

Business Model Design under Economic Uncertainty: Integrating Game Theory and Behavioral Economics in Strategic Decision-Making

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Abstract

Purpose: This study aims to design a comprehensive model for developing business models under economic uncertainty, emphasizing game theory and behavioral economics in strategic decision-making.

Methodology: A mixed-methods sequential-exploratory design was employed. In the qualitative phase, 24 semi-structured interviews were conducted with senior managers and strategic experts in Iran, and data were analyzed using Braun and Clarke's six-stage thematic analysis via MAXQDA 2022. In the quantitative phase, a researcher-developed questionnaire was distributed among 430 managers and senior experts across five industry clusters; 412 analyzable questionnaires were returned (95.8% response rate). Data were analyzed using SPSS 26 and SmartPLS 4 through PLS-SEM and Importance-Performance Analysis (IPMA).

Findings: The model comprises three principal dimensions: strategic environment awareness, behavioral dynamics of decision-makers, and competitive game structure. All three dimensions significantly influenced business model effectiveness. Behavioral dynamics exhibited the greatest influence ($\beta = 0.42$, $t = 7.12$), followed by strategic environment awareness ($\beta = 0.31$, $t = 5.84$) and competitive game structure ($\beta = 0.27$, $t = 5.23$). The model explained 58% of the variance in effectiveness ($R^2 = 0.58$), with satisfactory predictive relevance ($Q^2 = 0.42$) and goodness-of-fit ($GoF = 0.61$).

Conclusion: The proposed model offers a comprehensive analytical framework for organizations confronting economic uncertainty. Integrating game theory and behavioral economics facilitates anticipating competitors' behavior and recognizing decision-makers' cognitive biases. Managers should prioritize cognitive bias management, strengthen multi-scenario analysis, and continuously monitor their industry's competitive structure.

Keywords: Business Models; Economic Uncertainty; Game Theory; Behavioral Economics; Strategic Decision-Making; Systematic Review.

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1. Introduction

Over the past decade, the global economy has encountered unprecedented challenges, including severe energy price fluctuations, financial crises, the COVID-19 pandemic, and geopolitical tensions (International Monetary Fund [IMF], 2024). The International Monetary Fund (2024) warns that rising macroeconomic uncertainty can amplify downside risks to markets, credit supply, and gross domestic product growth, particularly when debt vulnerabilities are elevated or when financial market volatility diverges from economic fundamentals. These phenomena, collectively referred to as "economic uncertainty," have profoundly affected the business environment and challenged traditional approaches to strategic planning (Hassan et al., 2023). Economic uncertainty can be defined as the absence of complete information regarding future events and the consequences of decisions (Knight, 2021), a condition that confronts organizations' strategic decision-making processes with numerous challenges. Managers must contend not only with fluctuations in the external environment but also with opacity in supply chains and abrupt shifts in consumer behavior (Pirzada et al., 2024). Under such conditions, traditional decision-making approaches grounded in assumptions of full rationality and symmetric information lose their efficacy, and the necessity of adopting interdisciplinary approaches becomes increasingly evident (Felin & Zenger, 2024). Recent research in strategic management has demonstrated that understanding the nature and sources of uncertainty constitutes the foundation of entrepreneurial and strategic decision-making and remains a central focus of the field (Peters & Gadenne, 2023).

Game theory, as one of the most influential approaches in the analysis of strategic decision-making, provides a framework for analyzing the interactive behavior of economic actors and enables the modeling of competition and cooperation in unstable markets (Yang et al., 2024). Recent research on robust games demonstrates that by introducing uncertainty into game models and employing a worst-case approach on the part of players, more complex behaviors—such as non-monotonic reaction functions—can be explained even within simple market structures (Guan et al., 2025). However, traditional game theory is often predicated on assumptions of full rationality, which in practice are inconsistent with the realities of human decision-making and reveal the need for modification through behavioral approaches (Cosma et al., 2024). Conversely, behavioral economics, by critiquing the assumptions of full rationality in classical economics, examines the influence of psychological, cognitive, and emotional factors on economic decision-making (Kahneman & Tversky, 2023). Experimental research on strategic games has shown that real decision-makers frequently deviate from the normative patterns predicted by rational theories, with factors such as trust, controllability, and altruistic preferences playing a significant role in shaping their decisions (Choi & Liu, 2024). The integration of game theory and behavioral economics within a unified framework can provide a more comprehensive understanding of organizations' strategic decision-making processes under conditions of economic uncertainty (He et al., 2023).

Given the intensification of economic uncertainties in recent years, organizations are increasingly in need of new analytical frameworks for strategic decision-making (Schoemaker

& Day, 2023). Traditional strategic planning approaches are no longer effective under VUCA conditions (volatility, uncertainty, complexity, and ambiguity), and organizations require more dynamic approaches such as system dynamics modeling and simulation of competitive interactions (Smith et al., 2024). Research has demonstrated that combining causation and effectuation approaches can assist organizations in coping with environmental shocks and provide the necessary flexibility (McKelvie et al., 2025). Although each of the domains of game theory and behavioral economics has been addressed separately in the management literature, the integration of these two approaches within a unified model for business model design has received scant attention (Chen et al., 2024). Recent research indicates that evolutionary games with assumptions of bounded rationality can serve as powerful tools for analyzing long-term strategic interactions under uncertainty (Tan et al., 2023), and scholars in the field of behavioral games emphasize the necessity of designing models capable of simultaneously addressing the rational and social dimensions of decision-making (Molm & Collett, 2024).

Furthermore, given the specific characteristics of the Iranian economy—including currency fluctuations, economic sanctions, and political instability—the design of indigenous business models capable of functioning effectively under such conditions is of particular importance (RezaeiZadeh et al., 2024). Domestic research has demonstrated that environmental uncertainty functions as one of the key causal conditions in the strategic decision-making models of Iranian organizations, and factors such as managers' personality traits and organizational culture influence how this uncertainty is addressed (Mohammadkhani & Mousavirad, 2023; Taghipour et al., 2025). Moreover, in the era of digital transformation and the proliferation of emerging technologies, decision-making in complex and dynamic environments necessitates approaches capable of simultaneously addressing the rational and behavioral dimensions of decision-making (Parker et al., 2025). Despite considerable advances in each of the domains of game theory and behavioral economics, a comprehensive model that can elucidate the simultaneous application of these two approaches in the design of business models under conditions of economic uncertainty remains absent from the strategic management literature. This theoretical gap renders the present study necessary, with the aim of designing and validating such a model, with an emphasis on the Iranian context and indigenous applications, so as to provide both theoretical and practical implications and offer guidance to managers of Iranian organizations in coping with unstable economic conditions. Accordingly, the principal research question of the present study is: What are the dimensions and components of a model for designing business models under conditions of economic uncertainty based on game theory and behavioral economics, and what is the effect of each of these dimensions on the effectiveness of business models?

