Figure 12.

Figure 12 Page View of employee task process report

5. *Results of The Crawling Task View from Gmail*

The crawling task page serves as a link with the google mail server from "PT. ASIP" which can be connected using the SMTP (*Simple Mail Transfer Protocol*), POP3 (*Post Office Protocol version 3*) or IMAP (*Internet Message Access Protocol*) protocols , which are standard protocols for sending emails using the internet network as shown in Figure 13. To pull the data of customer service requests received in the email "PT. APSI" by pressing the "generate task" button. The process of withdrawing data from emails is limited in a day to a maximum of 4 withdrawals, as it is limited by google mail to free users.

Figure 13 Crawling Task Page view from Gmail

6. *Application Testing*

Applicationassessment, especially in modules developed using the *blackbox testing* method, which is a method commonly used in software development that focuses on the alignment between inputs and output of the main functions / modules of the developed application. This method can be used for the development of web-based, mobile or desktop-based software [11] [12]. The test is rated successful if the module/function being tested corresponds toa predetermined test s k enario.

Table 2 Summary of Employee Task Sharing System Testing Using Blackbox

No	System Testing	Test Description	Expected results	Status
1	Login Page	Task sharing system login	Go to the dashboard page	Succeed
2	Menu Customer	Displaying Customer List	Successfully display customer data on the customer page	Succeed
		Adding a New Customer, click the add customer button and enter customer data. Then click the save button	Successfully added a new customer and returned to the customer page	Succeed
		Edit Customer Data, Click the edit icon on the customer you want to edit. Edit the customer data you want to edit and click the save button	Successfully edit customer data and return to customer page	Succeed
3	Employee Menu	View the Employee List	Successfully display employee data on employee pages	Succeed
		Adding a New Employee, Click the add employee button and enter the employee data. Then click the save button	Successfully added a new employee and returned to the employee page	Succeed
		Edit Employee Data, Click the edit icon on the employee you want to edit. Edit the employee data you want to edit and click the edit button	Successfully edit employee data and return to employee page	Succeed
4	Task Sharing menu	Crawling tasks in gmail	Successfully crawled gmail and data successfully saved in the database	Succeed
		Employee task sharing, click the generate task button	Successfully distributed employee tasks and entered the task page	Succeed
5	Menu Task	(User HRD) Displaying the Task List	Successfully displayed all task lists on the task page	Succeed
		(Employee User) Displaying the Task List	Successfully display a list of tasks according to the employee's task on the task page	Succeed
		(Employee User) Pick up the Task you want to do, click the process icon on the task you want to do	Successfully retrieves the task and the task status becomes a process	Succeed
		(Employee User) Update Report or Task work report, click the update report icon on the task. Enter the work report on the update report page and click save	Successfully updated the report and the status changed to pending or finish	Succeed
		(HRD User & Employee) Displaying the Task Details, click the task detail icon on the task you want to view	Successfully displayed task details on the task detail page	Succeed
6	Change Password Feature	Change Password On Login Page	Successfully get the verification code email, successfully changed the password and entered the login page.	Succeed
		Change Password On Profile Page	successfully changed the password and entered the profile page	Succeed

7. *Testing the Accuracy of Employee Task Sharing Systems*

This test is carried out to assess the accuracy of the naïve bayes model developed to classify assignments by division and employee. The test was carried out a number of three experiments, details of the scenario of each experiment can be seen in *Table 3*. Accuracy testing uses an uneven distribution of training data scenarios to find out if there is any impact on the level of accuracy.

Table 3 Scenarios of Experiments testing the Accuracy of Employee Task Division Systems

No	Testing	Data Training		Data Testing	
		Total	Detail	Total	Detail
1.	First Testing	160	131 support division data, 24 mobile division data, and 5 network division data	40	21 support division data, 14 mobile division data, and 5 network division data
2.	Second Testing	320	First Test training data(160) plus 86 support division data, 63 mobile division data, and 11 network division data	40	21 support division data, 14 mobile division data, and 5 network division data
3.	Third Test	360	Second test training data(320) plus plus 21 support division data, 15 mobile division data, and 4 network division data	40	21 support division data, 15 mobile division data, and 4 network division data

The results of the first experiment showed that the accuracy rate of task assignment classification by division was 85%, while the accuracy rate of assignment classification by employee yielded 55%. The first experiment, the accuracy rate of assignment classification based on employees is still not good, below 60%, probably due to the uneven distribution of training data between divisions, namely 82% for the support division, 15% for the mobile division and 3% for the network division.

In the second experiment, 160 training data were added, so that the total training data reached 320 data with a more even distribution of training data compared to the first experiment, namely 68% of the support division data, 27% of the mobile division, 5% of the network division. The results of the second experiment showed that there was a significant increase in the accuracy of the classification of assignments based on employees to 77.5%, on the contrary, the results of the accuracy of classifications based on divisions increased but were less significant, only an increase of 2% from the first experiment. The increase in the distribution of training data that was more evenly distributed compared to the first experiment showed a significant increase in accuracy results, especially in the classification of task assignments to employees.

The third experiment was carried out by adding the training data of the second experiment with a total of 40 data with a more even distribution of training data compared to the first experiment, namely 66% of the support division data, 28% of the mobile division and 6% of the network division. As a result, there was a significant increase in accuracy in the division classification to 92.5% and in the accuracy of employee classification to 82.5%. In the third experiment, the accuracy value was more than 80%, the equitable distribution of training data showed an effect on increasing the accuracy of the classification of divisional and employee assignments, this was in line with research on dataset bias to the level of object

detection accuracy [13], the increase in dataset bias had an effect on reducing accuracy. A summary of the results of the accuracy test can be seen in Table 4.

Table 4 Summary of Accuracy Testing on Divisional and Employee Classifications

No	Testing	Test Results Divisional Classification	Employee Classification Testing Results
1.	First Testing	85%	55%
2.	Second Testing	87%	77,5%
3.	Third Test	92,5%	82,5%

CONCLUSION

The development of the system Automation Job Assignment using the prototyping method showed good results, testing using *Blackbox Testing* against its main function was not found error. The application of the naïve bayes algorithm results quite well from the level of accuracy of job assignment classification for divisions and employees using evenly distributed training data. Itscuration rate reaches 92.5% for classification of assignments by division and 82.5% for classification of assignments by employees. Dataset limitations in datatraining distribution for classification of task assignment divisions (dataset bias) have a significant effect on accuracy. The development of assignment classification research can then be done using other algorithms using more distruated datasets, for example the Support Vector Machine or the Histogram of Oriented Gradients.

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FINAL GRADE

GENERAL COMMENTS

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