

Development of Cloud Based Production Card Process for Manufacturing

Haris Setiawan, M. Yazid Diratama^a and Malfin

Politeknik Manufaktur Bandung, Jl. Kanayakan No.21, Dago, Bandung, Indonesia

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Abstract: Process card is an important piece for monitoring a production scheduling. Process cards are issued by the PPC (production planning control) unit in the Manufacturing Engineering department Polman Bandung. Process cards are issued for each part with information such as process sequence, processing date, and processing time. Currently the process card is issued by the PPC software for production scheduling in the PPC unit. The PPC software can only be accessed on Windows 7 and is not yet cloud-based, so the software needs to be developed to be more accessible in every device include smartphone. This study aims to develop the process card so that it can be accessed via a web browser with local network access to increase the accessibility of using process cards for planning and monitoring the production activity. The developed starts with analyzing the data needed before starting software design. The design of this software is done on HTML pages with PHP in order to be able to run SQL commands through web pages. The final result is a process card and a schedule in the form of a gantt chart.

1 INTRODUCTION

The main purpose of the PPC unit at Polman Bandung is to receive and carry out tasks from UPM to get an estimate of the time and price of an order, as well as to plan and control the schedule for the execution of the order project such as molds, press tools, and mechanical parts.


A PPC software designed by Polman itself and used as a production management that used to help the PPC unit to control and manage the production activity. The software can do a several task like select and write materials, select work processes and workers, planning machining operation and assembly operation. Another function is used to estimate quotation price for some projects begin from material costs until process cost. This software was programmed by using internal storage on Polman database to store important information used for estimation calculations and production control.

The production cards process is used for the machinist or operators in Polman workshop as a guide line for the manufacturing process sequence. The process cards issued by PPC software by input some of the data like number order, name order,

manufacturing process sequence, process time, and operators. But, the production card process still in paper form and has not been in digital form so the documentation process is still difficult to do and difficult to transfer the manufacturing information process as fast as possible for planning and monitoring activity.

Noviasari (2018) made production design and control system more interactive and computerized so that it is easier and faster to process and produce information. Dhuha et al. (2017) produced class diagrams, sequence diagrams, physical data models, component designs, and interface designs with budget management, procurement, and issue ticket functions that can be used by project managers in managing project costs, and other functions such as viewing project reports can be used by directors to supervising and as a reference in making decisions related to the project.

The goal of this research is to develop the cloud based production card process for used on job shop-based production activity using a cloud system in order to issue digital process cards and replace the current paper-shaped process cards for production activities in the manufacturing department as a

^a <https://orcid.org/0000-0002-9514-4335>

function for planning and monitoring.

2 SOFTWARE DEVELOPMENT

Cloud-based production cards process software is run on a web browser via the same local internet network as the host server PC (Personal Computer). This system is referred to as a client-server system. The development of production card process software is carried out in several stages as described in the following stages.

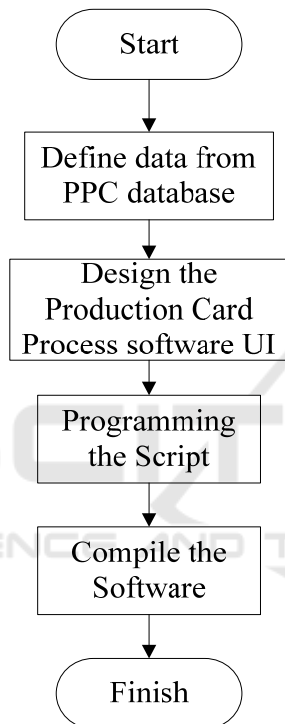


Figure 1: Development steps.

2.1 Define Data from PPC Database

The data like Number order, Part Number, and Workstation is stored into the PPC database on the host PC and can be accessed through the server PPC application.

In the production process card software, the data needed from PC database consist of three data that retrieved using SQL commands like shown in table below.

Table 1: Data and SQL Command.

Data name	SQL command
No Order	"SELECT OrdNumber FROM dbo.Orders"
Part Number	"SELECT PartName FROM dbo.Parts where OrdNumber= '\$OrderN' "
Workstation	"SELECT WCName FROM dbo.WorkCenters WHERE WCID in (select WCID from dbo.Operations where PartID in (select PartID from dbo.Parts where OrdNumber= '\$OrderNum' and PartName= '\$PartN')) "

2.2 Design the UI

The production process card software has three main menus there are process, image, and schedule. The script and the UI is shown below.

```

    <ul>
    <li><a href='edit2' target='iframe_a'>Process</a></li>
    <li><a href='view2' target='iframe_a'>Card</a></li>
    <li><a href='image2' target='iframe_a'>Image</a></li>
    <li><a href='test' target='iframe_a'>Schedule</a></li>
    <div class='login-container'>
    <li id='user' onclick='logout()' onmouseover='mouseonacc()' onmouseout='mouseoffacc()'>Operator logged in</li><li id='invisible'>Operator</li>
    </div>
    </ul>
  
