JURNAL MATEMATIKA, STATISTIKA DAN KOMPUTASI e-ISSN: 2614-8811
Published by Departement of Mathematics, Hasanuddin University, Indonesia
https://journal.unhas.ac.id/index.php/jmsk/index
Vol. 20, No. 2, January 2024, pp. 385-397
DOI: 10.20956/j.v20i2.32064

Analysis of Online Transportation Marketing Strategies Using Game Theory

Indah Hatika Lubis[1*], Ismail Husein[2], Rima Aprilia[3]
[*] *Department of Mathematics, Faculty of Science and Technology, University Islam Negeri Sumatera Utara*
***Email**: indah0703193080@uinsu.ac.id [1], husein_ismail@uinsu.ac.id [2], rima_aprilia@uinsu.ac.id [3]*

Abstract

Advances in information and communication technology that are growing rapidly also bring influence in the field of transportation. It can be seen with the emergence of online transportation applications that help people so that it can be easier to order fast and efficient transportation in reaching various places. Along with the many online transportation applications that appear, this makes competition between online transportation increase. For this reason, online transportation companies need the right and best strategy to reach consumer profits and interests. The purpose of this research is to analyze competitive strategies based on optimal online transportation marketing strategies. The solution that can be used for this problem is to use the Game Theory method. Game Theory method is an approach or technique used to analyze the situation of interaction between two or more people or entities that have conflicting interests in choosing the action to be performed. The results of the research obtained show competition between Gojek and Grab, Gojek's optimal strategy is Security and Promo while Grab is Service and Promo. In the competition of Gojek and InDrive, Gojek's optimal strategy is promo, while InDrive is price. In the Gojek and Maxim competition, the same optimal strategy is Promo. ~~On the~~ competition of Grab and InDrive, Grab's optimal strategy is Security, while InDrive is price. ~~In the~~ competition of Grab and Maxim, Grab's optimal strategy is Promo while Maxim is price. In InDrive and Maxim competition, InDrive's optimal strategy is Price, while Maxim is Promo. So, from the research results, it is concluded that gojek has the most profitable marketing strategy if it uses promos, grab uses service and security, maxim uses promos, and indrive uses prices.

Keywords: Competition, Game Theory, Online Transportation, Optimal Strategy

1. INTRODUCTION AND PRELIMINARIES

Advances in information and communication technology that are growing rapidly bring influence in the field of transportation [7]. People today need transportation not only for primary needs, due to technological advances that have an impact on varied human activities or time savings in daily activities [2]. With the existence of online transportation, it can make it easier for people to order fast and efficient transportation in reaching various places [22]. People today need transportation not only for primary needs, but also for non-primary needs such as recreational/entertainment or social needs, this is due to technological advances that have an impact on varied human activities or time savings in daily activities [5].

Online transportation or often referred to as application-based transportation has grown rapidly in Indonesia in recent years [9]. The rapid growth of smartphone users also has a major impact on changes, one of which is in the field of online transportation because online transportation

applications can be accessed via smartphones and become an easy and practical choice for people who need transportation, then the need for high mobility in big cities in Indonesia is another factor that encourages the development of transportation online [3] .

In the competition between ride-hailing platforms such as Gojek, Grab, Maxim and Indrive each platform must consider the strategies they will use in winning the competition and attracting users. In this context, game theory can help in analyzing the competitive situation between ride-hailing platforms. Each platform can be considered a player in a strategic game, and each platform must consider the actions of opponents in making strategic decisions [10]. By using game theory, it can be seen which strategy is the most optimal for the entire platform to gain profit. So in this study, game theory is used as a method that can help obtain the results of the objectives of this study.

Research using game theory methods has also been conducted by Wijayati and Supriyadi in 2021 with a study entitled "Application of game theory in determining the marketing strategy of informatics engineering and industrial engineering study programs". In this study, it was found that the Informatics Engineering and Industrial Engineering study programs used a mixed strategy game, where the Informatics Engineering study program could use the strategy of the number of graduates, costs, and the number of lecturers because it obtained a profit which was originally 0.767 to 0.79725. Meanwhile, the Industrial Engineering study program can use the strategy of tuition fees, popularity, and the number of graduates because it can reduce the loss from 0.812 to 0.79725.

