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ORIGINAL RESEARCH PAPER

# Conceptualizing collective decision-making in organizations: A grounded theory approaches

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**ABSTRACT**

**BACKGROUND AND OBJECTIVES:** Collective decision-making can increase the probability of reaching the correct decision. In Collective decision-making, information, experience, and knowledge are shared, and managers can use the wisdom of their employees with this method. In addition, in Collective decision-making, learning and ideation take place, and employees express their opinions freely and reach a common decision with the help of each other.

**METHODS:** In this study, the concepts related to Collective decision-making are explained using the research background. Then, by using the grounded theory method, the most important questions related to why and how Collective decision-making are answered. To get the opinions of organizational and academic experts in this field, a semi-structured interview was conducted with 54 people who were selected by purposeful sampling. After collecting the data through interviews, the components are coded in an open, axial, and selective.

**FINDINGS:** Through coding, 26 concepts were obtained which were later classified into 5 categories: causal conditions, contextual conditions, intervening conditions, central phenomenon, strategies, and consequences. The findings of this study provide a comprehensive model for the central phenomenon of Collective decision-making.

**CONCLUSION:** The results show that collection alliance, increased awareness and knowledge, growth, and development of members, increased wisdom and collective intelligence, increased members' commitment, increased quality of decision-making, and increased justice are the most important consequences of Collective decision-making. This study is important because it broadens the perspective of managers, and provides a deeper understanding of the nature of Collective decision-making in the organization.

| NUMBER OF REFERENCES | NUMBER OF FIGURES | NUMBER OF TABLES |
|---|---|---|
| 53 | 3 | 2 |

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## INTRODUCTION

According to Herbert Simon (1993), decision-making is the main issue of management. For this reason, Collective decision-making (CDM) is one of the most important subjects of management knowledge (Azizi *et al.*, 2020). To improve the decision-making quality of managers, the use of the CDM method will be very helpful (Zafeiris *et al.*, 2017). This claim is proved by various reasons, for instance, employee participation in decision-making can provide more information to deal with organizational problems and thus improve efficiency (Mann, 2018), or through participating in decision-making, employees will obtain more awareness, which can lead to better implementation of decisions (Dionne *et al.*, 2019). Also, CDM as a teamwork can led to the sharing of ideas, create learning and innovation, and facilitate trust among employees (Tajpour and Razavi, 2023). CDM is the process by which members of a group decide on an action with a consensus (De Oca *et al*., 2011). Thus, the CDM process can be defined as the process by which a group of individuals, based on their own opinions or preferences, try to reach a common solution to a decision-making problem with several options (Wu *et al*., 2017). In other words, CDM involves two or more actors seeking to improve their situation on a particular issue and they coordinate the goal they want to achieve and reach a similar decision (Marks *et al*., 2019; Xu *et al*., 2022). CDM is an increasingly growing field. Mainly due to the increase in many IT-enabled environments with which people interact and share information with others and they can easily make a collective decision (Rossi, 2014). Many human and environmental factors are effective in CDM. Addressing the CDM process for a long time by researchers shows the great importance and practicality of this scientific field (Neef *et al*., 2022; Zafeiris *et al*., 2017). Despite the many advantages of CDM, a comprehensive model that includes the dimensions of CDM and shows the factors and consequences of CDM have not yet been designed. This study fills this gap and tries to show the effective factors of CDM and its consequences in a model based on grounded theory. In this research, using interviews with experts, through three stages of open, axial, and selective coding as the basis of the grounded theory work of the foundation, first, the interviews are analyzed and then a model for CDM is designed. This method is chosen because the findings of the study are presented in the framework of a new conceptual model. Various questions can be asked in this research, but the most important questions that lead to the creation of a systematic process in this area are: What are the causal, interventional, and contextual conditions affecting CDM? And what are the most important strategies to face the CDM and what are the consequences. If the different dimensions of CDM and its consequences are well clarified and the strategies to reach it are determined, this important strategy can be recommended to managers who use CDM in various issues to achieve greater success.

### *Literature review*

#### *The necessity of CDM*

People face CDM situations everywhere in their daily lives (Veen, 2011). The study of CDM covers various areas such as the brain and behavioral sciences, economics, management sciences, and artificial intelligence, and focuses in particular on the question of how decision-makers can make optimal choices from multiple options (Hasegawa *et al*., 2017; Horsevad *et al*., 2022). The main task of groups is to provide effective solutions to the complex problems they face. This is a very relevant aspect of the behavior of social groups, because “collective wisdom” can be qualitatively beyond the behavior of individuals (Zafeiris *et al*., 2017). Due to the rapid changes in the environment, the decision-maker should have complete mastery of all issues, sciences, and technologies to be able to find the best solution to solve the problem or make good use of the situation (Chen *et al*., 2021). But few people know everything, have all the qualifications, and master all the sciences and technologies within the framework of their managerial duties. So, using CDM can greatly help them find the optimal solution. The social feature of changing the structure of society today is such that without the participation of managers and employees in the process of management decision-making and their implementation procedures, they cannot reach the optimal decision (Prigozhin, 1991). Having calculated the inevitable variation in the accuracy of individual decision-making, further improvement in CDM is indispensable (Bosel *et al*., 2017) and the learning of members increases with CDM (Zhang and Hsu, 2021). Studies show that when people’s voices are heard and people can respectfully