2. Theoretical Foundations and Literature Review

2.1. Systematic Review of the Research Literature

A systematic review of the literature, as one of the most rigorous methods in management research, facilitates the identification of theoretical gaps and provides a comprehensive

framework of existing knowledge. In this section, employing a systematic review approach based on the PRISMA protocol, studies related to the design of business models under conditions of economic uncertainty are examined. A systematic search was conducted in reputable databases, including Scopus, Web of Science, ScienceDirect, and Google Scholar, using combinations of the keywords "Business Model Design," "Economic Uncertainty," "Game Theory," "Behavioral Economics," and "Strategic Decision-Making." The search timeframe was set from 2020 to 2026 to ensure coverage of recent research. Following an initial screening of 384 articles and the application of inclusion and exclusion criteria—including thematic relevance, methodological quality, and publication in reputable journals—43 articles were selected for final analysis and were categorized into four principal domains.

2.2. Design of Business Models under Uncertainty

One of the central topics in the strategic management literature concerns how business models are designed and developed in the face of environmental uncertainty. Recent research indicates that traditional approaches to business model design, which rest on assumptions of environmental stability, lack the necessary efficacy under conditions of uncertainty (Felin & Zenger, 2024). In a study examining the impact of economic policy uncertainty on corporate productivity within the Iranian context, researchers demonstrated that economic policy uncertainty leads to a decline in corporate productivity, and that when the country distances itself from conditions of economic uncertainty, corporate productivity increases (Khodadadeh Shamlou et al., 2024). This finding suggests that the Iranian economic environment, with its distinctive characteristics, requires indigenous business models suited to unstable conditions.

In another study employing a systematic sampling method on 125 companies listed on the Tehran Stock Exchange during the period 2015–2022, researchers identified a U-shaped relationship between economic policy uncertainty and corporate financialization. Specifically, an increase in economic policy uncertainty at low levels leads to a reduction in investment in financial assets, whereas at high levels it results in increased investment in such assets (Taghizadeh Khanqah & Badavar Nahandi, 2025). This study, which diverges from research conducted in developed countries, emphasizes the prominent role of governance rules and regulations in managing Iran's economy and demonstrates that firms with strong financial constraints adjust their investment levels in a manner that ensures the liquidity required for commercial activities.

From a theoretical standpoint, economic uncertainty, as a systematic and macroeconomic risk beyond the control of individuals, firms, and capital market participants, compels economic actors to take this factor into account in their decisions (Amini et al., 2023). Research has shown that under conditions of high economic uncertainty, the payment period increases, and firms—in order to mitigate the risk of default, liquidity shortages, and bankruptcy—must simultaneously employ diverse financing methods. Furthermore, as economic uncertainty rises, firm value declines, and risk-tolerant investors can exploit these conditions for more optimal investment.

2.3. Application of Game Theory in Strategic Decision-Making

Game theory, as one of the most influential analytical frameworks in strategic management, provides powerful tools for analyzing competitive and cooperative interactions among organizations. As Kuzmanović (2021) observes, traditional decision-making models presuppose full rationality, whereas practice has demonstrated that the behavior and choices of actors are influenced by multiple factors, including motivations, beliefs, opinions, personal and social preferences, and cognitive biases. This study offers a comprehensive review of behavioral models of strategic decision-making and demonstrates bounded rationality and cognitive biases through the findings of numerous experimental studies.

In the domain of robust games, new concepts have been developed for analyzing the behavior of players under uncertainty. Within this framework, players employing a worst-case approach select strategies that yield the best performance under the worst-case scenario (Aghassi & Bertsimas, 2020). The robust-optimization equilibrium, in which worst-case outcome functions replace conventional outcome functions, enables the analysis of strategic behavior under conditions of parametric uncertainty. The conditions for the existence of this equilibrium include continuity and quasi-concavity of the worst-case outcome functions, which are analogous to the conditions of Nash's theorem in standard equilibria.

Recent research indicates that k -resilient equilibria and t -immune equilibria constitute useful concepts for analyzing the stability of strategies against individual and coalitional deviations. In resilient equilibria, no group of players (up to size k) has an incentive to form a coalition and deviate from equilibrium, whereas in immune equilibria, players are not harmed by the divergent behavior of certain factors (up to number t). These concepts are particularly applicable to the analysis of the stability of business strategies in dynamic and changing environments.

In a study examining the role of game theory in optimizing resources and business negotiation processes, researchers—through an analysis of articles indexed in Scopus during the period 2022–2025—demonstrated that game theory, whether in the form of behavioral game theory (BGT) or evolutionary game theory (EGT), plays a significant role in enhancing organizational efficiency, strengthening cooperation, and optimizing negotiation outcomes through rational and data-driven approaches. This study further revealed that game theory is capable of explaining the dynamics of strategic interaction among business actors in both competitive and cooperative situations.

Generalized game theory, developed by Burns and his colleagues, shifts the focus from purely rational and self-interested actors to actors embedded in social, cultural, and institutional contexts. Within this framework, actual interactions occur within systems of norms, rules, and role expectations that determine which strategies are legitimate or conceivable. This approach facilitates the analysis of organizational behavior, policy compliance, and institutional change.

2.4. Behavioral Economics and Organizational Decision-Making

Behavioral economics, by critiquing the assumptions of full rationality in classical economic theories, has examined the influence of psychological factors on economic decision-making. In recent years, this approach has attracted considerable attention from strategic management scholars. Kuzmanović (2021), in his comprehensive review of behavioral models of strategic decision-making, demonstrates that bounded rationality and cognitive biases systematically influence strategic interactions, and that understanding these influences is essential for designing effective business models.

Experimental research has shown that decision-makers facing strategic uncertainty exhibit a tendency toward ambiguity aversion. In a study involving 195 participants, researchers demonstrated that players significantly prefer games with known risks over ambiguous games. This finding, termed the "strategic ambiguity aversion effect," indicates that under conditions of uncertainty regarding the type of opponent or their strategies, decision-makers may deviate from rationally optimal choices. Furthermore, confidence in decisions was significantly higher in 2×2 games than in larger games, reflecting the influence of complexity on decision-maker confidence.