2. METHOD

The research will be conducted from February to July 2023. While the place or location of this research was carried out in Medan City. This research was conducted by distributing questionnaires to online transportation users in Medan City. The alternatives in this study are Gojek, Grab, InDrive, and Maxim. The criteria used are Price, Service, Security, Promo, and Practical. The research method in this study is the survey method, which is a research method carried out by collecting data from samples and populations through questionnaires distributed to respondents of online transportation users in Medan City. Determination of the number of respondents in this study using the Slovin formula as follows:

$$n = \frac{N}{(1 + (N \times e^2))} \qquad (2.1)$$

Description:
N = population sample
n = minimum sample
e = margin of error

The steps to be taken during research are called research procedures. By reviewing the processes that must be carried out when conducting research, procedures make it easier to study and conduct research. Here are the steps on how to research online transportation strategy analysis using game theory:

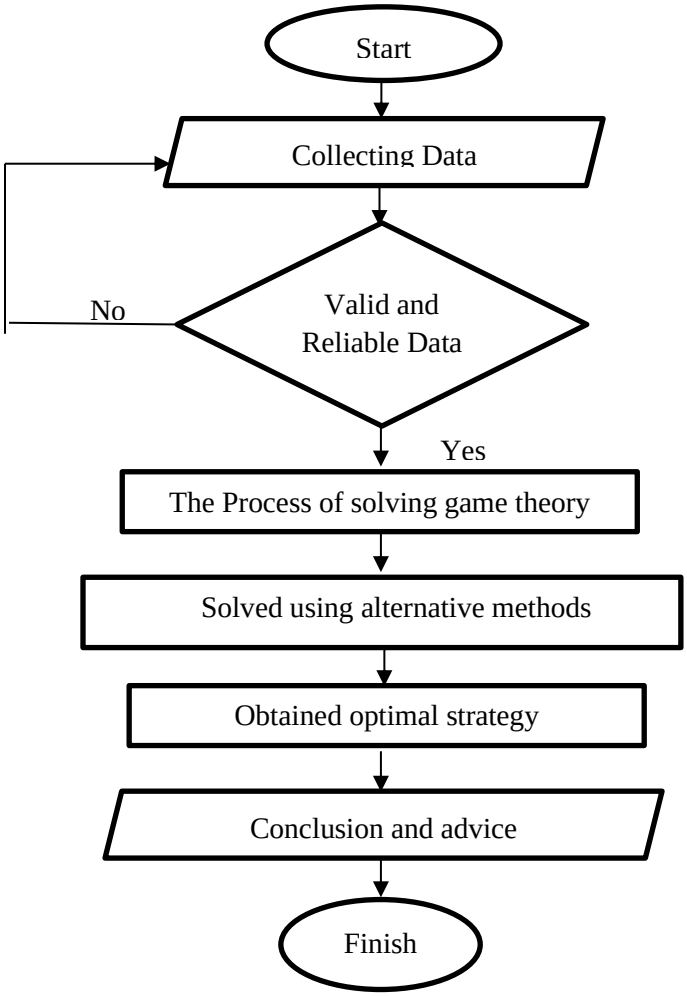

Figure 1. Flowchart

2.1 Game Theory

Game theory is one of the methods of solving that deals with the competitive state of two or more players in operations research [23]. Given an approach to game theory with a systematic picture by players in maximizing wins and minimizing losses [19]. Game theory was developed by Von Neumann in 1928 and he is considered the "Father of Games Theory" [17].

According to game theory can be classified based on the number of players and the number of payouts [6]. Based on the number of players can be explained as follows [16]:

1. Two person game: the game is followed by a pair or two players.
2. N-person game: the game is contested by more than two players.