participate in the decision, they are more willing to accept a collective decision, even if the outcome is against their wishes (Šerek *et al*., 2022). The study of CDM is necessary for many groups or participatory systems along with the development of the internet, electronic communications, knowledge-based economics, and information technology (Wu *et al*., 2017).

*Process of collective decision making*

In general, a CDM system can be composed of (1) Situations, goals, beliefs, or preferences of agents, (2) The ability of agents to influence the positions, preferences, and opinions of other agents, or the result of the final decision (3) Interpersonal interactions and groups that arise from these interactions and (4) the wider context in which a group is located (Zellner *et al.,* 2014). In CDM, individuals usually express their views despite some restrictions and preferences, then one consensus decision is made (Rossi, 2014). In CDM, in addition to people who generally make their decisions in a particular field, competent employees who are generally not directly involved in decision-making, participate on an equal basis (Prigozhin, 1991). Khaluf *et al*. (2019) examine the relationship and interaction among two components namely (1) Individual (microscopic) and (2) System-level (macroscopic). For CDM, two important types of information to be acquired by the system are examined and identified as neglected parts of the decision-making process: (I) stimuli, and (II) a set of choices (options) that are available for a particular decision. Different features of stimuli and options, such as their amount and distribution, affect the output of the decision-making process (Khaluf *et al*., 2019). In groups with a high level of communication and appropriate conditions, participation can quickly lead to an agreement at the group level. The behavior of the members of the group is also part of the formation of the CDM mechanism (Ward *et al*., 2011). When a collective decision fails, participants in a 'group issue' need to start bargaining or negotiating until a consensus is reached (Bui, 1987).

*Applications of CDM*

CDM is a widespread and practical phenomenon among organisms (Watzek *et al*., 2021). CDM is a major topic not only in economics and social choice theory, but also in communication, computer science, machine learning, game theory, and control theory (Parrondo *et al*., 2007). It can be seen in many organizations including the cabinet, the central bank, etc. (Veen, 2011). CDM is growing increasingly which is mainly due to the increase in many IT-enabled environments in which people interact and share information with others (Rossi, 2014). The introduction of technology into CDM can also help organizations cross physical, social, and psychological boundaries (Slevin *et al*., 1998). Thus, CDM is increasingly playing an important role in today's societies and organizations. As for advanced technologies, the number of engineers involved in designing a product can be hundreds or even a thousand, which goes far beyond the capacity of any engineer (Dionne *et al*., 2019). CDM is seen in a wide range of natural and artificial collective systems. In the case of natural systems, individuals in a group need to make collective decisions to get the best solution. In the field of artificial systems, CDM can be considered a principle for robotic collective behaviors (Prasetyo *et al*., 2019). Just as individuals in a group may prefer to participate in CDM in which all individuals seek agreement on a result or are functionally integrated, this may also be the case for a group of social insects (Bonabeau, 1996). Research on other organisms may provide new insights into the basic principles of CDM in social groups (Bosel *et al*., 2017). So far, many studies are being conducted on applications of CDM in other organisms such as insects (Frank and Linsenmair, 2017; Sasaki and Pratt, 2018), ants (Sasaki *et al*., 2015, 2019; Stroeymeyt *et al*., 2014; Stuttard *et al*., 2016), bees (Detrain and Deneubourg, 2008; Seeley *et al*., 2012; Szopek *et al*., 2013), bison (Ramos *et al*., 2015), monkeys (Rowe *et al*., 2018), robots (Vigelius *et al*., 2014; Wessnitzer and Melhuish, 2003), birds (Bhattacharya and Vicsek, 2010; Farine *et al*., 2014; Santos *et al*., 2016), etc. This research shows the importance of CDM for researchers because, with the help of simulation, its research findings can also be used in the human domain.