Within the domestic research context, Mohammadi et al. (2024) conducted a mixed-methods study to design and validate a model of cognitive biases in the decision-making of health system managers. The qualitative findings of this study, derived from thematic analysis and interviews with 12 managers, identified four overarching themes: biases grounded in environmental conditions, biases grounded in organizational conditions, biases grounded in individual conditions, and biases related to information processing. The quantitative findings further confirmed the validity of the research model. The study concludes that cognitive biases can function as "decision-making traps," significantly influencing the trajectory of managers' choices.

In another study employing qualitative thematic analysis with MAXQDA 2020 on 15 female managers, researchers demonstrated that managers face numerous cognitive and behavioral biases in organizational decisions, which constitute the primary source of errors and inaccurate judgments in many situations. This study classified the identified biases into three categories: emotional/affective biases (including prior emotional stimuli bias, over-optimism, emotional contagion, and fear of potential loss), cognitive biases (including information processing bias, reliance on memory, inattention, judgment error, and overconfidence error), and gender-stereotypical biases (including multiple-role error, social expectations and norms, perfectionism, and comparison with male counterparts).

2.5. Integration of Game Theory and Behavioral Economics

Despite considerable advances in each of the domains of game theory and behavioral economics, the integration of these two approaches within a unified framework remains a relatively new topic in the strategic management literature. Few studies have examined the synergy arising from the integration of these two approaches.

A study examining incomplete information games with players exhibiting ambiguity aversion demonstrates that ambiguity aversion expands the set of equilibria consistent with players' shared ambiguous beliefs. This study, published in the *American Economic Journal*, investigates the relationship between ambiguity aversion and belief robustness and shows that ambiguity aversion can give rise to new strategic behaviors, including the strategic use of ambiguity. These findings suggest that integrating game theory with behavioral economics can lead to a deeper understanding of how strategies are formed under conditions of uncertainty.

Another study addresses the design of information feedback in games with ambiguity-averse players. In this study, published in the *Journal of Economic Theory*, researchers employ the concept of Maxmin Self-Confirming Equilibrium to examine the design of information regarding other players' behavior in simultaneous-move games. The findings indicate that coarse feedback shapes strategic uncertainty and can alter players' equilibrium strategies in a desirable manner. This research demonstrates that both complete feedback and no feedback are suboptimal, and that optimal feedback design can enhance participation in public goods and voluntary games.

In a study employing a systematic review method to examine the application of game theory in economic decision-making, researchers demonstrated that integrating behavioral and evolutionary game theory can provide a more comprehensive understanding of competitive dynamics in unstable markets. In this study, researchers emphasize that although game theory provides powerful analytical tools for modeling strategic interactions, its assumptions regarding the full rationality of players are inconsistent with the realities of human decision-making. Conversely, behavioral economics, by offering insights into cognitive biases and the limits of rationality, can bridge this gap.

2.6. Conceptual Model of the Research

Based on the systematic review of the literature and the analysis of theoretical gaps, the conceptual model of the present study was formulated in terms of three principal dimensions and their respective components. The conceptual model was developed by drawing on existing theoretical frameworks and with an emphasis on the specific context of Iran.

First Dimension: Strategic Environment Awareness

This dimension encompasses the systematic analysis of the organization's external and internal environments. Under conditions of economic uncertainty, precise awareness of the strategic environment is of particular importance, as many traditional assumptions regarding environmental stability are called into question (Peters & Gadenne, 2023). The components of this dimension include: analysis of the macroeconomic, political, social, and technological environment; identification of emerging opportunities and threats; assessment of the organization's internal strengths and weaknesses; and analysis of market dynamics, including the behavior of competitors, suppliers, and customers. Domestic research has demonstrated that environmental uncertainty functions as one of the key causal conditions in the strategic

decision-making models of Iranian organizations, and that organizations must possess the capacity to rapidly identify and respond to environmental changes (RezaeiZadeh et al., 2024).

Second Dimension: Behavioral Dynamics of Decision-Makers

This dimension addresses the influence of psychological and social factors on the strategic decision-making process. According to the findings of behavioral economics, organizational decision-makers are influenced by cognitive biases, emotions, motivations, and social relationships, which can significantly affect the quality of strategic decisions (Kahneman & Tversky, 2023). The components of this dimension include: identification and management of cognitive biases such as confirmation bias, anchoring, and loss aversion; analysis of the role of emotions and affect in decision-making; examination of decision-makers' motivations and priorities; and the influence of social relationships and communication networks on the decision-making process. Domestic research has also demonstrated that cognitive biases can function as decision-making traps, significantly influencing the trajectory of managers' choices (Mohammadkhani & Mousavirad, 2023).

Third Dimension: Competitive Game Structure

This dimension, grounded in the concepts of game theory, addresses the analysis of the competitive structure of the industry and the strategic interactions among players. Under conditions of economic uncertainty, the competitive game structure is in a state of continuous change, and organizations must be able to identify these changes and respond to them in a timely manner (Yang et al., 2024). The components of this dimension include: identification of the number of players and their characteristics; determination of the type of game—cooperative, non-cooperative, or mixed; analysis of the rules of the game, including formal and informal industry regulations; examination of the state of information—whether symmetric or asymmetric; determination of the decision-making timeframe; and anticipation of the consequences of various scenarios. Within the framework of robust game theory, organizations can employ a worst-case approach to select strategies that yield acceptable performance even under the worst-case scenario.

Dependent Variable: Effectiveness of Business Models under Uncertainty

The effectiveness of business models under uncertainty, as the dependent variable of the present study, encompasses the organization's ability to achieve its objectives despite environmental fluctuations and ambiguities. This variable is measured through indicators such as strategic flexibility, speed of response to changes, quality of decision-making, financial performance, and survival and growth in the long term. Research has demonstrated that companies capable of adapting their business models to conditions of uncertainty enjoy a more sustainable competitive advantage (Schoemaker & Day, 2023).

The conceptual model of the present study offers an integration of the insights of game theory and behavioral economics within a unified framework for the design of business models

under conditions of economic uncertainty. This model, with an emphasis on the Iranian context and the specific characteristics of its economy, can serve as a practical guide for managers of Iranian organizations in coping with unstable economic conditions.

