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BUSINESS PROCESS RE-ENGINEERING OF LOGISTICS SYSTEM IN PHARMACEUTICAL COMPANY

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ABSTRACT

Logistics system has an important role for pharmaceutical companies, because logistics system regulates the flow of material from ordering material to shipping of finished good. In order to reduces delays that occur in the shipping process or finished goods distribution, pharmaceutical companies need to implement a better logistics system management. This study was developed with methods of business process reengineering to achieve significant process improvement. IDEF0 method is used to map and analyze logistics systems through input, control, output and mechanism (ICOM) function and to design the new logistics system. Results of this research is the design of new process through strategy that obtained from the analysis of problems occurred. To verify the effectiveness of the proposed improvements, a simulation model is built using iGrafx software. The simulation output shows decreased time process by 7.55 days and efficiency 7.93% in the logistics system.

Keywords: management information system, logistics system, pharmaceutical companies, business process re-engineering.

1. INTRODUCTION

Competition in industries or companies nowadays are requires company to increase performances or continuity of innovation in order to survive in global competition. Competition is also occurs in pharmacy industry and company. Pharmacy industry and company are business company focusing on research, developing and distributing drugs. (Jaconelli, 2008).

There are consists of 206 pharmaceutical companies operate in Indonesia, 4 are national owned companies, 26 multinational company and 176 local company (International Pharmaceutical Manufacturers Group, 2013). The number of local competitors can be competition factor on selling drugs to consumer. One key selling support for Pharmaceutical companies is the presence of well logistics management which become competitive advantages for company.

Poor logistic management will cause problems, such as stock out and over stock (Mauliana, Ilham, & Indrabayu, 2015). Stock out can result delivery delay, loss of consumer trust, and also financial losses. Over stock can result stopping of the drug investment, limited storage, damaged drugs, expired drugs, and increasing risk of loss. Many companies experiences big losses because of unintegrated logistic management. Integrated logistic concept is one way to increase quality pharmaceutical company.

The improvement of logistic management system can generate profit for pharmaceutical companies (Tseng, Taylor, and Long Yue, 2005). Improvement can begin from raw material supply, quality of process control, and production process to distribution of product goods. Those processes are interconnected, if one of process is delay it will cause delay for other process. The company performance and productivity can be declined.

All pharmaceutical company's activity or process needs information, where all process generates information. An integrated information system is necessary for pharmaceutical companies to avoid miss communication between division, which can cause ineffective and inefficient process (Litan, Velicanu, and Copcea, 2011). In order to reduce ineffectiveness and delay of logistic business system, it is necessary to reconstruct the old business process and information system.

The objective of this study is to reengineer logistic system business process in pharmaceutical company to reduce delay and inefficiency in business processes to increase productivity and performance.

2. LITERATURE REVIEW

2.1 Logistic

Logistic is part of the supply chain processes that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers requirements. Logistics describes the entire process of materials and products moving into, through, and out of company. Inbound logistics covers the movement of material received from suppliers. Logistic is process of moving and handling raw material and finished material,

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from beginning to end of production, the sales and process of waste disposal, in order to satisfy customers and increase business competitiveness. (Tseng, Taylor, and Long Yue, 2005).

2.2 Information System

In business process, information system is key component which perform of using or without using technology (Mansar and Reijers, 2007). Information technologies are group of people, materials, and communication procedure which well-organized, the information can transmit in the right place and right time (Arias and Solana, 2013). Information technology is designed to solve a problems and gives benefit to an organization or individual (Heinemann, 2003), and prepared company on facing environmental changes and help them gives a new services and goods for their consumer. (Issa-Salwe, Munir, Aloufi, and Kabir, 2010).

2.3 Business Process Re-engineering (BPR)

BPR was first introduced by Hammer in 1990. BPR is a device in business for generates radical changes. BPR is said a new approach in management process which can produce radical changes in company performances. BPR is a radical change and rethink of all process that already exist to achieve the overall performance in terms of cost, quality, service, and speed (Hammer and Champy, 1993), BPR is also can be defined as the analysis process and redesign company's workflow (Davenport and Short, 1990). BPR is a rethinking and rebuilding structure, workflow and value chain of a company (Talwar, 1993).

