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Rationalizing managerial judgment: The effectiveness of collective decision-making in bias reduction

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ABSTRACT

BACKGROUND AND OBJECTIVES: This study explores the influence of collective decision-making on mitigating key cognitive biases—namely, overconfidence, optimism, and anchoring effects—among managers in Iranian state-run organizations. Cognitive biases are systematic errors in thinking that impair judgment and decision quality, often leading to suboptimal outcomes in organizational contexts. Given the high stakes and complexity of managerial decisions in public sector settings, identifying mechanisms to reduce such biases is both practically and theoretically significant. The primary objective of this research is to determine whether collective decision-making, characterized by collaborative deliberation and shared responsibility, can serve as an effective tool for bias reduction.

METHODS: A quantitative survey methodology was employed, utilizing a structured Likert-scale questionnaire distributed among 152 managers at different hierarchical levels in governmental institutions. The instrument's internal consistency was verified with a Cronbach's alpha of 0.857, indicating high reliability. Data analysis included descriptive statistics, mean comparisons against scale midpoints, and significance testing using inferential methods.

FINDINGS: Findings revealed that collective decision-making significantly reduced the levels of overconfidence, unrealistic optimism, and anchoring bias among participants ($p < 0.05$). These results suggest that involving multiple perspectives in decision processes enhances rationality by exposing individual assumptions to group scrutiny, thus improving the quality and accuracy of managerial judgments.

CONCLUSION: The implications of this study are particularly relevant for organizational leadership and policy-making in public institutions. Encouraging collective decision-making not only minimizes the costs associated with biased decisions but also fosters a culture of collaboration, accountability, and shared learning. This approach can reduce psychological stress related to decision-making responsibilities and improve overall organizational performance. By highlighting the cognitive benefits of group-based decision strategies, the study contributes to the broader literature on decision science, organizational behavior, and public management, offering practical insights for managerial training and institutional reform.

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INTRODUCTION

Decision-making in individuals is shaped by three core components: cognitive functions, motivational forces, and emotional states. The reasoning capacity of each person is limited and low and is influenced by cognitive bias and hidden bias (Tweed, Thompson-Fawcett, & Wilkinson, 2013). In situations where there is risk and the volume of information is large, managers cannot process information properly and solve complex problems. In addition, managers may pay attention to quantitative signs and dimensions when making decisions. The lack of attention that has occurred can be caused by a variety of biases that affect people over a certain period (Roy, 2016; Wolman *et al*., 2023). Cognitive biases are caused by incorrect and unwanted use of the ability to simplify complex issues, make decisions despite incomplete information, and generally operate under limitations such as time, information, and cognitive capacity. Decision-making processes are influenced by simple heuristic techniques and common reasoning and are prone to bias, some of which are more obvious than others (Tweed *et al*., 2013). The pervasive influence of cognitive biases on managerial thinking can have substantial negative repercussions for businesses and investments. These biases can severely impair sound judgment, leading to errors in critical areas such as personnel selection, marketing implementation, strategic growth initiatives, and the adoption of beneficial technological advancements (Kaur & Sood, 2015). Recognizing the critical role of biases in shaping managerial choices, numerous studies have explored this phenomenon. One particularly relevant work is Jordão *et al.,* (2020), "Bounded rationality in decision making: An analysis of the decision-making bias." This study utilized bibliographic techniques to pinpoint the dominant biases affecting managers. Specifically, they discovered that overconfidence, optimism, and anchoring biases were prominent in the Portuguese port sector and then drew comparisons with data from the Brazilian civil construction sector. The focus on overconfidence, optimism, and anchoring arises from their well-documented influence on managerial decision-making. Overconfidence reflects inflated certainty in one's judgments and is frequently observed in high-stakes organizational contexts, often leading to misallocation of resources and strategic miscalculations (Kahneman & Tversky, 1979; Moore & Healy, 2008). Optimism bias, characterized by systematic overestimation of favorable outcomes, can undermine risk assessment and foster unrealistic expectations in public policy and project management (Sharot, 2011). Anchoring bias, in contrast, demonstrates the cognitive tendency to rely excessively on initial reference points when making judgments, thereby distorting rational deliberation in budgeting, forecasting, and negotiation (Furnham & Boo, 2011). Collectively, these three biases represent diverse yet critical pathways through which managerial rationality may be compromised. To counteract the detrimental effects of biases on managerial choices, the study of Jordão *et al*., (2020) outlines a set of interventions. A key element of these interventions is the promotion of collaborative decision-making, where the opinions of multiple individuals are prioritized over singular viewpoints, especially in high-stakes situations. Expanding on the work of Jordão *et al*., (2020), this investigation seeks to determine how this collaborative strategy influences overconfidence, optimism, and anchoring biases in various countries and organizations (Jordão, Costa, Dias, Pereira, & Santos, 2020). The primary objective of this research is to put the proposed method into practice and validate the suggested approach. Therefore, this research aims to answer the question of whether using the opinion of others in the form of collective decision-making can reduce the three important biases of overconfidence, optimism, and the anchoring effect in managers' judgment or not. To find the answer to this question, the researchers conducted a field study in Iranian state-run organizations. In this field study, they went to people who are managers at different levels and are aware of the collective decision-making method or use it in their work decisions. Data for this study were gathered through the use of a questionnaire and subsequently analyzed using SPSS software.