3. Methodology

3.1. Research Design

The present study employs a mixed-methods approach (qualitative-quantitative) based on a sequential-exploratory design. The selection of a mixed-methods approach is grounded in the multidimensional nature of the research topic and the need for an in-depth understanding of qualitative phenomena—such as cognitive biases and the behavioral dynamics of decision-makers—alongside the quantitative testing of relationships among variables. This approach, which is increasingly employed in strategic management research, enables the integration of the strengths of both qualitative and quantitative methods (Creswell & Creswell, 2023). In the first phase (qualitative), the dimensions and components of the conceptual model were identified and deepened through thematic analysis. In the second phase (quantitative), the model derived from the qualitative phase was validated and tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The selection of PLS-SEM was motivated by its capacity for modeling complex constructs, predicting dependent variables, and working with medium-to-small sample sizes (Hair et al., 2022).

3.2. Population and Statistical Sample

Qualitative Phase: The statistical population of the qualitative phase comprised senior managers, strategic deputies, and management consultants with a minimum of 10 years of experience in various industries in Iran and experience in coping with conditions of economic uncertainty. Purposive sampling was employed using the snowball technique, a method that is both common and valid in exploratory research within strategic management (Patton, 2023). The sample size was determined to be 24 participants based on the principle of theoretical saturation. Theoretical saturation was achieved when new interviews failed to contribute additional information to the identified categories. Table (1) presents the characteristics of the participants in the qualitative phase.

Table 1. Characteristics of Participants in the Qualitative Phase (Source: By author)

Participant Code	Gender	Age	Work Experience (Years)	Industry Sector	Organizational Role
M01	Male	52	27	Automotive	CEO
M02	Male	48	22	Banking	Strategic Deputy
M03	Female	45	18	Information Technology	Planning Manager
M04	Male	55	30	Petrochemical	Senior Consultant
M05	Male	42	15	Transportation	Commercial Manager
M06	Female	49	20	Insurance	Development Deputy
M07	Male	53	25	Construction	CEO
M08	Male	44	16	Pharmaceutical	Sales Manager
M09	Female	47	19	Telecommunications	Strategy Manager
M10	Male	51	24	Mining	CEO Advisor

Participant Code	Gender	Age	Work Experience (Years)	Industry Sector	Organizational Role
M11	Male	46	17	Textile	Production Manager
M12	Female	50	21	Higher Education	Administrative Deputy
M13	Male	54	28	Energy	Planning Manager
M14	Male	43	14	Agriculture	CEO
M15	Female	48	20	Services	Quality Manager
M16	Male	56	32	Steel	Senior Consultant
M17	Male	41	13	Electronics	Development Manager
M18	Female	46	18	Tourism	Marketing Manager
M19	Male	52	26	Food	CEO
M20	Male	49	22	Plastics	Strategic Manager
M21	Female	44	15	Media	Content Manager
M22	Male	50	23	Machinery	Sales Manager
M23	Male	47	19	Chemical	Production Deputy
M24	Female	53	24	Consulting	Senior Consultant

Quantitative Phase: The statistical population of the quantitative phase comprised all senior managers, middle managers, and senior experts of companies active in various industries in Iran. Given the indeterminate size of the statistical population, the sample size was calculated to be 384 participants based on Cochran's formula for infinite populations. To ensure sample adequacy and account for potential attrition, 430 questionnaires were distributed, of which 412 analyzable questionnaires were returned (a response rate of 95.8%).

The sampling method in the quantitative phase was multi-stage cluster random sampling. In the first stage, various industries were divided into five principal clusters (manufacturing, services, information technology, finance and banking, and commerce). In the second stage, 3 to 5 organizations were randomly selected from each cluster. In the third stage, within each organization, eligible individuals were selected for questionnaire completion using simple random sampling. Table (2) presents the sample distribution by industry cluster.

Table 2. Distribution of the Quantitative Sample by Industry Cluster (Source: By author)

Industry Cluster	Number of Organizations	Questionnaires Distributed	Questionnaires Returned	Response Rate
Manufacturing	5	120	115	95.8%
Services	4	90	85	94.4%
Information Technology	3	70	68	97.1%
Finance and Banking	4	80	76	95.0%
Commerce	4	70	68	97.1%
Total	20	430	412	95.8%

3.3. Research Instruments

Qualitative Phase: The principal instrument for data collection in the qualitative phase was semi-structured interviews. The interview protocol was designed on the basis of the theoretical framework of the research and inspired by the research questions. The interviews were conducted between October and December 2025. Each interview lasted between 45 and 90 minutes. All interviews were recorded with the participants' consent and subsequently transcribed in full. Sample interview questions included:

- How would you describe your experience of strategic decision-making under conditions of economic uncertainty?
- What factors play a role in your decision-making under unstable economic conditions?
- How do you anticipate competitors' behavior under conditions of uncertainty?
- What cognitive biases have you observed in your own decision-making?

Quantitative Phase: The instrument for data collection in the quantitative phase was a researcher-developed questionnaire based on the findings of the qualitative phase. The questionnaire comprised two principal sections: the first section included demographic questions (gender, age, work experience, industry, and organizational role), and the second section comprised items measuring the dimensions of the conceptual model and the dependent variable. Table (3) presents the dimensions and items of the questionnaire.

Table 3. Dimensions and Items of the Questionnaire (Source: By author)

Dimension	Component	Number of Items	Source
Strategic Environment Awareness	Macro-environment analysis	5	Derived from qualitative phase
	Identification of opportunities and threats	4	Derived from qualitative phase
	Assessment of strengths and weaknesses	3	Derived from qualitative phase
	Market dynamics	4	Derived from qualitative phase
Behavioral Dynamics	Cognitive biases	5	Derived from qualitative phase
	Emotions and affect	3	Derived from qualitative phase
	Motivations and priorities	3	Derived from qualitative phase
	Social relationships	3	Derived from qualitative phase
Competitive Game Structure	Number of players	2	Derived from qualitative phase
	Type of game	3	Derived from qualitative phase
	Rules of the game	3	Derived from qualitative phase
	Information	3	Derived from qualitative phase
	Timeframe	2	Derived from qualitative phase
	Outcomes	3	Derived from qualitative phase
Effectiveness of Business Models	—	8	Derived from qualitative phase

All items were designed on the basis of a five-point Likert scale (from "strongly disagree" with a score of 1 to "strongly agree" with a score of 5).

