THE APPLICATION OF PRODUCTION AND PROFIT OPTIMALIZATION IN TOWEL GARMENT COMPANIES

SYARIEF HIDAYAT

Departement of Informatics Faculty of Engineering and Computer Science
Indonesian Computer University
Dipati Ukur Street No. 112-116 Bandung
syarief10106710@yahoo.co.id

ABSTRACT

Surya Gunung Mukti is a textile company in garment producing towels. The problem faced by these companies is the difficulty to optimize the existing raw material for production of yarn towels that can be generated in one day so that the maximum corporate profits bigger. Therefore, companies require a certain calculation basis in order to optimize use of limited raw material yarn.

Production and application optimization benefits to the company Towel Garment was built to overcome these problems. This application has the capability to process raw data string, the working time data, the data needs of the production of towels and expense data for optimization calculation. The calculation was conducted on the basis of calculation and optimization using the simplex method, branch and bound method. Simplex method is a mathematical procedure repeated to find the optimal solution of many problems of Linear Programming applied in allocating scarce resources to maximize profits and minimize costs. While Branch and Bound is a method used to round off the value of decision variables is obtained from the calculation simplex method.

The output of this application are plenty of towels are manufactured based on the existing resources of yarn, the total cost burden of expenditure incurred during the production process as well as gross and net profits from sales of towels. This application can increase the percentage of corporate profits and big profits depend on selling price comparisons between the towel with each other.

Keywords: *Optimatization, Simplex Method, Branch and Bound Method, Linier Programming, percentage.*

1. INTRODUCTION

Optimization problem of a lack of raw material usage of yarn in the garment industry towels that do not lead to optimal production quantity and yield benefits that are not stable, so we need a calculation that estimates the available resources can be allocated properly. To solve the optimization problem of this production is necessary to build an application on the optimization of production and profit goals deangan towel garment company

1. Utilizing technology developed to help corporate performance.
2. Can optimize the number of towel production and stabilize profits.
3. Provide an estimate of how available resources should be allocated.

Benefits of this application is that it can determine a lot of towels, produced based on the existing resources of yarn, the total cost burden of expenditure incurred during the production process as well as gross and net profits from sales of towels. To overcome the constraints that occur in these garment companies, the Simplex method is used and Integer Linear Program (ILP) Branch and Bound algorithm method so it can maximize revenue and minimize the wastage of raw materials.

2. MODEL ANALYSIS, DESIGN AND IMPLEMENTATION.

The study was conducted using descriptive analysis method is a method that aims to get a clear picture about the things that need through the following stages:

a. Data Collection, consisting of: literature study, interview studies, and study documentation.
b. System development method, comprising: collecting needs, build a prototyping, evaluation, prototyping, coding systems, test systems, evaluation systems, using the system.

2.1 General System Description

The process that occurs in this system is, the first user is required to log into the system and if the login is successful then displayed the main page (home) from the application.

This application is available at five other submenus of Master Data, Data Needs, Data Order, Optimization and Logout. In the master data have User Data, Data Towel, Yarn Data and Data Charges. Need data-input data used for data production needs a towel, which then used that data to do the optimization process. Optimization menu functions to perform the optimization process by applying the Simplex method and the Branch and Bound based on data needs that have previously been entered on the Data menu requirements.

2.2 System Analysis

Surya Gunung Mukti is a garment company that is able to produce hundreds of towels towels every day. Determination of total production so far is done manually by the owner This often makes a lot of the rest of the main raw material in production were unused yarn so that the company was experiencing losses.

1. Completion Using Simplex Method

To solve the optimization problem, it needed a complete data production process towel. These data are obtained and then inserted into the table a combination of towel production:

Table 1. Table problem combination towel production

Kind Of Towel	Resource needs				Price (/unit)
	Work Time (/minute)	Red Yarn (/gram)	Blue Yarn (/gram)	White Yarn (/gram)	
Towel 80 x 60	25	420	232.2	222	Rp. 18.000
Towel 60 x 120	25	139.7	139.7	141.6	Rp. 15.000
	≤720	≤5000	≤8500	≤181000	

Determine the unknown variables (decision variables) and is expressed in mathematical symbols:

$X_{1=}$ Number of towels1

$X_{2=}$ Number of towels2

Based on the above statement, then forming an objective function and constraint functions:

Maximize

$Z=18.000X_1+15.000X_2$

Constraint:

$25X1+25X2 \quad \leq 720$

$420X1+139.7X2 \quad \leq 5000$

$232.2X1+139.7X \quad \leq 8500$

$222\ X1+141.6X2 \quad \leq 181000$

$X_1, X_2 \quad \geq 0$

The next step is change the function of inequality constraints into the equation by adding "slack variables".

