

Game Theory Analysis of Usability Strategies in Gojek and Grab Using Nielsen's Usability Attributes

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Abstract: The rapid growth of mobile transportation services has intensified competition between Gojek and Grab, particularly in providing applications that are easy to learn, efficient, memorable, low in errors, and satisfying to use. However, previous usability evaluations have generally focused on descriptive average scores without identifying the specific usability attributes that provide the strongest competitive advantage. This study aimed to evaluate and determine the optimal usability strategies of Gojek and Grab using game theory based on Nielsen's five usability attributes: learnability, efficiency, memorability, errors, and satisfaction. A quantitative comparative approach was applied using purposive sampling involving 150 respondents who had actively used both applications. Data were collected through a five-point Likert scale questionnaire containing three items for each usability attribute. Instrument validity was examined using Pearson's product-moment correlation, while reliability was evaluated using Cronbach's alpha. The average usability scores were transformed into a game theory payoff matrix and analyzed using maximin and minimax principles. The results showed that all questionnaire items were valid and reliable. Gojek achieved higher scores in learnability, memorability, and satisfaction, whereas Grab obtained higher scores in efficiency and error-related usability. The analysis produced equal maximin and minimax values of 0.03, resulting in a saddle point between Gojek's satisfaction strategy and Grab's efficiency strategy. The study concluded that satisfaction represents Gojek's strongest usability strategy, while efficiency represents Grab's strongest strategy, although their overall competitive positions remain closely balanced. Strategically, Gojek needs to maintain interaction comfort while simplifying transaction flows, whereas Grab must preserve its procedural efficiency while improving user satisfaction and error communication. This study demonstrates that integrating usability dimensions into a game-theoretic framework offers practical priorities for digital platform interface development.

Keywords: Game Theory; Gojek; Grab; Nielsen's Usability Attributes; Usability.

1. Introduction

The development of information technology has driven changes in various aspects of society, including the widespread adoption of application-based transportation services. Through online transportation applications, users can order vehicles and food, dispatch goods, conduct digital payments, and access diverse daily amenities within a single consolidated ecosystem (Christanto *et al.*, 2024). Gojek and Grab represent two dominant digital platforms operating with closely matched service architectures and market offerings. These operational similarities compel both companies to compete continuously in delivering responsive digital services and compelling user experiences capable of attracting and retaining active users. Prior investigations have further confirmed that both platforms have evolved into multi-service super apps designed to sustain essential urban mobility and consumer routines (Partogi *et al.*, 2025). As these ecosystems expand, user interfaces serve as the primary operational gateway, making interactive performance central to sustained user engagement. Competition between Gojek and Grab is not limited to pricing structures, promotional subsidies, catalog volume, or geographic coverage. The ease with which users interact with application interfaces represents an equally decisive strategic battleground. Users routinely assess how quickly an application can be mastered, how swiftly desired services can be accessed, how reliably transactional procedures are recalled, how infrequently system disruptions occur, and whether the interaction leaves a favorable impression (Umar *et al.*, 2024). Consequently, interface usability and ergonomic efficiency exert a profound influence on overall user evaluations and platform allegiance (Hyun & Marsden, 2023).

The operational quality of human-system interaction can be systematically evaluated using established usability principles. According to Jakob Nielsen, usability is a multifaceted quality attribute that determines how easily a software interface can be operated by users (Nielsen, 2005). Nielsen distinguished five fundamental usability dimensions: learnability, efficiency, memorability, errors, and satisfaction (Nielsen, 1993). Learnability denotes how easily novice users complete basic tasks upon their initial encounter with the system. Efficiency concerns the speed and economy of effort with which experienced users execute designated activities. Memorability refers to the ease with which casual users re-establish operational proficiency after intervals of inactivity. Errors reflect the frequency, severity, and reversibility of mistakes encountered during task execution. Satisfaction encompasses the subjective comfort and positive acceptance experienced throughout the interactive process. These five dimensions provide a rigorous comparative framework for evaluating Gojek and Grab, as both systems employ distinct visual architectures, menu hierarchies, navigation pathways, ordering workflows, and feedback mechanisms. Previous empirical inquiries have assessed Gojek and Grab through standardized tools such as the User Experience Questionnaire and the System Usability Scale, while complementary studies have mined user reviews to document transactional errors and service disruptions (Khuntari, 2022; Damanik *et al.*, 2025). Furthermore, text mining on 5,000 Gojek user reviews corroborated that application stability and transactional friction are paramount in shaping user sentiment (Amri *et al.*, 2024). These studies systematically demonstrate that both platforms exhibit divergent performance across specific usability parameters. While such diagnostic assessments provide valuable insights into perceived interface strengths and functional limitations, their analytical scope is conventionally confined to descriptive mean scores, composite indices, percentile rankings, or unidirectional performance comparisons that merely document which platform outscores the other on isolated metrics.