3.4. Validity and Reliability of Instruments

Qualitative Phase: To ensure the validity and reliability of the qualitative findings, the four criteria of Lincoln and Guba—credibility, transferability, dependability, and confirmability—

were employed (Lincoln & Guba, 1985). To enhance credibility, member checking by participants and expert reviewers was utilized. To enhance transferability, thick description of the research context and participant characteristics was provided. Dependability was confirmed through re-coding by two independent researchers and calculation of the kappa coefficient. The calculated kappa coefficient was 0.84, indicating a high level of inter-coder agreement.

Quantitative Phase: The content validity of the questionnaire was confirmed through the opinions of 8 professors of strategic management and experts in the business domain. The content validity ratio (CVR) for all items was calculated to be above 0.79, exceeding the critical value (0.75) at the 0.05 level. The content validity index (CVI) was 0.87, indicating satisfactory content validity.

To examine construct validity, confirmatory factor analysis was conducted. Factor loadings for all items were above 0.45 and significant ($P < 0.05$). The average variance extracted (AVE) for all constructs was above 0.50, indicating satisfactory convergent and discriminant validity (Fornell & Larcker, 1981). The reliability of the questionnaire was assessed using Cronbach's alpha and composite reliability (CR). Cronbach's alpha values for all constructs were above 0.70, and CR values were above 0.80, indicating satisfactory instrument reliability. Table (4) presents the validity and reliability indices.

Table 4. Validity and Reliability Indices of Research Constructs (Source: By author)

Construct	Number of Items	Cronbach's Alpha	CR	AVE
Strategic Environment Awareness	16	0.87	0.91	0.63
Behavioral Dynamics	14	0.84	0.89	0.58
Competitive Game Structure	16	0.86	0.90	0.61
Effectiveness of Business Models	8	0.82	0.88	0.56

3.5. Data Analysis Method

Qualitative Phase: Qualitative data analysis was conducted using Braun and Clarke's six-stage thematic analysis, comprising familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report (Braun & Clarke, 2006). The coding process was conducted using MAXQDA 2022 software. Table (5) presents a sample of the coding process.

Table 5. Sample of the Qualitative Data Coding Process (Source: By author)

Documented Quotation	Initial Code	Category	Main Theme
"When the exchange rate fluctuates, we cannot accurately predict the cost of procuring raw materials" (M04)	Exchange rate fluctuation and cost unpredictability	Environmental uncertainty	Strategic Environment Awareness
"Managers typically pay more attention to information that confirms their prior beliefs" (M09)	Confirmation bias in decision-making	Cognitive biases	Behavioral Dynamics
"We must constantly monitor competitors, because the rules of the game change every day" (M13)	Constant change in competitive rules	Competitive dynamics	Competitive Game Structure

Quantitative Phase: Quantitative data analysis was conducted using SPSS version 26 and SmartPLS version 4. At the descriptive level, frequency, percentage, mean, and standard deviation indices were employed. At the inferential level, the normality of the data was first

examined using the Kolmogorov-Smirnov test. Subsequently, path analysis was conducted using Partial Least Squares (PLS) to test the research hypotheses. To assess model fit, the coefficient of determination (R^2), predictive relevance (Q^2), and goodness-of-fit (GoF) indices were employed.

3.6. Ethical Considerations

The present study was conducted in full compliance with research ethics principles. All participants in both the qualitative and quantitative phases signed an informed consent form prior to their participation. Participants were assured that the collected data would be kept confidential and that their identities would remain anonymous in reporting. Codes assigned to participants (M01 to M24) were used in place of their actual names. Furthermore, participants were granted the right to withdraw from participation at any stage of the research. The raw data of the study, following the completion of the analysis, are maintained in an encrypted archive by the researcher and will be used solely for research purposes.

4. Findings

4.1. Findings of the Qualitative Phase

The analysis of qualitative data derived from 24 semi-structured interviews, employing Braun and Clarke's six-stage thematic analysis (Braun & Clarke, 2006), resulted in the identification of three main themes, eight sub-themes, and 42 initial codes. Table (6) presents the structure of the identified themes.

Table 6. Structure of Main and Sub-Themes of the Qualitative Phase (Source: By author)

Main Theme	Sub-Theme	Number of Codes	Frequency of Reference
Strategic Environment Awareness	Macro-environment analysis	6	22
	Identification of opportunities and threats	5	19
	Assessment of strengths and weaknesses	4	15
Behavioral Dynamics	Market dynamics	5	21
	Cognitive biases	7	24
	Emotions and affect	4	16
	Motivations and priorities	4	14
	Social relationships	3	11
Competitive Game Structure	Number of players	3	13
	Type of game	4	17
	Rules of the game	5	20
	Information	4	18
	Timeframe	3	12
	Outcomes	4	15

First Main Theme: Strategic Environment Awareness

The analysis of the interviews revealed that strategic environment awareness, as the first main theme, plays a foundational role in the design of business models under conditions of economic uncertainty. Participants repeatedly emphasized the importance of an in-depth

understanding of the economic, political, and social environment. One participant (M04) stated: "Under conditions where the exchange rate changes daily and economic policies shift every few months, we cannot make any strategic decision without a precise understanding of the environment." Another participant (M13) remarked: "We must simultaneously have multiple scenarios for the future, because the environment is so dynamic that a single scenario is ineffective."

The analysis of the codes extracted within this theme indicated that Iranian organizations, when confronted with economic uncertainty, require multi-scenario approaches and dynamic analyses. This finding is consistent with the results of the study by Khodadadeh Shamlou et al. (2024), which demonstrated that economic policy uncertainty leads to a decline in corporate productivity and that organizations must possess a more precise understanding of the environment in order to maintain their performance.

Second Main Theme: Behavioral Dynamics of Decision-Makers

The second main theme extracted from the analysis of the interviews was the behavioral dynamics of decision-makers. Participants repeatedly referred to the influence of psychological factors on their decision-making. One participant (M09) stated: "I have noticed that in my decision-making, I pay more attention to information that confirms my prior beliefs. This has caused me to make incorrect decisions on several occasions." Another participant (M02) remarked: "The fear of losing capital under unstable conditions causes us to be overly cautious and to miss out on good opportunities."