While based on the amount of payout, game theory is classified as follows [14]:

1. Zero sum game: A game whose sum of losses and gains equals zero.
2. Non zero sum game: A game whose total losses and gains are not necessarily equal to zero.

2.2 Pure Strategy

A pure strategy game is a game with the best choice position each player achieves by choosing a single strategy [11]. So pure strategy is a game where every player uses one strategy with

probability 1 while the probability of another strategy is zero [1]. If the maximum value is equal to the minimax value then the game can be solved with a pure strategy where the equilibrium point has been reached [4]. This equilibrium point is known as the saddle point [18].

2.3 Mixed Strategy

The theory of zeros from two players (zero sum games) sometimes does not have a saddle point on the pay-off matrix, so balance will be found in another way, namely with mixed strategy games [15]. Each player often does not know what strategy is chosen by the opposing player, so he must decide on a strategy that will have at least the same effect as the strategy chosen by other players [21]. The pay-off that will try to be obtained is the same way as a pure strategy, which is to use the Maximin concept for A (row) and the Minimax concept for B (column) [8].

2.4 Alternative Methods

A. Graphical Method

Visual solutions are available for all $2 \times n$ games and $m \times 2$ games. Where a $2 \times n$ game is where the player in the row has two strategies and the player in the column has n strategies. Whereas an $m \times 2$ game is where the player in the row has m strategies and the player in the column has two strategies [12].

B. Analysis Method

This approach aims to develop a mixed strategy pattern so that the profits or losses experienced by both companies are the same. This pattern is developed by determining a probability distribution for different strategies. These probability values allow for the discovery of an optimal mixed strategy [13].

a) $ap_1 + c(1 - p_1)$ if player B executes strategy 1
b) $bp_1 + d(1 - p_1)$ if player B executes strategy 2

Description:
p_1 = probability that Player A chooses Strategy 1
$1 - p_1$ = probability that Player A chooses Strategy 2
$a, b, c,$ and d = constants or parameters that likely represent payoffs

C. Simplex Method

The linear program model for line players (P1) is as follows:

$$\text{Minimize } z = \frac{1}{v} = X_1 + X_2 + \cdots + X_n \qquad (2.4.1)$$

While the linear program model for column players (P2) is as follows:

$$\text{Maximize } z = \frac{1}{v} = Y_1 + Y_2 + \cdots + Y_n \qquad (2.4.2)$$

Description:
v = Nilai permainan
X_1= Probabilitas pemain P1 memilih strategi i
Y_1= Peluang pemain P2 memilih strategi ke-j

3. MAIN RESULTS

3.1 Result

The determination of the number of preliminary questionnaires in this study was assumed to be close to the normal distribution based on Walpole and Myers, the central limit theorem is almost normal for the general sample mean when $n \geq 30$. In this study, the author distributed preliminary

questionnaires to 30 respondents [20]. To determine the number of respondents on the comparison questionnaire using the sloving formula in equation 2.1 as follows:

$$n = \frac{N}{(1 + (N \times e^2))}$$

$$n = \frac{2.494.512}{(1 + (2.494.512 \times 0{,}1^2))}$$

$$= \frac{2.494.512}{(1 + (2.494.512 \times 0{,}01))}$$

$$= \frac{2.494.512}{(1 + (24.945{,}12))}$$

$$= \frac{2.494.512}{24.946{,}12}$$

$= 99{,}995 \approx 100$ Respondents

Therefore, a minimum sample of 99,995 respondents was obtained. Thus, the sample taken in this study amounted to 100 respondents.

3.2 Validity Test

A questionnaire is said to be valid if the result of. The validity test in this study is as follows: $r_{hitung} > r_{tabel}$

Table 3.2.1 Validity Test Results

No	Strategy	r Calculate	r Table	Valid/Invalid
1	Price	0.582	0.361	Valid
2	Service	0.718	0.361	Valid
3	Security	0.657	0.361	Valid
4	Promo	0.705	0.361	Valid
5	Practical	0.726	0.361	Valid

Test the validity of the data in this study using IBM SPSS 26 software. If $r_{hitung} > r_{tabel}$ then the question / indicator is declared valid. From the validity test results, the value r_{tabel} is 0.361 was obtained. In this case, each item or strategy, namely Price, Service, Security, Promo, and Practicality, is declared valid because the obtained $r_{hitung} > r_{tabel}$.

