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Applying the Simplex Method to Optimize Employee Distribution to Increase Sales Internet Data Package

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ABSTRACT

The goal of this article is to ascertain how to maximize sales of internet data packages while keeping the company's marketing budget within reasonable bounds. The technique utilized is linear programming using the Simplex method; this approach's benefit is the ability to compute two or more choice variables, which produces results that are superior to those of the graphical method. Variable Three are utilized in this study: senior marketing (X1), junior marketing (X2), and apprentice marketing (X3). The maximum amount of data package cards that may be sold by the three marketing is 3000. The marketing senior target can sell 1200 packages, whereas the marketing junior target can sell 1200 packages, according to optimization simulation findings using the simplex approach.

Keywords: optimization, simplex, linier programing

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1. INTRODUCTION

The intense competition between businesses will cause a decline and increase in turnover for each organization. As a result, businesses require a plan to raise profits by taking into account both strengths and weaknesses and running optimization simulations using a variety of techniques, such as marketing performance improvements, promotion techniques, and corporate service improvement (Jatiningrum, 2019). The company's marketing performance has to be improved since marketing works best when it interacts directly with customers or through social media. (Sari, 2020)Companies can undertake factor analysis using a variety of approaches, including an analytical hierarchy process (Hozairi, 2019).

The Tembung region is serviced by the business PT. Bistion Ponsel, which sells various internet data package products. The firm employs 20 (two twenty) people in marketing who are responsible for sales campaigns in Deliserdang's Bandar Khalifah, Sei Rotan, Medan Estate, and Bandar Setia Regencies. twenty marketing There are 4 marketing apprentices/contracts, 8 marketing juniors, and 8 marketing seniors in this group. By making the most of its 20 staff, PT. Bistion Ponsel aims to sell 3000 data packages to customers each month. The challenge facing PT. Bistion Ponsel is how to maximize business profit while selling the targeted 3000 data packages with a little staff. Therefore, PT. Bistion Ponsel requires an answer to its problem.

An mathematical process used to calculate and store data is called the simplex technique. Numerous figures in the current iterations are considered while choosing the following iterations (Saryoko, 2016). A technique to do anything is called simplex. Numerous inequalities and numerous variables are present in linear programming issues (Haslan, 2018). When utilizing the simplex method The linear programming model must be modified to a universal form known as "standard form" in order to solve the linear programming issue (Rumetna M. S., 2020). The conventional form of the linear program model is all barriers expressed as an equation with a non-negative right side, with the aim being either maximization or minimization (Aprilyanti, Optimasi Keuntungan Produksi Kemplang Panggang Menggunakan Linear Programming Melalui Metode Simpleks, 2018).

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The goal of the study is to maximize business earnings and staff assignment distribution, with a cap of 3000 data package goods sold every month. The researcher employed an Excel solver in the simulation process optimization utilizing the simplex linear programming approach to address the issues raised above. One of the additional features offered by Microsoft Excel is called Solver, and it helps you determine the best value for a formula in just one cell (also known as the target cell) on an Excel worksheet.

In this study, the author employs solver add-ins to determine firm earnings and to solve optimization issues related to marketing and distribution. This solution was chosen by the author because it is free, doesn't need to be constructed, is simple to use, and is simple to obtain—specifically, solver add-ins for Microsoft Excel. Previous research has shown that the simplex method can be applied to a variety of problems, including maximizing bread sales (Lina, 2020) maximizing billboard production, maximizing the increase in production profits (Rumetna M. L., 2019).

2. RESEARCH METHOD

The goal of this study is to solve difficulties at PT. Bistion Ponsel with the aim of maximizing corporate profitability while taking into consideration personnel restrictions and company success goals. Research stages are depicted in Figure 1. It has numerous steps, including: (1) identifying the business problem By identifying choice factors, research limitations, and goals research, as well as by applying the linear method simplex programming and using simulation to solver excel, PT. Bistion Ponsel, (2) did a literature study of various prior works and collected data from PT. (3) In order to increase data package sales turnover, businesses should (4) analyze the simplex optimization findings for the applicability of methodologies, variables, and research restrictions, and (5) choose the best course of action. Excel solvers are the tools used to model research issues. A tool called Solver is an add-in for Microsoft Excel that may be used for what-if analysis. The optimal (highest or least) value for formulae inside a single cell, known as the destination cell, must be subject to the constraints given, and this is done by using a solver.

3. RESULTS AND DISCUSSION

Based on data that will be used as a measurement, including the number of marketing department employees, the price of each incentive paid at the marketing level for each data package sold, and the monthly number of cards used for installing data packages (Ary, 2017).

A. Data description for fields

A large number of marketing employees, various levels of marketing, incentive money given to each level of marketing for each Internet package sold, the number of devices required to install an Internet package for a month, and the terms and conditions of the target that must be met by each marketing department employee are among the data used as a measurement tool.

