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Raw Material Usage and Process Order Module Development using SAP: A Case Study from General Packaging Manufacturer

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Abstract

ERP systems widely used in manufacturing companies, as manufacturing order and costing become a key component in the core business process. In order to increase the management effectiveness in the company, raw material usage in the manufacturing process becomes essential data to be discovered by the company, as the production cost derived from the usage of the raw material itself. SAP ERP can be customized and tailored to meets the business process needs as the leading software company in providing end-to-end ERP Systems. This research uses the UML diagram in the module design process, and the module application itself built under the SAP environment. With the outcome of ERP system module design from this research, the company could discover manufacturing process efficiencies by utilizing a set of system modules.

Keywords: ERP System, Manufacturing, Process Order, Raw Material Usage.

1. Introduction

Raw material becomes an essential element in the manufacturing business, especially for big processing industries in raw material (Suryaningrat 2016). Mismanagement in raw material could lead the manufacturing business in the wrong direction. Not only a small error but also a “checkmate” for the business. The company could order a ton of extra material, assuming that more stock increase “safety” in the manufacturing process. However, this strategy could lead a company to face the increase of manufacturing costs related to the storage, maintenance, and transportation of the raw material inventory. The way a company deals with its raw material affects business operations in the short and long term (Florén et al. 2016). In the short term, the availability of raw material could affect the smoothness of the operations in the manufacturing process. In the long term, it can affect the value proposition of the company related to product quality (Jaipuria, Jenamani, and Ramkumar 2016).

The company could face the challenges above in raw material management by using an enterprise solution, which built on the top of the Enterprise Resource Planning (ERP) system. The maturity of ERP system adoption today has led the companies to the advanced stage in perceiving the benefit of ERP adoption (Cukur and Svensson 2016). With help from advance ERP adoption, a manufacturing company could foresee most of the ways towards the production efficiencies in the future. Research from (Bradford and Gerard 2015) found that ERP system implementation creates a significant impact on manufacturing. Another research from (Huang and Huang 2019) provides a design scheme, architecture, and function model under the ERP environment to be implemented in the company purchasing process. This research was fueling the ERP system grasp related to the process optimization in manufacturing business.

Fueled by the benefits of the ERP system adoption in the manufacturing business, this paper will focus on providing a solution for a company related to the raw material usage and

process order module in manufacturing processes. A case study was taken from a general packaging business located in Indonesia. The company produces various types of containers made of cardboard and use SAP ERP as the end-to-end system in the company. In order to meet the company's needs, the SAP ERP implementation still needs to be customized to get the optimum benefit of the application (Junnarkar and Verma 2017). For the customization, this research uses a UML diagram to visualize the business process, while the solution itself built under the hood of the SAP ERP system (SE) by using ABAP programming development. The objective of the development is to conquer the gap between user needs and current application capabilities.

2. Research Methodology

The module development in this research uses the Unified Process method combining with the UML diagram in developing the business model (current business process) and software design (User Interface).

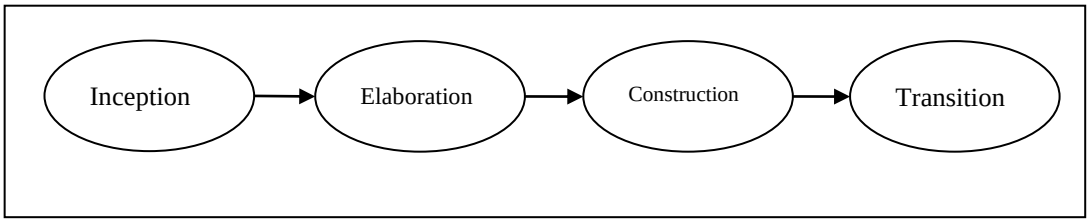

Figure 1. Phases of Unified Process Model

The original Unified Process consists of 4 phases are (Sarkar, Bhalla, and Singal 2017): a). ***Inception****:* A phase when the concept of project development is formed. It is informal, and very low details are written. *b). Elaboration:* Exploring the requirements and adding details to understand the requirements. *c).* ***Construction****:* A phase when we start to build the software. This phase deal with designing, coding, and testing the software. *d).****Transition****:* This phase has the objective of releasing the final version of the software and deals with the deployment activity in the client location.

This method is combined with UML design as the tools in building the business process model and user interface in the software development process.