Literature review

Cognitive bias

The brain's fundamental cognitive functions include decision-making, a process that cognitive decision science seeks to understand by examining underlying psychological principles (Scholz, 1983). Cognitive biases, as defined in psychology, are systematic deviations in human reasoning that produce predictable patterns of flawed judgment (Tweed *et al.,* 2013). These biases constitute consistent errors in thought and influence both individual choices and evaluations (Mina, Ruiz-Fernández, Falcão, Vasquez-Reina,

& González-Agirre, 2025). While these biases may be apparent to external observers, their impact on decision-making can lead to significant negative outcomes (McShane, Nirenburg, & Jarrell, 2013). Cognitive biases arise from inherent limitations in human cognitive processing and represent systematic deviations from rationality in judgment and decision-making (Vos, Nieto, Amanvermez, Smeets, & Everaert, 2025). They produce predictable patterns of thought and behavior that result in inaccurate perceptions, flawed interpretations, and illogical conclusions. Often, these biases stem from heuristics—mental shortcuts that simplify complex information—, but they can also be shaped by emotions, social pressures, and memory limitations (Giaume, Lamblin, Pinol, Gignoux-Froment, & Trousselard, 2025). Consequently, cognitive biases can distort objective reality and lead to systematic errors in reasoning, diverging from normative models of rational choice (Bird, Jones, & Ballantyne, 2025). Cognitive bias demonstrates that actual human behavior systematically deviates from the predictions of classical statistical laws (Dhami, 2020). Many decision errors and related problems arise from psychometric weaknesses and mental biases (Cherkes & Ryan, 1985). While numerous biases affect managerial judgment, this study focuses on three: overconfidence, optimism, and the anchoring effect. Evidence shows that these biases can lead to poor decision-making, particularly among managers. Judgmental vulnerabilities associated with these biases can have serious consequences at both individual and organizational levels, making it crucial to identify and address them to prevent downstream effects (Jordão *et al*., 2020). The following sections provide detailed explanations of each of these three biases.

Overconfidence bias

Overconfidence bias, a pervasive cognitive distortion, manifests as an individual's tendency to overestimate their abilities, knowledge, and the accuracy of their judgments, particularly in situations involving uncertainty. This bias leads to an inflated sense of certainty, often exceeding actual performance or objective evidence, and results in a skewed perception of one's capabilities relative to others or to reality (Costa, Soares, de Melo Moreira, & Tonelli, 2025). It can manifest in various domains, from intellectual assessments to predictions of future events, and contributes to suboptimal decision-making by fostering an unwarranted belief in one's competence, thereby hindering the pursuit of further information or corrective feedback (Maheshwari, Samantaray, Panigrahi, & Jena, 2025). Overconfidence bias reflects the human inclination to inflate perceptions of one's competence and ingenuity. Originating in social psychology, this bias describes an individual's conviction that their knowledge exceeds factual accuracy, leading them to prioritize personal information over objective evidence (C.-C. Lee, Lee, Yeh, & Yu, 2022). Essentially, overconfidence manifests as an unjustified belief in one's cognitive abilities, skills, expertise, and personal attributes (Boussaidi, 2022). Two important factors cause overconfidence:

1. *Unrealistic positive self-evaluation, this factor makes people estimate their abilities above reality*
2. *Unrealistic optimism, this optimism causes people to estimate the probability of their success above what it is (Van Der Wege, Jacobsen, Magats, Mansour, & Park, 2021).*

Consequently, overconfidence leads managers to overestimate their expertise, causing them to overlook potential risks associated with their decisions (Costa, de Melo Carvalho, de Melo Moreira, & do Prado, 2017). Various factors have been identified as contributing to overconfidence bias, including the better-than-average effect, miscalibration, and self-attribution (Boussaidi, 2022), as well as the planning fallacy, positive illusions, and the aforementioned factors (ul Abdin, Qureshi, Iqbal, & Sultana, 2022).

Optimism bias

The inclination to perceive oneself as superior to the average person, coupled with the belief that negative events are more likely to befall others, reflects an overestimation of favorable outcomes (Chen, Ishfaq, Ashraf, Sarfaraz, & Wang, 2022). An optimism bias is based on the assumption that I am less at risk than others. An optimism bias is based on the belief that an optimist is less at risk than others. Optimistic people want to see the world as better than it is. Some studies show that for all positive personal characteristics, such as driving skills, good looks, longevity, etc., most optimists tend to rate themselves as better and above average (Kotikalapudi, Dricu, Moser, & Aue, 2022) (Deekonda & Bernstein, 2011). Optimism, in this context, describes a tendency to anticipate future events with a positive outlook, correlating with individual life satisfaction, physical well-being, and self-worth. Optimism

bias can be broadly categorized into biases towards favorable and unfavorable occurrences. When making choices, managers may exhibit unwarranted optimism, leading to an exaggeration of potential gains and an underestimation of required expenditures (H. Liu, Jiang, Liu, Hertogh, & Lyu, 2018). The illusion of control, which is the belief that one can effectively manipulate outcomes in random situations, is a significant contributor to optimism bias, even in purely chance-driven events (Bracha & Brown, 2012).

