

Analysis of Service Provider Marketing Strategy in Achieving Customer Loyalty Using Game Theory for Senior High School Students in Samarinda City

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Abstract. The competition between two or more interested parties facing each other can be modeled using a mathematical model through a game theory. Telkomsel and Indosat are two telecommunication service providers in Indonesia that compete with each other in getting consumers. In the pandemic era, marketing strategies are needed to attract elementary, middle, high school, and college students which require internet services for online learning. This study aims to analyze the service provider's marketing strategy in achieving customer loyalty using a game theory for senior high school students. In this study, the sample was senior high school students in Samarinda, variables of study were starter pack prices, networks and signals, social media package promos, conference package promos, internet package prices and the validity period of internet packages. The results of game data analysis showed that the optimal game value was 5.53, where the optimal strategy for Telkomsel card providers was superior in network and signal (X_2) and conference package promos (X_4). Then the Indosat provider card had the advantages in the price of the internet package (Y_5) and the validity period of the internet package (Y_6).

Keywords: provider card, Samarinda, Senior high school, game theory

INTRODUCTION

Marketing strategy is a form of decision to be taken relating to marketing costs, forms of marketing and marketing allocations that will be related to expected environmental conditions and competitive situations. One way to achieve the goals of a company is to run a marketing strategy, so that marketing strategies have an important role in a company [1]. According to [2] the design of marketing strategies requires an integrated planning process within the company to be able to adapt well to the environment that affects, among others, economic, socio-cultural, legal and political and competition. The marketing strategy is designed by developing the application of the marketing mix or known as the marketing mix. The marketing mix with the 4P strategy is product, price, place, and promotion. The marketing mix is a combination of marketing activities carried out by a company to market certain goods and services over a period of time and in a certain market area. These activities require combination and coordination so that company goals can be achieved effectively and efficiently. So, the company must combine well the marketing strategy and coordinate the various elements of the marketing mix [3]

Internal factors include finance, personnel and especially in the field of marketing which consists of product, price, promotion, location, and physical evidence. The analysis is an assessment of whether the marketing strategy that has been determined and implemented is in accordance with the current situation. Game theory is one way that can be used to analyze marketing strategies in order to obtain the profits desired by the company. To estimate the best marketing strategy that must be carried out, companies must study or at least estimate the steps of their competitors and differentiate themselves from competing companies [4]. Game theory is a field of science that can support the determination of marketing strategies, which are widely applied to competitive marketing conditions. This technique is a form of competition between two competing parties or groups using rules that are known by both competing parties[5].

Decisions must be made to get optimal results. The decision is taken to maximize the maximum win or profit or minimize the minimum loss or loss [6]. During a pandemic like now, learning is carried out online because it reduces student activity at school or on campus. The implementation of learning using an online system requires an internet quota because of face-to-face learning in cyberspace. Internet quota can be obtained by telecommunication card products such as Telkomsel, XL, Three, Indosat providers.

All of them provide attractive options and give each other promotions to provide a choice of data packages. Providers compete with each other in providing services ranging from competitive prices, signal strength, virtual packages, validity periods and others. In the 2018 Kominfo data, the number of Telkomsel subscribers is 150 million and XL Axiata 45 million customers and Indosat Ooredoo 34 million subscribers, Tri Indonesia 17 million and Smartfren 7 million subscribers[7]

MATERIALS AND METHODS

The research data was obtained based on the distribution of questionnaires to high school students in Samarinda City. Dissemination of online questionnaires with accidental sampling technique. Distribution of questionnaires for 50 Telkomsel card users and 50 Indosat cards.

Game Theory

Game theory is a mathematical approach to formulate situations of competition and conflict between various interests. This theory was originally developed by Emile Borel a scientist from France. In game theory involved two or more players, each player has a desire to win. Game theory is generally used to solve problems related to competition in the business field. As known in daily practice, every business unit or organization is always faced with competitors. Cases in game theory are identified first based on:

- Number of players
- Total gain and loss or player value
- The type of strategy used.

Based on the number of players known game theory with two players and game theory with n players. Meanwhile, based on the number of gains and losses, there are two types of games, namely the zero-sum game and the non-zero number game [8].

Two Person Zero Sum Game

A two-player game with zeros is also known as a matrix game. There are two types of game strategies that are commonly used, namely pure strategy and mixed strategy. There are two assumptions in game theory, namely:

1. The game result matrix with a combination of various strategies (pay-off) must be known by every player
2. The gaming strategy cannot be damaged by competitors/other factors.