The analysis of the codes within this theme indicated that cognitive biases—including confirmation bias, anchoring bias, loss aversion, and over-optimism—play a significant role in the decision-making of Iranian managers under conditions of economic uncertainty. This finding is consistent with the results of the study by Mohammadi et al. (2024) and with the findings of Kuzmanović (2021), which demonstrated that bounded rationality and cognitive biases systematically influence strategic interactions.

Third Main Theme: Competitive Game Structure

The third main theme was the competitive game structure, which was extracted on the basis of the concepts of game theory. Participants referred to the importance of understanding the competitive structure of the industry and strategic interactions with competitors. One participant (M13) stated: "We must constantly monitor competitors, because the rules of the game change every day. Sometimes we cooperate with one another, and at other times we engage in intense competition." Another participant (M07) remarked: "Under conditions of uncertainty, asymmetric information prevents us from accurately predicting competitors' behavior, and this makes decision-making extremely difficult."

The analysis of the codes within this theme indicated that the competitive game structure in Iranian industries is in a state of continuous change, and organizations must possess the capacity for rapid adaptation to these changes. This finding is consistent with the results of the study by

Yang et al. (2024), which demonstrated that game theory provides powerful tools for analyzing strategic interactions in unstable markets.

4.2. Findings of the Quantitative Phase

4.2.1. Descriptive Statistics

The data collected from 412 analyzable questionnaires were analyzed using descriptive statistics indices. Table (7) presents the frequency distribution of respondents by demographic variables.

Table 7. Frequency Distribution of Respondents by Demographic Variables (Source: By author)

Variable	Category	Frequency	Percentage
Gender	Male	289	70.1%
	Female	123	29.9%
Age	Under 30 years	48	11.7%
	30–40 years	142	34.5%
	41–50 years	156	37.9%
	Over 50 years	66	16.0%
Work Experience	Under 10 years	95	23.1%
	10–20 years	187	45.4%
	Over 20 years	130	31.6%
Industry	Manufacturing	115	27.9%
	Services	85	20.6%
	Information Technology	68	16.5%
	Finance and Banking	76	18.4%
	Commerce	68	16.5%
Organizational Role	Senior Manager	98	23.8%
	Middle Manager	186	45.1%
	Senior Expert	128	31.1%

4.2.2. Normality Test of Data

Prior to inferential analysis, the normality of the data distribution was examined using the Kolmogorov-Smirnov test. The results indicated that for all constructs, the significance level was less than 0.05, indicating non-normal data distribution. Accordingly, PLS-SEM was employed for data analysis, as this method is appropriate for non-normal distributions (Hair et al., 2022).

4.2.3. Assessment of the Measurement Model Fit

The fit of the measurement model was assessed through the examination of factor loadings, composite reliability (CR), average variance extracted (AVE), and discriminant validity (Fornell-Larcker criterion). Table (8) presents the results of this assessment.

Table 8. Fit Indices of the Measurement Model (Source: By author)

Construct	Number of Items	Factor Loadings (Min–Max)	CR	AVE
Strategic Environment Awareness	16	0.62–0.89	0.91	0.63
Behavioral Dynamics	14	0.58–0.85	0.89	0.58
Competitive Game Structure	16	0.60–0.87	0.90	0.61
Effectiveness of Business Models	8	0.65–0.84	0.88	0.56

As observed in Table (8), the factor loadings of all items exceed 0.50. The CR values for all constructs exceed 0.70, and the AVE values exceed 0.50, indicating satisfactory convergent validity and reliability of the constructs (Fornell & Larcker, 1981). Furthermore, the examination of discriminant validity using the Fornell-Larcker criterion indicated that the square root of the AVE for each construct is greater than its correlation with other constructs, indicating satisfactory discriminant validity. Table (9) presents the correlation matrix among the constructs.

Table 9. Correlation Matrix among Constructs and Discriminant Validity (Source: By author)

Construct	1	2	3	4
1. Strategic Environment Awareness	0.79			
2. Behavioral Dynamics	0.54	0.76		
3. Competitive Game Structure	0.48	0.51	0.78	
4. Effectiveness of Business Models	0.57	0.62	0.53	0.75

Note: The diagonal values (in bold) represent the square root of the AVE.

4.2.4. Assessment of the Structural Model Fit

The fit of the structural model was assessed through the examination of the coefficient of determination (R^2), predictive relevance (Q^2), and goodness-of-fit (GoF) index. Table (10) presents the results of this assessment.

Table 10. Fit Indices of the Structural Model (Source: By author)

Dependent Variable	R^2	Adjusted R^2	Q^2	GoF
Effectiveness of Business Models	0.58	0.56	0.42	0.61

The R^2 value of 0.58 indicates that 58% of the variance in the effectiveness of business models is explained by the three principal dimensions of the model. The Q^2 value of 0.42 indicates satisfactory predictive relevance of the model. The GoF index was calculated to be 0.61, confirming the overall fit of the model (Tenenhaus et al., 2005).

4.2.5. Testing of Research Hypotheses

The research hypotheses were tested using path analysis and the bootstrapping method (5,000 sub-samples). Table (11) presents the results of hypothesis testing.

Table 11. Results of Testing Research Hypotheses (Source: By author)

Hypothesis	Path	Path Coefficient (β)	t-value	P-value	Result
H1	Strategic Environment Awareness → Effectiveness of Business Models	0.31	5.84	0.001	Supported
H2	Behavioral Dynamics → Effectiveness of Business Models	0.42	7.12	0.001	Supported
H3	Competitive Game Structure → Effectiveness of Business Models	0.27	5.23	0.001	Supported

The results of hypothesis testing indicate that all three principal dimensions of the model (strategic environment awareness, behavioral dynamics, and competitive game structure) exert a positive and significant influence on the effectiveness of business models under conditions of economic uncertainty. The greatest influence pertains to the behavioral dynamics dimension,

with a path coefficient of 0.42, indicating the particular importance of psychological factors in strategic decision-making. This is followed by strategic environment awareness, with a path coefficient of 0.31, and competitive game structure, with a path coefficient of 0.27. Figure (1) presents the final research model with standardized path coefficients.