This conventional comparative framing does not capture the strategic trade-offs inherent in competitive markets where design adjustments by one platform elicit counter-responses from another. An interface enhancement in operational speed, error mitigation, or visual comfort by one platform frequently prompts the competing platform to counter by reinforcing equivalent functions or targeting alternative attributes where it maintains a higher relative advantage. A clear research gap therefore exists in translating empirical usability evaluations into a formal decision-making model that accounts for the strategic interdependence governing platform competition. Addressing this gap enables system architects and product strategists to move beyond passive score monitoring toward identifying which usability parameters should be treated as defensible competitive priorities. Game theory provides a rigorous mathematical methodology to examine such interdependent competitive environments, where the payoff earned by an individual decision-maker depends directly on the strategic choices adopted by its adversary (Chatterjee & Lilien, 1986). The framework has also established empirical relevance in structuring human-computer interaction evaluations into quantifiable strategic payoffs (Christanto, 2022). In this study, Gojek and Grab are modeled as opposing rational players, with Nielsen's five usability components—learnability, efficiency, memorability, errors, and satisfaction—serving as the selectable strategy sets. Empirical user evaluations across these dimensions are transformed into a zero-sum payoff matrix to determine whether platform rivalry converges toward an optimal pure strategy characterized by a saddle point, or necessitates a probabilistic mixed-strategy posture. Accordingly, this study aims to systematically quantify the comparative usability of Gojek and Grab and determine the optimal usability strategy for each platform. The principal contribution is the formal synthesis of Nielsen's usability model with

game-theoretic optimization, thereby equipping platform developers and product managers with an analytical framework to identify structural competitive advantages and prioritize interface design resources effectively.

2. Related Work

Research on mobile transportation applications has evolved across several interrelated domains, encompassing mobile usability evaluation, user experience measurement, digital platform competition, and game-theoretic modeling of ride-hailing services. Extant literature has predominantly examined Gojek and Grab from either an isolated human-computer interaction perspective or a broader business competition viewpoint. Usability inquiries have relied primarily on standardized instruments such as the System Usability Scale (SUS), the User Experience Questionnaire (UEQ), heuristic inspections, and user satisfaction surveys. In contrast, game-theoretic studies have focused on pricing mechanisms, promotional subsidies, safety perceptions, technological features, and operational market behavior. However, limited empirical research has directly embedded multidimensional usability metrics into the payoff architecture of a game-theoretic model.

2.1 Usability Models for Mobile Applications

Usability denotes the degree to which a system enables users to achieve specified goals effectively, efficiently, and satisfactorily. Nielsen defined five core usability attributes: learnability, efficiency, memorability, errors, and satisfaction (ISO, 2018; Nielsen, 1993). These operational components differ fundamentally from Nielsen's ten heuristic principles; heuristics serve as diagnostic inspection guidelines for usability specialists, whereas the five attributes quantify direct user interactions and experiential outcomes. Methodologically, previous research has introduced diverse frameworks to evaluate mobile interfaces. Harrison *et al.* (2013) established the PACMAD model specifically tailored for mobile application constraints, while Brooke (1996) formulated the System Usability Scale (SUS) to capture composite usability perceptions. Schrepp *et al.* (2017) designed the User Experience Questionnaire (UEQ) to measure both pragmatic and hedonic user experience qualities. Subsequent investigations have demonstrated that questionnaire surveys, heuristic evaluations, and cognitive walkthroughs effectively pinpoint interface friction and navigation bottlenecks (Farzandipour *et al.*, 2022; Galavi *et al.*, 2024; Weichbroth, 2024). Nevertheless, these conventional usability paradigms remain diagnostic and descriptive, evaluating software quality in isolation without modeling usability attributes as strategic levers in competitive multi-firm environments.

2.2 Comparative Usability and User Experience of Mobile Applications

Empirical comparisons between Gojek and Grab have documented distinct user experience profiles across the two platforms. Khuntari (2022) conducted a comparative assessment using the UEQ framework, revealing that Gojek outperformed Grab in perspicuity and novelty, whereas Grab attained superior ratings in efficiency, dependability, and stimulation. Similarly, an evaluation by Damanik *et al.* (2025) using the SUS metric recorded a higher usability score for Gojek (65.053) relative to Grab (61.835). While these studies establish that both platforms possess differentiated interface strengths, their analytical conclusions were restricted to percentile rankings, descriptive mean differences, and standalone usability classifications without identifying actionable strategic priorities under competitive platform interdependence.

2.3 Game Theory in Gojek and Grab Competition

Game theory models strategic decision-making scenarios wherein the payoff achieved by an individual actor depends intrinsically on the competitive responses of rival firms. Within platform markets, each firm selects tactical decisions to maximize its relative market position while anticipating opposing countermeasures. A pure-strategy equilibrium is established when the payoff matrix yields an identical maximin and minimax value (saddle point), whereas mixed strategies define optimal probabilistic allocations when no single deterministic equilibrium exists. In the context of Indonesian ride-hailing rivalry, Nurhasanah *et al.* (2023) transformed user preference indices into mixed-strategy distributions, suggesting that Gojek should concentrate on affordability and convenience, while Grab should prioritize safety and promotional incentives. Extending these competitive dimensions, Hafizh *et al.* (2025) analyzed multi-attribute variables spanning price, technical innovation, safety, operational efficiency, and customer convenience. Although these investigations provide valuable strategic roadmaps, the underlying payoff variables were predominantly drawn from marketing mix and pricing parameters rather than structured, ergonomic human-computer interaction frameworks.