What is meant by a saddle point is the point of balance between the game values of the two players. A two-player game with a total of zero is usually presented in tabular form as follows :

Table 1. Two-Player Games With Zeros

Row player strategi	Column player strategies			
	column-1	column-2	Column-n
row-1	A_{11}	A_{12}	A_{1n}
row-2	A_{21}	A_{22}	A_{2n}
.....	
row-m	A_{m1}	A_{m2}	A_{mn}

A two-player game with zero sums has the following characteristics:

1. There are two players, called row players and column players
2. A strategy of one player is deemed unbreakable by another player.
3. Row players must choose one strategy among m strategies and column players must choose one strategy among n strategies
4. If the row player chooses strategy-I and the column player chooses strategy-j, then the row player wins as much as the column player and loses as much as the column player.
5. A two-player game with a zero sum has the nature, for the selection of a certain strategy so that the number of benefits (rewards) obtained by the players is zero, or no player wins/loses or gains/losses. [8]

Pure Strategy Game

In pure strategy, the player will maximize and identify the optimum strategy using the maximum criteria, while the player who will minimize it (Player B) will identify the optimum strategy using the minimum criteria. If the maximum and minimum values are then the game is solved. In this case, a balance point has been reached which is called the saddle point [5]

Mixed Strategy Game

In games that do not have a saddle point, the solution must be done using a mixed strategy. The solution of this mixed strategy is still based on the maximin and minimax criteria. The difference is that Player A will choose X_i which maximizes the smallest expected payoff in a column, while Player B chooses Y_j which can minimize the largest expected payoff in a row [5]

RESULT AND DISCUSSION

The data of this study were obtained from the results of a questionnaire containing the comparison of each existing attribute. Questionnaire for senior high school students in the city of Samarinda totaling 100 respondents. The variables used are divided into X variables for Telkomsel and Y variables for Indosat. The following attributes are given to game theory that are used as variables in Table 2.

Table 2. Variabels Used in Game Theory

Attributes in game theory	Variabels Used in Game Theory	
	Telkomsel	Indosat
Prime card price	X_1	Y_1
Network and signal	X_2	Y_2
Conference package promo	X_3	Y_3
Social Media Package Promo	X_4	Y_4
Internet package price	X_5	Y_5
Internet package validity period	X_6	Y_6

Based on the above attributes can be used to form the value of competition between Telkomsel and Indosat. Based on the survey results, it can be concluded that the acquisition value matrix of Telkomsel and Indosat is used as the first step for a pure strategy. For row players (Telkomsel) use the maximin rule and for column players (Indosat) use the minimax rule. The table of calculation results can be seen in Table 3.

Table 3. Game Theory Value Results Table On Pure Strategy

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Minimum	Minimaks
X_1	-2	18	-6	6	-6	-2	-6	
X_2	26	26	10	18	2	17	2	
X_3	8	2	4	4	2	6	2	4
X_4	14	10	10	12	6	4	4	
X_5	-8	-2	-10	-2	-10	-8	-10	
X_6	12	4	8	14	4	10	4	
Maksimum	26	26	10	18	6	17		
Maksimin			6					

Based on the Table 3, the maksimum value is 6 and the minimum value is 4. Based on the acquisition of these values, the minimum value is not the same as the maximum value so that the pure strategy cannot be used. The next step is an analysis using a dominance strategy. This dominance strategy is carried out by issuing rows for those who are dominated by row players. The domination strategy is also carried out by removing the dominant column for column players. Each player plays 6 strategies in capturing market share and customer loyalty. Based on tables X_1 and X_5 are dominated by X_2 , then X_1 and X_5 are deleted, so that Tables 4. is obtained :

Table 4. First Reduced Payoff Matrix

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Minimum	Minimaks
X_2	26	26	10	18	2	17	2	
X_3	8	2	4	4	2	6	2	4
X_4	14	10	10	12	6	4	4	
X_6	12	4	8	14	4	10	4	
Maksimum	26	26	10	18	6	17		
Maksimin				6				

Based on the table above, the maximum value is 6 and the minimum value is 4, so the saddle point has not been met. So that the dominance analysis is carried out for column players. It can be seen that Y_1 and Y_2 are dominated by Y_5 , so the Y_1 and Y_2 strategies are deleted so that the following Table 5 is obtained:

Table 5. Second Reduced Payoff Matrix

	Y_3	Y_4	Y_5	Y_6	Minimum	Minimaks
X_2	10	18	2	17	2	4
X_3	4	4	2	6	2	
X_4	10	12	6	4	4	
X_6	8	14	4	10	4	
Maksimum	10	18	6	17		
Maksimin			6			

Based on the table above, it can be seen that the maximum value is 6 and the minimum value is 4, so the saddle point has not been reached. Because the saddle point has not been reached, the dominance analysis will be carried out again. The line player strategy shows that X_3 is dominated by X_6 so that X_3 is deleted in the strategy, so the Table 6 is obtained as follows:

Table 6. Third Reduced Payoff Matrix

	Y_3	Y_4	Y_5	Y_6	Minimum	Minimaks
X_2	10	18	2	17	2	
X_4	10	12	6	4	4	4
X_6	8	14	4	10	4	
Maksimum	10	18	6	17		
Maksimin			6			