```

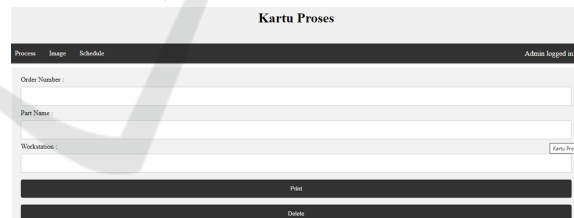


Figure 2: UI for production card process software.

Access to software is divided into operators, workshop heads, and PPC. If the user has not logged in either as an operator, workshop head, or PPC admin, then the user cannot access the software functions at all and can only access the main page with a blank display where the software functions should be located.

```

<?php
session_start();
$username = $_POST['username'];
$password = $_POST['password'];
if($username=="administrator"&&$password=="ppcadmin") {
    $_SESSION['logged_in']="admin";
    header('Location: /processcard');
} else
if($username=="operator"&&$password=="operator") {
    $_SESSION['logged_in']="operator";
    header('Location: /processcard');
} else
if($username=="workshop"&&$password=="adminworkshop") {
    $_SESSION['logged_in']="workshop";
    header('Location: /processcard');
} else {
    header('Location: /processcard');
}
?>
    
```

Figure 3: Script for account access.

2.3 Program the Script

The production process cards using PHP programming language to be able to make connections and run SQL commands on software web pages. The PHP programming language allows web pages to make connections and execute SQL commands. PHP writing is done with notepad and the SQL management software used is SQL Server 2019 from microsoft. Main menu in production process card software consist of three main menu they are process menu that two sub menu, image menu that have two sub menu, and schedule.

Process	Image	Schedule
Input	Upload	
View	View	

Figure 4: Three main menu and sub menu.

Process input menu have function to create, modify, or delete data or records of a process for a part in an order.

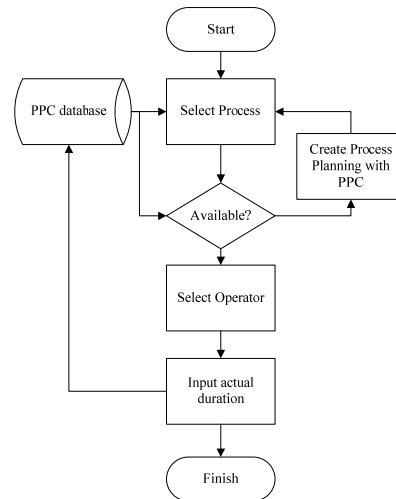


Figure 5: Flowchart for Process input.

Process card view have function to output any data that has been written from the process card input for all processes in a part of an order.

Table 2: Data on the input process.

Data name	Data on database
Incoming check	UserActSS
Outgoing check	UserActCS
Actual duration	ActRunTime
Actual start date	ActSS
Actual finish date	ActCS
Operator	OperatorID
Instructor	InstructorID
Order number	OrdNumber
Part name	PartName
Workstation	WCID

Uploading images have function to upload working images both by PPC and by the head of the workshop for operators to work on.

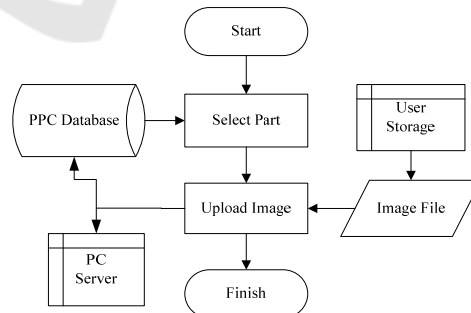


Figure 6: Flowchart of the process of uploading an image.

Image view have function to view the uploaded work images from image uploads.

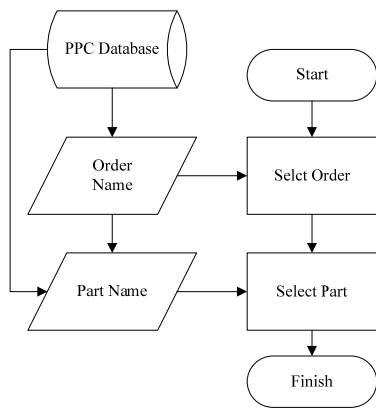


Figure 7: Flowchart to select a part on View Process.

Schedule is have funtion to issue a work schedule for an order in the form of a Gantt chart.

2.4 Software Compiling

After the user interface has been created and the scripting has been programmed for the PPC software, the next step is to run and test it.