Anchoring effect

The anchoring effect, also known as anchoring and adjustment, is a cognitive bias where individuals rely heavily on the first piece of information, or "anchor," they encounter when forming judgments and making decisions (Rezaei, 2021). Essentially, this means that quantitative estimations are unduly influenced by prior estimates or initial figures presented in a problem, with subsequent adjustments often proving insufficient (C. Y. Lee & Morewedge, 2022; Tweed *et al.*, 2013). In ambiguous situations, managers frequently turn to anchors, such as past sales data, forecasts, or personal opinions, to guide their decisions (Smith, Stone, Kisamore, & Jawahar, 2010). An anchor acts as a focal point, fixating the mind on a specific value and hindering objective reasoning (Pomerol, 2003). Varying starting points lead to divergent estimates. In essence, the anchoring effect significantly impacts managerial decisions, leading to judgments biased toward previously presented values. A prevalent explanation for this phenomenon is that the anchor establishes a range of plausible values, at least temporarily (Costa *et al.*, 2017). While anchors can assist managers in resolving uncertainty and justifying their choices, they may be unsuitable for certain decisions, or managers may fail to perform adequate calculations regarding the initial anchors (Smith *et al.*, 2010). Thus, anchoring can result in flawed decision-making, leading to increased costs for companies, organizations, or governments (Selim, 2021). Recognizing and mitigating the detrimental effects of anchoring can enhance the quality of decision-making (Berger & Daumann, 2021).

Collective decision making

Collective decision-making involves a scenario where multiple individuals, each with unique perspectives, attitudes, motivations, and personalities, recognize a shared problem and collaborate to reach a unified decision (Bui, 1987). Decision-making, in general, can be understood as a cognitive process leading to the selection of one option from a range of possibilities (Liang, Guo, & Liu, 2024; Wu, Zhou, Jin, Lin, & Leung, 2017). Collective decision-making can also be described as a process where individuals with diverse viewpoints and personalities strive to achieve a common resolution (De Oca *et al.*, 2011). Alternatively, it may involve two or more actors coordinating on a specific issue to achieve a desired outcome (Gerrits & Marks, 2017). Typically, in collective decision-making, individuals express their preferences and opinions regarding potential choices, ultimately leading to the selection of a single decision (Rossi, 2014). This process can be broken down into four key modules (Wu *et al.*, 2017):

1) *Opinion collection*: Gathering initial user feedback, often via questionnaires, to establish a baseline of opinions.

2) *Opinion processing:* Facilitating the exchange of user feedback, allowing individuals to refine their opinions through interaction, utilizing methods such as voting and weighted voting.

3) *Negotiation:* Grouping users based on shared opinions, engaging in discussions, and iteratively refining results through voting and ranking.

4) *Consensus:* Recalculating voting weights and ensuring that a final decision is reached when a sufficient level of agreement is attained (Mirbagheri, Atani, & Parsanejad, 2024).

The primary function of groups is to generate effective solutions to complex challenges (Zafeiris, Koman, Mones, & Vicsek, 2017)considerable efforts have been\ndevoted to the question of collective decision making related to\nproblems involving a single dominant feature. Here we introduce a\nquantitative formalism for finding the optimal distribution of the group\nmembers' competences in the more typical case when the underlying\nproblem is complex, i.e., multidimensional. Thus, we consider teams that\nare aiming at obtaining the best possible answer to a problem having a\nnumber of independent sub-problems. Our approach is based on a generic\nscheme for the process of evaluating the proposed solutions (i.e.,\nnegotiation. Further enhancements to collective decision-making are possible by accounting for the inherent variability in individual decision-making accuracy (Bosel, Reinal, & Marshall,

2017). Many advantages of collective decision-making need to be carefully analyzed. Examining these advantages and disadvantages will help a lot in choosing or not choosing this method. The advantages of collective decision-making are detailed in Table 1.

Factors affecting collective decision-making

Collective decision-making involves both internal psychological states, such as beliefs, emotions, and intentions, and external interactions with individuals possessing diverse mental frameworks. To reach a mutually agreeable decision, these internal states must be harmonized through social interaction. This process not only aligns intentions towards a shared outcome but also fosters common individual understandings and sentiments. Bosse *et al*. (2013) presented a model that illustrates the interplay of various factors that influence Collective decision-making. This model posits that an individual's inclination toward a specific decision is determined by their beliefs (cognitive evaluation) and feelings (affective responses) regarding that option. Furthermore, the model suggests that beliefs can trigger emotions (emotional reactions), such as fear, which, in turn, can modify the intensity of those beliefs (emotional influence) (Bosse *et al*., 2013). Another factor that influences collective decision-making is the quality of the argument. There is an interaction between the quality of reasoning and the social impact of information. As the quality of reasoning increases, so does the social impact, and this issue increases the acceptance of information for collective decision-making. Also, resource credibility is effective in increasing the level of information acceptance for collective decision-making (Cho & Chan, 2019). Information uncertainty and conflicting preferences are two additional significant determinants of collective decision-making (Conradt, 2012). The effectiveness of collective decision-making in situations with conflicting information is contingent upon both the volume and credibility of the data individuals receive (Mann, 2018). Research indicates a significant correlation between conflict reduction and bias mitigation within collective settings, as these factors are interdependent. Specifically, homogenous groups, characterized by members with similar backgrounds, expertise, and viewpoints, tend to exhibit lower internal conflict but may face an elevated risk of collective bias. Conversely, heterogeneous groups, composed of individuals with diverse backgrounds, expertise, and perspectives, may experience greater internal discord but potentially reduce collective bias, fostering more in-depth discussions and enhanced integration of ideas. This is because diverse viewpoints are more likely to accurately represent the complexity of an issue. Dionne *et al*., (2019) simulated this phenomenon, revealing that groups with minimal collective bias and a shared understanding of the problem tend to generate higher-value ideas and achieve better decision-making convergence (Dionne *et al*., 2019). This shows what kind of strategies will be optimal for collective formation and for maximizing the real efficiency of collective decisions. One thing that remains indirect and problem-related is that the best composition of a team, group, or collective may largely depend on the specific configuration of the problem. In situations where a team is tasked with a critical time-bound mission, speed of convergence is essential for achieving success. Therefore, prioritizing group uniformity to limit internal conflicts is advisable. However, if the team's goal is to identify a high-quality solution, minimizing the likelihood of group-level bias is vital, potentially necessitating increased diversity within the team (Dionne *et al*., 2019). Collective systems face a choice between rapid and precise decision-making. The quality of a group's decision is significantly influenced by the well-known trade-off between speed and accuracy. Prioritizing swift decisions among a predetermined set of options can restrict the potential for accuracy, as superior alternatives may become apparent later (Khaluf *et al*., 2019). In the article (Sueur *et al*., 2011)·the factors that affect collective decisions are