Based on the table above, the maximum value of 6 and minimum value of 4 is obtained, so that the saddle point has not been reached. The dominance analysis was carried out again on the column player strategy. Based on the table, it can be seen that Y_3 and Y_4 were dominated by Y_5 , so Y_3 and Y_4 were deleted in the game strategy. So that the following Table 7 is obtained:

Table 7. Fourth Reduced Payoff Matrix

	Y_5	Y_6	Minimum	Minimaks
X_2	2	17	2	
X_4	6	4	4	4
X_6	4	10	4	
Maksimum	6	17		
Maksimin	6			

Based on the table above, the maximum value is 6 and the minimum is 4, so the saddle point has not been reached. Dominance analysis is carried out again on the line player strategy. Based on the table, it can be seen that X_6 is dominated by X_2 and X_4 , so X_6 is deleted in the game strategy. So that the following Table 8 is obtained:

Table 8. Game Pay off Matrix Table

	Y_5	Y_6	Minimum
X_2	2	17	2
X_4	6	4	4
Maksimum	6	17	

Then the probability value is calculated for each strategy, both rows and columns. The first step is to calculate the probability value for line players, if Telkomsel plays the X_2 strategy, then the probability value is obtained as follows:

For Telkomsel :

If strategy X_2 with probability p , and X_4 with probability value $(1-p)$. If Indosat plays the Y_5 strategy, then the benefits obtained by Telkomsel are:

$$\begin{aligned} 2p + 6(1-p) &= 2p + 6(1-p) \\ &= 6 - 4p \end{aligned} \quad (1)$$

$$\begin{aligned} 17p + 4(1-p) &= 17p + 4 - 4p \\ &= 13p + 4 \end{aligned} \quad (2)$$

Based on equations 1 and 2 obtained:

$$\begin{aligned} 6 - 4p &= 13p + 4 \\ 17p &= 2 \\ p &= \frac{2}{17} = 0,1176 \end{aligned}$$

If the two probability values above are entered into the two equations, the profit value from Telkomsel is as follows:

With equation 1:

$$\begin{aligned} &= 2p + 6(1-p) \\ &= 2(0,1176) + 6(1-0,1176) \\ &= 0,235 + 6(0,8823) \\ &= 0,235 + 5,295 \\ &= 5,53 \end{aligned}$$

With equation 2 :

$$\begin{aligned} &= 17p + 4(1 - p) \\ &= 17(0,1176) + 4(1 - 0,1176) \\ &= 2 + 4(0,8823) \\ &= 2 + 3,529 \\ &= 5,53 \end{aligned}$$

Based on the calculation results that both are the same in producing the expected profit, namely 5,53. In this mixed strategy, Telkomsel made a profit of 5,53, whereas before using this strategy it only made a profit of 2, meaning there was an increase of 3,53 for Telkomsel

For Indosat :

Similarly, the expected payoff for Indosat can be calculated. If the probabilities for Strategy Y_5 are q and Y_6 are $(1 - q)$. If whatever strategy is used by Indosat, then Telkomsel responds with Strategy X_2 , then the equation is obtained:

$$\begin{aligned} &= 2q + 17(1 - q) \\ &= 2q + 17 - 17q && (3) \\ &= 17 - 15q \end{aligned}$$

$$\begin{aligned} &= 6q + 4(1 - q) \\ &= 6q + 4 - 4q && (4) \\ &= 2q + 4 \end{aligned}$$

Based on equations 3 and 4 obtained:

$$\begin{aligned} 17 - 15q &= 2q + 4 \\ 17q &= 13 \\ q &= \frac{13}{17} = 0,765 \end{aligned}$$

If the two probability values above are entered into the two equations, the loss value from Indosat is as follows: with equation 1:

$$\begin{aligned} &= 2q + 17(1 - q) \\ &= 2(0,765) + 17(1 - 0,765) \\ &= 1,53 + 17(0,235) \\ &= 1,53 + 4 \\ &= 5,53 \end{aligned}$$

With equation 2 :

$$\begin{aligned} &= 6q + 4(1 - q) \\ &= 6(0,765) + 4(1 - 0,765) \\ &= 4,588 + 4(0,235) \\ &= 4,588 + 0,941 \\ &= 5,53 \end{aligned}$$

Based on the results of calculations that both are the same in producing the expected loss of 5,53. In this mixed strategy, Indosat earned a loss of 5,53, whereas before using this strategy it only had a loss of 17, meaning that there was a decrease in loss of 11,47 for Indosat.

CONCLUSION

The results of game data analysis showed that the optimal game value was 5.53, where the optimal strategy for Telkomsel card providers was superior in network and signal (X_2) and conference package promos (X_4). Then the Indosat provider card had the advantages in the price of the internet package (Y_5) and the validity period of the internet package (Y_6)

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