3. Result and Discussion

3.1. Current Business Process

A. Process Order

In the make-to-order production process, the production starts when the production order request derived from the sales order has arrived in Production Planning and Inventory Control (PPIC) division. Since the application is built in the SAP system and environment, the production workflow subsequently follows SAP Production Planning – Process Industries (PP-PI) component (SE). This component provides an integrated planning tool for batch-oriented process manufacturing which supports: a). The integrated planning of production, waste disposal, and transport activities within a plant. b). The integration of plants within the company both vertically (central business applications down to process control) or horizontally (coordination of planning across the division).

The figure below shows the activity diagram of the current production process in the company. As described before, the production process starts when PPIC receives the order data from the sales order. Then the subsequent process, including: production plan, process order creation, machine configuration, production, and delivery orders, are conducted through several divisions.

The process starts when Production Planning and Inventory Control (PPIC) division receive sales order, then PPIC continue the process through preparing the production plan and create process order. In accordance, the production receives the process order and starts the machine configuration and production process. After the production process completed, production results and confirmation created and finished goods being sent to the warehouse for the future process in product distribution.

The Following is the activity diagram of the production process above, the role and responsibilities in the production process are described on the following table. The divisions that are related to the production process are Production Planning and Inventory Control (PPIC), Production, Warehouse, and Distribution.

Table 1. Role in Production Process

Division	Roles and Responsibilities
Production Planning and Inventory Control	Receive notification from the sales order, prepare production planning, generate process order.
Production	Receive production schedule, configure the machine for production, production run, and result confirmation.
Warehouse	Receive finished goods, transport and store goods
Distribution	Prepare delivery orders, deliver finish goods.