3.3 Reliability Test

A questionnaire is said to be reliable if the value of. The results of reliability tests in this study are as follows:$\propto > 0{,}6$

Table 3.3.1 Reliability Test Results

No	Strategy	α	Information
1	Price	0.755	Reliable

2	Service	0.721	Reliable
3	Security	0.747	Reliable
4	Promo	0.719	Reliable
5	Practical	0.718	Reliable

From the results of the questionnaire reliability test using IBM SPSS 26 software, the value $\alpha = 0.755$ was obtained. In this case each item or strategy, namely Price, Service, Security, Promo, and Practical, is declared reliable because the obtained value $\alpha = 0.755 > 0.60$.

3.4 Data Processing Using Game Theory

1. Gojek and Grab

Table 3.4.1 Pay-Off Matrix and Pure Strategy Completion

		Grab					Maksi-min
		B1	**B2**	**B3**	**B4**	**B5**	
Gojek	**A1**	26	18	18	-4	22	-4
	A2	12	14	14	0	18	0
	A3	26	20	24	6	34	6
	A4	34	8	14	26	30	8
	A5	26	14	22	6	18	6
Minimax		34	20	24	26	34	

In the table above, the maximum value is 8 and the minimum value is 20, which means that it does not get the same value, indicating that there is no saddle point. As a result, the game cannot be solved using pure-strategy, so the solution continues with mix-strategy.

Table 3.4.2 Solution I of Gojek and Grab's Mixed Strategy

		Grab					Maksi-min
		B1	**B2**	**B3**	**B4**	**B5**	
Gojek	**A1**	26	18	18	-4	22	-4
	A2	12	14	14	0	18	0
	A3	26	20	24	6	34	6
	A4	34	8	14	26	30	8
	A5	26	14	22	6	18	6
Minimax		34	20	24	26	34	

The use of the dominance rule is when in the pay-off table there are strategies that dominate other strategies. For row players, rows with larger values are selected, then rows with smaller values are eliminated. From the table above, row A3 dominates rows A1, A2, and A4 so that all three columns are omitted.

Table 3.4.3 Solution II Gojek and Grab Mixed Strategy

	Grab

Gojek		B1	B2	B3	B4	B5	Maksi-min
	A3	26	20	24	6	34	6
	A4	34	8	14	26	30	8
Minimax		34	20	24	26	34	

The use of the dominance rule is when in the pay-off table there are strategies that dominate other strategies. For column players, the column with the smaller value is selected, then the column with the larger value is eliminated. From the table above, column B2 dominates column B1, B3, and B5 so that all three columns are omitted.

Table 3.4.4 Solution III Gojek and Grab Mixed Strategy

Gojek	Grab		Maksi-min
	B2	**B4**	
A3	20	6	6
A4	8	26	8
Minimax	20	26	

In the table above, the maximin value is 8 and the minimum value is 20, which means that they do not get the same value. As a result, the pay-off matrix of the mixed strategy results of competition between Gojek and Grab still has not obtained a saddle point, so the game theory calculation is continued with an alternative method. The alternative method used in this research is the analysis method.

3.5 Analysis Methods

This approach aims to develop a mixed strategy pattern so that the profits or losses experienced by both companies are the same. This pattern is developed by determining a probability distribution for different strategies. These probability values allow for the discovery of an optimal mixed strategy. Probability values can be calculated in the following way.

