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From Individual Minds to Collective Decisions: The Function and Contribution of Cognitive Mapping

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A B S T R A C T

This literature study examines the role and contributions of cognitive mapping in participatory decision-making processes. Through a systematic qualitative analysis, it investigates how cognitive mapping functions as a mechanism for extracting and aligning tacit knowledge among participants, and evaluates its impact on the quality of both the process and the outcomes of collective decisions. The findings reveal that cognitive mapping serves as a powerful tool for externalizing individual mental models, facilitating the negotiation of meaning, and fostering iterative social learning. Regarding process quality, it significantly enhances communication transparency, deepens discussion, manages conflict constructively, and improves group efficiency. Concerning outcomes, it contributes to more robust and legitimate decisions, strengthens implementation capacity and adaptive learning, creates reusable knowledge artifacts, fosters innovative solutions, and builds social capital and group cohesion. The study concludes that cognitive mapping transcends being a mere recording technique; it is a transformative methodology that fundamentally improves the ecology of participatory deliberation by making collective cognition visible, negotiable, and actionable, thereby leading to more sustainable and widely supported solutions for complex problems.

INTRODUCTION

Decision-making in collective settings, from community levels to corporate and governmental spheres, is a complex process laden with diverse perspectives. This process often confronts the reality that every individual involved carries a unique framework of understanding, assumptions, and priorities regarding the shared problem at hand. If not managed well, these differences can hinder communication, spark conflict, and result in suboptimal or poorly accepted decisions (Walker & Daniels, 2019). In an effort to achieve participatory, collaborative, and inclusive decisions, an approach is needed that does not merely collect opinions but is also capable of aligning and integrating various differing viewpoints. The fundamental challenge lies in finding a method that can bridge the gap between each participant's subjective reality to create a coherent shared understanding as a foundation for decision-making (Liddo, 2022). This need for alignment becomes increasingly urgent in the modern era, given that social dynamics in the field are often complicated by the clashing identities of actors who tend to engage in symbolic consumption as a practice of asserting identity and social distinction for their group (Aisyah & Mardikaningsih, 2023).

The concept of cognitive mapping emerges as a promising theoretical and methodological framework to address this challenge. At its core, cognitive mapping relates to how humans internally represent, organize, and store knowledge about a domain. It is a mental structure containing beliefs, concepts, causal relationships, and values used by a person to understand and navigate a situation (Cunha et al., 2016). Every individual has their own cognitive map of a problem, shaped by their experience, knowledge, and social position. These maps are often implicit, not clearly articulated, and may contain internal contradictions. In participatory decision-making processes, conflict and deadlock often stem from clashes between these differing cognitive maps, where participants may use the same vocabulary while referring to vastly different structures of understanding (Christiansen et al., 2022). If such communication

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clashes and deadlocks are left without systematic cognitive alignment, public service systems and their entire workforce are vulnerable to collective empathy fatigue due to the burden of tension that is not managed well (Khayru & Darmawan, 2023).

From a phenomenological perspective, every individual's experience in facing a shared problem is a life-world that possesses its own internal coherence. Authentic participatory approaches require an effort to access and respect the life-world of each participant, not by treating it as isolated data, but as part of an interconnected whole (Denwood et al., 2022). Cognitive mapping offers a language and a tool to achieve this. By explicitly depicting key elements and relationships within a person's mental map, this process helps make the implicit explicit. This is not merely a technique for recording opinions, but an effort to reconstruct the internal logic underlying those opinions (Biedenweg et al., 2020). Through this reconstruction of internal logic, shared forums can unravel the structural root causes of societal problems, including understanding the vulnerability of urban workers and the phenomenon of economic informality in city governance, which are often overlooked in formal discussions (Mahmudah, 2022). Thus, dialogue can shift from debates about fixed positions toward the collaborative exploration of the thought structures underlying the problem.

