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Design and Build a Web-Based Co-working Space System Using the Dynamic Priority Scheduling Algorithm Case Study: PT Permata Bank

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Abstract:

PT Bank Permata Tbk is one company that has several divisions, where each division routinely conducts meetings and works together to discuss a matter that is in the company. The company has several workspaces available for use together. However, the use of workspace which is carried out together causes irregularity in the implementation of activities. In addition to the workspace lending activities in this company are still done manually by contacting the receptionist directly and waiting for confirmation about availability regarding the availability of the room to be used for work. In this study, we propose to design a workplace booking application. With the aim that this application was built to provide information about workspace usage schedules. The results of this study provide information that applications that have been built have helped the company manage loan space.

Keywords — **Application, Coworking space, Lending managemen.**

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I. INTRODUCTION

A bank is a business entity that collects funds from the public in the form of savings and distributes funds to the public to improve the standard of living in the form of credit and/or other forms.[1] One of them, PermataBank or Bank Permata, has now developed into a large private bank that offers innovative and complete products and services, especially in terms of delivery channels including Internet Banking and Mobile Banking.

With the development of the times, the development of technology in the current era of globalization is so fast, so that with the rapid growth of various information media, the dissemination of information to the public has also become very fast.[2] However, Permata Bank also has aspirations to become the leading financial service provider in Indonesia, by wanting to improve the quality of their services to make it easier for customers as well as attract new customers to want to save at the bank. One of the ways is a good strategy and innovation to be able to compete with other banking companies and to survive in this era of global competition. In designing this strategy, a forum is needed in the form of a place to exchange ideas and thoughts which can be called a meeting. A meeting is an activity that is usually carried out in a company. In addition to designing strategies, meetings are also important for solving problems or coordinating work-related matters by exchanging ideas and opinions between employees.

In its implementation, the meeting requires a supportive room with a conducive atmosphere so that the meeting can run smoothly and produce the

best decisions. Currently, the workspace ordering process that runs at the Permatabank head office is still done manually, starting from information on workspace availability, booking meeting rooms, and arranging meeting schedules are still done manually by contacting the receptionist using email or telephone. This is very ineffective because employees do not know the information on the availability of existing rooms so they have to contact the receptionist first and have to wait for confirmation about the availability of the room to be used.

From this background, we get the following problem formulation:

1. How to manage an effective workspace reservation process?
2. How can all order data be stored and controlled properly?
3. How to help PT Bank Permata in managing the workspace properly?

The discussion of the topic raised has the following problem boundaries:

1. This application only discusses ordering workspace that is structured according to a priority schedule.
2. This application can only be accessed via the web, not yet available for mobile
3. This application is only for internal companies

This research aims to:

1. To replace the manual workspace reservation process with a reservation system.
2. To manage workspace reservation data so that it can be controlled properly.
3. To prevent double ordering.

II. LITERATURE STUDY

A. *Analysis*

An analysis is a step of breaking down information into smaller components to make it easier to understand. The analysis will at least form a fixed or consistent pattern so that the results can be reviewed quickly and clearly.[3]

B. *Design System*

System design is a stage of determining needs at an early stage of system development, these problems can be overcome with the system to be built.[4]

C. UML (Unified Modelling Language)

UML (Unified Modeling Language) is a visual modeling language used to develop object-oriented systems. The language can convey design communication from the analysis, design, system design to implementation stages so that an easy-to-understand UML is built on 4 models + 1 View. These five views correspond to the diagrams described in UML. Each point of view is related to a certain point of view, where the system will represent the interests of certain stakeholder groups.[5]

D. Waterfall

Waterfall development is the original structured design method which is still in use today. Using a waterfall-based development approach, analysts and users can move from one stage to the next. This method is called waterfall development because it moves from one stage to another in the same way like a waterfall. While it is possible to go backward in SDLC (for example, from design to analysis), it is very difficult.

1. Planning

The planning stage is the basic process for understanding why the system should be built and determining how the project team will build the system.

2. Analysis

At this stage, the project team of the current system will identify improvement opportunities and develop concepts for the new system.

3. Design

At this stage, the system operation mode is determined from the aspects of hardware, software, network infrastructure, user interface, forms, reports, program details, databases, and required documents. Although most strategic decisions about systems are made when the system concept is developed during the analysis phase, the steps in the design stage accurately determine how the system operates.