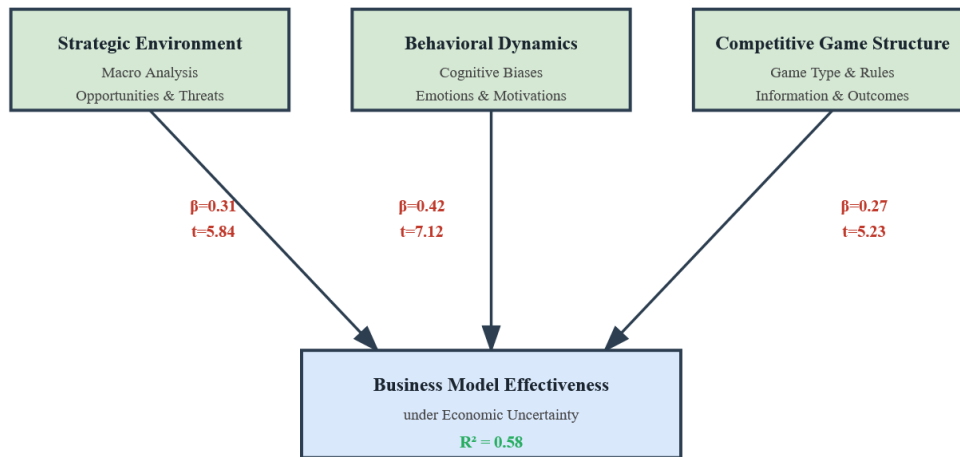


Figure 1. Final Research Model with Path Coefficients (Source: By author)

4.2.6. Importance-Performance Analysis (IPMA)

To provide practical insights for managers, Importance-Performance Analysis (IPMA) was conducted on the three principal dimensions of the model. Table (12) presents the results of this analysis.

Table 12. Results of Importance-Performance Analysis (IPMA) (Source: By author)

Dimension	Importance (Path Coefficient)	Performance (Mean)	Improvement Priority
Behavioral Dynamics	0.42	3.58	High
Strategic Environment Awareness	0.31	3.72	Medium
Competitive Game Structure	0.27	3.45	High

The results of the IPMA indicate that the behavioral dynamics dimension, with an importance of 0.42 and a performance of 3.58, holds the highest improvement priority. The competitive game structure dimension, with an importance of 0.27 and a performance of 3.45 (the lowest performance), also requires particular attention from managers. The strategic environment awareness dimension, with a performance of 3.72, is in a relatively more favorable position.

4.3. Summary of Findings

The findings of the present study indicate that the model designed for the development of business models under conditions of economic uncertainty comprises three principal dimensions: strategic environment awareness, behavioral dynamics of decision-makers, and

competitive game structure. The quantitative analysis demonstrated that all three dimensions exert a significant influence on the effectiveness of business models, with the behavioral dynamics dimension exhibiting the greatest influence. This finding is consistent with the results of prior research in the domain of behavioral economics, which demonstrated that psychological factors and cognitive biases play a determining role in strategic decision-making (Kahneman & Tversky, 2023; Mohammadi et al., 2024). Furthermore, the findings of the qualitative phase indicated that Iranian managers, under conditions of economic uncertainty, face numerous challenges—including currency fluctuations, information opacity, and continuous changes in competitive rules—which necessitate integrated approaches combining game theory and behavioral economics for effective decision-making.

5. Discussion and Conclusion

5.1. Interpretation of Research Findings

The present study was conducted with the aim of designing a comprehensive model for the development of business models under conditions of economic uncertainty, with an emphasis on the application of game theory and behavioral economics. The findings of both the qualitative and quantitative phases indicated that the designed model comprises three principal dimensions—strategic environment awareness, behavioral dynamics of decision-makers, and competitive game structure—all of which exert a significant influence on the effectiveness of business models under conditions of economic uncertainty.

The greatest influence pertained to the **behavioral dynamics of decision-makers** dimension, with a path coefficient of 0.42. This finding indicates that under conditions of economic uncertainty, psychological factors and cognitive biases play a determining role in strategic decision-making. This result is consistent with the findings of Kuzmanović (2021), who demonstrated that bounded rationality and cognitive biases systematically influence strategic interactions. Furthermore, this finding aligns with the results of the study by Mohammadi et al. (2024), as well as the study of female managers in organizational decisions, which demonstrated that cognitive biases can function as decision-making traps, significantly influencing the trajectory of managers' choices.

The second most influential dimension was **strategic environment awareness**, with a path coefficient of 0.31. This finding underscores the importance of an in-depth understanding of the economic, political, and social environment under unstable conditions. The results of the study by Khodadadeh Shamlou et al. (2024) similarly demonstrated that economic policy uncertainty leads to a decline in corporate productivity, and that organizations require a more precise understanding of the environment in order to maintain their performance. Moreover, the findings of Taghizadeh Khanqah and Badavar Nahandi (2025) regarding the U-shaped relationship between economic policy uncertainty and corporate financialization confirm the importance of this dimension.

The third dimension, **competitive game structure**, exhibited a path coefficient of 0.27. This finding indicates that understanding the competitive structure of the industry and strategic

interactions with competitors plays a significant role in designing effective business models under conditions of uncertainty. The results of this section are consistent with the findings of Yang et al. (2024), as well as the study by Guan et al. (2025) on robust game theory, which demonstrated that under conditions of parametric uncertainty, players employing a worst-case approach select strategies that yield acceptable performance even under the worst-case scenario.

The Importance-Performance Analysis (IPMA) revealed that the behavioral dynamics dimension, with an importance of 0.42 and a performance of 3.58, holds the highest improvement priority. This finding indicates that Iranian organizations, despite their awareness of the importance of behavioral factors, have not yet succeeded in designing effective mechanisms for managing cognitive biases in strategic decision-making. Furthermore, the competitive game structure dimension, with an importance of 0.27 and a performance of 3.45 (the lowest performance), requires particular attention from managers. This finding suggests that Iranian organizations face serious challenges in understanding and analyzing the competitive structure of their industry and in predicting competitors' behavior under conditions of uncertainty.

5.2. Comparison with the Research Background

The findings of the present study can be compared with the existing literature along several axes:

First: In the domain of business model design under uncertainty, the results of this study are consistent with the findings of Felin and Zenger (2024), who demonstrated that traditional approaches to business model design lack the necessary efficacy under conditions of uncertainty. Furthermore, the emphasis of this study on multi-scenario approaches and dynamic analyses is consistent with the results of Smith et al. (2024) regarding system dynamics modeling.