Objective Function :

$Z\text{-}18.000X_1 - 15.000X_2+S_1+ S_{2+} S_{3+} S_{4+} S_5$

Constraints :

$25X_1 + 25X_{2\,+} +S_1 \qquad \leq 720$

$420X_1+139.7X_2 \quad +S_2 \qquad \leq 5000$

$232.2X_1+139.7X_2 \quad +S_3 \qquad \leq 8500$

$222\ X_1+141.6X_2 \qquad +S_4 \qquad \leq 181000$

$X_1, X_2, S_1, S_2, S_4 \qquad \geq 0$

The first table iteration is :

Table 1. The first Simplex iteration Table

Z	X_1	X_2	S_1	S_2	S_3	S_4	Solution
Z	-18000	-15000	0	0	0	0	0
S_1	25	25	1	0	0	0	720
S_2	**(420)**	139.7	0	1	0	0	5000
S_3	232.2	139.7	0	0	1	0	8500
S_4	222	141.6	0	0	0	1	181000

Value of 420 as the pivot element is obtained from the columns that have a value at the Z line / function goal marked the largest negative and the absolute price and the value of the smallest division of the solution column of each element in the pivot column. Then all the key elements in the row divided by the key element, by applying the Gauss Jordan method, type 1. In addition to changing key elements in the row, the elements on the other line was also changed by applying the Gauss Jordan method type.

The same calculation process is done repeatedly until the optimal result is achieved. Optimal results are achieved when there is no negative value in row Z.

Based on the calculation of the final results are obtained a new solution is X1 = 25.32 and X2 = 3:48 and the value of Z = 442 411.

2. Solution using Branch And Bound Method

The optimum solution to this problem is X1 = 25.32 and X2 = 3:48 and the value of Z = 442 411.The next step is dividing the variable with the largest fractional value into two parts. Because the solution X2 = 3:48 has selected the biggest breaks. To eliminate the burst value of X2 = 3:48, two new constraints are created. In this case, the two nearest whole value of 3:48 was the third and fourth. Thus obtained two new issue with X2 X2 ≤ 3 and ≥ 4 which will be described as A and B.

Part A:

Maximize:

Z = 18.000X1 +15,000 X2

Constraints : 25X1+25X2 ≤720

420X1+139.7X2 ≤5000

232.2X1+139.7X2 ≤8500

222 X1+141.6X2 ≤181000

$X_1 \qquad \leq 3$

$X_1, X_2 \qquad \geq 0$

Part B :

Maximize:

$Z=18.000X_1+15.000X_2$

Costraints : 25X1+25X2 ≤720

420X1+139.7X2 ≤5000

232.2X1+139.7X2 ≤8500

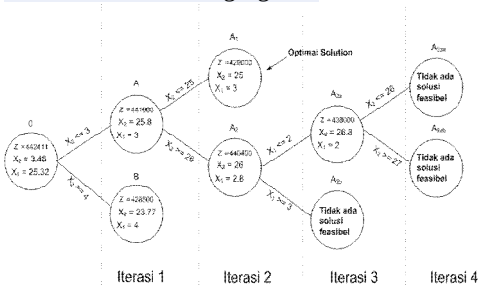
222 X1+141.6X2 ≤181000

$X_1 \qquad \geq 4$

$X_1, X_2 \qquad \geq 0$

The result of calculating the optimal solution of the simplex A and B are: Part A: Z = 441 000; X1 = 3, X2 = 8.25 Part B : Z = 428 500; X1 = 4, X2 = 23.77

A feasible solution values continue dicabangkan broken into sub-sub-problems, to obtain optimal results which approached the objective function value calculated simplex with X1 and X2 in the form of an integer. If the search was completed, rounded solution with the highest objective function value is selected as the optimum solution. For this problem the optimum solution is to round Z = 429 000; X1 = 3, X2 = 25 are generated by the Subdivision A1 All of the branch and bound procedure is shown in the following figures:

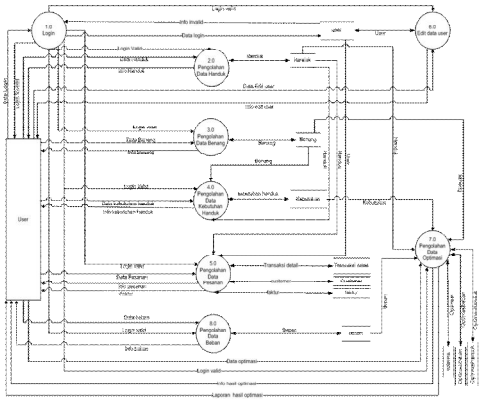


Picture 1. Branch and bound optimization procedure towel production.