*How to reach a collective decision*

In general, a CDM system can be composed of (1) situations, goals, beliefs, or preferences, (2) the ability of an agent to influence positions, preferences, or other operating opinions or the result of the final decision, (3) Interpersonal interactions and group

fields that arise from these interactions and (4) the wider context in which a group is located (Zellner *et al.*, 2014). Many aspects of CDM can be predicted by considering what a logical agent is (Mann, 2018). CDM processes emerge from social feedback networks within a group (Planas-Sitja *et al.*, 2015). In CDM, individuals usually express their views despite some restrictions and preferences rather than a certain set of possible decisions, and then one decision is selected (Rossi, 2014). In CDM, in addition to people who generally make their decisions in a particular field, competent employees, who are generally not in direct decision-making, participate on an equal basis (Prigozhin, 1991). Research on the design of CDM mainly examines the relationship and interaction between the two components: (1) Individual (microscopic) and (2) system-level (macro). For CDM, we highlight two types of important information that should be obtained by the system, and we remind them as forgotten parts of the decision process: (I) stimuli and (II) a set of choices (options) that are available for a particular decision. A stimulus is a signal that stimulates the system to begin a decision-making process. Different features of stimuli and options, such as the amount and distribution of them, affect the output of the decision-making process. In general, interaction mainly affects two characteristics of collective decisions: (1) the degree of coherence of decision-making, and the percentage of people who are committed to the same belief. The coherence of a collective decision describes the level of agreement in the system, that is, the percentage of individuals who are committed to the majority. (2) Decision-making speed, through the speed of information dissemination in the system (Khaluf *et al.*, 2019). Collective decisions are coherent, namely, relying on joint information and consensus, which allows the system to act as a unified entity when exposed to different inputs and stimuli. Processes that lead to coherent decisions create tension in a decentralized system between (1) individual feedback to select actions and (2) a common system goal. Despite these tensions, many natural systems show how a collective system can make its own organized and coherent decisions. Common examples include social insects, brain neurons, and immune system cells (Khaluf *et al.*, 2019). In a collective with high communication and appropriate conditions, the selection in the collective can very quickly lead to an agreement at the collective level. In groups with high communication and appropriate conditions, choosing in the group can lead to an agreement at the group level. The behavior of the members of the group is also part of the formation of the decision-making mechanism at the group level. In unrelated groups, individual behavior should maximize their expected compatibility in the group. The inference of "group recognition" capabilities for unrelated groups may be more difficult than previously felt (Ward *et al.*, 2011). When a collective decision fails, participants in a group issue need to start bargaining or negotiating until a consensus is reached (Bui and Co-oP, 1987).

*Models of CDM*

To define and develop effective CDM systems, we need efficient and flexible techniques to help agents both model and present their preferences and calculate their CDM (Rossi, 2014). (Bui and Co-oP, 1987) In the book "A group decision support system for cooperative multiple criteria group decision making", five different structures of CDM are presented. They also show the predicted effects of these structures on the speed and accuracy of the decision-making process. These five structures are hierarchical, star, wheel, honeycomb, and multi-connected. In this book, it is found that, in general, star configuration seems to be the most effective for solving structured and ill-structured problems, while wheel configuration seems to be a little more appropriate for creative or unstructured decision-making situations (Bui and Co-oP, 1987).

In another model, CDM consists of four main parts (Wu *et al.*, 2017):

1) Opinion Collecting Module: First, we should consider the comments and direct settings of all users as basic data that can be collected through a questionnaire. This section includes one process: Get original comments.

2) Opinion Processing Module: User comments may be changed by the influence of others. So, after getting direct feedback from users, the second part is to share the information with everyone and then help them make new decisions after being influenced by other users. Many methods can be used, such as voting and auctions. Also, different decisions are made by different people with different voting weights. Therefore, this section consists of two processes: the voting process and the weight calculation process.

These processes may be repeated several times to reach a final decision.

3) Negotiation Module: To support CDM, we must consider not only the opinion of the individual but also the whole group (social community). So, users are categorized into different groups by analyzing their opinions, and then, they discuss with each other and rearrange the results. This section includes three processes: user grouping, negotiation, and the process of ranking with the voting result. After the discussion, a balance point must be found to make the final decision. Therefore, the negotiation process must be repeated several times, and feedback on the data related to the opinion processing section must be sent.

4) Consensus: The last step is to reach a consensus. After discussing the negotiation process, the weight of the voting results must be recalculated and rearranged. If the weight of the first opinion is higher than the threshold (average), it can be considered the final collective decision. In another model proposed by (McHugh *et al.*, 2016), CDM includes individual characteristics (intelligence and knowledge), collective characteristics (collective intelligence, Participative Leadership Type, and inspiration), work structure (i.e., Collaboration method), and the characteristics of the work (i.e., Task complexity). McHugh *et al.,* (2016) have validated this model with two methods of agent-based simulations and content-coded field study data.

The aims of this study is to identify the dimensions and parameters affecting CDM. These parameters are categorized into 5 categories: causal conditions, contextual conditions, intervening conditions, strategies, and consequences. In this study, various questions have been asked in the field of CDM, and the research findings have been presented in the framework of a new conceptual model. The current study has been carried out in Tehran- Iran in 2022.

