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Game Theory Analysis of Indihome and Biznet in the Salatiga Internet Market

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Abstract

With the rapid expansion of internet usage in Indonesia, comprehending the competition within the internet service provider sector has become imperative. This study investigates the competitive dynamics between Indihome and Biznet in the Salatiga internet market, examining various strategic dimensions such as pricing strategies, network quality, promotions, payment models, customer service, accessibility, product portfolios, and data security. Employing game theory methodology, the research discerns optimal strategies for each provider, utilizing maximin and minimax strategies to minimize potential losses and maximize potential gains. Validity and reliability testing ensures the integrity of the analysis, confirming the validity and reliability of all variables. Results reveal that Indihome employs strategy X5 (Customer Service) to attain a maximum profit of 36, while Biznet adopts the same Y5 strategy to minimize a loss of 36. This study provides valuable insights for both service providers to adeptly navigate the competitive landscape.

Keywords: game theory, internet provider, network quality, promotions, customer service

1. INTRODUCTION

The progress of information technology within the internet network is consistently on the rise. Data illustrates a notable surge in internet users in Indonesia annually, reaching 202.6 million in 2021 from 175.4 million the year before [1]. This illustrates the internet's fundamental role as an essential necessity for the Indonesian populace, including those residing in Salatiga.

The ramifications of this advancement are evident across multiple spheres, particularly in the utilization of the internet for business endeavors [2]. Various firms specializing in internet infrastructure, such as Indihome and Biznet, have emerged in Indonesia, providing a diverse array of services to meet the populace's demand for swift and dependable internet connectivity. Numerous factors have contributed to the expansion of the internet sector, notably in Salatiga. These factors encompass the expected benefits from internet usage (effort expectancy) and social influences, like employing the internet for knowledge enrichment, entertainment, and social engagement.

Nonetheless, alongside rapid expansion arises fresh hurdles, particularly in upholding service excellence for clientele [3]. Service caliber stands as pivotal for firms in retaining and enticing new patrons [4]. In the current digital epoch, consumers frequently utilize social platforms to voice grievances or offer feedback regarding the products or services they avail [5, 6]. Customer reactions toward a company's service provision significantly sway its reputation and prosperity [7].

Within the competitive landscape of Indihome and Biznet, this phenomenon presents a compelling avenue for deeper exploration. This study seeks to analyze their rivalry through the lens of Game Theory, concentrating on strategic elements like pricing, network connectivity, promotional tactics, payment structures, customer support, accessibility, product offerings, and data security. By delving into these aspects, the goal is to garner a comprehensive understanding of how Indihome and Biznet compete to capture the Salatiga market, along with the strategic repercussions for both providers.

Several previous studies have used game theory to analyze competition, including examining the competition between TikTok and Instagram in the realm of marketing strategies. In seeking solutions to this issue, this research considers strategies based on the 'place' variable on both platforms. [8]. The research about competition strategy between Gojek and Grab using Game Theory outlines that utilizing a mixed strategy through game theory methodology would yield the most advantageous strategy for both online transportation firms. This optimal strategy encompasses a secure approach and non-cash payment system, resulting in maximum profit impact and minimal loss for each online transportation company, with an optimal value of 6.84 [9, 10].

The research about competition strategy between Alfamart dan Indomaret in Kebumen delves into the application of game theory methodology to assess the significance and contentment levels of customers patronizing Alfamart and Indomaret in Kebumen. Game theory serves as a tool to ascertain the suitable strategy in delivering the requisite level of importance and satisfaction [11].

Referring to the findings of previous studies, the current research aims to expand the understanding of the internet market dynamics in Salatiga, particularly in the context of competition between Indihome and Biznet. By employing a game theory approach, this study seeks to delve deeper into the optimal strategies that can be adopted by these two service providers to succeed in the market competition in the region. It is hoped that this research will provide a richer contribution to our understanding of strategies in the internet market competition and lay a strong foundation for further research in this domain.

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2. METHODS

The steps of the methodology conducted in this research are segmented into multiple phases. These phases include determining the strategy, data collection, data validity, data reliability, processing data, and conclusion. The phases can be seen as depicted in Figure 1.

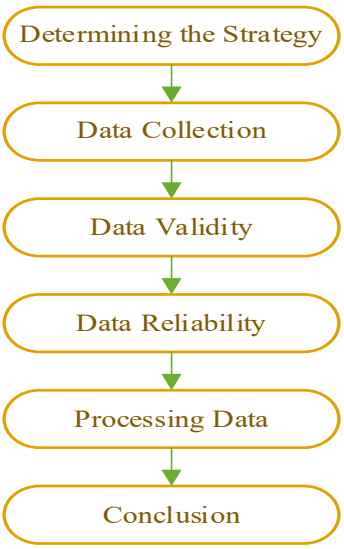

Figure 1. Research Phase

2.1. Determining the Strategy

In the initial step of determining the strategy using Game Theory, the focus lies on defining the marketing strategies of each provider, considering a range of crucial indicators [12]. These strategies are formulated based on various indicators including pricing, network connectivity, promotional activities, payment methods, customer service, accessibility, product offerings, and data security. Through a thorough examination of these factors, tailored strategies are formulated within the framework of Game Theory to navigate the competitive landscape between TikTok and Instagram effectively.