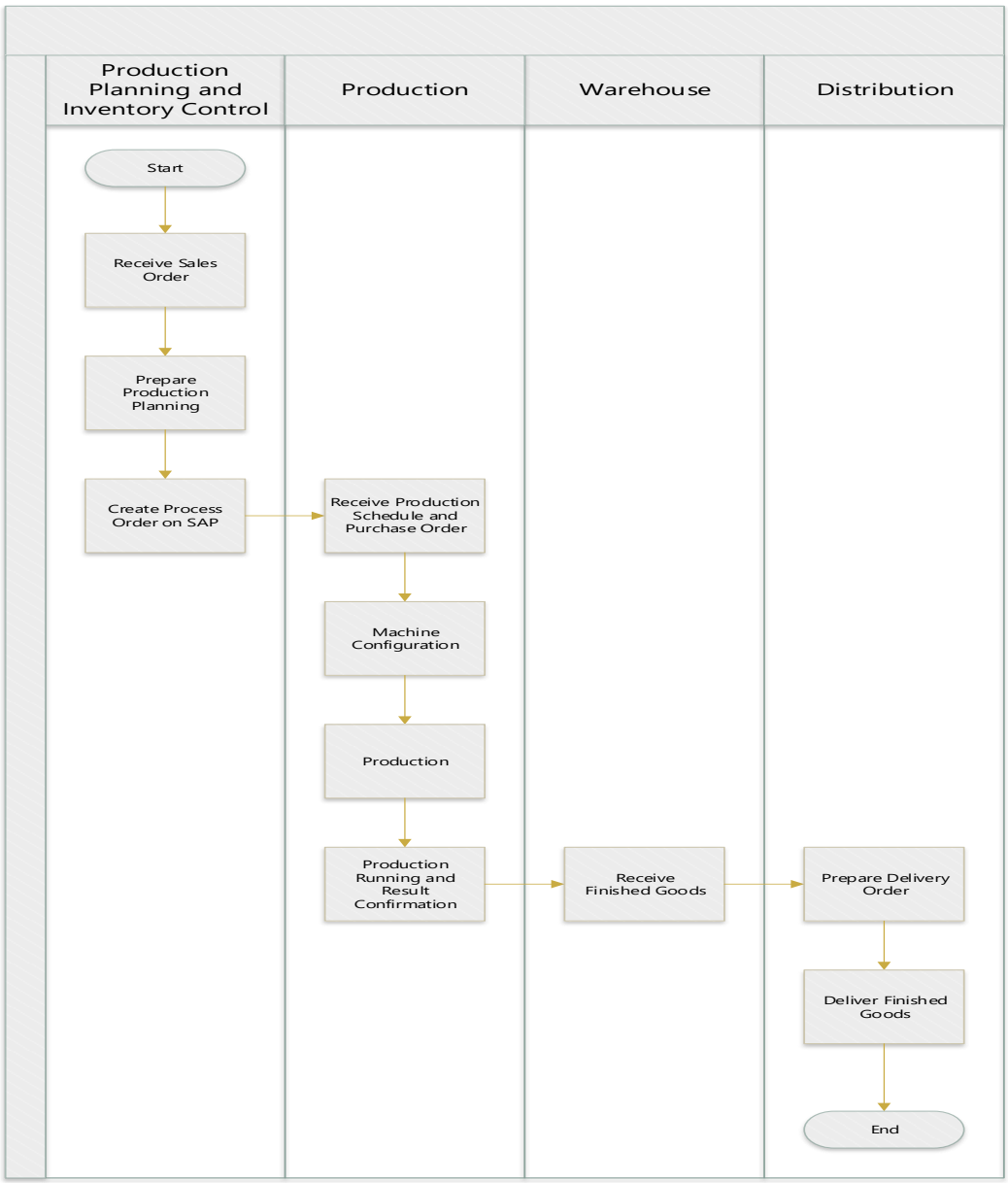

Figure 2. Activity Diagram of Production Process

B. Order Settlement

Following the process in the previous section (Process Order), there is another process called the order settlement process. The process started when the production batch finished, and the corrugator operator writes the raw material usage and production report from the production that previously done. The raw material usage and production report are bundled with running/downtime reports and waste reports. The data then sent to the SAP user (production division) to be checked and then forwarded to PPIC in order to generate order settlement. The following figure shows the activity diagram of the order settlement process.

The order settlement process starts when the production job is finished, and the corrugator operator creates the post-production reports(usage, production, running time, downtime, and waste). SAP users in the production division receive the reports and create data confirmation. Final data confirmed then sent to the PPIC to be included in the settlement process.