In milk industry, the design of reengineering results in improved effectiveness and efficiency of the process of quality releases are supported by the condition of the production process, good performance and good quality (Dachyar and Christy, 2014).

2.4. IDEF0

IDEF0 is modeling technique to analyze, compile, reengineer, and integrate information technology, business process or engineering analysis software. IDEF0 is modeling tool that is used to create a model or represented structure from the function of a system, information, and object (Waltman and Presley, 1993).

IDEF0 are consists of data and object related with its function (represented by arrow) as shown in Figure1. There are four arrows pointing to one function box. Arrow on the box function can be called ICOM, abbreviation of:

- **I**nput, shows data needed to perform the function.
- **C**ontrol, limiting and determining the function.
- **O**utput, data generated from a function.
- **M**echanism, show person who operate the function.

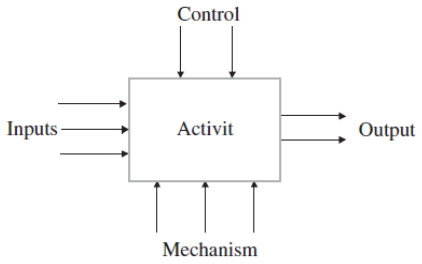

Figure-1. IDEF0 Representation of a function.

3. RESEARCH METHODOLOGY

This research is developed by Business Process Re-engineering methods which consist of four steps. (Kettinger, Teng, and Guha, 1997).

3.1 Identify/Categorize targets

First step begin with identification of research object, which are logistic system in pharmaceutical company, analyze background and formulate problems that occurred in the logistics system in pharmaceutical company.

The terms contained in the logistics system pharmaceutical company are:

- **IPP:** Document that contains planning of material ordering
- **MRP:** Document that contains data on the number of raw material and packaging material required for the production process and inventory of raw materials and packaging materials in the warehouse.
- **MPS:** Document related to the scheduling of the production process.
- **BPCS:** An integrated system of the pharmaceutical company that contains internal data of the company
- **SO:** Document that contains material required for the production process.

3.2 Assess business process

The second step begins by interviewing three employees and direct observation to a pharmaceutical company which is the object of research. This conducted to understand the business processes of logistics system in a pharmaceutical company, understand information system flow and problems that often occur within the business process.

3.2.1 Logistic system in Pharmaceutical Company

Logistics system becomes important role for pharmaceutical companies, because the logistics system regulates the flow of material from reception of raw

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materials and packaging materials to delivery of finished goods. If there are a delays in any of the material flow process, it will affect all other processes resulting in the distribution of finished goods to be blocked. Figure-2 shows logistic system business process of pharmaceutical company which consists of five sub processes associated with several divisions.

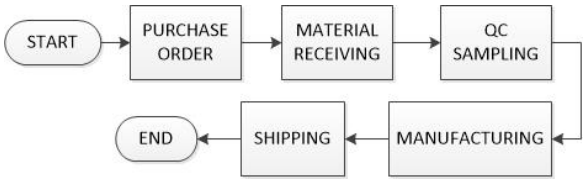

Figure-2. Logistics system business process in Pharmaceutical Company.

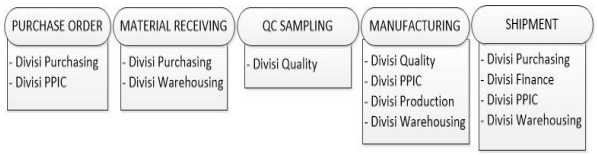

Figure-Error! No text of specified style in document.**.** Related logistics system division of Pharmaceutical Companies.

3.3 Design business process

The third step begins with mapping the business process logistics system using IDEF0, analyzes present problems that occur in the logistics system in a pharmaceutical company then performed a simulation using iGrafx software and analyzed to see what problems occurred.

3.3.1 Mapping with IDEF0

In mapping with IDEF0, depictions of model conduct in stages. From common activities (logistics system in a pharmaceutical company) to a detailed activity (activity of each subprocess). Content of diagram commonly called A0 or parent diagram (see Figure-4). Moreover, creating decomposition page or a child, which is detailed explanation of a system (see Figure-5).