2.2. Data Collection

At this phase, the researcher gathers data utilizing Simple Random Sampling. This process involves distributing questionnaires directly and disseminating a Google Form link through communication platforms like Gmail and WhatsApp to 120 distinct users of relevant providers.

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2.3. Validity Test

Validity of the data is ensured to ascertain the accuracy of the questionnaire data collected in this study [13]. The correctness of the data is assessed based on attributes such as price, network connectivity, promotions, payment model, customer service, ease of access, product quality, and data security. All these attributes are utilized as input attributes to generate the target attribute, where the target attribute serves as the output class to determine the satisfaction level of users of both providers [14, 15]. Validity is assessed using the Karl Pearson's Product Moment correlation formula, which correlates the outcomes of each item with the total value of that item to elucidate the relationship between the same two variables [16, 17]. Karl Pearson's Product Moment formula is as shown in Equation 1.

$$r = \frac{\sum((X-\bar{X})(Y-\bar{Y}))}{\sqrt{\sum(X-\bar{X})^2 \sum(Y-\bar{Y})^2}} \quad (1)$$

Where r is Pearson correlation coefficient. X and Y is Variables being correlated. $\bar{X}$ and $\bar{Y}$ is Means of variables X and Y

2.4. Reliability Test

The reliability stage assesses the precision of the outcomes acquired from a measurement. A reliability test is conducted to gauge the level of confidence in the measurement results [18]. In this research, a reliability test using Cronbach's Alpha is employed to examine the validity and reliability of the questionnaires [19]. IBM SPSS is utilized to assist in the reliability stage. The formula for Cronbach's Alpha is as shown in Equation 2.

$$a = \left(\frac{N}{N-1}\right)\left(1 - \left(\frac{\sum Variances\ of\ items}{Variance\ of\ total\ score}\right)\right) \quad (2)$$

Where:
α = Cronbach's Alpha coefficient
N = Number of items in the questionnaire

2.5. Processing Data

During this stage, data undergoes processing utilizing Game Theory, distinguishing between row players and column players. Row players are those regarded as having an upper hand, while column players are those viewed as experiencing setbacks [20]. Following this, the minimum value of the maximum payoff (minimax) for row players and the maximum value of the minimum payoff (maximin) for column players are identified [21]. Subsequently, saddle point calculations are performed to determine the strategy employed in each scenario [22].

3. RESULTS AND DISCUSSION

Each provider utilizes strategies based on indicators including price, network connectivity, promotions, payment methods, customer service, accessibility, product offerings, and data security. These variables are categorized as variable x for Indihome and variable y for Biznet. Table 1 presents the attributes utilized in game theory as variables.

Table 1. Variable in Game Theory

Attribute	Variable of Biznet	Variable of Indihome
Price	x_1	y_1
Network Connectivity	x_2	y_2
Promotion	x_3	y_3
Payment Model	x_4	y_4
Customer Service	x_5	y_5
Accessibility	x_6	y_6
Product	x_7	y_7
Data Security	x_8	y_8

3.2. Validity Test

Based on the collected questionnaire data with a sample size of n = 120, the degrees of freedom (df) = n-2 = 118, with a significance level of 0.05. Therefore, the critical t-value (rtabel) is 0.179. The validation test outcomes suggest that all attributes are deemed valid. The validation test results of the questionnaire data are illustrated in Table 2.

Table 2. Questionnaire Data Validity Test

No	Atribut	$r_{Variable}$	r_{Table}	Validation
1	Price	0. 785	0.179	Valid
2	Network Connectivity	0. 853	0.179	Valid
3	Promotion	0. 801	0.179	Valid
4	Payment Model	0. 722	0.179	Valid
5	Customer Service	0. 760	0.179	Valid
6	Accessibility	0. 796	0.179	Valid
7	Product	0. 782	0.179	Valid
8	Data Security	0. 603	0.179	Valid

3.2. Reliability Test

The SPSS analysis yielded a strong reliability coefficient ($\alpha = 0.897$) for the studied variables - price, network connectivity, promotions, payment model, customer

service, accessibility, products, and security - all surpassing the threshold of 0.80, indicating reliability. This robust coefficient affirms the questionnaire's internal consistency and stability, enhancing the credibility of collected data and subsequent analyses. The Reliability Test results in Table 3 validate the reliability of each variable, ensuring dependable data analysis and generalizability of findings to the broader target population.