4. Implementation

The final stage of waterfall construction is the implementation stage, where the system is built. This is usually the most worrisome stage, as for most systems it is the most expensive part of the development process.[6]

E. Coworking Space

Co-working spaces are shared workplaces that are used by various knowledge professionals (especially freelancers) to engage in various levels of specialized work in a broad field of the knowledge industry.[7]

F. Dynamic Priority Scheduling Algorithm

Priority Scheduling (PS) is a priority scheduling algorithm where each scheduling process is assigned a priority number.[8] Processes with higher priority will use this algorithm first. If multiple processes have the same priority, first-come, first-served (FCFS) technology will be used, which prioritizes earlier-arriving processes (Yakub, 2012).

1. Scheduling is a function of decision making to determine the most appropriate plan.

2. Scheduling is a theory that includes a set of principles, models, technology, and logical conclusions in the decision-making process. The scheduling system is for managing information in the form of data in the process of planning activities by dividing the implementation time

The scheduling criteria are as follows:

1. Treat the process fairly and fairly. Fairness here does not mean that every process has the same treatment, but there are many variables, such as priority. This will be studied later.

2. Throughput is the number of processes that are completed in one unit of time. The purpose of scheduling is to maximize the number of jobs processed per unit time.

3. Turn Around Time is the time required to run the process starting from the waiting request position, waiting for the queue to be ready, executing, and executing I / O.

a. Turn Around Time = execution time + waiting time.

b. The purpose of the plan is to minimize turnaround time. Waiting-Time is the time required for the waiting process in a ready queue. Scheduling goal: minimize waiting time.

4. Response time refers to the time it takes for the process from a request to provide service to the first response to a request. Scheduling goal: shorten response times

Many methods can be done in scheduling. Each scheduling method has different characteristics. When deciding which method to use, the nature of each method must be considered. The following are some of the methods used in scheduling:

1. First Come - First Served Scheduling (FCFS) The FCFS scheduling algorithm is very simple. The process that comes first will be served first.

2. Shortest Job First Scheduling (SJF) The process that has the smallest burst time will be done first.

3. Priority Scheduling Each process has priority, the higher priority is done first. If there is the same priority, the FCFS algorithm will be carried out.

4. Round Robin Scheduling The basic concept of this algorithm is to use time-sharing. Each process gets a quantum time (quantum time) to limit the processing time. After the time is up, the process is suspended and added to the ready queue

Priority scheduling is a priority scheduling algorithm. Each process is assigned a priority number (the smallest integer is usually the highest priority). Workmanship prioritizes processes with the highest priority. If multiple processes have the same priority, the first come first serve (FCFS) algorithm will be used.[9]

Priority scheduling can also run preemptively or not. In preemptive mode, if a newly arrived process has a higher priority than the current process, the ongoing process will stop and then transfer to the new process. At the same time, in the non-preemptive case, the newly arrived process will not interfere with the currently running process, but will only put it in front of

the queue. If process P1 arrives while P0 is running, it will see P1 priority. If priority P1 is greater than priority P0, in the non-preemptive case, the algorithm will still parse P0 until it runs out, and then place P1 in the head queue position. If priority is the same, a process run first / first out first (FIFO).

III. RESEARCH METHOD

A. ***Data Collection Techniques***

1. This research is conducted directly on the object of research because the types of research are:
   a. Observation: To understand the current system, the author uses this observation method by making direct observations at PT Permata Bank. How does the room rental system work so that information can be obtained and used as research references?
   b. Interview: A method of gathering information by asking questions or direct interviews with the general staff. In this case, the company must conduct supervision.

2. System Design Method

The design method used in this study is the Waterfall method consisting of:

- Requirements analysis and definition.
  Analysis of software requirements related to user requirements, then define them in detail and use them as system specifications.
- System and software design.
  At this stage, UML (Unified Modeling Language) is used to model the program design in the form of use case diagrams and activity diagrams. Used to convey design in system analysis, design, and design.