Table 1. Employee data for the marketing division of PT. Bistion Mobile

No	Marketing Level	Amount	incentive(Rp.)
1	Senior Marketing	8	5000
2	Junior Marketing	8	2500
3	Marketing Intern	4	1000

Twenty marketing personnel work at PT. Bistion Ponsel, and there are three marketing levels: Senior Marketing, Junior Marketing, and Intern Marketing, as shown in Table 1. Four sub-districts—Bandar Khalifah, Sei Rotan, Medan Estate, and Bandar Setia Regencies—are responsible for marketing. Based on the quantity of items offered each month, data package sales and marketing goals are set. As a monthly minimum sales objective, there are 3000 cards available in data packages that are ready for marketing.

Each member of the marketing department must meet the following criteria in order to meet the target:

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1. Senior marketing sales objectives must be higher than those of junior and apprentice marketing sales targets.
2. Senior marketing sales objectives must be twice as large as junior marketing sales targets, and
3. Junior marketing sales targets must be double the size of apprenticeship marketing sales targets.

B. Determination of variables, constraints and objective function

Researchers utilized the Simplex approach helped by Adsin Solver in Microsoft Exel to determine the quantity of internet data package sales per month by Facebook marketing maximum income and minimal business expenditures for reward money are acquired for personnel in the marketing department (Warman, 2021). Following are the steps for the solution:

- Define variables
  The data for the variable is determined by the number of cards sold according to the level marketing, including:
  X^1 = The number of cards sold by senior marketing
  X^2 = The number of cards sold by junior marketing
  X^3 = The number of cards sold by the marketing apprentice
- Define the objective function
  Based on Table 1 above, the target function is to maximize incentive funds from all three tiers of marketing, specifically:
  $Z = 5000X^1 + 2500X^2 + 1000X^3$
- Define boundaries
  - Constrain_1 = jumlah kartu yang harus terjual oleh ketiga tingkatan marketing, maka:
    $X^1 + X^2 + X3 \leq 3000$
  - Constrain_2 = target marketing senior harus lebih besar dibandingkan dengan marketing junior, maka: $X1 \geq X2$
  - Constrain_3 = target marketing senior dua kali lebih besar dibandingkan dengan marketing magang, maka: $X1 \geq 2X3$
  - Constrain_4 = target marketing junior dua kali lebih besar dibandingkan dengan marketing magang maka : $X2 \geq 2X3$
- The description of the mathematical model
  Purpose Function:
  $$Maksimumkan\ Z = 5000X^1 + 2500X^2 + 1000X^3$$
  Constraint Function:
  $X^1 + X^2 + X^3 \leq 3000$
  $-X^1 + X^2 \leq 0$
  $-X^1 + 2X^3 = 0$
  $-X^2 + 2X^3 = 0$

C. Excel solver simulation results with the simplex method

Using the Simplex technique and the Ads-in Solver in Microsoft Exel, a simulation will be run based on the variable data, objective function, constraint function, and mathematical model of the issue.

1. Enter data values according to the mathematical model above into Exel

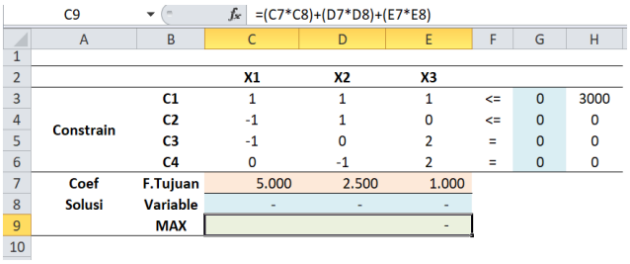
Fig. 1 Input data according to the mathematical model

	A	B	C	D	E	F	G	H
1								
2			X1	X2	X3			
3	Constrain	C1	1	1	1	<=	0	3000
4		C2	-1	1	0	<=	0	0
5		C3	-1	0	2	=	0	0
6		C4	0	-1	2	=	0	0
7	Coef	F.Tujuan	5.000	2.500	1.000			
8	Solusi	Variable	-	-	-			
9		MAX			-			
10								

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2. Enter the Maximum formula, namely F.Purpose x Variable =((C7*C8)+(D7*D8)+(E7*E8)) so that it produces a value of 0 before the solver is carried out. The results of writing formulas and display in excel can be seen in Figure 2.