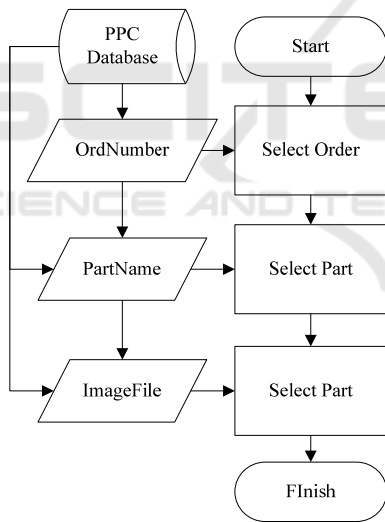


Figure 8: Display the process selection interface.

3 IMPLEMENTATIONS

After all the planning has been completed on the PPC software, starting from part planning to assy and scheduling, with the kartuproses software, the head of the workshop selects an operator and instructor for each operation on the workstation for each process and part.

The workshop head can also upload working drawings for operators to work on in the drawing section.

The operator fills the part of the kartuproses software with operator access to enter the actual time and date that the operator is working on. Operators can view working drawings uploaded by the head of the workshop in the drawing section. The end result of this whole process is a process card that contains all the processes for a part in sequence.

3.1 Software Test

After the user logs in, the user can choose part or process depending on what is selected. If the user selects an input process, an interface will appear to select a process. If the user selects view process, an interface will appear to select a part.

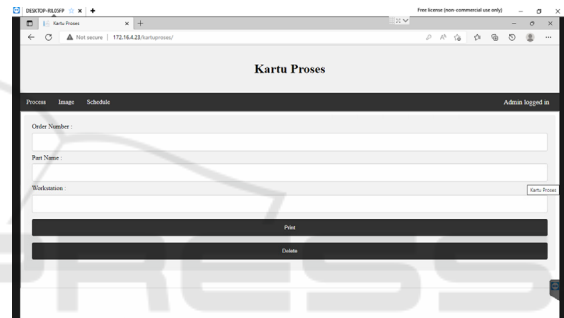


Figure 9: Display process selection interface.

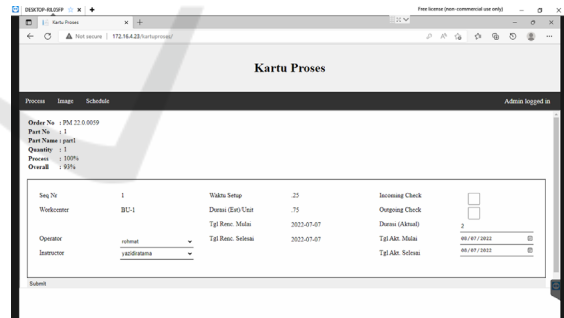


Figure 10: Display the program input process interface.

Selecting and uploading technical drawings by uploading and viewing images is the same as the view process, an interface will appear to select a part. It's just that in the upload image there is a section where the user can choose a technical drawing to upload and then view it in the view image. In the image view there is also a section where the user can select the previously uploaded image.

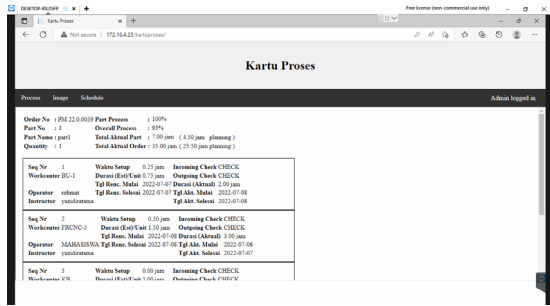


Figure 11: Display of the results of the view process of a part.

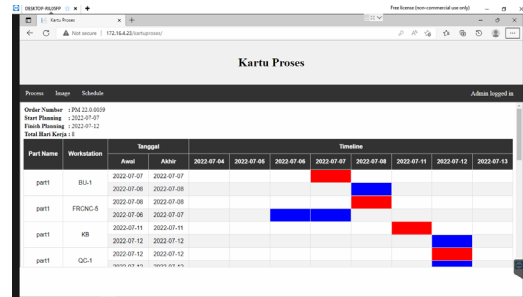


Figure 15: Result of schedule view.

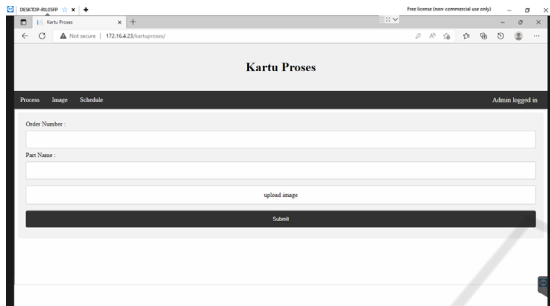


Figure 12: Interface for uploading images.