1) The degree of diversity and environmental uncertainty,

2) Social relationships with other members of the group,

3) Potential ways for people to obtain information about their environment.

The structure of participants, both socially and within an organization, can also impact the results of collective decision-making (Dionne *et al*., 2019). It is clear that increased group size, or network complexity, leads to greater variability in decision-making convergence. However, larger group sizes do correlate with the emergence of more valuable ideas (Dionne *et al*., 2019). One example of participation in collective decision-making is through voting. The more inclusive the number of voters, the fewer external factors in-

Table 1: Disadvantages and advantages of collective decision-making

Row	Disadvantages	Reference
1	Infiltration	(Van Deemen & Rusinowska, 2010)
2	More time-consuming	(Karami, 2017)
3	Only one or more actors have the power of final decision-making	(Zellner *et al.*, 2014)
4	The administration and mechanical presence of members	(Bui, 1987)
Row	**Advantage**	**Reference**
1	Collective Alliance	(McHugh *et al.*, 2016), (Siegner, Panwar, Kozak, & Searcy, 2025)
2	Increase comprehensive information	(Mann, 2018), (Carbone & Giannoccaro, 2015), (Rossi, 2014)
3	Increase awareness and knowledge	(Mann, 2018), (Carbone & Giannoccaro, 2015), (McHugh *et al.*, 2016), (Carbone & Giannoccaro, 2015)
4	Increase motivation	(McHugh *et al.*, 2016) (J. Liu, Shui, Jin, Shao, & Zhu, 2025)
5	Increase collective wisdom	(Zafeiris *et al.*, 2017)
6	Increase employee participation	(Prigozhin, 1991), (Dionne, Sayama, & Yammarino, 2019), (McHugh *et al.*, 2016)
7	Increase employee commitment	(Khaluf, Simoens, & Hamann, 2019)
8	Increase the quality of the decision	(McHugh *et al.*, 2016), (Mann, 2018)
9	Increase the accuracy of the decision	(Bosel *et al.*, 2017), (Khaluf *et al.*, 2019)
10	Increase the level of determination and effort	(McHugh *et al.*, 2016)
11	Increase justice	(Myerson, 2013)
12	Increase the independence of individuals	(McHugh *et al.*, 2016)
13	Increase collective intelligence	(McHugh *et al.*, 2016)
14	Reduce decision execution time	(Karami, 2017)
15	Reduce mistakes	(McHugh *et al.*, 2016) (Qudrat-Ullah, 2025)
16	Avoid instability and intractability	(Fu, Sui, Luo, & Han, 2020)
17	Reaching consensus	(Wu *et al.*, 2017)
18	Achieve the optimal decision	(Prigozhin, 1991), (Bosel *et al.*, 2017), (Carbone & Giannoccaro, 2015)

fluencing decision-making for members (Van Deemen & Rusinowska, 2010). The expenses associated with collective decision-making rise in proportion to both team size and the number of hierarchical groups involved. These costs encompass various elements, such as administrative expenses for meeting coordination and the time required for discussions, including the articulation of individual positions and ideas (Berg & Paroush, 1998). A summary of the key influences on collective decision-making is presented in Table 2.

Collective decision-making methods

This section explores several prominent practical models utilized in collective decision-making. The most prevalent approach is the interactive group method, characterized by face-to-face interactions and unrestricted communication among group members. The final decision is determined through an unstructured group discussion to generate and integrate ideas, followed by a majority vote (Qudrat-Ullah, 2025). Another method is the nominal group technique, a structured meeting where participants work