Second: In the domain of behavioral economics, the findings of this study are consistent with the results of Kahneman and Tversky (2023), as well as experimental studies on strategic ambiguity aversion. Recent research has demonstrated that under conditions of uncertainty regarding the type of opponent or their strategies, decision-makers may deviate from rationally optimal choices and exhibit ambiguity-averse behaviors. The findings of the present study similarly indicated that cognitive biases—including confirmation bias, anchoring bias, and loss aversion—play a significant role in the decision-making of Iranian managers under conditions of economic uncertainty.

Third: In the domain of game theory, the results of this study are consistent with the findings of recent research on robust games and robust equilibria. These studies demonstrate that under conditions of parametric uncertainty, players employing a worst-case approach select strategies that yield acceptable performance even under the worst-case scenario. The findings of the present study similarly indicated that Iranian organizations, when confronted with economic uncertainty, require robust and multi-scenario approaches.

Fourth: In the domain of integrating game theory and behavioral economics, the findings of this study are consistent with the results of recent studies on incomplete information games

with ambiguity-averse players and on the design of information feedback. These studies demonstrate that ambiguity aversion can give rise to new strategic behaviors, including the strategic use of ambiguity. The findings of the present study similarly indicated that the integration of game theory and behavioral economics can lead to a deeper understanding of how strategies are formed under conditions of uncertainty.

5.3. Theoretical Implications

The present study offers several significant theoretical implications for the strategic management literature:

First: By presenting an integrated model of game theory and behavioral economics, this study contributes to the enrichment of the strategic management literature. The proposed model demonstrates that a comprehensive understanding of strategic decision-making under conditions of uncertainty requires the integration of both rational and behavioral insights. This finding is consistent with the emphasis of recent research on the necessity of interdisciplinary approaches in strategic management.

Second: By identifying the three principal dimensions of strategic environment awareness, behavioral dynamics, and competitive game structure, this study provides an integrated framework for analyzing strategic decision-making under conditions of uncertainty. This framework can serve as a foundation for future research in the domain of business model design.

Third: The findings of this study indicate that within the Iranian context, behavioral factors play a more prominent role in strategic decision-making. This finding, by emphasizing the necessity of developing indigenous theories of strategic management, contributes to the enrichment of the management literature in developing countries.

Fourth: By emphasizing the concepts of "robust equilibria" and "worst-case strategies" in game theory, this study contributes to the theoretical development of this domain and demonstrates how these concepts can be employed to analyze organizational behavior under conditions of uncertainty.

5.4. Practical Implications

The findings of this study offer several significant practical implications for managers of organizations:

First: Managers should pay particular attention to the identification and management of cognitive biases in the strategic decision-making process. Given that the behavioral dynamics dimension exhibited the greatest influence on the effectiveness of business models, organizations can employ tools such as decision-making checklists, nominal group techniques, and multi-criteria decision-making methods to mitigate the negative effects of biases.

Second: Organizations should strengthen their capacity for multi-scenario environmental analysis. Given the high dynamism of the Iranian economic environment, managers should—rather than relying on a single scenario—design multiple possible scenarios and formulate appropriate strategies for each.

Third: Managers should continuously monitor and analyze the competitive game structure of their industry. Given that the competitive game structure dimension exhibited the lowest performance in the IPMA, organizations can employ competitive analysis tools such as Porter's Five Forces analysis, strategic maps, and key player analysis.

Fourth: Organizations should strengthen an organizational culture grounded in learning and adaptation. Under conditions of economic uncertainty, organizations that possess the capacity for rapid learning from experience and adaptation to change will enjoy a more sustainable competitive advantage.

Fifth: Given the emphasis of this study on the Iranian context, managers of Iranian organizations should pay particular attention to the specific characteristics of the Iranian economy—including currency fluctuations, economic sanctions, and political instability—and adapt their business models to these conditions.

5.5. Limitations of the Research

Despite efforts to adhere to methodological rigor, the present study has certain limitations that must be considered in interpreting the findings:

First: Limitation in the generalizability of findings: Although the statistical sample of this study comprised 412 senior managers and experts from various industries, the results may not be fully generalizable to all industries and organizations in Iran. Industrial, regional, and organizational differences can influence the manner of strategic decision-making.

Second: Limitation in measuring behavioral variables: Although the designed questionnaire possessed satisfactory validity and reliability, the measurement of psychological variables such as cognitive biases is invariably accompanied by challenges. The possibility of response bias in answering questions exists, which can influence the results.

Third: Limitation in the time frame: The data of this study were collected between October and December 2025. Given the high dynamism of the Iranian economic environment, the results may differ in other time frames.

Fourth: Methodological limitation: Although the mixed-methods approach of this study enabled the integration of the strengths of qualitative and quantitative methods, the use of PLS-SEM rather than CB-SEM may not fully reveal certain complex relationships among variables.

Fifth: Limitation in access to real data: Despite efforts to employ real data, some of the collected data are based on the perceptions and personal judgments of respondents, which may diverge from objective realities.

5.6. Suggestions for Future Research

Based on the findings and limitations of the present study, the following suggestions are offered for future research:

First: Future research can examine the model proposed in this study in greater depth within specific industries (such as the automotive, banking, or information technology industries) and design more specialized models for each industry.

Second: Given the importance of the behavioral dynamics dimension, future research can design more precise instruments for measuring cognitive biases in strategic decision-making and evaluate the effectiveness of behavioral interventions.

Third: Future research can employ longitudinal research methods to examine changes in strategic decision-making over time and in the face of various economic shocks.

Fourth: Given the high dynamism of the Iranian economic environment, future research can employ simulation methods (such as agent-based modeling) to model organizational behavior under conditions of uncertainty.

Fifth: Future research can employ comparative approaches to examine differences in strategic decision-making under conditions of uncertainty between Iran and other developing or developed countries.

Sixth: Given the developments in emerging technologies, future research can examine the role of artificial intelligence and machine learning in improving strategic decision-making under conditions of uncertainty.

Seventh: Future research can employ experimental methods (such as economic experiments) to examine more precisely the influence of game theory and behavioral economics on strategic decision-making.

Declarations

Author Contributions (CRediT taxonomy)

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation and revision. All aspects of this work were undertaken by the author.

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Ethical Statement

Informed consent was obtained from all participants. The study was conducted in accordance with established ethical guidelines for qualitative research.

Authors' AI Use Statement

The author declares that no artificial intelligence (AI) tools were used in the preparation of this manuscript for writing, analysis, or data generation. All content is the result of the author's own human effort and judgment.

Conflict of interest

The author declares no competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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