## MATERIALS AND METHODS

Grounded Theory was introduced into social research by Glaser and Strauss (1967), which provides inductive methods for generating new theories through data. Experimental hypotheses are generated through the initial analysis of raw data, such as unstructured interviews or observations. Participants in the interviews are more likely to seek to expand and correct hypotheses, a process known as theoretical sampling. Grounded Theory is a Constant Comparative Method (CCM) that identifies patterns and interpretations in primary data and seeks a comprehensive explanation and presentation of a theory (Yates, 2020). Grounded Theory is a qualitative research method to elucidate the social processes behind human interactions. Grounded Theory is a method in which, instead of interpreting and analyzing information based on a theory, a theory is formulated focusing on the data collected and based on their content (King and Snowden, 2020). In this approach, research does not begin with a theory and then prove it, but the research process begins with a field of study, and gradually, related cases emerge (Kokorelias and Ashcroft, 2020). According to the explanations provided, this method was chosen for this study for the following reasons:

1- It is appropriate to the social and managerial field of study.

2- It analyzes primary raw data such as interviews well.

3- Makes a connection between the data and builds a model or theory, which is the purpose of this study.

4- CDM is done in a social process, this method also seeks to clarify social processes in people's interactions.

There are 5 analytical (but not necessarily consecutive) steps in a Grounded Theory (Fig. 1):

In the Grounded theory method, three types of coding are used, which are: (Da Silva Barreto *et al.*, 2018)

Open coding: creating concepts and their features

Axial coding: Communicating between concepts

Selective coding: integrating and improving concepts

These are reciprocal steps, for example, when open coding, some of the relationships between concepts are considered correct by the researcher, and these relationships are established. Also, new concepts are discovered when communicating between concepts. Coding here means choosing words for themes; In other words, when a word is assigned to a subject, that subject is coded (Zimmermann *et al.*, 2020). Data collection in this method is done with the help of the interview and the selection of the next sample of the interview is done until no new code is extracted from the interview. In other words, no new information will be obtained, and new interviews will not add data to


Fig. 1: The stages of a grounded theory (Corbin and Strauss, 2014)

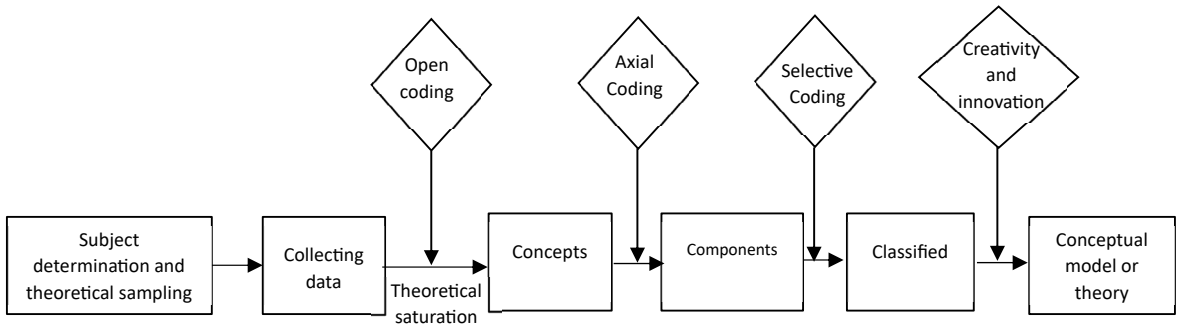


Fig. 2: The developed model of the grounded theory implementation process

previous categories or alter the relationships between categories (theoretical saturation). After categorizing the information, the results are analyzed based on it to extract the mental pattern of individuals in CDM. Therefore, the modeling stages of the grounded theory are that first, the data is open coding, then the basic concepts are extracted, and then, based on the axial coding, the data are classified into main categories. Finally, based on selective coding, the overall structure of the mental model is extracted (Charmaz, 2015). These steps are shown in Fig. 2.

*Data collection*

The statistical sample of this research includes government managers who have at least five years of managerial experience and are familiar with the issues of CDM and collective work. In this study, to collect the highest quality data and have the knowledge that exists of effective managers, at the beginning of the work with 54 managers with top performance among a large number of government managers, initial interviews were conducted and thus, the initial questions listed in line with the main research question were reviewed. At this stage, the focus and questions of the interview were reviewed and gradually corrected based on the feedback received from the initial interviews. In each interview session, participants identified one or two people who could help make the research more productive. Then by referring to other experts who had experience using CDM and were familiar with the concepts related to CDM, the desired sample was obtained. The request to introduce the next person was made at the end of the interview session, and the participant could introduce the next person more accurately, considering the familiarity with the research objectives and the type of questions. This method of obtaining samples in the methodological literature is called the Snowball sampling method. Because in this study, the research is based on a qualitative method and grounded theory is used, sampling is also subject to the rules of the same method and is done in a purposeful and theoretical manner. In this approach, the sample size is determined during the work and, as mentioned, the sampling continues until the data is saturated. In this study, after 44 interviews, the researchers reached data saturation and no new data was added to the previous data, but to ensure the theoretical saturation, 10 more interviews were also conducted, and no data was added to the previous data in the new interviews. For this reason, 54 interviews were conducted for this study and it was sufficient. To obtain data that can answer the research question, in-depth and semi-structured interviews were conducted with selected