Table 2: Factors influencing collective decision-making

Row	Indicator	Reference
1	Perception	(Bui, 1987)
2	Attitude	(Bui, 1987)
3	Motivation	(Bui, 1987), (McHugh *et al.*, 2016)
4	Belief	(Marks, Gerrits, & Marx, 2019), (Zellner *et al.*, 2014), (Bosse *et al.*, 2013)
5	position	(Zellner *et al.*, 2014)
6	Target	(Zellner *et al.*, 2014)
7	Preferences	(Zellner *et al.*, 2014)
8	Interaction (communication)	(Khaluf *et al.*, 2019), (Sueur *et al.*, 2011), (Dionne *et al.*, 2019)
9	Cohesion	(Khaluf *et al.*, 2019)
10	obligation	(Khaluf *et al.*, 2019)
11	Information Sharing	(Khaluf *et al.*, 2019), (Sueur *et al.*, 2011), (Wu *et al.*, 2017)
12	infiltrate	(Van Deemen & Rusinowska, 2010)
13	Hypocrisy	(Rossi, 2014)
14	Technology	(Slevin, Boone, Russo, & Allen, 1998)
15	emotion	(Bosse *et al.*, 2013)
16	intention	(Bosse *et al.*, 2013)
17	Quality of argument	(Cho & Chan, 2019)
18	Coordination	(Sueur *et al.*, 2011)
19	bias	(Dionne *et al.*, 2019)
20	Experience	(Dionne *et al.*, 2019)
21	Specialty	(Dionne *et al.*, 2019)
22	Group diversity	(Dionne *et al.*, 2019)
23	Culture	(Dionne *et al.*, 2019)
24	Group size	(Dionne *et al.*, 2019)
25	Knowledge	(Carbone & Giannoccaro, 2015), (McHugh *et al.*, 2016)
26	Intelligence	(Carbone & Giannoccaro, 2015), (McHugh *et al.*, 2016)
27	Social or organizational structure	(Dionne *et al.*, 2019), (McHugh *et al.*, 2016)
28	Honesty	(Xu, 2019)
29	Cost	(Berg & Paroush, 1998), (Van Deemen & Rusinowska, 2010)
30	Type of leadership (from authoritarian to participatory)	(McHugh *et al.*, 2016)
31	Characteristics (complexity) of the work	(McHugh *et al.*, 2016)
32	Dependence and independence	(McHugh *et al.*, 2016)
33	Collaboration method (virtual or face-to-face)	(McHugh *et al.*, 2016)
34	Collection	(Wu *et al.*, 2017)

independently, recording their ideas without verbal interaction for a specified period. Subsequently, ideas are presented in a round-robin format, discussed, and then voted upon (Bui, 1987). Counseling, providing a supportive environment for personal, family, and social decisions, is also considered a valuable approach (Karami, 2017). Consultation is integral to collective decision-making, enabling information sharing and improved decisions (Iaryczower, Shi, & Shum, 2018). The Delphi method, a consensus-building tool, facilitates stakeholder participation through a series of questionnaires, with participants remaining physically separated (Wu *et al.*, 2017). Simulation methods, particularly agent-based modeling, are employed to address the challenges of studying large and complex systems in traditional settings. Agent-based modeling allows for the simulation of autonomous agents interacting within a system, applicable to diverse fields (McHugh *et al.*, 2016). Biologists also use analytical and computational models, such as multi-agent simulations, to understand collective behaviors by identifying individual rules. These models allow for systematic changes in individual behavior to analyze model parameters. The dynamics of collective behavior are influenced by information acquisition, processing, and transmission, and mathematical models can incorporate relevant components and hypotheses (Bosel *et al.*, 2017). Voting rules serve as a mechanism for collective decision-making, with the rational voting model being widely used (Cina & Endriss, 2016) (Xu, 2019). Voting in various settings often involves communication among members, ranging from optional to structured (Iaryczower *et al.*, 2018). Similar mechanisms are used in multi-agent systems for coordination, conflict resolution, and information categorization (Cina & Endriss, 2016). Table 3 summarizes the methods and tools of collective decision-making.

Collective decision-making and bias mitigation

Theoretical and empirical research suggests that collective decision-making—through processes of deliberation, dissent, and accountability—can attenuate individual cognitive distortions (Dionne *et al.*, 2019). Exposure to multiple perspectives increases the likelihood that faulty assumptions will be challenged, thereby enhancing judgment accuracy (Kerr & Tindale, 2004; Bonaccio & Dalal, 2006). For example, group discussion has been shown to reduce overconfidence by encouraging individuals to reconsider the strength of their evidence (Sniezek & Henry, 1989). Similarly, optimism bias may be tempered when group members highlight potential risks overlooked by individuals (Lovallo & Kahneman, 2003). Anchoring effects, while resistant to correction, can

Table 3: Methods and tools of collective decision-making

Row	Methods / Tools	Reference
1	Interactive method (face-to-face)	(Bui, 1987), (Iaryczower *et al.*, 2018), (Karami, 2017)
2	Nominal group method	(Bui, 1987)
3	Delphi method	(Wu *et al.*, 2017), (Bui, 1987)
4	Consult	(Iaryczower *et al.*, 2018), (Karami, 2017)
5	Social and Internet networks	(Sueur, Deneubourg, & Petit, 2012), (Slevin *et al.*, 1998), (Dionne *et al.*, 2019), (Wu *et al.*, 2017), (Planas-Sitja, Deneubourg, Gibon, & Sempo, 2015)
6	agent-based modeling (simulation)	(McHugh *et al.*, 2016), (Bosel *et al.*, 2017)
7	voting	(Cina & Endriss, 2016), (Wu *et al.*, 2017), (Xu, 2019), (Iaryczower *et al.*, 2018), (McHugh *et al.*, 2016)
8	questionnaire	(Wu *et al.*, 2017)
9	Negotiation	(Wu *et al.*, 2017), (McHugh *et al.*, 2016)
10	mathematical modeling	(Bosel *et al.*, 2017)
11	Collective decision website	(Dionne *et al.*, 2019)
12	Forming a common knowledge base	(Dionne *et al.*, 2019)
13	Auction	(Wu *et al.*, 2017)