Table 3.5.1 Pay-off matrix

Gojek	Grab		Maksi-min
	B2 (q)	**B4 (1-q)**	
A3 (p)	20	6	6
A4 (1-p)	8	26	8
Minimax	20	26	

For Gojek company (A)
Assume:
Strategy A3 has a probability of p
Strategy A4 has a probability of 1 – p
If company B implements strategy B2, the benefits obtained by Company A are:

$$20p + 8(1 - p)$$
$$20p + 8 - 8p$$
$$12p + 8 \quad \ldots\ldots (1)$$

If company B implements strategy B4, the benefits obtained by Company A are:
$6p + 26(1 - p)$
$6p + 26 - 26p$
$-20p$
$+ 26$ …….. (2)
Next, combine both equations to find the optimal strategy of company A
$12p + 8 = -20p + 26$
$12p + 20p = 26 - 8$
$32p = 18$
$p = 18/32$
$p = 0.5625$
Substitute p-values in equations (1) and (2)
$12p + 8 = 12\,(0.5625) + 8$
$= 6.75 + 8$
$= 14.75$
$-20p + 26 = -20\,(0.5625) + 26$
$= -11.25 + 26$
$= 14.75$
The same expected profit is 14.75, which means that using this mixed strategy provides an increase in profit of 6.75 where company A's previous profit was only 8.

For Grab companies (B)
Assume:
Strategy A3 has a probability of q
Strategy A4 has a probability of 1 – q
If company A implements strategy A3 the benefits obtained by Company B are:
$20q + 6(1 - q)$
$20q + 6 - 6q$
$14q$
$+ 6$ …….. (1)
If company A implements strategy A4 the benefits obtained by Company are:
$8q + 26(1 - q)$
$8q + 26 - 26q$
$-18q$
$+ 26$ …….. (2)
Next, combine both equations to find the optimal strategy of company B.
$14q + 6 = -18q + 26$
$14q + 18q = 26 - 6$
$32q = 20$
$q = 20/32$
$q = 0.625$
Substitute p-values in equations (1) and (2)
$14q + 6 = 14\,(0.625) + 6$
$= 8.75 + 6$
$= 14.75$
$-18p + 26 = -18\,(0.625) + 26$
$= -11.25 + 26$
$= 14.75$

The minimum expected loss is the same at 14.75. Which means that using this mixed strategy gives a decrease in losses of 5.25 where company B's previous profit was -20.

2. Gojek and InDrive

Table 3.5.2 Gojek and InDrive Pay-Off Matrix

		InDrive					Maxi-min
		C1	**C2**	**C3**	**C4**	**C5**	
Gojek	**A1**	-26	6	6	-8	-8	-26
	A2	-12	14	24	-2	6	-12
	A3	2	26	34	12	26	2
	A4	4	32	16	16	18	4
	A5	-22	2	12	-14	6	-22
Minimax		4	32	34	16	26	

From the table above there is a saddle point, namely the maximum value = minimax value, so the value of the game is 4 (A4, C1). That means:

a. Gojek will only get a maximum profit of 4 by implementing a strategy, namely promo.
b. InDrive will get a minimum loss of -4, if InDrive responds to strategy A4 by implementing a price strategy.

So, if each player has only one optimal approach, this game can be solved with pure-strategy.

3. Gojek and Maxim

Table 3.5.3 Pay-Off Matrix and Pure Strategy Completion

		Maxim					Maxi-min
		D1	**D2**	**D3**	**D4**	**D5**	
Gojek	**A1**	12	34	30	24	28	12
	A2	20	32	42	20	42	20
	A3	38	54	38	38	52	38
	A4	42	40	46	40	54	40
	A5	30	48	40	32	48	30
Minimax		42	54	46	40	54	

From the table above, it can be seen that the maximum value = minimax so that the saddle point or saddle point is 40. That is:

a. Gojek will only get a maximum profit of 40 by implementing a promo strategy
b. Maxim will get a minimum loss of -40, if Maxim responds to strategy A4 by implementing a promo strategy.

So, if each player has only one optimal approach, this game can be solved with pure-strategy.