IV. RESULTS AND DISCUSSION

The priority scheduling algorithm is one type of scheduling algorithm that pays attention to the priority of each process. The algorithm has two approaches: a static approach and a dynamic approach. The main difference is that if the method is static, preset priority cannot be changed, whereas the dynamic method can be changed. In this algorithm, processes or activities with higher priority
will be processed first. However, if there are processes with the same priority, more processes or activities will be served first.[10]

As an example, there are 5 (five) processes in table I below this. Each process has a respective arrival time and execution duration, as well as predefined levels of priority.Recommended font sizes are shown in Table 1.

TABLE I
LIST OF PROCESSES TO BE EXECUTED

Proses	Arrival Time	Burst Time	Prioritas
P1	0	20	1
P2	0	5	4
P3	0	10	3
P4	0	5	5
P5	0	15	2

Source : [10]

Then the Gantt chart can be drawn as follows:

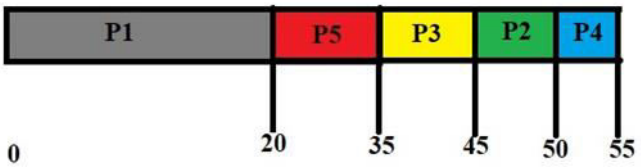


Figure 4.1 Gantt Chart Priority Scheduling[10]

When process P1 is executed or executed (AT = 10), then enter the P6 process with burst time = 13, and with priority = 3, or as shown in the table II below.

TABLE II
CHANGES IN PRIORITY

Proses	Arrival Time	Burst Time	Prioritas
P1	0	20	1
P2	0	5	4
P3	0	10	3
P4	0	5	5
P5	0	15	2
P6	10	13	3

Source : [10]

Then the sequence of execution of each process changes to something like shown in Figure 2 below.

Gantt Chart processes after changing priorities

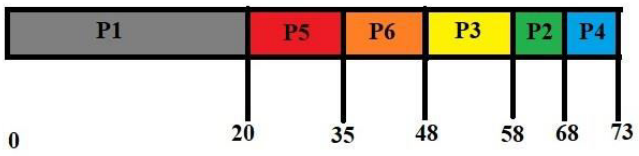


Figure 4.2 Gantt Chart Changes After Changing Process Priorities[10]

To realize the dynamic priority scheduling algorithm, there are several program steps. Starting from determining user priority, determining initial ordering parameters, structuring queue space, and queuing results. The following is the pseudo-code of the Dynamic Priority Scheduling (DPS) algorithm that is applied to a coworking space system:

Dynamic Priority Scheduling Algorithm
1. Start
2. Retrieve employee reservation data in the form of, employee_id, position, reservation time, and events
3. Compare the position of each incoming employee order data, then sort by the highest position
4. If there are two or more reservation data that have the same position then do:
   a. Record the order time of each reservation
   b. Calculate reservation minutes by subtracting the reservation time from the current time
   c. Sort orders by the time of largest reservation
5. Combine orders based on the smallest position and largest reservation minutes
6. Manage employee queues
7. Done

It appears that the application of the dynamic priority algorithm needs to maintain the main data in the form of data. In the attribute ordering data used are the location and the minute of ordering. The first attribute of the position is the result of pulling data from higher-ranking employees compared to employees with lower ranks. At the same time, the second attribute, the number of reservation minutes, is generated by calculating the current time minus the time the employee's order is converted to minutes. After understanding the concept of dynamic priority scheduling algorithm in terms of co-working space reservation, order priority will be determined.

A. Determination of order priority

The first step to implementing a dynamic priority scheduling algorithm is determining reservation priority. There are two priorities in determining the order of co-working space reservations. The two priorities are (1) Position and (2) time of reservation, which are described in detail in Table I below

TABLE III

COWORKING SPACE RESERVATION PRIORITY

Order of Priority	Explanation
Priority 1	Users or employees who have higher positions
Priority 2	If there are 2 or more users or employees who have the same position or level, then the user order is based on which user or user the order is first (referring to DateTime) is the user who gets higher priority.

After determining the priority order of the coworking space reservation, the next parameter is determined to determine the threshold in determining the coworking space reservation

B. Initial Parameter Determination

There are two parameters to determine priority limits in implementing the dynamic priority scheduling algorithm, namely

1) Position < Director

If there are two employees (Employee A & Employee B) together will make a reservation. Employee A has a position as Manager, while Employee B is a Staff. Then both of them place an order, then the employee with the highest position gets the order first compared to employee B.