also be moderated when alternative reference points are introduced during group deliberation (Epley & Gilovich, 2006). Nonetheless, the relationship between collective decision-making and bias is not unequivocally positive. Research on groupthink and conformity demonstrates that group processes can amplify existing biases rather than mitigate them (Janis, 1982; Esser, 1998). Anchoring effects, for instance, may persist or even strengthen when groups converge prematurely on salient but flawed reference points (Furnham & Boo, 2011). Similarly, groups sometimes exhibit overconfidence at the collective level, especially when social pressures discourage dissenting opinions (Sniezek, 1992). Therefore, the theoretical foundation of this study rests on a critical tension: while collective decision-making has the potential to reduce bias by leveraging diversity of thought, it may also introduce new dynamics that perpetuate cognitive distortions. Exploring this dual potential is crucial for advancing both theory and practice in organizational decision-making. According to the explanations provided, the research hypotheses can be defined as follows:

1. Collective decision-making reduces overconfidence bias.

2. Collective decision-making reduces optimism bias.

3. Collective decision-making reduces the bias of the anchoring effect.

MATERIALS AND METHODS

To get a comprehensive view of the subject and get familiar with the basic concepts and principles, various references are collected and studied in a library style. To achieve the goal of the research, a questionnaire was designed regarding the research hypothesis. The questionnaire consisted of two sections with a total of 24 items.

Section A: Demographic information (e.g., age, gender, managerial level, and years of experience).

Section B: Measurement of three cognitive biases—overconfidence (8 items), optimism (8 items), and anchoring effect (8 items). The questionnaire employed a Likert scale, where respondents indicated their agreement level on a scale from "strongly disagree" to "strongly agree," corresponding to scores from 1 to 5. Specifically, "strongly disagree" was assigned a score of 1, and "strongly agree" a score of 5 (Chen *et al.*, 2022). Example items include:

Overconfidence: "I am usually certain about the accuracy of my judgments, even when information is limited."

Optimism bias: "I generally expect organizational decisions to result in outcomes better than average."

Anchoring bias: "My initial impression strongly influences my final judgment, even when new information becomes available."

To assess the questionnaire's accuracy, content validity was employed, while Cronbach's alpha was utilized to determine its reliability. Validity ensures that the measurement tool accurately captures the intended traits, and reliability indicates the consistency of the tool's results under similar conditions. Cronbach's alpha is a statistical measure of internal consistency among questionnaire items. A Cronbach's alpha value of 0.70 or higher is considered acceptable, with values below this threshold indicating poor internal consistency and a lack of model fit reliability (Tobias-Webb, Limbrick-Oldfield, Vearncombe, Duka, & Clark, 2020)

Target Population and Sample Size

Purposive sampling was selected due to the specific focus of the study. The questionnaire is distributed among managers of Iranian state-run organizations (at different management levels) who are aware of collective decision-making or have experience using it. Cochrane's formula was used to determine the necessary sample size (Damghanian & Ghanbari Ghaleroudkhani, 2022; Song & Wassell, 2003)

$$n = \frac{z^2.p.(1-p)}{e^2}$$

z = 1.96 for a 95% confidence level, p = 0.5 (assumed population proportion), and e = 0.05 (margin of error). Based on these parameters, the recommended minimum sample size was 169. The study's statistical population was estimated to be 300 individuals. Utilizing Morgan's table (Krejcie & Morgan, 1970). A sample of 170 academic and organizational experts was selected for questionnaire distribution. After reviewing the returned questionnaires, 152 were found to be complete and appropriate for analysis. Data were entered into SPSS software for statistical analysis. Descriptive statistics were used to summarize sample characteristics, while inferential analyses—including one-sample mean comparisons and significance testing—were employed to test the hypotheses.

Table 4: Descriptive statistics of the sample

		Frequency	Percent	Valid Percent
Gender	Male	114	75.0	75.0
	Female	38	25.0	25.0
Education	Bachelor	7	4.6	4.6
	Master	98	64.5	64.5
	Ph.D.	47	30.9	30.9
Age	<40	24	15.8	15.8
	40-49	62	40.8	40.8
	50-60	50	32.9	32.9
	≥60	16	10.5	10.5
	Total	152	100.0	100.0

Demographic variables

Demographic variables, including gender, education level, and age, are considered to be control variables in this research. The demographic information of the statistical sample is shown in Table 4. The results showed that above 90% of the respondents have master's and doctorate degrees, and this issue increased the credibility of the research.

Validity and reliability of the questionnaire

To establish the questionnaire's validity, expert opinions were sought. Before distribution, feedback was collected from 20 university professors and specialists in collective decision-making, and subsequent revisions were made to the questionnaire. The questionnaire's reliability was then assessed using Cronbach's alpha (α).

The results of this study (Table 5) show that Cronbach's alpha values for the 3 variables are 0.857, which is higher than 0.7 and is within the acceptable range.

$$\alpha = \left(\frac{n}{n-1}\right)\left(\frac{s_t^2 - \sum_{i=1}^{n} s_t^2}{s_t^2}\right)$$

Table 5: Reliability statistics

Cronbach's Alpha	N of Items
0.857	3

Hypothesis test about the community's average

The hypothesis test about the community average checked whether the average opinions or points of the respondents were higher than the average scores. In this research, because a 5-point Likert scale is used, the number 3 will be the middle or neutral number. The closer the obtained number is to 5 or 0, the greater the agreement or disagreement with that hypothesis. Therefore, the statistical hypotheses are defined as follows:

$$\begin{cases} H_0: \mu \leq x & H_0\text{: The average points obtained are lower than the average of the test.} \\ H_0: \mu \leq x & H_1\text{: The average points obtained are higher than the average of the test.} \end{cases}$$

Table 6 provides the descriptive statistics of the data, including the mean and standard deviation, which indicate the data's dispersion from the average.