2.4 Game-Theoretic Models of Ride-Hailing Platforms

Contemporary inquiries have increasingly applied sophisticated game-theoretic models to analyze operational ride-hailing dynamics. Cai *et al.* (2024) formulated a dynamic duopoly evolutionary game to

evaluate platform governance and market fluctuations. Wang *et al.* (2024) developed a mixed-strategy Nash equilibrium model to assess competitive postures in autonomous ride-hailing deployments, while Wang and Li (2024) examined market equilibrium and technology transfers between autonomous and conventional fleets. Complementary models have investigated driver multi-homing behaviors (Gao *et al.*, 2025) and multi-party horizontal collaboration across digital logistics ecosystems (Deng *et al.*, 2023). In digital platform benchmarking, Christanto *et al.* (2023) applied matrix game theory to evaluate TikTok and Instagram using the 7P marketing mix, identifying a saddle point that validated matrix games for strategic platform comparisons. Despite these analytical advancements, existing game models remain centered on pricing schedules, asset configurations, labor allocations, and algorithmic dispatching, leaving interface usability largely unaddressed as an active competitive determinant.

2.5 Comparison with Previous Studies

Previous studies on Gojek and Grab have predominantly followed two separate research streams. The first stream focuses on usability and user experience evaluation through empirical instruments such as the User Experience Questionnaire (Khuntari, 2022) and the System Usability Scale (Damanik *et al.*, 2025). Although these investigations effectively map user perceptions and identify operational interface strengths, their analytical conclusions are confined to descriptive score comparisons and percentile rankings without establishing strategic decision priorities. The second stream applies game theory to examine competitive platform interactions, evaluating dimensions such as marketing attributes (Nurhasanah *et al.*, 2023), promotional mixes (Christanto *et al.*, 2023), pricing mechanisms, and fleet operations (Cai *et al.*, 2024; Wang *et al.*, 2024; Wang & Li, 2024). However, these game-theoretic models rarely consider human-computer interaction parameters as direct competitive strategies. This study differs from previous research by integrating Nielsen's usability dimensions directly into a game-theoretic payoff framework. Rather than evaluating interface quality in isolation or limiting game models to operational and marketing variables, this study positions Gojek and Grab as competing decision-makers whose strategic alternatives are defined by learnability, efficiency, memorability, errors, and satisfaction. Transforming empirical user evaluations into relative payoff values analyzed through maximin, minimax, and saddle point principles allows this study to determine the specific usability attributes that offer the strongest competitive advantage for each platform, thereby bridging interface evaluation and strategic decision-making.

3. Methodology

This study used a quantitative comparative approach to analyze the competitive usability strategies of the Gojek and Grab applications using matrix game theory. Both applications were positioned as competing players, while the five usability attributes proposed by Jakob Nielsen, namely learnability, efficiency, memorability, errors, and satisfaction, were used as the strategic alternatives. The operational stages of the research consisted of determining the strategy, collecting data, testing data validity, testing data reliability, processing the data into a payoff matrix, and drawing research conclusions, as illustrated in Figure 1.



Figure 1. Research Stages

The initial stage involved identifying the decision-making players and defining the strategies used in the game theory model. Gojek was positioned as the row player and the maximizing player, while Grab was positioned as the column player and the minimizing player. Because both platforms provide similar digital ecosystems—including online transportation, food delivery, parcel logistics, and digital payment services—competition between Gojek and Grab is influenced not only by price and promotional offers, but also by the quality of user interactions with each interface. A high level of usability enables users to access services more easily, complete transactions more efficiently, and encounter fewer difficulties during interaction. Accordingly, the strategic alternatives for both players were operationalized using Nielsen's five usability attributes. Learnability refers to the ease with which users can understand and learn how to operate an application upon first exposure, including recognizing menus, locating required services, and understanding transaction steps. Efficiency denotes the speed and effort required to complete activities after users understand how the application operates, facilitating rapid task execution through clear procedures. Memorability represents users' ability to remember operating procedures, menu locations, and navigation paths after a period of nonuse without needing to relearn them. Errors concern the frequency and severity of mistakes experienced by users, alongside the clarity of error notifications and the ease of error recovery without restarting the entire transaction. Finally, satisfaction reflects users' comfort, pleasant experience, interface appeal, and willingness to continue using the application in future transactions. Empirical assessments across these five attributes were subsequently converted into payoff values to evaluate which strategic dimensions provide the strongest relative competitive advantage for each platform.