Effective participatory decision-making functions as a process of negotiating and integrating fragmented individual cognitive maps into an enriched, agreed-upon collective map that acknowledges and manages differences. This process acts as a catalyst for deep social learning and consensus building rather than superficial compromise, which ultimately serves as a major pillar in minimizing urbanization-induced social inequality and strengthening urban social cohesion (Mardikaningsih, 2021). Therefore, examining cognitive mapping in this context is not merely studying a technical tool, but understanding how external representations of internal thought structures facilitate reflective, productive collaboration based on a shared understanding. Positioning cognitive mapping as a systematic approach to improve shared transparency, this exploration reveals its potential and limitations in achieving meaningful participation—an urgency that aligns with creating sustainable public policies that balance economic, social, and environmental dimensions (Mardikaningsih & Hariani, 2021), while reflecting legal adaptations to globalization and urbanization pressures (Rizky et al., 2022).

The fundamental problem that often arises in participatory decision-making is the fragmentation of understanding and the difficulty of achieving productive synthesis from the diverse viewpoints present. Although many parties are involved, the process is often trapped in a situation where participants convey mature positions and arguments without any room to explore the basis of those positions. Discussions revolve around the level of solutions without ever delving into the differing assumptions about the nature of the problem itself, the underlying causal relationships, or the ultimate goals to be achieved. As a result, the decisions taken might be compromises that do not satisfy any party or represent the dominance of one viewpoint over another, which ultimately erodes the meaning of participation itself and potentially creates resistance during implementation. Participation becomes merely a ritual of consultation without substantial transformation of understanding. In many cases, the failure to achieve this synthesis is rooted in the weakness of effective leadership manifestations and a lack of orientation toward inclusive public service governance (Rojak, 2021).

The second problem lies in the tacit and unstructured nature of participants' knowledge and beliefs, as individuals often struggle to articulate their entire network of implicit assumptions and values systematically. This gap between thought and expression creates communication barriers where participants feel unrepresented, facilitators fail to locate common ground, and decisions risk ignoring critical stakeholders' perspectives unless facilitators enforce high ethical principles and professional integrity to maintain justice (Saktiawan et al., 2021). Examining this issue is increasingly vital due to growing demands for democratization, accountability, and transparency across public and corporate governance, where simply increasing the quantity of participation often leads to deadlocks due to unmanaged complexity. Cognitive mapping directly targets these communication roots by enhancing a group's capacity to structure tacit knowledge and decide together effectively, offering a highly relevant method to navigate contemporary democratic challenges, domestic social integration, and global governance vulnerabilities amidst the rise of ethno-religious nationalist populism (Fariz, 2021).

Recent developments in digital technology and collaborative software also open new opportunities to apply cognitive mapping on a larger scale and in more dynamic ways. These technologies enable both synchronous and asynchronous participation, rich visualization, and qualitative data analysis that

support the mapping process. A study on how the principles of cognitive mapping can be integrated with and enriched by these technologies has become essential. Furthermore, in an increasingly complex and interconnected world, the problems faced are often intricate systems with numerous variables and feedback loops. Cognitive mapping, with its capacity to represent causal relationships and system structures, is viewed as a suitable tool for understanding such complexity. Thus, an academic examination of this topic is not only relevant but timely, serving to inform more sophisticated participation practices that align with the demands of the twenty-first century.

This literature study aims to conduct a systematic conceptual analysis to elucidate the role and mechanisms of cognitive mapping in the context of participatory decision-making. Specifically, this study seeks to explain how the principles and techniques of cognitive mapping operate to bridge the gap between individual tacit knowledge and the need for explicit, structured collective understanding. Furthermore, this research aims to identify and categorize various forms of cognitive mapping contributions, both regarding process aspects such as improved communication, group learning, and consensus construction, and regarding outcome aspects such as decision quality, legitimacy, and implementation capacity. The expected theoretical contribution is the integration of insights from cognitive science, organizational studies, and public participation into a coherent framework on how external representations facilitate group cognition and collaboration. Practically, this synthesis can serve as a guideline for facilitators, managers, and policymakers in designing and guiding participatory processes that are more reflective, inclusive, and effective.