The One-Sample Test results, as detailed in Table 4, allow for the following conclusions to be made.

1- Regarding overconfidence bias, a significant value of 0.000 is obtained, which is smaller than 0.05. The t-test statistic for this bias is 128.627, and it is above the critical value of $t_{0.05,}$ i.e., 1.96. Because the mean of responses is 4.76, H_0 is rejected. Also, the upper and lower limits of the confidence interval are greater than zero (positive), and H_1 is confirmed (Kaurav, Gursoy, & Chowdhary, 2021). Therefore, with 95% confidence, it can be said that collective decision-making reduces overconfidence bias.

2- Regarding optimism bias, a significant value of 0.000 is obtained, which is smaller than 0.05. The t-test statistic for this bias is 118.607, and it is above the critical value of $t_{0.05,}$ i.e., 1.96. Because the mean of responses is 4.64, H_0 is rejected. Also, the upper and lower limits

Table 6: Results of descriptive statistics of the data

	N	Mean	Std. Deviation	Std. Error Mean
Overconfidence	152	4.76	0.457	0.037
Optimism	152	4.64	0.482	0.039
Anchoring	152	4.67	0.485	0.039

of the confidence interval are greater than zero (positive), and H_1 is confirmed (Loffing, 2022). Therefore, with 95% confidence, it can be said that collective decision-making reduces optimism bias.

3- Regarding the anchoring effect, a significant value of 0.000 is obtained, which is smaller than 0.05. The t-test statistic for this bias is 118.683, and it is above the critical value of $t_{0.05,}$ i.e., 1.96. Because the mean of responses is 4.67, H_0 is rejected. Also, the upper and lower limits of the confidence interval are greater than zero (positive), and H_1 is confirmed (Shaikh, Malik, Talpur, & Abro, 2021). Therefore, with 95% confidence, it can be said that collective decision-making reduces the anchoring effect.

RESULTS AND DISCUSSION

Cognitive science researchers state that psychological emotions affect a person's decisions, and sometimes decisions become irrational under the influence of cognitive bias (Chen *et al.*, 2022). Ordinary people do not have any information about the factors that influence irrational decisions and need to be informed so that they can make the best decisions. It is proposed that the influence of certain cognitive biases on judgment errors can be lessened when counselors within collective decision-making environments identify and alert colleagues to potentially biased decisions (McShane *et al.*, 2013). This study investigated the effect of collective decision-making on reducing the three biases of overconfidence, optimism, and the anchoring effect. Previous studies also showed that these three biases have a great impact on reducing the quality of managers' decisions (Jordão *et al.*, 2020). The analysis in this study proved that the collective decision-making method can have a significant effect in reducing these biases in managers' decisions. Evidence of the help that collective decision-making provides to reduce bias is shown in Table 7.

Despite the prevalence of individual-level biases, the study's findings indicate that collective decision-mak-

Table 7: Collective decision-making aids in reducing bias

Row	Type of bias	Cause of bias	Collective decision-making aid
1	Overconfidence	Overestimating your abilities and creativity	Collective knowledge surpasses individual knowledge, leading to improved decision quality and validity in intricate tasks (Dionne *et al.*, 2019); (Khaluf *et al.*, 2019); (McHugh *et al.*, 2016); (Mann, 2018).
2	Optimism	Overestimation of the probability of the desired outcome	A diverse range of knowledge and experience among individuals fosters collective learning, resulting in a richer and more profound comprehension of environmental circumstances (McHugh *et al.*, 2016), (Bouwmans, Runhaar, Wesselink, & Mulder, 2017), (Carbone & Giannoccaro, 2015), (Irving & Williams, 1999), (Lauring, Guttormsen, & McNulty, 2019). Comparably, collective opinions and consultations shape decision-makers' selections by broadening their horizons and facilitating the evaluation of all viable alternatives (Bui, 1987);(Mann, 2018); (Iaryczower *et al.*, 2018)
3	Anchoring	Relying on the first information received	Collective decision-making necessitates the consideration of all group members' perspectives (Wu *et al.*, 2017). A holistic approach, encompassing all facets of a decision and evaluating its systemic impacts, is crucial for effective decision-making (Iaryczower *et al.*, 2018); (Khaluf, Ferrante, Simoens, & Huepe, 2017); (Sueur *et al.*, 2011); (Wu *et al.*, 2017); (Dionne *et al.*, 2019).

ing provides mechanisms that can mitigate their effects. Specifically, when managers engage in group deliberation, the diversity of perspectives encourages participants to confront differing viewpoints, thereby reducing reliance on overconfident or overly optimistic judgments. Additionally, critical evaluation and peer scrutiny inherent in collective processes compel decision-makers to justify their assumptions, which lessens the anchoring effect by introducing multiple reference points. These mechanisms are consistent with the theoretical premise that collective rationality emerges from distributed cognition and the aggregation of perspectives.