2) Position and Time of Order

If there are two employees (employee A and employee B) both have the position of Director. Employee B places an order first compared to

employee A, so the employee with the prior order time (employee B) gets a higher priority than employee A.

3) Reservation Day-1

If there are two employees (Employee A & Employee B) together will make a reservation. Employee A has a position as Manager, while Employee B is a Staff. Employee B places an order first compared to employee A, so the employee with the prior order time (employee B) gets a higher priority than employee A.

C. Reservation scheduling

If it is assumed that the coworking space application accepts a reservation of 4 rooms with the details of the reservation as shown in Table II below

TABLE IV

COWORKING SPACE RESERVATION DETAILS

Employees	Positions	Time Order
Alia Sholeha	Staff Credit Preparation	15:24:02
Shinta Evita	Mgr Credit Preparation	15:24:01
Dayan S	Director HR	15:24:03
Darwin W	Director WB	15:25:00

It can be seen in Table II above that there are two groups of users, namely employees with positions < Director (Shinta Evita and Alia Sholeha) and employees with positions > = Director (Dayan S and Darwin W). From the two groups above, it can be ascertained that the first group (Shinta Evita and Alia Sholeha) will get priority under the second group (Dayan S and Darwin W).

However, in each group, it cannot be determined which one has the higher priority. For this reason, the parameters specified above are used. In the first group (< Position), job parameters are used. It can be seen that the position of Alia Sholeha (Staff) is lower than Shinta Evita (Manager). Therefore Shinta Evita is in 3rd place and Alia Sholeha is in 4th place.

Meanwhile, in the second group (> = director), the parameters of the position and time of the order are used. This is because both users have the same title as or more than the director. In this condition, the coworking space application will automatically activate the order time parameter. Therefore Dayan S is in 1st place while Darwin W is in 2nd priority. This is because the order time for Darwin W (15:25:00) is below the order time for Dayan S (15:24:03).

D. Scheduling Results

The following is the result of scheduling coworking space reservations based on bookings made through the application

TABLE V

RESERVATION SCHEDULING RESULTS

Employees	Positions	Time Order	Priority
Dayan S	Director HR	15:24:03	1
Darwin W	Director WB	15:25:00	2
Shinta Evita	Mgr Credit Preparation	15:24:01	3
Alia Sholeha	Staff Credit Preparation	15:24:02	4

Based on the results of calculations by the dynamic priority scheduling algorithm, the user priority order is obtained, namely Dayan Sadikin, Darwin Wibowo, Shinta Evita, and finally Alia Sholeha.