Data collection was conducted on a population consisting of active users who had direct experience using both Gojek and Grab. Because the exact size of the population utilizing both applications was unknown, the research targeted a minimum of 150 valid respondents. A total of 172 responses were gathered. Following data screening, 22 responses were excluded because they did not satisfy the inclusion criteria, contained incomplete answers, or represented duplicate submissions, leaving 150 valid responses for the final analysis. Respondents were selected using purposive sampling because not every digital transportation consumer possesses sufficient operational experience to benchmark both platforms objectively. The predetermined inclusion criteria required that the respondent was at least 17 years old, had used both Gojek and Grab, had personally operated both applications rather than relying on third parties, had completed at least one commercial transaction on each platform, and had actively used both applications within the previous six months. Respondents were excluded if they had only used one application, had never personally completed a transaction, submitted incomplete responses, or provided duplicate submissions. Evaluating both applications through the same respondents minimized confounding variance stemming from disparate individual user characteristics, ensuring that each participant compared Gojek and Grab based on direct personal experience. The research instrument comprised a structured questionnaire organized into screening verifications, demographic profiles, and comparative usability evaluations of Gojek and Grab. The usability section evaluated the five dimensions using three operational statements per attribute, resulting in 15 statements per application. Because identical statements were applied to both platforms, each respondent answered a total of 30 usability items, consisting of 15 items for Gojek and 15 items for Grab. The complete questionnaire statements are presented in Table 1.

Table 1. Questionnaire

Variable	Code	Statement
Learnability	X1_1	The Gojek/Grab application is easy to learn.
	X1_2	Required services in the Gojek/Grab application can be found easily without assistance.
	X1_3	The transaction steps in the Gojek/Grab application are easy to understand.
Efficiency	X2_1	Transactions can be completed quickly using the Gojek/Grab application.
	X2_2	Services in the Gojek/Grab application can be accessed without unnecessary steps.
	X2_3	The menus and features in the Gojek/Grab application support efficient task completion.
Memorability	X3_1	The operating procedures of the Gojek/Grab application are easy to remember after a period of nonuse.
	X3_2	The locations of menus and features in the Gojek/Grab application are easy to remember.
	X3_3	Transaction processes in the Gojek/Grab application can be repeated without relearning the procedures.
Errors	X4_1	Errors rarely occur during the use of the Gojek/Grab application.
	X4_2	The Gojek/Grab application provides clear information when an error occurs.
	X4_3	Errors in the application can be corrected without repeating the entire process.

Satisfaction	X5_1	The overall experience of using the Gojek/Grab application is satisfactory.
	X5_2	The interface and navigation of the application provide a comfortable user experience.
	X5_3	The Gojek/Grab application is suitable for continued use in future transactions.

All statements were framed positively so that higher scores indicated superior usability performance. For the errors attribute, higher scores reflected fewer operational mistakes, clearer feedback, and more seamless error recovery. The questionnaire utilized a five-point Likert scale, as detailed in Table 2.

Table 2. Likert Scale

Score	Response
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly

Validity testing was performed to determine whether each questionnaire item accurately measured its intended usability construct (Correa *et al.*, 2026). The analysis was conducted independently for Gojek and Grab because identical statements could elicit distinct evaluations across the two platforms. The construct validity of each item was evaluated using Karl Pearson's product-moment correlation, which assesses the association between individual item scores and the composite score of the corresponding usability attribute. Higher correlation coefficients indicate greater alignment with the attribute under evaluation. The product-moment correlation coefficient was calculated using Equation (1) (Almanasreh *et al.*, 2019):

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

where r is the Pearson correlation coefficient, X and Y are the variables being correlated, and $\bar{X}$ and $\bar{Y}$ represent the respective sample means of X and Y . Reliability testing was conducted to verify the internal consistency and dependability of the instrument in measuring the five usability attributes across both applications (Hund & Schroeder, 2020). A reliable instrument produces stable measurements rather than random variance (Peeters & Harpe, 2020). In this study, internal consistency was evaluated via Cronbach's alpha using IBM SPSS Statistics. An attribute was considered reliable when its Cronbach's alpha coefficient was at least 0.70. The coefficient was computed using Equation (2) (Malkewitz *et al.*, 2023):

$$\alpha = \left(\frac{k}{k-1} \right) \left(1 - \left(\frac{\sum \sigma^2 i}{\sigma^2 X} \right) \right) \quad (2)$$

where α is the Cronbach's alpha coefficient, k is the number of items in the scale, $\sigma^2 i$ is the variance of individual item i , and $\sigma^2 X$ is the variance of the composite total score. After the questionnaire items were confirmed to be valid and reliable, respondent ratings were processed to compute the mean score for each usability attribute. For each respondent, ratings across the three items within an attribute were averaged, and these individual means were subsequently averaged across all 150 respondents to establish the final mean scores for learnability, efficiency, memorability, errors, and satisfaction for Gojek and Grab. These empirical mean scores were transformed into a payoff matrix for game-theoretic analysis, with Gojek designated as the maximizing row player and Grab as the minimizing column player. Each cell within the payoff matrix represented the relative usability differential between a specific Gojek strategy and a specific Grab strategy, formulated using Equation (3):

$$P_{ij} = G_i - R_j \quad (3)$$

where P_{ij} is the payoff value at row i and column j , G_i is the mean score of usability strategy i for Gojek, and R_j is the mean score of usability strategy j for Grab. A positive payoff value indicated a relative advantage for Gojek, whereas a negative value indicated an advantage for Grab; payoff values approaching zero denoted relative parity between the compared strategies. Following matrix construction, the row minimum was identified for each Gojek strategy to represent its least favorable outcome, with the highest value among these row minimums designated as the maximin value. Conversely, the column maximum was identified for each