4. Grab and InDrive

Table 3.5.4 Pay-Off Matrix and Pure Strategy Completion

		InDrive					Maxi-min
		C1	C2	C3	C4	C5	
Grab	B1	-24	-6	-2	-18	-10	-24
	B2	-18	16	16	2	8	-18
	B3	-2	22	28	22	24	-2
	B4	-12	8	20	20	10	-12
	B5	-20	14	20	2	0	-20
Minimax		-2	22	28	22	24	

From the table above, it can be seen that the value of maximin = minimax so that a saddle point of -2 is obtained. This means:

a. InDrive will get a maximum profit of 2 by implementing a price strategy.
b. Grab will get a minimum loss of -2, if Grab addresses strategy C1 by implementing strategy B3, namely the security strategy.

So, if each player has only one optimal approach, this game can be solved with pure-strategy.

5. Grab and Maxim

Table 3.5.5 Pay-Off Matrix and Pure Strategy Completion

		Maxim					Maxi-min
		D1	D2	D3	D4	D5	
Grab	B1	-2	18	18	20	16	-2
	B2	16	32	42	16	42	16
	B3	20	40	42	40	40	20
	B4	24	36	46	26	42	24
	B5	12	46	38	32	36	12
Minimax		24	46	46	40	42	

From the table above there is a saddle point, namely the maximum value = minimax value, so the value of the game is 24 (B4, D1). This means:

a. Grab will only get a maximum profit of 24 by implementing strategy B4, namely promo.
b. Maxim will receive a minimum loss of -24, if InDrive responds to strategy D1 by implementing a pricing strategy.

So, if each player has only one optimal approach, the game can be solved with pure-strategy.

6. InDrive and Maxim

Table 3.5.6 Pay-Off Matrix and Pure Strategy Completion

		Maxim					Maxi-min
		D1	D2	D3	D4	D5	
InDrive	C1	36	48	36	34	48	34
	C2	30	28	26	14	32	14

	C3	36	34	40	30	38	30
	C4	30	42	32	28	32	28
	C5	28	44	30	28	44	28
Minimax		36	48	40	34	48	

From the table above there is a saddle point, namely the maximum value = minimax value, so the value of the game is 34 (C1, D4). This means:

a. InDrive will only get a maximum profit of 34 by implementing strategy C1, namely price.
b. Maxim will receive a minimum loss of -34, if Maxim responds to strategy D4 by implementing a promo strategy.

So, if each player has only one optimal approach, the game can be solved with pure-strategy.

3.6 Analysis Results

The results of the research that have been obtaine, the results of analysis based on game theory are as follows:

Table 3.6.1 Analysis Result

Competition	Player To-	Ride hailing	Strategy probability					Perrival value
			Price	Service	Security	Promo	Practical	
1	I	Gojek	-	-	0,56	0,44	-	14,75
	II	Grab	-	0,63	-	0,38	-	
2	I	Gojek	-	-	-	1	-	4
	II	InDrive	1	-	-	-	-	
3	I	Gojek	-	-	-	1	-	40
	II	Maxim	-	0.13	-	0,88	-	
4	I	Grab	-	-	1	-	-	-2
	II	InDrive	1	-	-	-	-	
5	I	Grab	-	-	-	1	-	24
	II	Maxim	1	-	-	-	-	
6	I	InDrive	1	-	-	-	-	34
	II	Maxim	-	-	-	1	-	

In the first competition, namely the competition between Gojek and Grab, it was found that Gojek's optimal strategy was security and promos. Meanwhile, Grab's optimal strategy is service and promos. The value of the game in this competition is 14.75. This shows that maximizing Gojek's victory at 14.75 and minimizing Grab's defeat at -14.75. So if the two are added together, it will produce zero, because the game theory used is a two-number zero-sum game. In the second competition, namely the competition between Gojek and InDrive, it was found that Gojek's optimal strategy was a promo. While InDrive's optimal strategy is price. The value of the game in this competition is 4. This shows that Gojek will maximize its victory at a value of 4 and InDrive will minimize its defeat at a value of -4.