Table 3. Reliability Test

No	Atribute	Biznet	Reliability
1	Price	0. 881	Reliable
2	Network Connectivity	0. 873	Reliable
3	Promotion	0. 880	Reliable
4	Payment Model	0. 888	Reliable
5	Customer Service	0. 886	Reliable
6	Accessibility	0. 881	Reliable
7	Product	0. 882	Reliable
8	Data Security	0. 899	Reliable

3.3. Processing Data

Utilizing the gathered questionnaire data, an extensive analysis is conducted to compile and examine the strategies employed by each player concerning every variable. These strategies are then aggregated and summarized, presenting a comprehensive overview of the approaches taken by both Biznet and Indihome. The resulting insights shed light on the nuanced dynamics of their competitive landscape and strategic decision-making processes. Furthermore, the aggregate values representing each player's strategies are meticulously documented in Table 4, serving as a valuable reference point for understanding the strategic interactions between Biznet and Indihome. Table 4 serves as a pivotal tool in this analysis, displaying the game values derived from the interactions between Biznet and Indihome. By delving into these game values, researchers gain a deeper understanding of the strategic positioning and competitive strategies employed by each player. The process involves subtracting the value attributed to Biznet (as the row player) from that of Indihome (as the column player), thereby elucidating the comparative performance of both platforms across various scenarios.

Table 4. Recapitulation Value for Indihome and Biznet

PI\PII	**y_1**	**y_2**	**y_3**	**y_4**	**y_5**	**y_6**	**y_7**	**y_8**
	90	75	72	60	116	75	100	92
x_1	136	136	136	136	136	136	136	136
	90	75	72	60	116	75	100	92

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PI\PII	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
x_2	148	148	148	148	148	148	148	148
	90	75	72	60	116	75	100	92
x_3	112	112	112	112	112	112	112	112
	90	75	72	60	116	75	100	92
x_4	124	124	124	124	124	124	124	124
	90	75	72	60	116	75	100	92
x_5	152	152	152	152	152	152	152	152
	90	75	72	60	116	75	100	92
x_6	140	140	140	140	140	140	140	140
	90	75	72	60	116	75	100	92
x_7	124	124	124	124	124	124	124	124
	90	75	72	60	116	75	100	92
x_8	124	124	124	124	124	124	124	124

Based on the competition values, acquisition values are determined. These values are calculated by subtracting the sum of column players' profits from the sum of row players' [20]. The acquisition value represents the total acquisition of Biznet minus the amount obtained by Indihome. To begin, players will try using pure strategies, where row players follow the maximin rule and column players adhere to the minimax rule.

Table 5. Game Value

PI\PII	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	Minimum
x_1	46	61	64	76	20	61	36	44	20
x_2	58	73	76	88	32	73	48	56	32
x_3	22	37	40	52	-4	37	12	20	-4
x_4	34	49	52	64	8	49	24	32	8
x_5	62	77	80	92	**36**	77	52	60	**36 maximin**
x_6	50	65	68	80	24	65	40	48	24
x_7	34	49	52	64	8	49	24	32	8
x_8	34	49	52	64	8	49	24	32	8
Maximum	62	77	80	92	**36 minimax**	77	52	60	

From the analysis of the provided game theory table, it is evident that the strategic decisions made by each player, Player I (PI) and Player II (PII), are crucial in determining their respective outcomes in the game. Upon careful examination, it can be deduced that the maximin strategy for PI is represented by x5, yielding a minimum payoff of 36. This strategic choice indicates PI's preference for

minimizing the potential maximum loss in this particular game scenario. Conversely, the minimax strategy for PII is denoted by y5, offering a maximum payoff of 36. This strategic selection suggests that PII opts to maximize the potential maximum gain in this game.

In this specific game scenario, x5 and y5 emerge as the strategies respectively chosen by PI and PII to mitigate the potential maximum loss and maximize the potential maximum gain, aligning with the fundamental principles of maximin and minimax in game theory. These strategies reflect the players' rational decision-making processes, where PI aims to minimize the risk of worst-case outcomes, while PII seeks to maximize potential gains under the assumption of worst-case scenarios. This strategic alignment underscores the intricate interplay of risk management and payoff maximization within competitive decision-making.

4. CONCLUSION

The results of this study provide deep insights into the dynamics of competition between Indihome and Biznet in the Salatiga internet market. By meticulously collecting and analyzing data, this research successfully identifies various strategic dimensions, ranging from pricing strategies, network quality, promotions, payment models, to data security. Game theory methodology is employed to identify optimal strategic decisions, with the application of maximin and minimax strategies to minimize potential losses and maximize potential gains. Validity and reliability testing of the data are conducted to ensure the integrity of the analysis results, showing that all variables are deemed valid and reliable, with a strong reliability level, as indicated by the value of $\alpha = 0.897 > 0.80$. Based on the saddle point values, strategy X5 (Customer Service) is utilized by Indihome to achieve a maximum profit of 36, while Biznet implements the same Y5 strategy to minimize a loss of 36. By optimizing Game Theory strategies, both service providers can position themselves strongly in the internet market. As for future research, further exploration potential lies in understanding the development of consumer preferences and behaviors alongside technological advancements. Research can also explore the impact of regulatory frameworks and policy changes on market dynamics in greater depth. Additionally, analyzing the implications of new technologies such as 5G, IoT, and AI on market competition is also an interesting direction for research to provide strategic insights in the future.

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