Grab strategy to represent the maximum advantage conceded to Gojek, with the lowest value among these column maximums designated as the minimax value. When the maximin and minimax values were identical, a saddle point was confirmed, indicating that the corresponding choices formed optimal pure strategies; when the two values diverged, mixed-strategy probability distributions were solved to establish equilibrium (Chatterjee & Lilien, 1986). In the final stage, empirical findings from the validity tests, reliability tests, attribute mean scores, and game-theoretic optimization were synthesized to draw conclusions. The analysis identified the usability attributes that provided the strongest competitive advantages for Gojek and Grab, established the optimal strategic equilibrium for both platforms, and provided practical recommendations for interface enhancements across learnability, efficiency, memorability, error prevention, and user satisfaction.

4. Results and Discussion

4.1 Results

A total of 150 respondents participated in this study, consisting of 78 males (52.0%) and 72 females (48.0%), indicating a balanced gender distribution. Respondents aged 21 to 25 years formed the largest age group, comprising 60 individuals (40.0%), followed by those aged 26 to 30 years with 33 respondents (22.0%). In aggregate, 93 respondents (62.0%) were between 21 and 30 years old, confirming that the majority of participants belonged to a digitally active demographic that frequently utilizes mobile applications and online transportation platforms. Respondents aged 17 to 20 years accounted for 18.0%, while those aged 31 to 40 years and older than 40 years represented 14.0% and 6.0%, respectively. In terms of occupation, students constituted the largest single cohort with 54 respondents (36.0%), closely followed by private sector employees with 51 respondents (34.0%). Entrepreneurs represented 12.0%, civil servants 10.0%, while homemakers and respondents from other occupations each accounted for 4.0%. Regarding usage frequency, 66 respondents (44.0%) accessed Gojek or Grab three to five times per week, 39 respondents (26.0%) used the applications six to ten times per week, and 21 respondents (14.0%) operated them more than ten times weekly. Only 24 respondents (16.0%) reported using either platform one to two times per week. Consequently, 126 respondents (84.0%) utilized Gojek or Grab at least three times per week, ensuring substantive familiarity with navigation patterns, transaction workflows, operational error occurrences, and overall interface ergonomics across both platforms. These demographic foundations substantiate user evaluations across learnability, efficiency, memorability, errors, and satisfaction, providing an empirical basis for the payoff matrix. The complete demographic profiles are detailed in Table 3 and Figure 2.