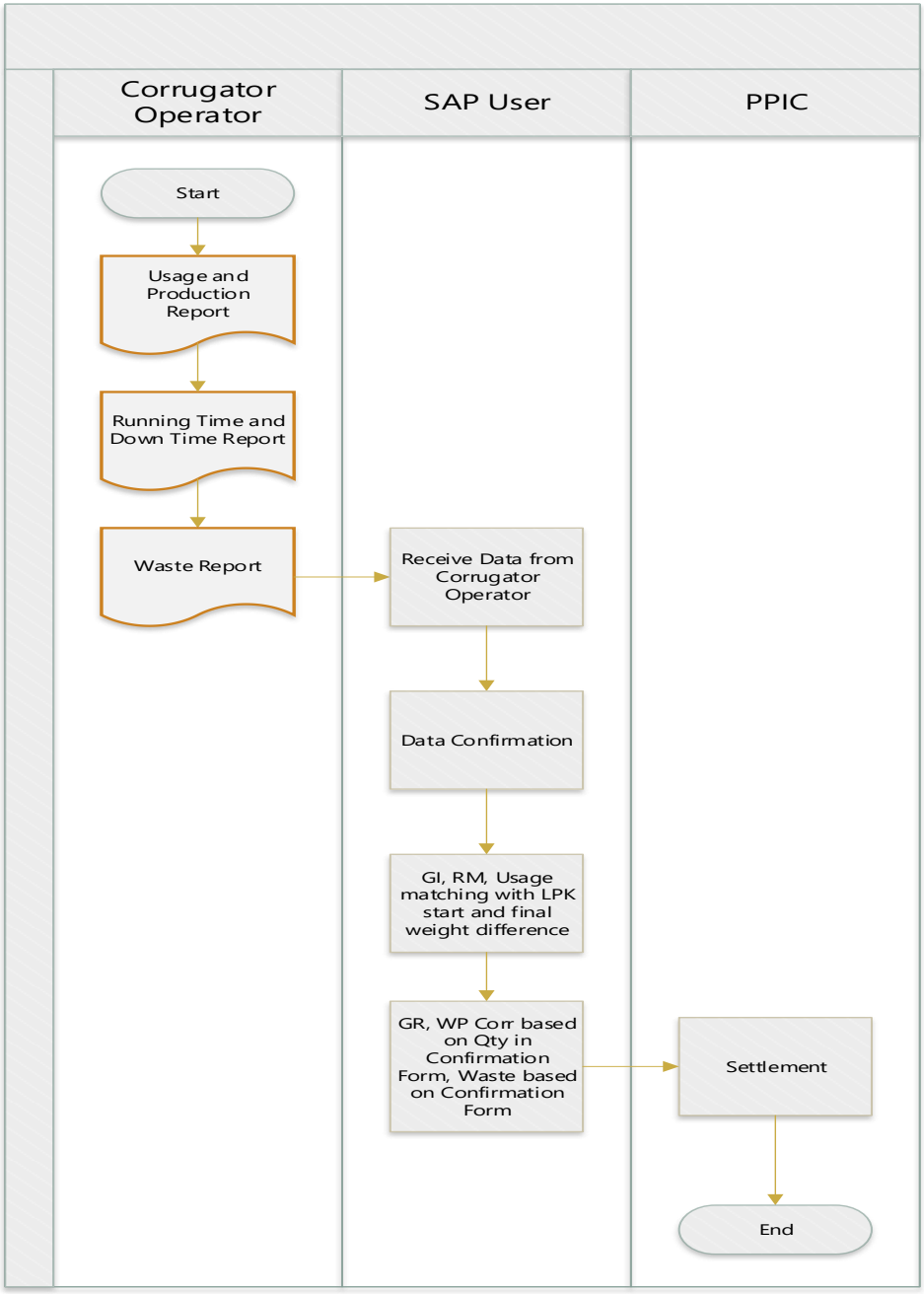

Figure 3. Activity Diagram of Order Settlement Process

C. Problems in the current business process

In the legacy system, usage and production report is recorded manually on the report paper. The SAP user receives the report paper from the production and entry of the data to the SAP system and forwards it to the PPIC for settlement. This manual process generates difficulties for employees as using raw material usage data written in paper is not accurate and time-relevant compared to the real production data in the system. This issue led this research to design a new customized application module on the top of the current SAP system.

In overview, the module covers two reports below for the production recording activity: 1). Production, running time, downtime, and waste report. 2). Material usage report.

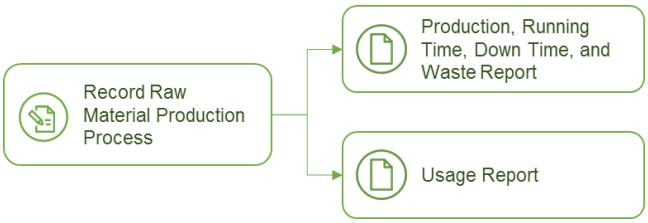

Figure 4. The Report from the production process

D. System Workflow in Production Process

The design of system workflow in the production process are shown in the following figure. It starts with Input Data for Raw Material Usage (YCOR6N), Actual Settlement Order (KO88), Process Order Information System - Header, and Components (COOISPI), and Raw Material Usage Analysis (YR03). This transaction screen is built on the SAP System and connected with the current database of the system.

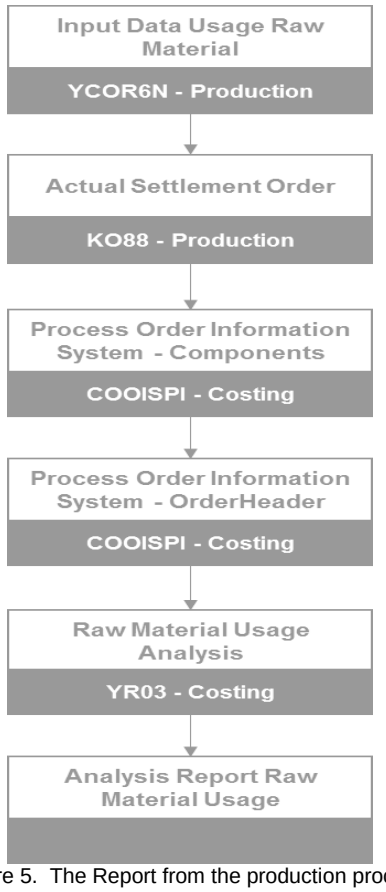

Figure 5. The Report from the production process

E. SAP Configuration

The following are the technical steps in developing this customize the module. These steps required in executing a query to retrieve the production and raw material usage data from SAP, as follows: 1). Retrieve process order number from table 'AUFM'. 2). Filter the movement type from '261-262' (good issue and cancelation) and '101-102' (good receipt and cancelation). 3). From table 'AUFM', the raw material usage (movement type '261') and output (movement type '101'). 4). Retrieve process order number from table 'RESB'. 5). The required quantity and standard usage data from process order can be retrieved from the table 'RESB'. 6). Retrieve process order number from table 'CAUFV'. 7). The order quantity, start date, and finish date data from process order can be retrieved from the table 'CAUFV'. 8). The calculation of variant quantity is: ***Variant quantity = Standard Usage – Actual Usage.*** 9). The calculation of actual usage is: ***Actual Usage = Require Quantity –Quantity Withdrawn***

The steps above are designed and executed before the development of the application module is running. These steps are essential as the foundation for bridging the application to the SAP database.