Explaining the high mean values

The analysis revealed consistently high mean values for the three investigated cognitive biases—overconfidence (M = 4.76), optimism (M = 4.64), and anchoring effect (M = 4.67)—with limited variation across respondents. At first glance, these elevated mean scores suggest that cognitive biases are highly prevalent among managers in Iranian state-run organizations. However, closer interpretation highlights several underlying dynamics. The anomalously high mean values (ranging between 4.64 and 4.76 on a 5-point Likert scale) require careful interpretation. One explanation may be social desirability bias, as respondents, particularly managers in hierarchical organizational structures, may feel compelled to present themselves as more rational or aligned with collective norms. Furthermore, cultural factors rooted in collectivist tendencies and hierarchical respect for authority in Iranian organizations may have contributed to inflated self-assessments of decision-making behaviors. While these factors do not invalidate the findings, they suggest caution in generalizing the magnitude of the results beyond this context.

Comparative analysis with previous studies

Our findings align with Jordão *et al.* (2020), who observed that collective settings can reduce the influence of overconfidence and optimism by fostering shared accountability and cross-checking of assumptions. However, a divergence was observed regarding the anchoring effect: whereas Jordão *et al.* (2020) reported significant attenuation of anchoring in group contexts, our findings suggest a more moderate reduction. This discrepancy may reflect contextual differences, particularly the organizational culture and decision-making structures in Iranian state-run organizations, where authority figures can still anchor group judgments despite collaborative processes. Overall, the study suggests that while collective decision-making does not eliminate cognitive biases, it provides mechanisms—such as diversity of perspectives and critical evaluation—that meaningfully mitigate their impact. However, the influence of social desirability bias and cultural context underscores the importance of interpreting these findings with caution and conducting further cross-cultural comparative studies.

Limitations

Several limitations should be acknowledged. First, the study's focus on Iranian state-run organizations limits the generalizability of findings to other cultural and organizational contexts. The high mean values observed may also be influenced by survey-related biases, particularly social desirability and the hierarchical nature of Iranian workplaces, which may have encouraged favorable self-reporting. Furthermore, reliance on a cross-sectional survey design constrains the ability to establish causal inferences.

Directions for Future Research

Future research should extend this analysis across diverse cultural and institutional contexts to assess the universality of the observed mechanisms. Experimental and longitudinal designs would be particularly valuable in clarifying causal pathways and the durability of bias mitigation over time. Moreover, subsequent studies could examine additional biases—such as confirmation bias, escalation of commitment, or availability heuristic—to provide a more comprehensive understanding of how collective decision-making interacts with cognitive limitations in organizational contexts.

In conclusion, this research highlights both the promise and the boundaries of collective decision-making as a corrective to cognitive biases, offering actionable insights for managers while setting a clear agenda for scholarly inquiry.

CONCLUSION

Managers have to make a variety of decisions in their lives at individual, organizational, and social levels. Due to the complexity of the environment, the influence of multiple factors, and dependence on simple heuristics and common arguments, managers' decisions are susceptible to cognitive bias, and

therefore, they may commit numerous errors. For example, they may be overconfident in their knowledge and skills, significantly optimistic about their future, or rely on anchors in their judgments. In this regard, the three biases of overconfidence, optimism, and the anchoring effect have a great impact on managers' judgments. This study examined the relationship between collective decision-making and the mitigation of cognitive biases—overconfidence, optimism, and the anchoring effect—among managers in Iranian state-run organizations. To check the effectiveness of this method, 152 managers of Iranian state-run organizations (at different management levels) are surveyed using a Likert scale questionnaire. SPSS software analysis showed that the questionnaire enjoys good validity and reliability. The findings also showed a significant value of 0.000 for these three biases, which is smaller than 0.05; the t-test statistic for these biases is also higher than the critical value of $t_{0.05}$, which is 1.96. Since the average of the answers on the Likert scale is above 3, hypothesis H_0 regarding these three biases is rejected. The upper and lower limits of the confidence interval are greater than zero, and H_1 is confirmed. Therefore, it can with 95% confidence be concluded that collective decision-making reduces the bias of overconfidence, optimism, and anchoring effect. The findings demonstrate that while these biases are highly prevalent at the individual level, collective processes can play an important role in moderating their influence through mechanisms such as diversity of perspectives, critical evaluation, and peer scrutiny. The findings of this study can motivate managers to use the collective decision-making method to reduce bias and reach an optimal decision.

Practical Recommendations

For practitioners, several guidelines emerge. Managers can strengthen group decision-making by:

1. Encouraging diversity of perspectives through cross-functional teams that reduce reliance on a single dominant viewpoint.
2. Implementing structured deliberation techniques such as Nominal group method or the Delphi method, which encourage critical evaluation of assumptions and reduce overconfidence.
3. Establishing clear decision protocols that minimize anchoring effects by requiring consideration of multiple alternatives before finalizing choices.
4. Providing bias-awareness training to sensitize managers to the subtle ways in which overconfidence, optimism, and anchoring may shape their judgments.

AUTHOR CONTRIBUTIONS

S.M. Mirbagheri conducted the literature review and methodology, compiled the data, drafted the manuscript, and contributed to the results and discussion sections. A. Rafiei Atani was responsible for performing the literature review and analyzing the data.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy, have been completely witnessed by the authors.

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ABBREVIATION

n	sample size
e	margin of error or desired precision
p	percentage of the population demonstrating the attribute
z	z-value derived from a standard z-table
H	Hypothesis
S_t	standard deviation of the entire questionnaire
S_i	standard deviation of the ith question

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