BUSINESS PROCESS IMPROVEMENT: ORDER FULFILLMENT PROCESS

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ABSTRACT

A company that directly related to customer satisfaction needs a good working performance. A good working performance can be seen by a well-regulated business process. One classic problem of business process is order fulfillment. Company cannot meet the its standard demand fulfillment lead time.

By mapping current process using Data Flow Diagram and analyze it using Business Process Improvement method, it is found that there are some lack of coordination within the organization. On the other way, device that is used cannot support user's need optimally.

The proposed result based on the analysis are suggestions in terms of change of the flow, additional process, application of the formula on tools by using Microsoft Excel, application of Ms. Access, procedure of using delivery performance form and Standard Operating Procedures (SOP).

Keywords : *Business Process Analysis, tool modification, process modification*

1. INTRODUCTION

Business process is a measured, structured activity for producing certain outputs for certain stakeholders. Business process have strong emphasize on "how", unlike the "what" on the output itself (Davenport, 1993). In order to satisfy the stake holders, Business process should be simple, easy to follow, and effective. Some symthomps of ineffective business process are delay, lateness, or many defect products.

Business Process Improvement (BPI) provide a system that will help in simplifying business processes, with guarantee that the organization's internal and external stakeholders will get better output (Harrington, 1991).

Business process of PT. X is used as study case in this paper. In order to keep customer satisfaction, there is 7 days standard delivery lead time since order is received. Since PT X is a manufacturer, its direct customer is branches that spreading in many areas in Indonesia. The delivery lead time standard is often cannot be fulfilled. Based on observation, there is only "delivery order' letter but no further formal notification whether the product has or has not been delivered. The officer often did not notice if there is delay in delivery. This fact make the officer often did not notice if there are problems. Moreover, the officer also did not get any notification when the late order finally has been delivered

2. THEORETICAL BACKGROUNDS

Business process is a measured, structured activity for producing certain outputs for certain stakeholders. Business process have strong emphasize on "how", unlike the "what" on the output itself. A process is a specific sequences across time and space, with a start and an ending, that clearly defines the input and output (Davenport, 1993). Business Process Improvement (BPI) provides a system that will help in simplifying business processes, with guarantee that the organization's internal and external stakeholders will get better output (Harrington, 1991).BPI have three objectives, which are effectiveness, efficiency, and adaptability. There are ten steps on conducting BPI (Page, 2010) :
1. Develop the process inventory
2. Establish the foundation
3. Draw the process map
4. Estimate time and cost
5. Verify the process map

6. Apply improvement techniques
7. Create internal control, tools, and metrics
8. Test and rework
9. Implement change
10. Drive continuous improvemen

According to (Page, 2010), there are several tools to achieve BPI's objective:
a. Eliminate bureaucracy: eliminating administrative works, unnecessary paper works, etc.
b. Value added: Evaluating every aspect on business process to determine its contributions toward stakeholder's need.
c. Eliminate duplication: eliminating every similar works that occurred at different processes.
d. Simplification: reducing the complexity of business process.
e. Reduce cycle time: determine a way to reduce cycle time, minimize storage costs.
f. Automation: implementation of mechanical tools/computerization on routine and repetitive works.

3. RESEARCH METHOD

1. Mapping Current Business Process
   Mapping process is done using Data Flow Diagram. Data flow diagram is used because its capability to explain process from general view and more detail view. Each process should be validated in order to make sure that the process the properness with the actual business.
2. Analyzing Current Business Process
   To analyze current business process, each process is assessed using criteria some criteria (Forster, 2006), which are time, quality, cost, and delivery. Only 3 that will be used in this paper
   a. Time
      Overall amount of time needed for an activity from its beginning to completion. Since it is difficult to assess each process by direct measurement, process time is estimated by interviewing employee that responsible for the process
   b. Quality

Specific characteristics of a person, object, process, etc. Quality estimates effectiveness of each process. Generally, quality is measured by comparing true value by the target. For each process, characteristic of process is different, depend on purpose of the process
   c. Flexibility
      Flexibility is process ability to adapt toward changes.