Use Case

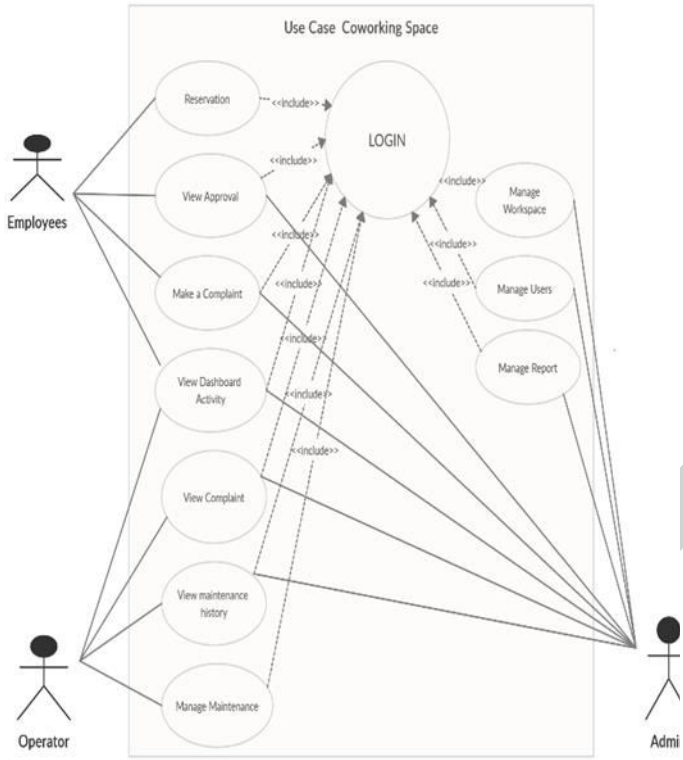
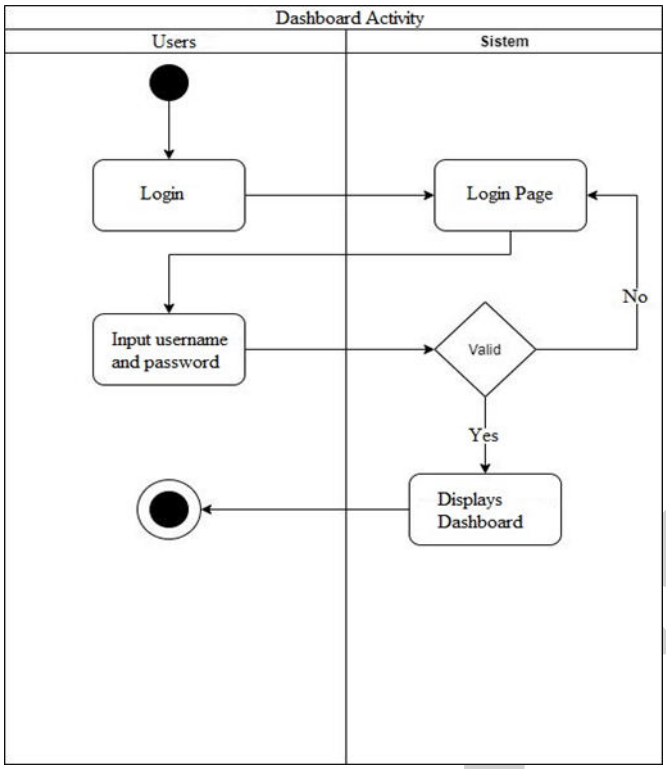