managers. In these interviews, which vary in time from 10 to 100 minutes, the topics of the interview were provided to the interviewee in advance, so that she could participate in the meeting with the desired preparation and provide the desired information. Interviews were recorded, and each was immediately analyzed. In some sentences, the interviewees used terms that could be used directly as a code, and in some cases, a concept was hidden behind the sentences, to which the researcher attributed a concept according to the speaker's intention and considered it as an initial code. Based on open, axial, and selective three-stage coding, the data were continuously reviewed and refined, and based on the similarities and consistencies of the data, in an inductive process, a set of similar data was gathered around a concept. Concepts that had common meanings were organized into categories that had a more abstract surface than the concepts. Finally, categories that semantic and content loads were more closely related were placed under a special category. This process was repeated over and over again until, after repeated refinements, the initial codes to the concepts and concepts were organized into a broader concept as a category based on the conceptual homogeneity process, and the resulting categories were combined in the form of classes on a more abstract level, based on the logic of continuous comparison in terms of conceptual similarity.

*Reliability and validity*

To ensure the reliability and validity of the findings and the accuracy of the data analysis process, despite the theoretical saturation in the forty-four interviews, the interviews continued until the fifty-four persons. Some of the initial codes were seen by the interviewees, the results of the selective coding were shared with several CDM experts, and their opinions were applied. Also, the results of the research were provided to several employees of government organizations who had managerial expertise, and based on the provided feedback, the strength of the results was strengthened. Therefore, to ensure the validity of the research, the following measures have been taken:

1. Adaptation by participants; Expert opinion was applied in the coding stage.

2. Review by other professors; Thirty faculty members of the university related to the subject, reviewed the findings and commented.

3. Participatory research; The present study was obtained simultaneously with the participation of the authors and the opinions of all three members were aggregated in the analysis and interpretation of the data.

4. Comparison with research background; All the concepts extracted in the interviews are also present in the background of the research. The point is that the factors identified in the background of the research were scattered and inconsistent, but in this study, they are organized and presented as a conceptual model.

## RESULTS AND DISCUSSION

The findings are reviewed in the form of results obtained from three types of open, axial, and selective coding.

*Open coding*

Open coding is an analytical process of naming concepts and classifying and discovering their features and dimensions in data through continuous comparison, in which the researcher examines and analyzes concepts from different angles from inside and outside or upside down to gain a different perspective on the importance and status of concepts (Corbin and Strauss, 2014). In this stage, first, the issues related to CDM in interviews are reviewed, sentence by sentence, and its key points and topics are coded. These codes are in the form of concepts, which are derived from the sentences of texts related to CDM. By reviewing and studying the information, 86 sentences related to the subject were extracted from the texts, then the contents with duplicate codes were removed, and finally, 26 sentences were coded, which are collected in Table 1. The collective decision ID is indicated by the letter "R".

*Axial coding*

After finding concepts related to CDM, they are categorized. "Category is the classification of concepts". When concepts are compared with each other and appear to be related to similar phenomena, these categories are discovered. In this way, the concepts are categorized in a more orderly manner. A category is a concept, which is more abstract than other concepts (Zimmermann *et al.*, 2020). The categorization method in this research is the accumulation method, in which