From the results of calculations simplex and branch and bound above, we can get optimal benefits from the products amounted to USD. 429 000 with the optimal production lot size of 80 x160 for towels as much as three pieces and measures 60 x 120 towels as much as 25 units.

2.3 DFD (Data Flow Diagram)

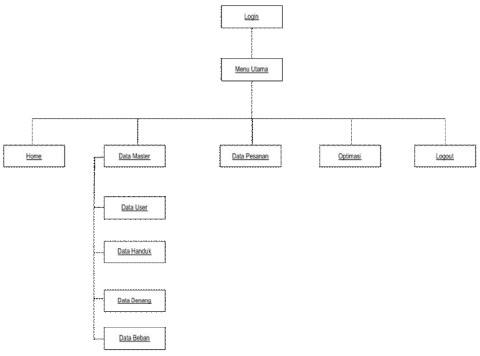
Modeling of these applications use the Data Flow Diagram using Visio tools.



Picture 2. DFD Level 0

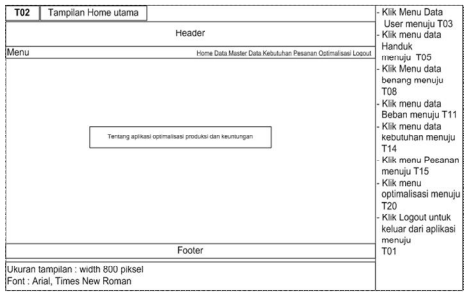
2.4 Structure Design Program

Optimizing Application program structure design Production And Gain Pda Paerusahaan Garment Towel is as follows:



Picture 3. Menu Structure

2.5 Interface Designing



Gambar 4. Interface Design of Main Menu (Home)

2.6 Implementation

Implementation phase is the phase of software creation, continuation phase of system design activities. This stage is the stage where the system is ready for operation.

Hardware equipment (hardware) and software (software) used in building these applications are:

Table 3. Hardware used

Devices	Specification
Processor	Kecepatan 2.66 GHz
RAM	1 GHz
Harddisk	120 Gb
Monitor	Resolusi 1280 x 800
VGA	128 Mb

Table 4. Software Used.

No	Software	Description
1	Sistem Operasi	Windows 7
2	Bahasa Pemrograman	PHP
3	*DBMS*	MySQL 5.0.27
4	*Web browser*	Mozilla firefox 3.6, Opera, Chrome
5	*Code editor*	Macromedia Dreamweaver 8
6	DFD modeler	Microsoft Visio 2007

3. Result And Discussion

The results from the application of this identification can be seen in the tables below:

1. Do you agree that the look of the website is quite interesting and easy to understand and user friendly?

Table 5. The results of a questionnaire testing 1

	Explanation	**Responden**	**Prosentase (%)**
1	Very agree	1	100
2	Agree	0	0
3	Simply Agree	0	0
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

2. Do you agree that the information given by the calculation of this application in accordance with the information you need?

Table 6. The results of a questionnaire testing 2

	Explanation	Responden	Prosentase (%)
1	Very agree	0	0
2	Agree	1	100
3	Simply Agree	0	0
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

3. Do you agree that this system will make it easier for its users in determining lot of towel material should be produced in one day based on the raw materials?

Table 7. The results of a questionnaire testing 3

	Explanation	Responden	Prosentase (%)
1	Very agree	0	0
2	Agree	0	0
3	Simply Agree	1	100
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

4. Do you agree that with this application, the company Surya Mount Mukti will be easier to compare the results of the previous production with the towel now?

Table 8. The results of a questionnaire testing 4

	Explanation	Responden	Prosentase (%)
1	Very agree	1	100
2	Agree	0	0
3	Simply Agree	0	0
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

5. Does the existence of this optimization applications, the raw material can be optimized with good yarn well as materials production and reduce the amount of unused yarn?