F. Process Order Information System

Figure 6 above shows the transaction screen of the Process Order Information System (COOISPI). This COOISPI transaction divided into two sections (header and component section). When this transaction is initiated, the user has to complete the input on the header section then continue to input the component section.

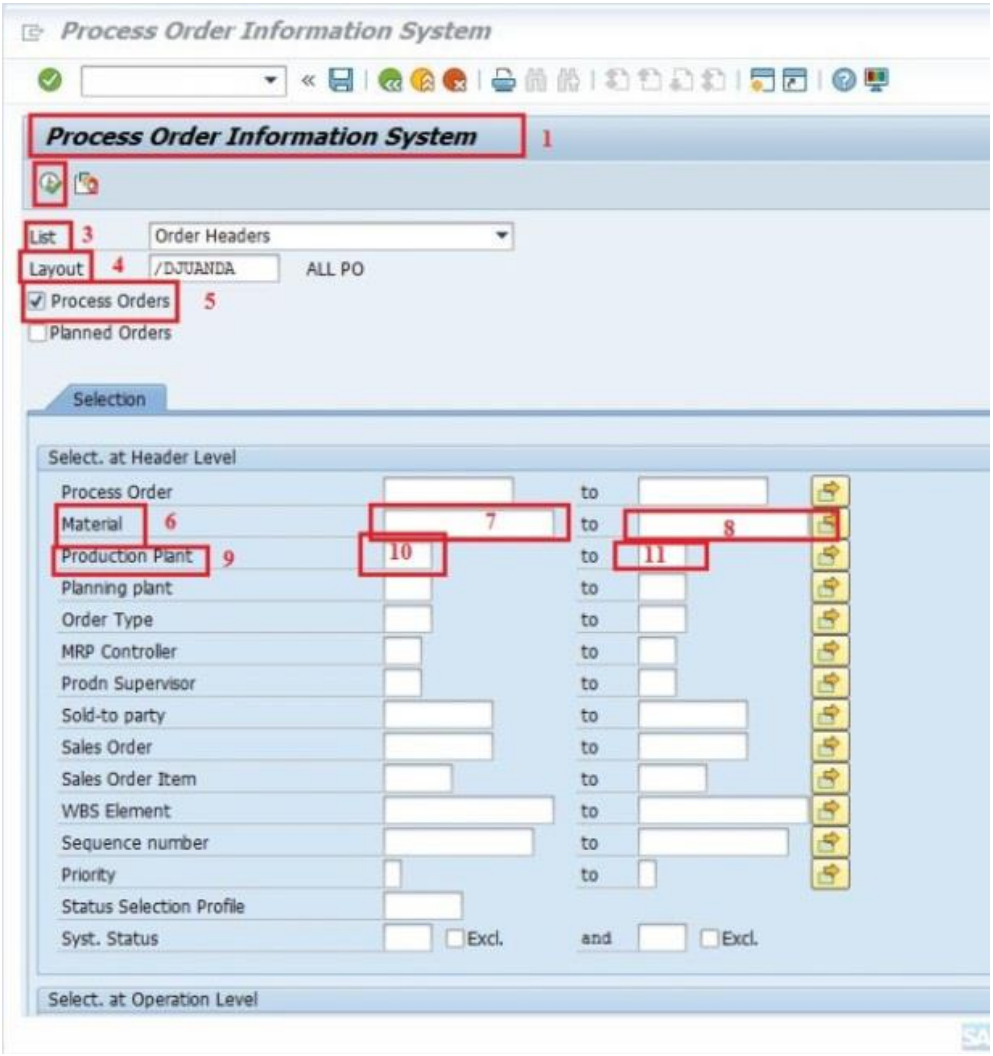

Figure 6. Process Order Information System – Transaction Code: COOISPI

G. Raw Material Usage Report

Related to the problem in the prior section, the raw material usage report is created to give the company an accurate number of raw materials used in the production process. The raw material usage module consists of two sections: input transaction (YCOR6N) and usage analysis (YR03).