Figure 4.3 Use Case Diagram

Activity Diagram



Figures 4.4 Activity Dashboard

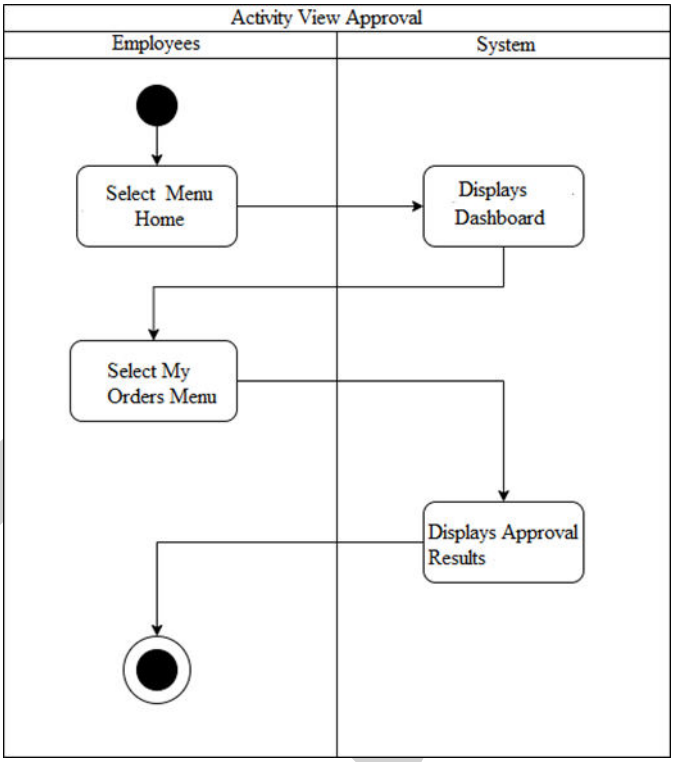


Figure 4.6 Activity Approval

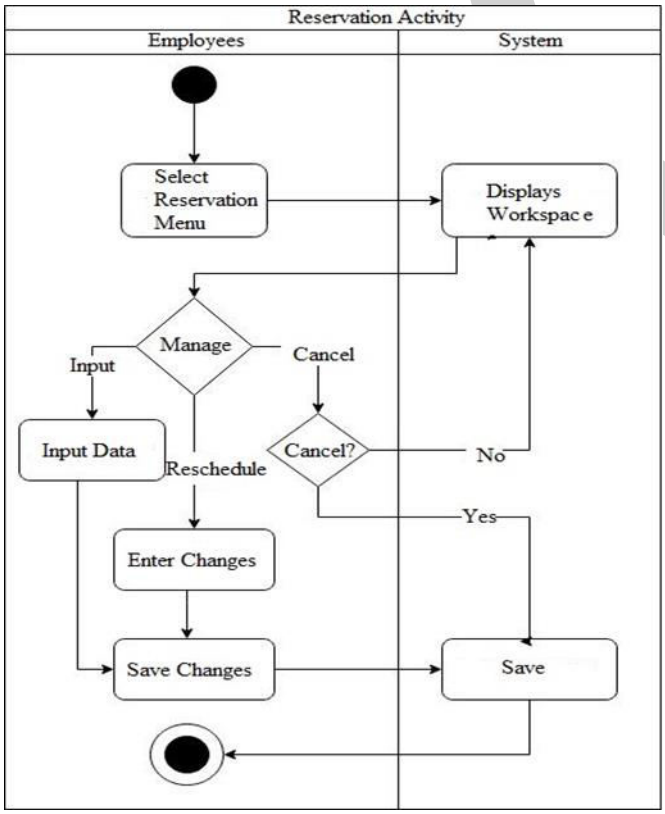