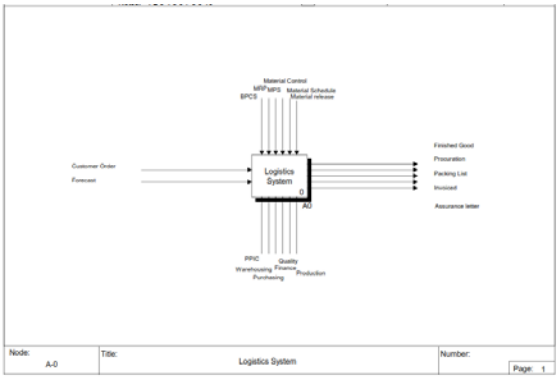

Figure-4. IDEF0 Logistics system.

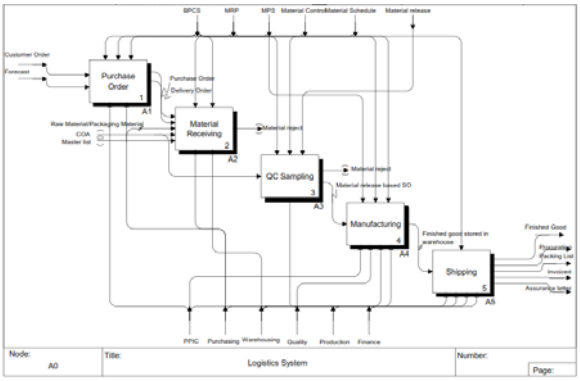

Figure-5. Node index level A0 Logistics system.

Furthermore, Node Index A0 elaborated into more detailed activities.

- Node Index level A1 (Purchase Order)

A11 update MRP and MPS

1. Update Forecast and Customer Order
2. Simulation MPS (Ms Excel)
3. Link MPS report with MRP
4. Check Availability Material
5. Check Warehouse Capacity
6. Confirm Final MPS-MRP

A12 Inventory purchase planning

1. Review MRP (IPP)
2. IPP prepared based on MRP
3. Input IPP to BPCS
4. Upload PR to e-PO
5. Print outstanding PR from e-PO
6. Attach approved IPP to PR

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A13 Issuing purchase order

1. Input PR to PO
2. Send PO to Supplier
3. Process of Material Shipment

- Node Index level A2 (Material Receiving)

1. Check Documentation
2. Receive Material
3. Input Data to BPCS
4. Identification Label Printing
5. Transfer Material into Location

- Node Index level A3 (QC Sampling)

1. Receive Material
2. Material Sampling
3. Material Testing
4. Input status material release
5. Check SO

- Node Index level A4 (Manufacturing)

1. Sales and Operation Planning
2. Monthly Production Planning

A43 Production process

1. Dispensing
2. Mixing
3. Primary Packaging
4. Secondary Packaging
4. Input Finished Good Release
5. Transfer Finished Good into Location

- Node Index level A5 (Shipping)

A51 Prepare shipping document

1. Prepare Shipment Schedule and Order Entry
2. Prepare Proforma and PL Booking
3. Prepare Shipping Instruction and Booking Container
4. Prepare Proforma Invoice and Allocate FG
5. Print Picker
6. Prepare Packing List
2. Loading FG to Container
3. Confirm and Print Despatch Note
4. Billing and Print Invoice
5. Prepare FG Document
6. Send All Document to Customers

3.3.2 Current logistics system process analysis

The research conducts interviews with expert companies to understand the problems occured. There are problems that often occur in the logistics system:

1. Repeated process
2. Estimated time for each process exceeds the performance standards
3. Inefficient input and print form process
4. Information System (BPCS) has not been use effectively
5. Sudden material booking sometimes occur
6. Human resources are not use properly
7. Employees often work overtime

3.3.3 Current logistics system proses analysis

After conducting as-is analysis process in logistic system, as-is model simulation model processed using iGrafx software. Time used in simulation is an average time of each activity. Simulations conducted over 12 months in which eight hours working day. In one week there are five days, and one month there are 22 working days. Simulations conducted at intervals of 1 month, the interval is the time between the processes will begin. Table-1 shows the results of a simulation using iGrafx software.