Table 1: Generate basic concepts from data related to CDM in open coding

| ID | Data | Concept /code |
|---|---|---|
| R1 | Wrong decisions of officials in various matters and their negative effects. | Wrong decisions |
| R2 | Weakness in reaching understanding, and aggregation of decision makers' opinions and tastes in CDM. | Weakness in reaching an agreement |
| R3 | Lack of knowledge about the benefits and low culture of CDM and, consequently, collective work. | Failure |
| R4 | Low productivity and motivation of employees and increasing tensions and complaints in organizations due to communicating individual decisions of managers. | Low productivity and motivation of employees |
| R5 | Groups can have complex structures and include individuals, groups, and even much larger social networks. | Structure |
| R6 | Ideas, beliefs, judgments, and values can influence and guide individuals in decision-making situations. | Beliefs |
| R7 | The influence and psychological and cultural interactions of individuals in each other, including the decision execution environment, the culture that governs the decision-making environment, the norms and anomalies of the environment, and the practices and values that dominate the decision-making environment. | Culture |
| R8 | People use their inner desire and energy to make decisions and behave to achieve their goals. | Motivation |
| R9 | Organized and analyzed information that can be understood as well as applied to problem-solving and decision-making. | Knowledge |
| R10 | Creating and developing the skills needed to make good decisions is vital. | Skill |
| R11 | Experience changes people's preferences and influences decision-making through the cognitive process. | Experience |
| R12 | Minimizing the possibility of Prejudice and absolutism at the group level is critical to group success, and may require increased diversity within the group. | Prejudice |
| R13 | Infiltration between delegates in CDM situations, in which individuals must choose between different options, may have a significant impact on CDM and, consequently, on collective performance. | Infiltration |
| R14 | The arrogant do not value the participation of decision-making members, nor do they use the knowledge and information of others themselves, nor do they inform others. | Arrogance |
| R15 | Individuals under the influence of group pressure present an opinion that is not their real opinion and has been imposed on them, and in such cases, CDM is not effective. | Group Coalition |
| R16 | Due to the weakness of the culture of collective work, one of the most important strategies is to create a culture and explain the benefits of collective decisions. | Coherent culture building |
| R17 | The result of collective behavior is strongly dependent on the structure of information sharing in the group as well as the quality of information transmitted. | Transfer and share information |
| R18 | Experience and training to develop human capabilities affect preferences and consequently decision-making in different ways. | Education of collective members |
| R19 | People who are members of a group must be justified and coordinated with the goals of the group, otherwise, they may cause clutter and disintegration over time. | Selection of appropriate human resources |
| R20 | CDM enables the manager to actively collaborate with different groups of employees in the organization and unite different departments in the performance of their common tasks. | Collection Alliance |
| R21 | The collective benefit to a particular individual can be the transfer of information between them, that is, a central individual increases his or her awareness and knowledge by gaining access to information held by others. | Increased awareness and knowledge |
| R22 | One of the most important goals of CDM is to formulate specific recommendations to deal with the desired task develop the skills of the participants and find collective solutions to common problems. | Growth and development of members |
| R23 | Aggregates can have superior decision-making performance over individuals for a variety of reasons. The simplest argument is based on "collective wisdom" and the intelligence of each individual in the collective contributes to collective intelligence as a whole. | Increased wisdom and collective intelligence |
| R24 | As people's participation in decision-making increases, CDM becomes more valuable and easier to implement, and employees execute decisions with greater commitment and interest. | Increased members commitment |
| R25 | CDM increases the quality of decision-making by maximizing the knowledge capacity of members and making it possible to reach the optimal decision. | Increasing the quality of decision-making |
| R26 | If a collective decision is made, individuals can freely express their views and resolve disputes and conflicts. | Increased justice |

Table 2: Concepts and categories related to CDM in axial coding

| ID | concepts | categories |
|---|---|---|
| R1+R2+R3+R4 | Wrong decisions + Weakness in reaching an agreement + Failure + Low productivity and motivation of employees | causal conditions |
| R5+R6+R7+R8 | Structure + Beliefs + Culture | intervening conditions |
| R9+R10+R11+R12+R13 R14+R15 | Motivation + Knowledge + Skill + Experience + Prejudice + Infiltration + Arrogance + Group Coalition | contextual conditions |
| R16+R17+R18+R19 | Coherent culture-building + Transfer and share information + Education of collective members + Selection of appropriate human resources | strategies |
| R20+R21+R22+R23+R24+R25+R26 | Collection Alliance + Increased awareness and knowledge + Growth and development of members+ Increased wisdom and collective intelligence + Increased members' commitment + Increasing the quality of decision-making + Increased justice | consequences |

while working on the content and in dealing with each concept, a new class is formed and concepts similar to the new class are organized under that title. Table 2 shows the concepts of each of the data extracted from the text and finally their classification. Thus, based on the similarity, conceptual relationship, and common characteristics between open codes, 26 concepts were classified into 5 categories: causal conditions, contextual conditions, intervening conditions, strategies, and consequences.

The following are definitions related to these 5 categories (Corbin and Strauss, 2014):

*Causal conditions*

Causal conditions are conditions that are the main cause of the phenomenon under study. The results of the content analysis of the interviewees' answers to questions such as their perception of the causes of CDM and the necessity of using it indicate the existence of 5 main concepts regarding the causal conditions for creating the phenomenon under study, open codes related to which are described in Table 1.

*Core Phenomenon*

An incident or major event that has a series of interactions to control or manage it, and is related to it. The core Phenomenon studied in this research is CDM. All 5 categories are related to the central phenomenon, and for this reason, this category is not included in Table 2.

*Intervening conditions*

Intervention conditions are general and broad which affects how they interact. In the present study, based on the content analysis of the interviews, four components were identified as environmental intervening conditions.