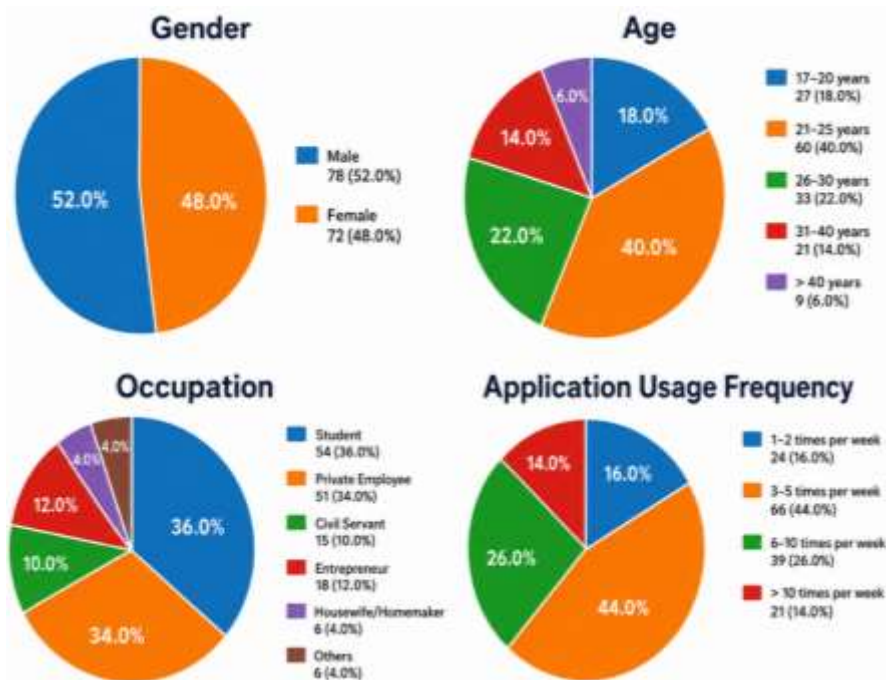


Figure 2. Respondent Demography

Table 3. Respondent Demographic Profile

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	78	52.0
	Female	72	48.0

Age	17 to 20 years	27	18.0
	21 to 25 years	60	40.0
	26 to 30 years	33	22.0
	31 to 40 years	21	14.0
	More than 40 years	9	6.0
Occupation	Student	54	36.0
	Private employee	51	34.0
	Civil servant	15	10.0
	Entrepreneur	18	12.0
	Homemaker	6	4.0
	Others	6	4.0
Application Usage Frequency	1 to 2 times per week	24	16.0
	3 to 5 times per week	66	44.0
	6 to 10 times per week	39	26.0
	More than 10 times per week	21	14.0

The construct validity test results confirmed that all questionnaire items measuring Gojek and Grab were statistically valid. For Gojek, the calculated Pearson correlation coefficients ($r_{\text{calculated}}$ / $r_{\text{calculated}}$) ranged from 0.552 to 0.819. For Grab, the coefficients ranged from 0.564 to 0.806. All calculated correlation values exceeded the critical threshold of $r_{\text{table}}=0.160$ / $r_{\text{table}}=0.160$ evaluated at a significance level of $\alpha=0.05$ / $\alpha=0.05$ ($n=150$ / $n=150$). Therefore, all 15 operational statements measuring learnability, efficiency, memorability, errors, and satisfaction adequately represented their targeted constructs, qualifying them for reliability testing and payoff matrix construction. Detailed validity outcomes are presented in Table 4 and Table 5.

Table 4. Validity Test Results for Gojek

Variable	Code	$r_{\text{calculated}}$	r_{table}	Result
Learnability	X1_1	0.682	0.160	Valid
	X1_2	0.741	0.160	Valid
	X1_3	0.653	0.160	Valid
Efficiency	X2_1	0.798	0.160	Valid
	X2_2	0.716	0.160	Valid
	X2_3	0.762	0.160	Valid
Memorability	X3_1	0.594	0.160	Valid
	X3_2	0.671	0.160	Valid
	X3_3	0.709	0.160	Valid
Errors	X4_1	0.552	0.160	Valid
	X4_2	0.623	0.160	Valid
	X4_3	0.688	0.160	Valid
Satisfaction	X5_1	0.819	0.160	Valid
	X5_2	0.786	0.160	Valid
	X5_3	0.748	0.160	Valid

Table 5. Validity Test Results for Grab

Variable	Code	$r_{\text{calculated}}$	r_{table}	Result
Learnability	X1_1	0.661	0.160	Valid
	X1_2	0.728	0.160	Valid
	X1_3	0.642	0.160	Valid
Efficiency	X2_1	0.781	0.160	Valid
	X2_2	0.704	0.160	Valid
	X2_3	0.751	0.160	Valid
Memorability	X3_1	0.583	0.160	Valid
	X3_2	0.649	0.160	Valid
	X3_3	0.693	0.160	Valid
Errors	X4_1	0.564	0.160	Valid
	X4_2	0.612	0.160	Valid
	X4_3	0.701	0.160	Valid
Satisfaction	X5_1	0.806	0.160	Valid
	X5_2	0.773	0.160	Valid
	X5_3	0.759	0.160	Valid

The internal consistency assessment indicated that all usability dimensions across both questionnaires satisfied the reliability criteria. As summarized in Table 6 and Table 7, the dimension-level Cronbach's alpha values for Gojek ranged from 0.731 to 0.864, with an overall composite reliability of 0.892. For Grab, dimension-level alpha coefficients ranged from 0.724 to 0.851, achieving an overall instrument reliability of 0.883. Because every coefficient surpassed the benchmark threshold of 0.70, the measurement scales demonstrated robust internal consistency and measurement stability.

Table 6. Reliability Test Results for Gojek

Variable	Number of Items	Cronbach's Alpha	Result
Learnability	3	0.782	Reliable
Efficiency	3	0.836	Reliable
Memorability	3	0.758	Reliable
Errors	3	0.731	Reliable
Satisfaction	3	0.864	Reliable
Overall Instrument	15	0.892	Reliable

Table 7. Reliability Test Results for Grab

Variable	Number of Items	Cronbach's Alpha	Result
Learnability	3	0.769	Reliable
Efficiency	3	0.821	Reliable
Memorability	3	0.746	Reliable
Errors	3	0.724	Reliable
Satisfaction	3	0.851	Reliable
Overall Instrument	15	0.883	Reliable

The calculated average usability scores revealed differentiated competitive profiles between the two platforms. Gojek attained superior ratings in learnability (4.12 vs. 4.06), memorability (4.05 vs. 3.98), and satisfaction (4.34 vs. 4.25). The higher learnability and memorability ratings suggest that Gojek's menu hierarchy and procedural flows were perceived as slightly more intuitive to master initially and recall after periods of disuse. Gojek's highest empirical rating occurred in satisfaction (4.34), reflecting favorable user experiences regarding visual design, comfort, and ongoing utility. Conversely, Grab secured higher scores in operational efficiency (4.31 vs. 4.28) and error-related usability (3.92 vs. 3.88). Because the error statements were phrased positively, Grab's higher rating denotes fewer perceived disruptions, clearer system warnings, and more seamless error recovery. The consolidated usability ratings are summarized in Table 8.