Usually criteria "Cost" is used by doing financial measurements to determine the condition of business. However, it is difficult to assess financially estimates cost of each process one by one. Since all administration processes are done by person without special material, generally the longer time needed to do certain process, the higher the cost. Beside literature and observation, estimation is done by having a direct interview to PPIC, production and distribution.
3. Develop improvement
   Improvement is developed in 3 category, which are:
   a. Process modification
      Based on analysis, processes that need improvement based on QCDF criteria then further analyzed, whether the processes could be modified or not. Process modification is done by using several tool to achieve BPI's objective (Page, 2010)
   b. Supporting application
      In order to run the process more optimal, some supporting tools will be built. In existing process, user only uses Ms Excel to maintain its process. The improvement will try to optimize the usage of Ms. Excel. For database, Ms. Access is application will be built.
4. Mapping proposes business process
   After developing some improvements, there will be some changes in process due to processed or tool modification. So that, all processed are mapped again using Data Flow Diagram

4. RESULTS

As an example of the methodology, a business process of a manufacturing

company is used. The process that is analyzed here only focus on order fulfillment. In the first stage, all related processed were mapped in Data Flow Diagram. The diagram can be breakdown until very detail process, based on requirement. Figure 1 show level 1

diagram, sub process 2 of Order fulfillment system. Sub process 2 give detail activities of order realization process. The process start in process "check document" and end in process "confirm transportation availability".
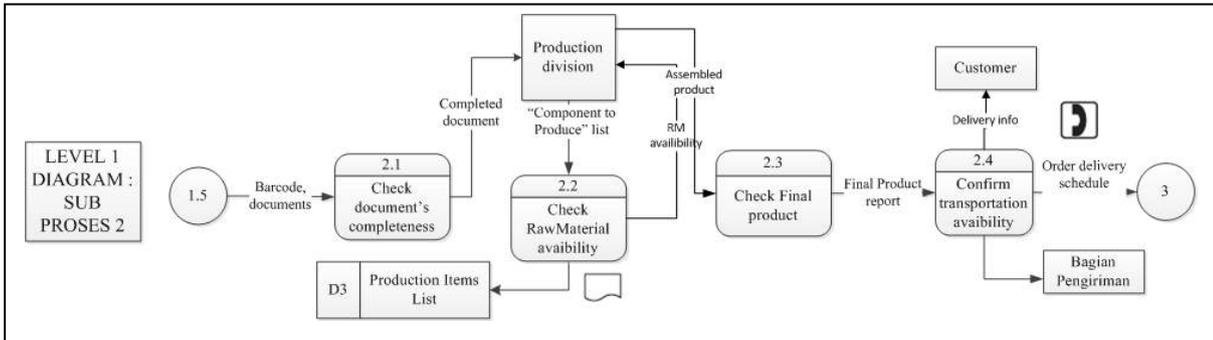

Figure 1. Existing Level 1 Data Flow Diagram: Sub Process 2

Based on complete DFD, each process is analysis using Quality, Delivery, and flexibility criteria. From the analysis, there are some processes that do not run optimally. For instance is car confirmation process regarding delivery product to customer (process 2.4). The company always rent truck that is used to transportation. Since there are many uncertainties in delivery process (traffic jam, broken car, etc), truck is not always available when it is needed. In the existing system truck availability confirmation is done after the product finished. If the truck is not confirmed, then the products will be stored at warehouse. Due to tight schedule of order fulfillment (from order preparation, production, until delivery), this condition automatically will cause delay in delivery (exceed 7 days). Moreover, the storage condition in warehouse is not well managed. This cause another problem, which is damage in product and makes the product has to be repaired before delivery. The worst case, the product is rejected. Table 1 presents analysis results of some processes based on Quality, Delivery time, and Flexibility criteria.

Table 1. Identification of Problems in Process based on Quality, Delivery Time, and Flexibility criteria

Process	Description	Q	D	F	Description
1.1.2.2	Select main order	X	X		take too much time to separate main order, order left
1.3.1.	Define product height		X		Identify height by looking at catalog manually
1.3.3	Calculate total products volume		X	X	Ms Excel, have to input data manually for each order
2.2	Confirm raw material availability		X	X	- material stock status is not available
2.4	Confirm vehicle availability		X	X	- Car is not available (cause delay in delivery)
3.4	Loading items		X	X	- Space is used for other items - Reject in items
Q: Quality		D: Delivery			F: flexibility

All processes that are not efficient need to be improved. The improvement is made based on category in literature (Page, 2010) and discussion with the company. There are

some modifications that is done to make the system simpler, without neglecting the output quality of process.