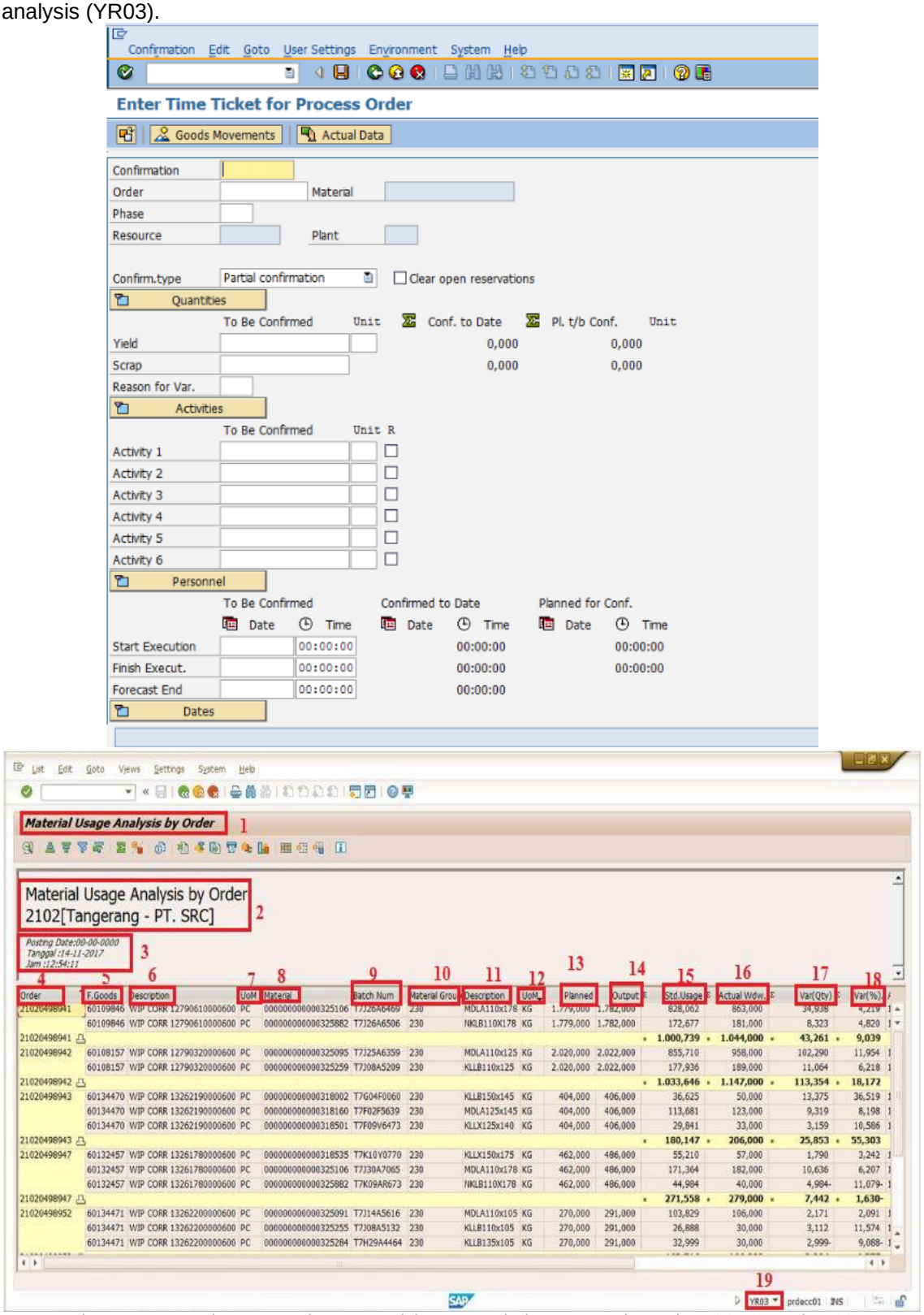

Figure 7. Transaction Input and Raw material usage analysis – Transaction code: YCOR6N and YR03

4. Conclusion

From the analysis in the previous section, the company faced a problem while its employee has difficulties in recording the raw material usage in the production process related to human error, inaccurate data, and time-relevance. The solution proposed from this research helps the company to discover the raw material usage accurately and efficiently. The proposed features/module in this research including input data usage raw material, actual settlement order, process order information systems - components, process order information systems – order header, raw material usage analysis, dan report raw material usage analysis. These modules are developed under the hood of the SAP system and already in the process of user acceptance test (UAT). For future research, there is an opportunity to enrich these modules with an automation module that could detect the data from the PLC segment to cut the human error in raw material data input.

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