Table-1. Igrafx simulation results on current logistics system process.

		Transaction statistics (Days)			
Subprocess	**Count**	**Avg Cycle**	**Avg Work**	**Avg Wait**	**Avg Block**
Purchase Order	13	88.74	88.74	0	0
Material Receiving	13	0.57	0.53	0.04	0.04
QC Sampling	7	10.14	10.14	0	0
Manufacturing	57	2.87	1.46	1.4	0.67
Shipping	291	2.54	2.54	0	0
Proses *Logistics System*	13	95.18	95.16	0.02	0.02

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3.4 Process change

The fourth step begins with drafting to-be process, which determined improvement strategies obtained by literature study and discussion with company. In order to understand better scenario, iGrafx software is used.

3.4.1 Determine improvement strategies

In redesigning business process, there are elimination of activity that do not have added value. It can be done using the ESIA (Eliminate, Simplify, Integrate, Automate). (Peppard, 1995):

1. Eliminate: delete processes that do not have added value.
2. Simplify: After a process of elimination to the process is not required, the remaining process needs to be simplified.
3. Integrate: Combine process each other.
4. Automate: Automation applied after doing the above three previous processes.

Beside ESIA method, there is best practice as the strategy of BPR. There are the top ten models of best practices: (Limam Mansar and Reijers, 2005)

1. Task elimination: Eliminate unnecessary task from a business process
2. Task composition: Combine small task into composite task and divide large task into workable smaller task
3. Integral technology: Try to evaluate physical constraints in a business process by applying new technology
4. Empower: Give workers most of the decision-making authority and reduce middle management
5. Order assignment: Let workers perform as many steps as possible for single orders
6. Resequencing: Move task to more appropriate place
7. Specialist-Generalist: Consider the integration with a business process of the customer
8. Integration: Consider the integration with a business process of the customer or a supplier
9. Parallelism: Consider whether task may be executed in parallel
10. Numerical Involvement: Minimize the number of departments, groups and persons involved in a business process

3.4.2 Designing improved logistic system

Based on simulation results and discussions with experts, and then there will be designing a new system of logistics processes in pharmaceutical companies. According to literature study about BPR requirements on previous discussion, improvement strategy process is shown in Table-2.

From the strategy previously discussed, five scenarios for a new logistic system business process was developed five scenarios as explained in Table-3.

Table-2. Design improvement of logistics system.

No.	Subprocess	Aktivitas	Jenis
1	Purchase Order	Combine activities related to MPS and MRP document	Integrate
2	Purchase Order	IPP input into the BPCS system can be done if IPP has been approved by logistic plant manager	Simplify
3	Material Receiving	Documents inspection is done only once	Task Composition
4	Material Receiving	Material input can be done if materials has released status	Resquencing
5	QC Sampling	Combining sampling and testing activities	Integrate
6	QC Sampling	Reduction of testing activity time	Order Assignment
7	Manufacturing	Combine activity of inputting finished goods to BPCS system with storage of finished goods to warehouse	Order Assignment, Integrate
8	Shipping	The shipping document preparation activities carried out only by purchasing division.	Numerical involvement, Parallelism

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Table-3. Improvement scenario.

Scenario	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5	Strategy 6	Strategy 7	Strategy 8
	Combine activities related to MPS and MRP document	IPP input into the BPCS system can be done if IPP has been approved by logistic plant manager	Documents inspection is done only once	Material input can be done if materials has released status	Combining sampling and testing activities	Reduction of testing activity time	Combine activity of inputting finished goods to BPCS system with storage of finished goods to warehouse	The shipping document preparation activities carried out only by purchasing division.
1	✓	✓	✓	✓	✓	✓	✓	
2	✓	✓		✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓		✓
5	✓	✓		✓	✓	✓	✓	

Scenario is determined according to the level of importance of each strategy. A strategy that has the highest rate of interest will be inserted into all scenarios, whereas if a strategy exists at the lowest level of interest then the strategy will not be put in some scenarios.