In the third competition, namely the competition between Gojek and Maxim, it was found that Gojek's optimal strategy was a promo. While Maxim's optimal strategy is service and promo. The game score on this competition is 40. This shows that Gojek will maximize its victory at 40 and Maxim will minimize its defeat at -40. In the fourth competition, namely the competition between Grab and InDrive, it was found that Grab's optimal strategy was security. While InDrive's optimal

strategy is price. The game value in this competition is -2. This indicates that InDrive will maximize its wins at 2 and Grab will minimize its losses at -2.

In the fifth competition, namely the competition between Grab and Maxim, it was found that Grab's optimal strategy was promo. While the optimal strategy of Maxim is price. The game score on this competition is 24. This indicates that Grab will maximize its wins at 24 and Maxim will minimize its losses at -24. In the sixth competition, namely the competition between InDrive and Maxim, it was found that InDrive's optimal strategy was price. While Maxim's optimal strategy is promo. The game score on this competition is 34. This indicates that InDrive will maximize its wins at 34 and Maxim will minimize its losses at -34.

4. CONCLUSION

Based on the research results, the game theory obtained an optimal strategy for online transportation which can be concluded as follows: (1) Competition between Gojek and Grab Gojek's optimal strategy is security and promo. Gojek's strategic advantage is security with a probability of 0.56. While Grab's optimal strategy is service and promo. The superiority of Grab's strategy is service with a probability of 0.63. The value of the game produced by both is 14.75. (2) Competition between Gojek and InDrive Gojek's optimal strategy is promo with a probability of 1. While InDrive's optimal strategy is price with a probability of 1. The value of the game produced by both is 4. (3) Competition between Gojek and Maxim Gojek's optimal strategy is promo with a probability of 1. While Maxim's optimal strategy is service and promo. The superiority of Maxim's strategy is promo with a probability of 0.88. The game value generated by both is 40. (4) Competition between Grab and InDrive Grab's optimal strategy is security with a probability of 1. While InDrive's optimal strategy is price with a probability of 1. The game value generated by both is -2. (5) Competition between Grab and Maxim Grab's optimal strategy is promo with probability 1. While Maxim's optimal strategy is price with probability 1. The game value generated by both is 24. (6) Competition between InDrive and Maxim InDrive's optimal strategy is price with probability 1. While Maxim's optimal strategy is promo with probability 1. The game value generated by both is 34.

REFERENCES

[1] Adabawiyah, R., 2022. Strategi Pemasaran Produk Sepeda Motor Honda Menggunakan Fuzzy Teori Permainan. *Zeta - Math Journal*, *7*(1), 11–18.

[2] Andika, M., Masithoh, S., Kholiq, Y. N., Nisa, D. A., & Rohmah, N., 2021. Efektivitas Marketplace Shopee sebagai Marketplace Belanja Online yang Paling Disukai Mahasiswa. *Journal of Education and Technology*, *1*(1), 24–29.

[3] Azzahra, A. R., Shamara, A., & Saleh, M. Z., 2023. Fenomena Pelayanan Jasa Transportasi Online Gojek Pada Mahasiswa Universitas Pembangunan Jaya. *Jurnal Manajemen, Ekonomi, Hukum, Kewirausahaan, Kesehatan, Pendidikan Dan Informatika (MANEKIN)*, *2*(1), 182–186.

[4] Bekius, F., & Gomes, S. L., 2023. A framework to design game theory-based interventions for strategic analysis of real-world problems with stakeholders. *European Journal of Operational Research*, *309*(2), 925–938. https://doi.org/10.1016/j.ejor.2023.01.046

[5] Bharmawan, A. S., & Hanif, N., 2022. *Manajemen pemasaran jasa: strategi, mengukur kepuasan dan loyalitas pelanggan*. Surabaya: Scopindo Media Pustaka.