Figure 4.5 Activity Reservation

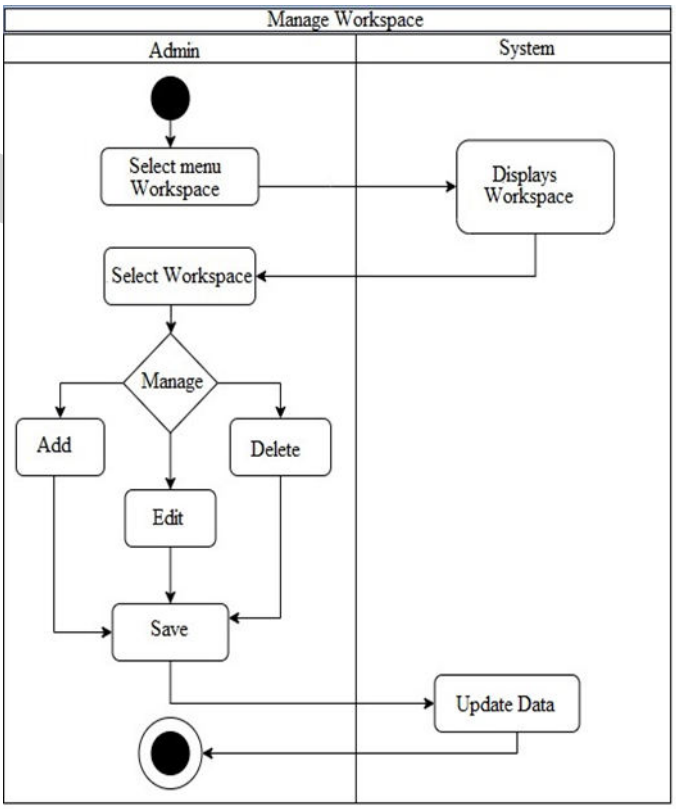


Figure 4.7 Activity Manage Workspace

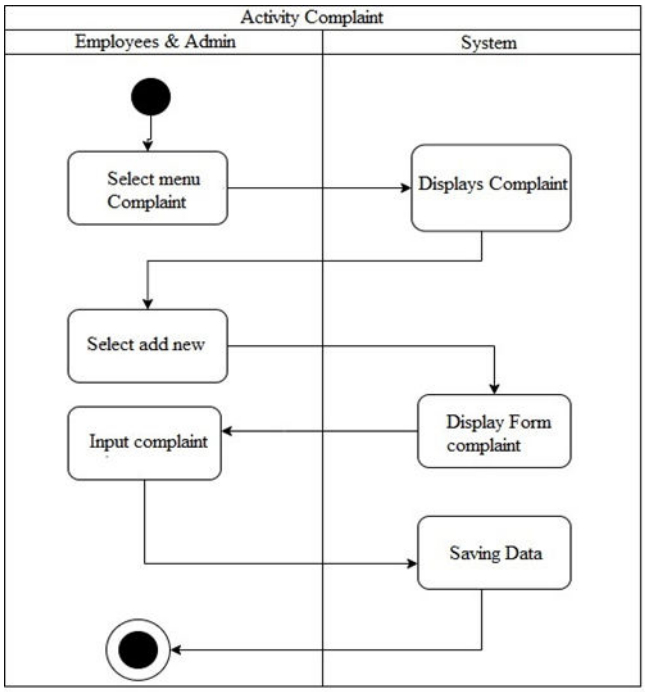
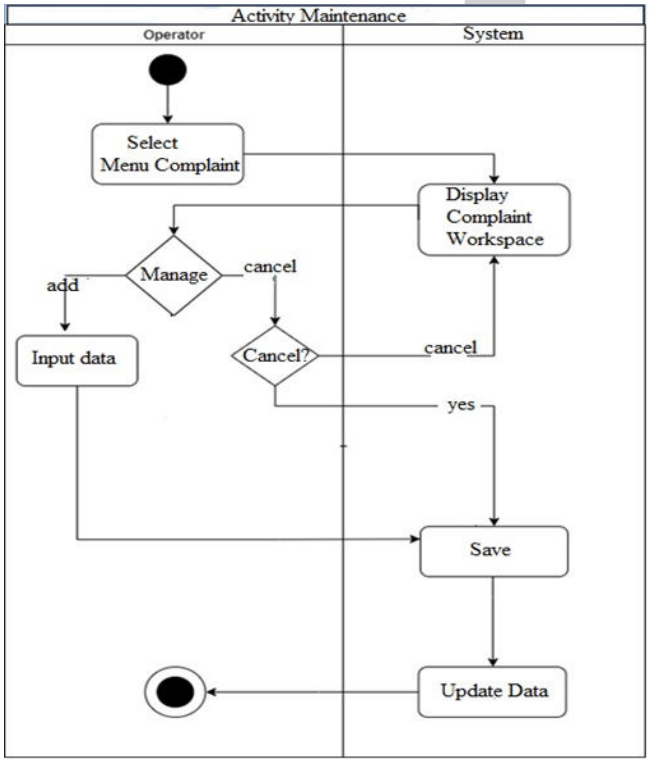