*Contextual conditions*

Represents several special features that underlie the emergence of a phenomenon; In other words, it is the place of events related to phenomena in which interaction takes place to control, manage, and respond to the phenomenon. Contextual conditions are specific conditions that affect the main phenomenon and strategies. Contextual conditions in this research are divided into two parts: encouraging conditions and deterrent conditions. Encouraging conditions increase the speed of CDM, and deterrent conditions are conditions that are known as an obstacle to achieving the goal. These conditions usually slow down the speed of achieving results or prevent them from continuing.

*Strategies*

Strategies in grounded theory refer to providing solutions to deal with the phenomenon under study, the purpose of which is to manage and show sensitivity to it. In this research, 4 important strategies have been identified.

*Consequences*

Consequences are the result of the action and reaction of the conditions that exist regarding the phenomenon. In this study, 12 basic outcomes to achieve the desired situation regarding CDM have been proposed.

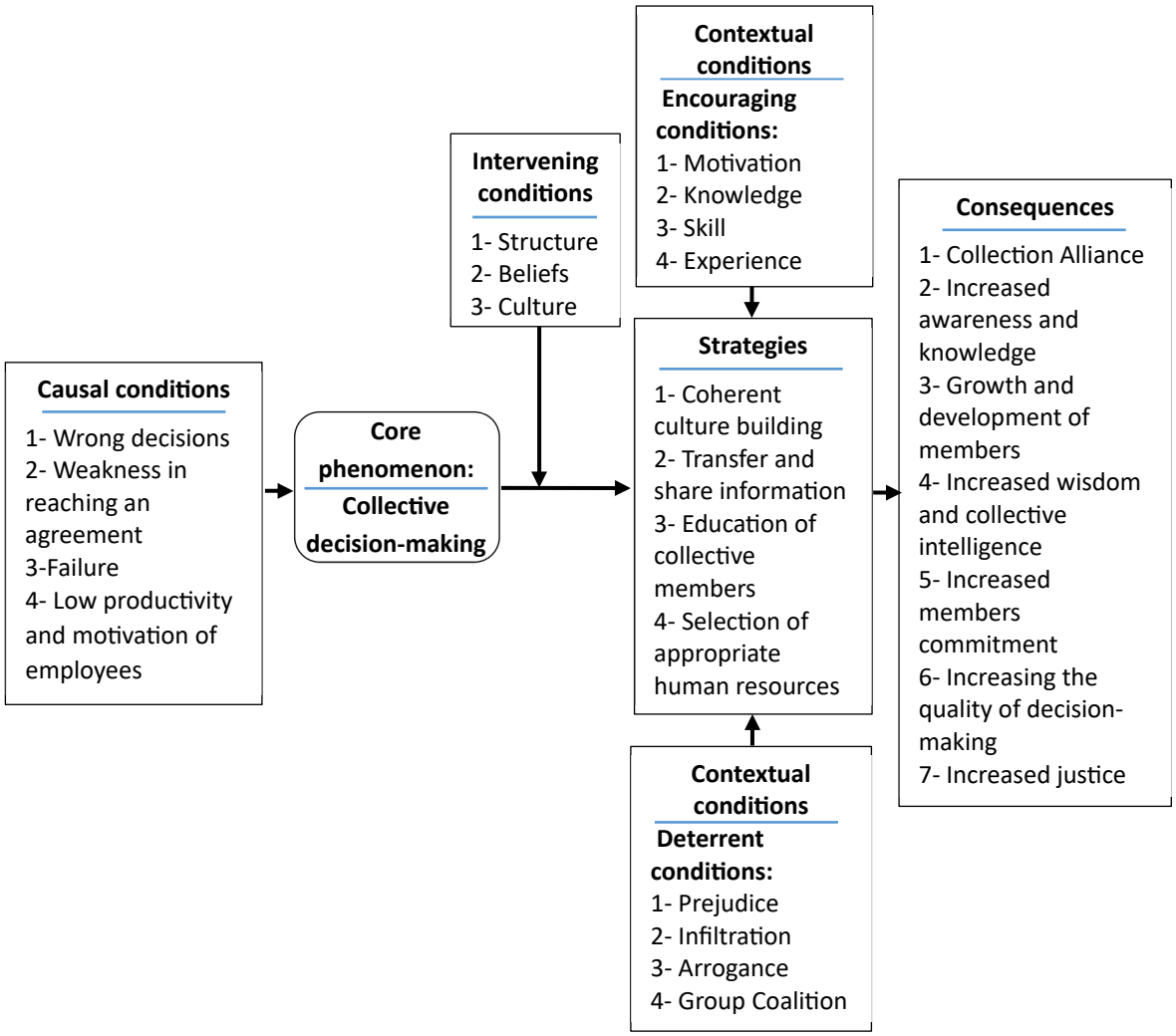


Fig. 3: The conceptual model of collective decision-making

*Selective coding*

In the grounded theory method, the obtained categories and the relationships between them are discovered and those categories are related in a new way rather than the usual way. Therefore, at this stage, the central phenomenon of "CDM" is placed in the center of the process, and then the categories obtained in Table 2 in the model according to the type of their relationship with the central phenomenon, the paradigm is placed and related. (Corbin and Strauss, 2014). This step involves drawing a diagram, which is called a "coding pattern" and is a kind of model derived from the findings. This model is shown in Fig. 3.