[6] Caetano, R. V., & Marques, A. C., 2023. Could energy transition be a game changer for the transfer of polluting industries from developed to developing countries? An application of game theory. *Structural Change and Economic Dynamics*, *65*, 351–363. https://doi.org/10.1016/j.strueco.2023.03.007

[7] Fauzi, A. A., Harto, B., Mulyanto, M., Dulame, I. M., & Pramuditha, P., 2023. *Pemanfaatan teknologi informasi di berbagai sektor pada masa society 5.0* (I). Jambi: PT. Sonpedia Pu blishing Indonesia.
[8] Hartiny, J., 2021. *Penentuan Strategi Pemasaran Kartu Kuota Internet IM3 Dan Smartfren Yang Optimal Menggunakan Teori Permainan*. Universitas Negeri Medan.
[9] Karim, A., Sunarta, D. A., Yunus, A. I., Marlita, D., & Asniar, N., 2023. *Manajemen Transportasi*. Batam: Yayasan Cendikia Mulia Mandiri.
[10] Keban, Y. T., Hernawan, A., & Novianto, A., 2021. *Menyoal Kerja Layak dan Adil dalam Ekonomi Gig di Indonesia* (I). Yogyakarta: IGPA Press.

[11] Mamdudah, S., Kuzairi, K., & Mardianto, M. F. F., 2022. Penerapan Teori Permainan Dalam Menentukan Strategi Pemasaran Batik di Kecamatan Proppo Kabupaten Pamekasan. *Zeta - Math Journal*, *7*(1), 28–33.

[12] Maschler, M., Zamir, S., & Solan, E., 2020. *Game Theory* (II). Cambridge University Press.
[13] Mutaqin, G., Admaja, F. P., & Mardhiyah, A., 2021. Implementasi Game Theory Pada Simulasi Dan Perancangan Software Berbasis Matriks Pay-Off Dengan Metode Non-Zero Sum Game. *ILKOMNIKA:Journal of Computer Science and Applied Informatics*, *3*(2), 266–272.
[14] N, K., & Visalakshidevi, E. M., 2023. Evolutionary game theory to predict the population growth in Few districts of Tamil Nadu and Kerala. *Measurement: Sensors*, *27*, 100736. https://doi.org/10.1016/j.measen.2023.100736
[15] Praditya, A.-F. R., & Prasetyo, S. Y. J., 2021. Game Theory Dalam Penentuan Strategi Pemasaran Optimal Dalam (Studi Kasus Persaingan E-Commerce Shopee dan TokoPedia). *TIN: Terapan Informatika Nusantara*, *2*(2), 53–57.
[16] Puspitasari, C. I., Wasono, W., & Huda, M. N., 2023. Penerapan Fuzzy Teori Permainan dalam Menentukan Strategi Optimal Provider di Bengalon. *Basis: jurnal ilmiah matematika*, *2*(2), 22–32.
[17] Putra, D., & Ahmad, D., 2021. Strategi Kompetisi Antara Tokopedia Dan Shopee Menggunakan Teori Permainan. *Journal Of Mathematics UNP*, *6*(3), 85–90.
[18] Salmah, S., 2023. *Teori permainan dan aplikasinya*. Yogyakarta: Gadjah Mada University Press.
[19] Sirait, D. E., 2021. Implementasi teori permainan pada strategi pemasaran produk kecantikan oriflame dan jafra. *Mes: Journal of Mathematics Education and Science*, *7*(1), 35–40.
[20] Tobing, T. P. L., 2018. *Strategi Kompetisi Antar Gojek dan Grab dengan Menggunakan Game Theory*. Universitas Sumatera Utara.
[21] Usman, M. Y., 2023. Mitra Sanding Pelayanan Publik Bidang Transportasi Online (Studi Kasus Kebijakan Publik dalam Konteks Transportasi). *SEIKO: Journal of Management & Business*, *6*(2), 325–356.
[22] Watung, M. P., Rotinsulu, D. C., & Tumangkeng, S. Y. L., 2020. Analisis perbandingan pendapatan ojek konvensional dan ojek online di kota manado. *Jurnal Berkala Ilmiah Efisiensi*, *20*(03), 126–139.
[23] Wijayati, D., & Supriyadi, E., 2021. Aplikasi teori permainan dalam penentuan strategi pemasaran program studi teknik informatika dan teknik industri. *E-Jurnal Matematika*, *10*(2), 131–136.