Figure 4.8 Activity Complaint



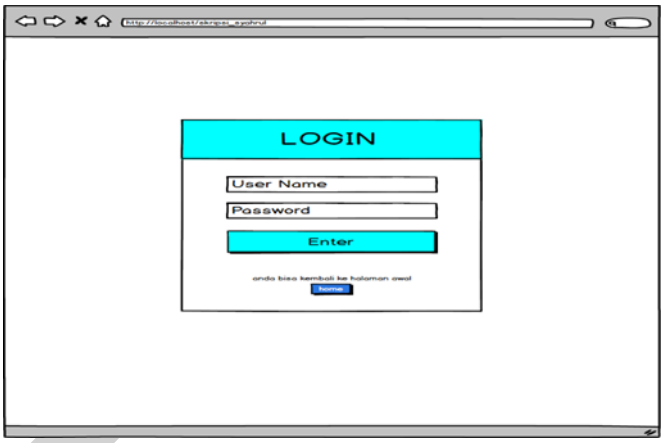


Figure 4.10 Mockup Login

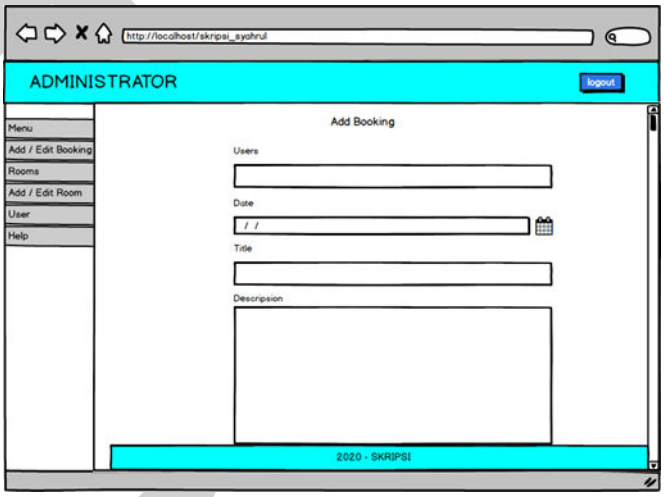


Figure 4.11 Mockup Reservation

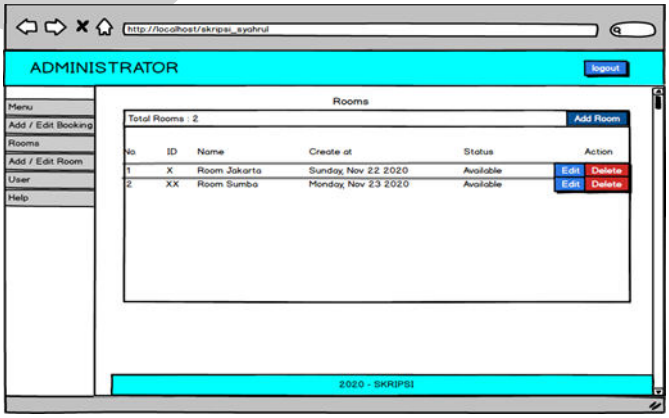


Figure 4.12 Mockup Manage Workspace

Mockup

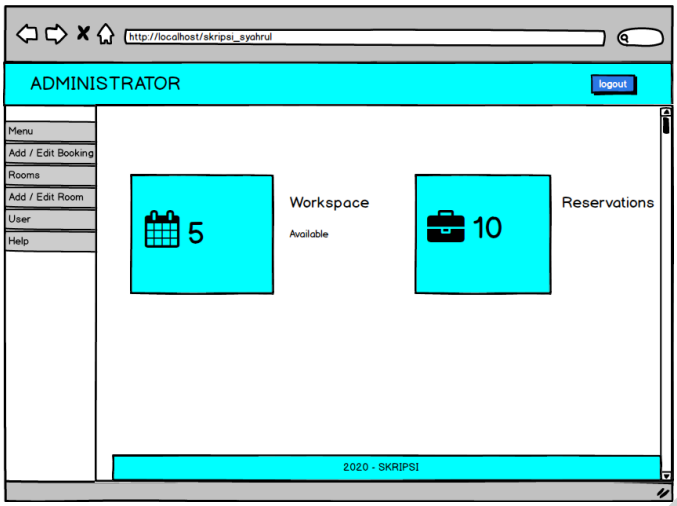


Figure 4.13 Mockup Home Dahsboard

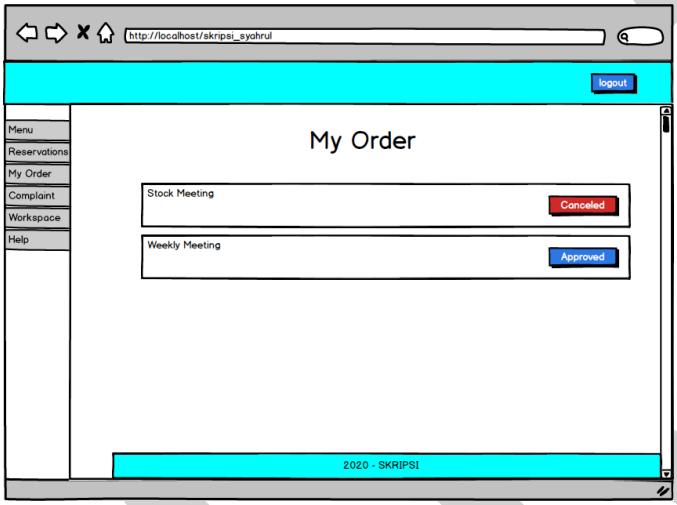


Figure 4.14 Mockup Approval

Figure 4.15 Mockup Complaint

V. CONCLUSION

The dynamic priority scheduling algorithm has been successfully applied to coworking space applications. This can be seen by generating a user priority order based on priority rules, namely the position and time of the order in the application. By embedding a dynamic priority scheduling algorithm, the ordered order will be dynamic according to the assigned priority rule (changes with the input sequence). This study still uses the parameters of the position and time of the order. For further research, other parameters can be added as a basis for determining priorities. One that can be added as a parameter is the event type or the user's location.

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