As shown in Fig. 3, According to the coding steps and data analysis, it can be said that the conditions affecting CDM are in three general categories of conditions: "causal conditions, intervening conditions, and contextual conditions". In the next step, according to these conditions, "strategies" are presented, and then the short-term and long-term results of CDM are identified as "consequences". In this model, it is shown what factors justify CDM, what factors influence CDM, what conditions are the foundation/ obstacle of CDM, what strategies should be adopted to promote CDM, and what consequences will result

if decisions are made in a collective organization. The models that were designed in previous studies were often about CDM structures. For example, Bui (1987) presents five different structures of CDM including hierarchical, star, wheel, honeycomb, and multi-connected. In another model designed by McHugh *et al*. (2016), the collective decision model includes parameters such as individual characteristics (i.e., intelligence and knowledge), collective characteristics (i.e., collective intelligence, participative leadership, and inspiration), work structure (i.e., collaboration method), and the characteristics of the work (i.e., task complexity). In another model, CDM consists of four main parts (Wu *et al*., 2017): Opinion collecting module, opinion processing module, negotiation module, and consensus. As it is clear, none of the previous studies have investigated CDM regarding causal conditions, intervening conditions, contextual conditions, strategies, and consequences. This article tries to fill this research gap. In this study, using grounded theory, the effective factors in CDM have been taken into consideration and an attempt is made to have a comprehensive view of CDM to create more motivation for managers to use CDM.

## CONCLUSION

Decision-making is the main problem of management and managers must make correct decisions in different situations. Due to the many mistakes of managers in their decisions, CDM is one of the most important tools to make the right choices that bring great benefits to the individual and the organization. Since, a group holds more knowledge than an individual, to some extent, the quality of decision-making in complex tasks is protected and decision-makers make decisions with deeper knowledge and less bias. The purpose of this paper, presented in the form of a grounded theory, is to provide a broad view of the dimensions and consequences of CDM. The main novelty of this research is the presentation of a comprehensive model of CDM, derived from the findings, which can motivate managers to use the CDM method in their choices. In this study, five important research questions have been answered through interviews with 54 experts and university professors. To do so, the grounded theory is utilized to obtain data which is categorized into three types open, axial, and selective coding. In open coding, the findings were summarized in 26 concepts, and in the axial coding stage, these 26 concepts were classified into 5 main categories: causal conditions (generating conditions), contextual conditions (internal conditions affecting the main phenomenon, including encouraging conditions and deterrent conditions), Intervention conditions (mediators), strategies (solutions and programs) and results of the collective decision (consequences). In selective coding, these categories were structured, and by establishing a relationship between them, they were presented as a CDM model with 5 main criteria and 26 sub-criteria. The classification of this 26 sub-criteria has been as follows: causal conditions (Wrong decisions, Weakness in reaching an agreement, Failure, Low productivity and motivation of employees), intervening conditions (Structure, Beliefs, Culture), contextual conditions (Motivation, Knowledge, Skill, Experience, Prejudice, Infiltration, Arrogance, Group Coalition), strategies (Coherent culture-building, Transfer and share information, Education of collective members, Selection of appropriate human resources), consequences (Collection Alliance, Increased awareness and knowledge, Growth and development of members+ Increased wisdom and collective intelligence, Increased members' commitment, Increasing the quality of decision-making, Increased justice). This model clearly shows that many conditions play a role in CDM, and despite its very helpful consequences, many deterrent conditions do exist. Eliminating these barriers requires believing in the benefits and conceivable improvements of CDM which is time-consuming and requires planning and discourse-building in the organization. Obtaining information from a small number of managers who use the CDM method in their work was the limitation of this study. Using CDM as a managerial attitude is a suitable tool to increase productivity and advance organizations toward their goals. The research in this area could be extended in future studies to investigate its other dimensions. The following three suggestions are presented for future studies. First, a cross-cultural analysis of the acceptance or rejection of CDM methodology among managers in different societies could be studied. Second, researchers could carry out further research on barriers to CDM such as individual bias. Third, researchers could carry out further research on moderating variables that influence collective decision making such as gender,

age, and experience of managers.

## AUTHOR CONTRIBUTIONS

S.M. Mirbagheri performed the literature review, and methodology, analyzed and interpreted the data, and prepared the manuscript text. A. Rafiei Atani performed the manuscript edition, literature review, compiled the data, and manuscript preparation. M.R. Parsanejad helped in the literature review, results, and discussion.

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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

| | |
|---|---|
| CDM | Collective decision-making |

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