Table 8. Average Usability Scores of Gojek and Grab

Usability Attribute	Gojek Mean Score	Grab Mean Score
Learnability	4.12	4.06
Efficiency	4.28	4.31
Memorability	4.05	3.98
Errors	3.88	3.92
Satisfaction	4.34	4.25

These mean scores were derived from the responses of all 150 respondents. For each respondent, ratings across the three items per dimension were averaged to compute individual attribute means, which were subsequently aggregated to yield the overall dimension means. The empirical averages across nearly all attributes hovered around or exceeded 4.00, demonstrating that respondents maintained favorable evaluations of both platforms. However, the score differences between Gojek and Grab remained marginal, signifying that both applications provide closely balanced usability experiences with distinct relative proficiencies across dimensions. The payoff matrix was subsequently constructed by substituting the empirical mean scores into Equation (3), where each cell value $P_{ij}=G_i-R_j$ represents the relative usability differential between Gojek strategy i and Grab strategy j . The resulting $5 \times 5 \times 5$ matrix generated 25 distinct payoff cells, as displayed in Table 9. Gojek was positioned as the maximizing row player and Grab as the minimizing column player. Positive values designate an advantage for Gojek, negative values signify an advantage for Grab, and values approaching zero indicate parity.

Table 9. Game Theory Payoff Matrix

Grab Gojek	Learnability	Efficiency	Memorability	Errors	Satisfaction	Row Minimum
Learnability	0.06	-0.19	0.14	0.20	-0.13	-0.19
Efficiency	0.22	-0.03	0.30	0.36	0.03	-0.03
Memorability	-0.01	-0.26	0.07	0.13	-0.20	-0.26
Errors	-0.18	-0.43	-0.10	-0.04	-0.37	-0.43
Satisfaction	0.28	0.03	0.36	0.42	0.09	0.03
Column Maximum	0.28	0.03	0.36	0.42	0.09	

Following matrix formulation, the minimum payoff in each row was identified to determine the worst-case outcome for each Gojek strategy, and the maximum value among these row minimums was selected as the maximin value. Concurrently, the maximum value in each column was identified, and the minimum value among these column maximums was established as the minimax value for Grab. In this study, both the maximin and minimax values were 0.03, producing a saddle point at the intersection of Gojek's satisfaction strategy and Grab's efficiency strategy. Therefore, an optimal pure strategy was achieved, with a game value of $V=0.03$, indicating that Gojek maintains a slight relative usability advantage at equilibrium while overall platform competition remains tightly balanced.

4.2 Discussion

The empirical findings establish that Gojek and Grab deliver positive and highly competitive usability experiences. Both platforms recorded mean ratings at or near 4.00 across most dimensions, while error handling remained the lowest-scoring dimension for both systems (3.88 for Gojek and 3.92 for Grab). This confirms that users find both platforms intuitive, efficient, and memorable, but encounter occasional operational friction during task execution. As detailed in Table 8, Gojek demonstrated clear strengths in learnability, memorability, and satisfaction, whereas Grab secured modest advantages in operational efficiency and error management. Gojek's advantage in learnability and memorability indicates that its visual hierarchy, categorization scheme, and task navigation are easily interpreted by users and readily recalled after periods of platform dormancy. Interface familiarity and consistent menu taxonomies reduce cognitive load during initial onboarding and routine task execution. Nevertheless, the marginal magnitude of these score differentials underscores subtle user tendencies rather than substantial systemic disparities between the platforms. Grab's superior efficiency score indicates that its transactional workflows are perceived as more streamlined, requiring less time and operational effort. This outcome is likely driven by direct navigational routes, concise booking confirmations, and fewer intermediate screens. Grab also scored slightly higher on the errors dimension, reflecting better perceived operational resilience, informative warning banners, and smoother recovery pathways. However, because error management was the lowest-rated usability component across both platforms, both systems exhibit room for improvement regarding location pin accuracy, payment verification delays, and task disruptions.