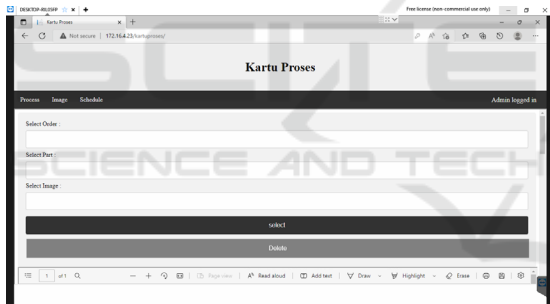


Figure 13: Interface for image views.

The scheduling section is a section for viewing the schedule of each process on an order in the form of a gantt chart. In it there is a section where the user can select the order number or job number from the database.

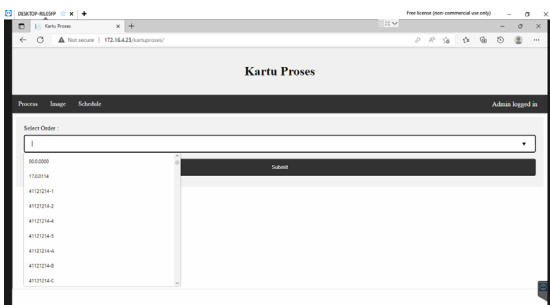


Figure 14: Interface for schedule.

3.2 Software Trial

An example component will be used to trial the production process card. The component is a general mechanics type that consist of four part with number order PM 22.0.0001.

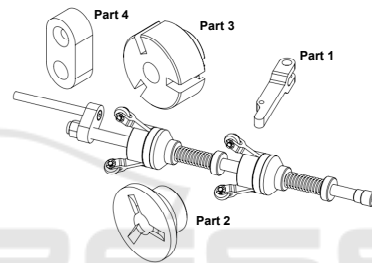


Figure 16: example component PM 22.0.0001.

A manufacturing sequence for these four component of Tripod shown by table below.

Table 3: Manufacturing sequence for component in Tripod.

Parts	Manufacturing Sequence			
	1	2	3	4
1	Mill	Workbench	Qc	
2	Turning	Mill	Workbench	Qc
3	Turning	Mill	Workbench	Qc
4	Mill	Drill	Workbench	Qc

These manufacturing sequence the stored into PPC software for every Tripod component. If we call the order number PM 22.0.001 in process card software, it will show the detail data about the process, it's sequence, process time, operators, actual time, planning time, etc like shown below.

After input the process time and delivery time for the project (in this example is Tripod), then we can see the ganchart schedule with actual and planning time for the project like shown below.

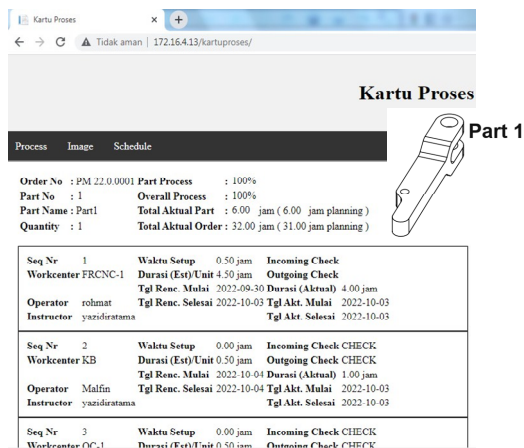


Figure 17: manufacturing sequence for part 1.

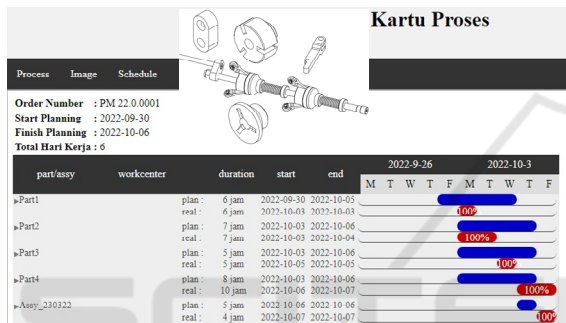


Figure 18: Manufacturing schedule process for Tripod component.

4 CONCLUSIONS

From the development of this cloud-based Production Cards Process software, two conclusions can be drawn as:

- 1 The software developed has succeeded in issuing process cards as a function of monitoring the work process as well as gantt charts from the schedule as planning and monitoring the entire process on an order.
- 2 The process card software workflow works with two types of users with different access, namely operators and workshop heads. The workshop head appoints an operator and instructor for an operation, and the operator fills in the actual duration and actual date of a process. The third account in the form of a PPC admin can access everything that the operator and the head of the workshop can access.

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