3.4.3 The Result analysis of to-be process logistics system simulation

Simulations on five combinations of strategies have been outlined in Table-3. It will conduct using iGrafx software. Time used as a parameter to see the effectiveness of the design of a new logistics system that has been made. Table-4 shows the differences in the results of the as-is simulation with the to-be simulation results (five scenarios).

Table-4. Time comparison of logistics system As-Is with To-Be.

Current time	The proposed scenario	Time of proposed process	Efficiency
95.18	1	89.04	6.45%
	2	87.63	7.93%
	3	87.88	7.67%
	4	87.90	7.64%
	5	88.93	6.56%

From the simulation results comparison, well designed process achieve from five suggested scenarios for logistics system, where the second scenario, with an efficiency of 7.93% or a reduction of 7.55 day. The second proposal on the scenario; there are several strategies implemented. The strategy is obtained by applying the method and best practices (see Table-3).

3.4.4 A new logistic system business process mapping with IDEF0

After mapping the new logistics system in IDEF0, there are differences on some node index IDEF0 current (As-is) with node index IDEF0 To-Be, as shown in Table-5.

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Table-5. Differences IDEF0 To-Be with IDEF0 As-is.

Node index	IDEF0 Current (AS-IS)	IDEF0 TO-BE
Node Index A11	1.Update Forecast and Customer Order 2.Simulation MPS (Ms Excel) 3.Link MPS report with MRP 4.Check Availability Material 5.Check Warehouse Capacity 6.Confirm Final MPS-MRP	1.Update Forecast and Customer Order 2.Simulation MPS (Ms Excel) 3.Link MPS report with MRP 4.Confirm Final MPS-MRP
Node Index A12	1.Review MRP (IPP) 2.IPP prepared based on MRP 3.Input IPP to BPCS 4.Upload PR to e-PO 5.Print outstanding PR from e-PO 6.Attach approved IPP to PR	1.Review MRP (IPP) 2.IPP approved prepared based on MRP 3.Input IPP to BPCS 4.Upload PR to e-PO 5.Print outstanding PR from e-PO
Node Index A2	1.Check Documentation 2.Receive Material 3.Input Data to BPCS 4.Identification Label Printing 5.Transfer Material into Location	1. Check Documentation 2. Receive Material 3. Identification Label Printing 4. Transfer Material into Location
Node Index A3	1. Receive Material 2. Material Sampling 3. Material Testing 4. Input status material release 5. Check SO	1. Material Sampling and Testing 2. Input status material release 3. Check SO
Node Index A4	1. Sales & Operation Planning 2. Monthly Production Planning 3. Production Process 4. Testing Finished Good 5. Input Finished Good Release 6. Transfer Finished Good into Location	1. Sales and Operation Planning 2. Monthly Production Planning 3. Production Process 4. Testing Finished Good 5. Input and Transfer Finished Good Release into Location
Node Index A5	Control function of Shipping subprocess (node index 5) is BPCS	Control function of Shipping subprocess (node index 5) added by shipping procedure.
Node Index A51	1. Prepare shipment schedule and order entry by PPIC 2. Prepare proforma invoice and PL booking by PPIC 3. Prepare shipping instruction and booking container by Purchasing 4. Prepare proforma invoice and allocate FG by PPIC	Prepare shipment schedule and order entry by PPIC

4. DISCUSSIONS

From the simulation results, the best result of five suggested scenarios for logistics system is the second scenario. A proposed of second scenario consists of several strategies which combine activities related to MPS and MRP document; IPP input into the BPCS system can be done if IPP has been approved by logistic plant manager; material input can be done if materials has released status, combining sampling and testing activities; reduction of testing activity time, combine inputting goods activity to BPCS system with storage of finished goods to warehouse; and the shipping document preparation activities carried out only by purchasing division.

In the implementation of these strategies, there are possibilities that will affect the process of logistics systems in pharmaceutical companies, such as not all human resources have been familiar to the task or not all human resources not well adapt with new task (trainings are suggested). The corporate culture or the commitment of the employees who are difficult to change, the cost required for larger companies to add more manpower.

5. CONCLUSIONS

The conclusions obtained from this research, there is a time reduction of logistics system in pharmaceutical company occured after applying the second proposed scenario, with an efficiency of 7.93% or a reduction of 7.55 day.

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