Table 9. The results of a questionnaire testing 5

	Explanation	Responden	Prosentase (%)
1	Very agree	0	0
2	Agree	1	100
3	Simply Agree	0	0
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

6. Is Application optimization of production and profitability of the company is able to optimize profits and can take into account the size of the burden of spending during the production process?

Table 10. The results of a questionnaire testing 6

	Explanation	Responden	Prosentase (%)
1	Very agree	1	100
2	Agree	0	0
3	Simply Agree	0	0
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

7. Do you agree that the application is eligible for implemantisikan diperushaan Surya Mount Mukti as product application and advantages Optimizer?

Table 10. The results of a questionnaire testing 7

	Explanation	Responden	Prosentase (%)
1	Very agree	1	100
2	Agree	0	0
3	Simply Agree	0	0
4	Regular only	0	0
5	Less Agree	0	0
6	Not Agree	0	0
7	Very not Agree	0	0

4. CONCLUSIONS AND RECOMMENDATIONS

Based on comparisons between software development objectives that will be built with the test results, then the conclusion that this application can provide an estimate of how available resources should be allocated. If the estimates that have been

generated actually implemented, then the system can increase production profits, while profits depend on the percentage rate data in the production of towels. The greater the percentage of profits depends on the data produced towels. The bigger the price comprasion between the towel with one another, the greater the percentage of he value generated.

This application can be developed again in the future. Like add administrative systems so that applications can run with more complex and complete. Scheduling system with a particular method can be used on systems with the order, so that the system becomes more integrated.

Applications can accept data that has not dioah. For example the application can calculate how much amount of stock owned, if the data had been entered in the form of bales of yarn into the form g / Kilogram.

5. REFERENCES

[1]. Hakim, Lukmanul., Trik Rahasia Master PHP Terbongkar Lagi, Lokomedia, Yogyakarta, 70-191, 2009

[2]. Hakim, Lukmanul., Membongkar Rahasia Para Master PHP, Lokomedia, Yogyakarta, 136 – 178, 2008

[3]. Membuat ERD http://www.sukarata.com/files/Membuat%20ERD.pdf diakses pada hari : Kamis, 14 Maret 2010, jam 23.00 wib

[4]. Pressman, Roger S., Rekayasa Perangkat Lunak : Pendekatan Praktisi, Buku kesatu, Terjemahan : Harnaningrum LN, edisi kedua, Andi, Yogyakarta, 1997

[5]. Mulyono, Sri., Riset Operasi, Lembaga Penerbit Fakultas Ekonomi UI,1-108, Jakarta, 2002

[6]. Sitinjak J.R, Tumpal., Riset Operasi untuk Pengambilan Keputusan Manajemen dengan Aplikasi Excel, Graha Ilmu, Yogyakarta, 2006

[7]. Thaha, Hamdy, A.,*Operations Research*, Departement of Industrial Engineering University of Arkansas, Fayetteville. 1993, Terjemahan : Wirajaya, Daniel, Riset Operasional, edisi kesatu, Binarupa Aksara, Jakarta, 1996

[8]. Parno. Data Flow Diagram http://docs.google.com/viewer?a=v&q=cache:VNzM8pAgGOcJ:tavipia.staff.gunadarma.ac.id/Downloads/files/15425/DFD.pdf+DFD&hl=id&gl=id&pid=bl&srcid=ADGEEShcSXOAnlXvjf2WKldwyqjvbeaVryDQT4cJ4tBUlaxqFi4lxWf8r0t0xjPHSgaL5rFjVEB0pz0oz9vir2UHD8yHgW1_l-6CjvxxU4mbImGRFy5bJNl74svbKUCu8UKofzwFy7JG&sig=AHIEtbS7_0drk3WymbLhbJ6O4026FNaRyQ. Diakses pada hari: kamis 10 Mei 2010, jam 23.25 Wib

[9]. Petra Chirstian University Library http://digilib.petra.ac.id/viewer.php?submit.x=0&submit.y=0&submit=prev&page=1&qual=high&submitval=prev&fname=%2Fjiunkpe%2Fs1%2Finfo%2F2007%2Fjiunkpe-ns-s1-2007-26403106-5395-integer-chapter3.pdf diakses pada hari : Sabtu, 7 Januari 2010, jam 14.00 Wib.