Satisfaction emerged as Gojek's highest-rated dimension (4.34), outperforming Grab (4.25). This finding confirms that overall user satisfaction is driven not solely by execution velocity, but by ergonomic comfort, visual clarity, and transactional dependability. This alignment corroborates previous empirical findings where Gojek achieved higher composite usability evaluations relative to Grab (Damanik *et al.*, 2025). The payoff matrix in Table 9 formalizes these comparative evaluations into strategic trade-offs. The row corresponding to Gojek's satisfaction strategy generated strictly positive payoffs across all Grab strategies, ranging from 0.03 to 0.42, establishing satisfaction as Gojek's most dominant and resilient strategy. Gojek achieved its highest individual payoff (+0.42) when its satisfaction strategy was pitted against Grab's error-handling dimension. Conversely, Gojek's error-handling row yielded uniformly negative payoffs against all Grab alternatives, recording its steepest deficit (-0.43) against Grab's efficiency strategy. This establishes error handling as Gojek's primary interface vulnerability. From Grab's defensive standpoint, the efficiency column yielded the smallest column maximum (0.03). Operating under the minimax criterion, prioritizing operational efficiency enables Grab to minimize the maximum relative usability advantage Gojek can capture. Because the maximin value for Gojek and the minimax value for Grab converged at exactly 0.03, the interaction satisfies the condition for a pure-strategy Nash equilibrium. The optimal strategic recommendation dictates that Gojek should prioritize interface satisfaction, while Grab should maintain operational efficiency as its primary usability defense.

The equilibrium game value of 0.03 indicates that platform rivalry is closely balanced. Gojek holds only a narrow relative edge, and neither platform commands an uncontested advantage. Consequently, minor design refinements or subtle shifts in user experience could readily displace this equilibrium. These strategies should therefore be viewed as targeted tactical priorities rather than permanent operational moats. In practical terms,

Gojek's product team should protect its satisfaction advantage by maintaining visual consistency, transparent feedback mechanisms, and interactive comfort, while actively rectifying its efficiency and error-handling deficits through simplified checkout steps and seamless error recovery. Grab should defend its transactional speed and efficiency advantages while modernizing its navigation structures to elevate learnability and user satisfaction. Both applications must enhance error management by introducing clearer error diagnoses, automated data-retention mechanisms during transaction drops, and frictionless recovery pathways that eliminate the need to restart transactions from scratch. These conclusions must be considered within the scope of the study's empirical constraints. The identified usability differences were small and derived from subjective Likert-scale evaluations rather than instrumented telemetry, task completion timing, or automated telemetry crash logs. Furthermore, the respondent demographic was predominantly young, educated, and technologically adept, which may limit generalizability to older user cohorts or individuals with accessibility requirements. Future inquiries should complement survey-based game matrices with lab-based usability tracking, eye-tracking metrics, and direct telemetry analytics to evaluate competitive platform dynamics across broader user segments.

5. Conclusion and Recommendations

This study integrated Jakob Nielsen's five usability attributes with zero-sum game theory to evaluate and determine the competitive usability strategies of Gojek and Grab. The empirical findings demonstrated that while both platforms deliver favorable and closely matched usability performance across most dimensions, their strategic advantages diverge. The matrix game analysis identified a pure-strategy saddle point with an equilibrium game value of $V=0.03$, establishing interface satisfaction as Gojek's optimal competitive strategy and operational efficiency as Grab's optimal defensive strategy. The marginal game value underscores that neither platform commands an uncontested ergonomic dominance, confirming that platform rivalry remains tightly balanced. The primary contribution of this study lies in operationalizing multidimensional human-computer interaction attributes as formal strategy sets within a game-theoretic payoff framework. Rather than confining usability analysis to standalone descriptive ratings, composite satisfaction scores, or percentile rankings, this integrated approach translates empirical user perceptions into relative strategic payoffs that support competitive decision-making. From an applied design perspective, Gojek's product team should safeguard its user satisfaction advantage through consistent visual hierarchies, responsive system feedback, and interactive comfort, while actively rectifying transaction latency and error-recovery procedures. Conversely, Grab should defend its competitive speed and transactional efficiency while enhancing its menu discoverability, operational memorability, and overall interface satisfaction. Furthermore, because the errors dimension received the lowest empirical ratings across both applications, both platforms must prioritize error mitigation through intuitive disruption notifications, persistent state retention during network drops, and frictionless transaction recovery that circumvents the need to restart tasks.

These findings must be evaluated in light of several methodological limitations. The sample was gathered via purposive sampling and was predominantly composed of young, technologically proficient users aged 21 to 30 years, which may constrain the immediate generalizability of the findings to older cohorts, novice digital consumers, or individuals with specialized accessibility needs. Additionally, the payoff formulation relied on subjective Likert-scale self-reports aggregated at the dimension level, which may be subject to perceptual biases and external influences such as device capabilities, operating system builds, network stability, and localized service availability. Future inquiries should validate and extend this framework by engaging broader demographic cross-sections and combining survey instruments with instrumented usability lab experiments, task completion timing, eye-tracking metrics, and telemetry crash logs. Constructing payoff matrices directly from respondent-level pairwise trade-offs or discrete choice experiments could provide deeper strategic granularity, particularly in competitive market scenarios where no pure-strategy saddle point exists and mixed-strategy distributions emerge. Finally, the proposed analytical framework can be readily adapted to benchmark interactive rivalry across other multi-sided digital service ecosystems, including mobile banking, e-commerce marketplaces, digital wallet platforms, and on-demand delivery services.

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