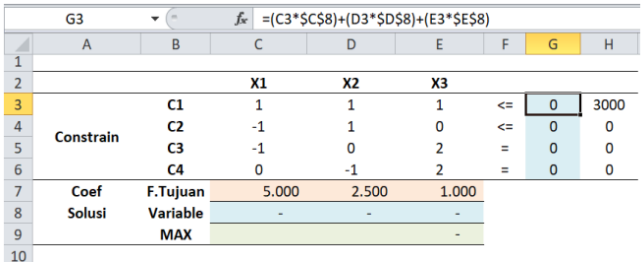
Fig 2. Calculating the maximum value



	A	B	C	D	E	F	G	H
1								
2			X1	X2	X3			
3	Constrain	C1	1	1	1	<=	0	3000
4		C2	-1	1	0	<=	0	0
5		C3	-1	0	2	=	0	0
6		C4	0	-1	2	=	0	0
7	Coef	F.Tujuan	5.000	2.500	1.000			
8	Solusi	Variable	-	-	-			
9		MAX			-			
10								

3. To determine the limit value, enter the Constrain x Abs Variable formula =(C3*C8)+(D3*D8)+(E3*E8)) do the same until the last boundary so that the resulting value is 0 before the solver. Results of formula writing and display in excel can be seen in Figure 3.

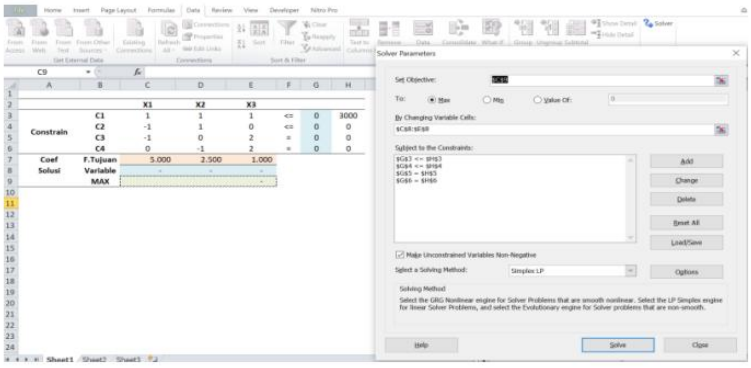
Fig. 3 Calculating the limit value



	A	B	C	D	E	F	G	H
1								
2			X1	X2	X3			
3	Constrain	C1	1	1	1	<=	0	3000
4		C2	-1	1	0	<=	0	0
5		C3	-1	0	2	=	0	0
6		C4	0	-1	2	=	0	0
7	Coef	F.Tujuan	5.000	2.500	1.000			
8	Solusi	Variable	-	-	-			
9		MAX			-			
10								

4. After finishing entering the maximum formula and limit formula, we do the solver by way of Data -> Solver. The results as shown in Figure 4.

Fig. 4 Simplex simulation process with solver



5. After completing the solver simulation using the LP Simplex method, then optimization results will be displayed in accordance with the objective function and the constraints entered. The results of the excel solver calculation can be seen in Figure 5.

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Fig. 5 Results of Excel Solver Calculation

	A	B	C	D	E	F	G	H
1								
2			X1	X2	X3			
3	Constrain	C1	1	1	1	<=	3000	3000
4		C2	-1	1	0	<=	0	0
5		C3	-1	0	2	=	0	0
6		C4	0	-1	2	=	0	0
7	Coef	F.Tujuan	5.000	2.500	1.000			
8	Solusi	Variable	1.200	1.200	600			
9		MAX			9.600.000			
10								

The highest incentive payment for staff members of the marketing department is Rp 9,600,000 per month, as evidenced by the solver calculations results in Figure 6. The sales goal distribution for senior marketing is 1,200/8, or 150 internet data packages, for junior marketing is 1200/8, or 150 internet data packages, for marketing apprentices it is just 600/4, or 150 internet data packages. Each Marketing will receive incentive money in accordance with the distribution plan as follows:

- Marketing senior (number of data packages x incentives) = 150 x 5000 = Rp. 750.000,-/month
- Marketing junior (number of data packages x incentives) = 150 x 2500 = Rp. 375.000,-/month
- Marketing apprenticeship (number of data packages x incentives) = 150 x 1000 = Rp. 150.000,-/month

This indicates that in order for the company PT. Bistion Ponsel to meet its monthly sales goal of 3000 internet data packages, it must provide an incentive payment of Rp. 9,600,000 to all marketing firms located throughout 4 (four) districts. If the corporation can sell 3000 data packages in one month and make a profit of Rp. 10.000,- per package on each internet package sold, the total profit for the month would be Rp. 30,000,000,- (10,000 x 3000).

4. CONCLUSION

This study has demonstrated the effectiveness of the simplex technique in helping marketing firms determine how to distribute internet data package sales objectives in order to increase business income by giving the marketers more incentives. The findings indicated that 150 data packages with an incentive of 750,000 per month for senior marketing, 150 data packages with an incentive of 275,000 per month for junior marketing, and 150 data packages with an incentive of 150,000 per month for marketing internships represented the ideal distribution of sales targets for each level of marketing. The corporation issues 9,600,000 in total incentives each month, and it makes 30,000,000 in total profits each month.

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