Table 2.
Proposed Improvement based on B,S,A criteria

Process	Description	B	S	A	Improvement
1.1.2.2	Select main order		X		Improve the usage of ms excel
1.3.1.	Define product height		X	X	Integrate existing ms excel application with ms access application
1.3.3	Calculate total products volume			X	Automatic calculation in ms access
2.2.	Check Raw Material availability	X			Automatic calculation in ms access
2.4.	Confirm transport availability	X			Modify existing process
3.4	Loading items	X		X	Modify existing process Automatic calculation of capacity
B: Bureaucracy S: Simplification A:Automation					

4.1. Modification of Process

First improvement is done by modify some process that is not effective or efficient. In this order fulfillment system there are 2 main problems that related to the process and urgently need to improve. First process relate to car availability confirmation regarding delivery finished product delivery. Second process related to Finished Goods Loading Process to truck.   In this paper, only one process that will be discussed, that is car confirmation process.

Since the problem is uncertainty of finished product delivery due to unavailable truck, this problem can be solved by simply switching the order of the process: truck availabilty confirmation, then do the assembling process if only truck availability is confirmed. If the truck is not available,plant should not assembly the order. need to assemble in order to minimize the problems occur as the product could be broken or used for
 another orders.

4.2. Modification of Tools

There are 2 software that is used as supporting application, there are: Ms. Excel and Ms. Access. These software are chosen because it is already widely used, easy to understand, and the most important, it is ease to modify based on requirements.
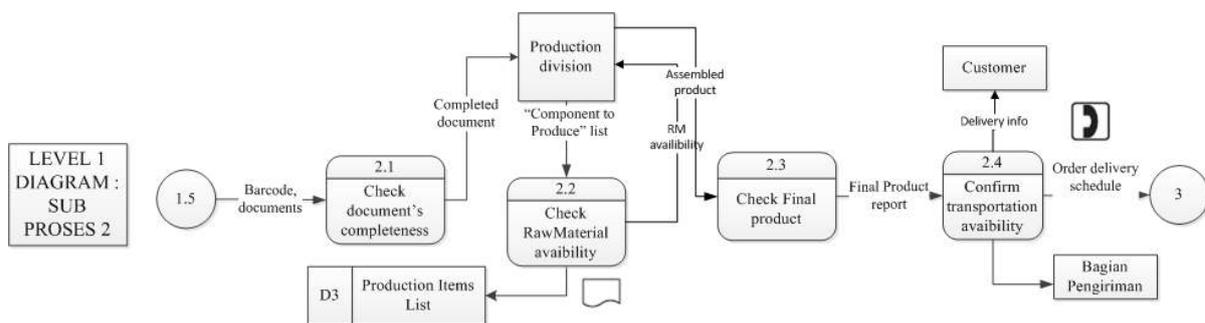

Figure 2. Proposed Level 1 Data Flow Diagram: Sub Process 2

In existing system, Ms Excel has already been used, however the applications is not used optimally, only for input and do simple calculation. The proposed system still uses the existing system and file. It only adds some columns and formulas to help in

selection process. "Combo box" tool is also used to give order status, something that has not done yet by the PIC. Table 3 present the modifications that is made in Ms. Excel. The modifications basically only adding some columns in existing file. The additional

columns consists of formula and combo box to ease current job and make existing calculation and selection process become faster.

Table 3. Proposed Modification of Ms. Excel

Process	Tools in Ms. excel
Define status of delivery	combo box
Divide orders based on branch	"filter", "Select characters" and "ifthen" function
Select main orders based on category products	"filter", "Select characters" and "ifthen" function

Figure 3 presents the additional column that use s combo box tool to identify status of order. This modification seems very simple. However it affects a lot in the process performance. In existing system the officer never has list of the order after it is sent to delivery division. This condition makes officer does not notice whether the goods has already been delivered or has not. Using the
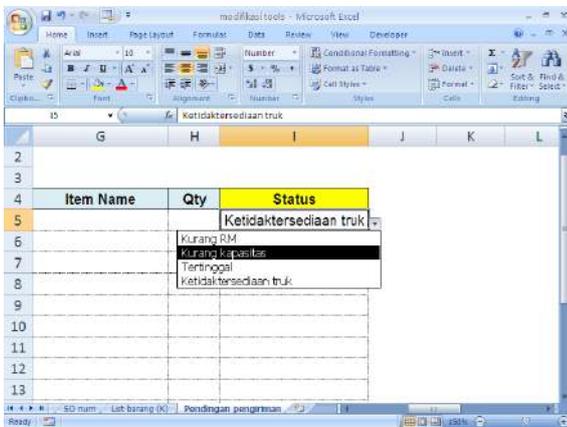

Figure 3. Combo Box tool to identify order status

Figure 4 shows how some functions are used to separate particular order among other orders. At first time functions that use to select characters in certain cells are used. The functions is used together with "if then" function to give certain rule for certain condition. Later, officer can use tool of "filter" to select certain order based on branch category, order category, or product length.

Figure 4. "Filter","Character Selection", and "If-then" functions that are used to help select main order

Second Modifications regarding tools are by developing Ms. Access application. This application is used capability in manage database in easy way. The Ms. Access is used to do these functions:
a. Calculate order capacity
b. Calculate raw material requirements
c. Produce "Work Instruction" based on machine characteristics

Based on product master data that contains length and depth of each product items, volume of product can be calculated. Later this volume is used to estimate total space requirement for each order (figure 5). This information is useful in defining which truck type (or capacity) should be rented. Moreover it can be used to calculate remaining space of truck if the delivery does not achieve normal or full capacity.

Figure 5. Report of Volume (or Space) Requirement for delivery

To help raw material requirement checking, a data base contains bills of material (BOM) are built. If there is an order, the total number of the order will be shown and the needs of the material that needed for and

will be known in completing the order (figure 6).

Figure 6. Checking availability and adequacy of raw material

5. DISCUSSION

The proposed solution is just a little modification and does not significantly change the way process run. This fact makes the proposed modification is easy to accept by the current employee. Proposed modification of tool also has proved their utility.

For instance is the usage of Ms. Excel. In order to ease the order selection process, current process has already used Ms. Excel. However the software is not used optimally, many functions that are not used. Upon this condition, using the same file and format that is used by current process and employee, some built in function in Ms Excel are added. By adding some columns, using a filter, or combo box functions, all processes can be run faster and more effective. From the observation, employees that do the process daily did not meet any difficulties in using the additional functions. In fact, since some process no longer did manually (but using filter or predetermined "if then" formula the process time is much reduced.

Since Ms Access is not as familiar as Ms. Excel, user needs more time to learn and adapt with the new tools. The adaption is mainly in doing the step by step for integrates Ms Excel file with the Ms Access. However, since the related table in Ms Access has been developed with the same arrangement and format, user can easily copy paste or import data from Ms Excel to Ms Excel. The output can be exported or copy-pasted back to Ms. Excel. Otherwise, user can directly see the output in "Report" section in Ms Access. Some outputs that can be shown in Ms Access are: total production volume per product category, total production volume per branch, or total raw material requirement per material.

Beside the benefit of the modification, there are some weaknesses or limitation for the improvement:

1. Process does not always solve solution, additional tool is needed to achieve optimality
Not all problems can be solved immediately by modify the process. For instance is for the car availability problem. By modifying business process, we can reduce possibility of damage product due to storage. However the improvement still cannot increase the availability level of truck. It needs other formula to help scheduling trucks
2. Business process need coordination between division
Business process is interdependent activity. It is almost impossible if only one man or one division eager to improve without support from other division. For instance is for loading process to truck. The process the has been improved by giving the rule which products (or order) should be the priority to load and which product (or order) could be loaded in the truck when space is still available. It needs commitment from all staffs in every division to follow the rule. By following the rule, there will be no case of delivery lateness due to lack of space in truck
3. Automation tool will help if master data is completed and data is updated regularly
Tool that has been developed, such as application in Ms Access, has helped user in manual searching or calculating process. However, to run the application properly for any kind of transaction, all master data should be completed, including material master data,
4. Standardization
All critical process should be provided with proper standard operating procedure (SOP) and Work Instruction in order to ensure that all persons in charge will have similar activity, method, and response in maintaining certain activities.

6. CONCLUSIONS

Conclusion of the business process analysis are:

1. To improve business process, emphasis in little process or tool modification makes the proposed modification is easy to accept by the current employee.
2. Beside easy to understand, developed supporting tool should be easy to modify based on requirements. Additional function in Ms Excel and simple database calculation in Ms Access is acceptable for common employees.
3. In order to succeed the improvement, coordination among employees and divisions is required, both in following standard of procedure and maintaining database regularly

7. LITERATURE

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