RESEARCH METHOD

This research is designed as an exploratory and interpretative qualitative literature study. This approach was chosen because it aligns with the goal of building an in-depth conceptual understanding of a topic that lies at the intersection of several scientific disciplines. Qualitative research allows the researcher to explore the complexity and nuances of a phenomenon through a deep analysis of relevant academic texts (Denzin & Lincoln, 2011). In this case, the focus is on the synthesis and critical interpretation of the existing body of knowledge regarding cognitive mapping and participatory decision-making, rather than on hypothesis testing or statistical proof. The pure nature of a literature study allows the researcher to cross disciplinary boundaries, connecting findings from cognitive psychology, management science, participatory planning, and information systems to generate an integrated and comprehensive perspective.

The research execution procedure follows a systematic thematic analysis method as outlined by Braun and Clarke (2006). The primary data sources consist of reputable scientific journal articles, academic textbooks, and conference proceedings that discuss the theory and application of cognitive mapping, group decision-making, and public participation. Literature searches were conducted using scientific databases such as Scopus, Web of Science, and Google Scholar, with combinations of keywords including "cognitive mapping," "mental models," "participatory decision-making," "group cognition," and "collaborative planning." Once gathered, literature was selected based on criteria of relevance, depth of analysis, and originality of contribution. The analysis phase began with a thorough and repeated reading of all materials. The researcher then coded text segments containing information related to the functional mechanisms or impact contributions of cognitive mapping. These codes were grouped and revised iteratively to form coherent initial themes. These themes were subsequently organized and refined to form a robust analytical narrative, which directly addresses the formulated research questions.

RESULT AND DISCUSSION

The Role of Cognitive Mapping as a Mechanism for Extracting and Aligning Tacit Knowledge

In the modern knowledge approach, cognitive mapping is an essential management mechanism. Cognitive mapping functions as a mechanism for extracting tacit knowledge through a structured process of visualization and externalization. Tacit knowledge, as discussed in various literature, is personal, difficult to formalize, and embedded in individual experiences and actions. In participatory decision-making, this knowledge is often both a source of valuable insights and a cause of misunderstanding. Cognitive mapping is chosen because it is better suited for handling causal ambiguity and is more likely to create a more complete understanding of systems, ultimately for selecting and planning quality improvement initiatives (Ladinig & Vastag, 2021). Cognitive mapping techniques, such as creating concept maps or causal diagrams, compel individuals to translate their internal understanding into an external representational form consisting of nodes and

relationships. The map-making process is not a passive activity; it is an active cognitive effort that requires one to identify key elements of their thinking, name concepts that may be vague, and explicitly determine how those concepts relate to one another. Thus, the primary function of cognitive mapping is as a catalyst for articulation, where previously hidden and unspoken knowledge is brought to the surface and given a form that can be seen and discussed. This description reaffirms the initial role of cognitive mapping in opening access to dimensions of hidden knowledge and serving as an essential instrument in realizing the sustainability of public policy that balances economic, social, and environmental aspects on a macro scale (Mardikaningsih & Hariani, 2021).

The extraction of tacit knowledge is significantly strengthened by the visual nature of cognitive maps, which leverage the human brain's capacity to process graphic data holistically and parallelly, unlike linear verbal processing. When participants see their thoughts diagrammed, they gain a metacognitive perspective acting as a cognitive mirror to refine internal logic and expose unsupported assumptions while collective visualization contrasts diverse minds to enrich the extraction of implicit, personal knowledge layers (Lucina & Popadiuk, 2020). This individual and group reflection deeply influences the dynamics between social factors and well-being (Warin, 2021), as well as personal quality of life (Binti Ismail, 2021). Following this individual stage, the alignment phase utilizes fuzzy graph structures to describe causal arguments for effective problem-solving (Ahmadi et al., 2020), creating a shared framework and common language to translate tacit knowledge into explicit concepts through dialogue (Nonaka & Toyama, 2015; Nonaka & von Krogh, 2009). By displaying differing maps simultaneously, participants shift comparisons from final solutions to underlying relational logic, enabling them to locate structural convergence and localize divergence (Crossan et al., 2011), which systematically manages differences while strengthening effective leadership in public governance (Rojak, 2021).

Group interaction presents a space for the formation of shared meaning. This alignment process often involves the negotiation of meaning and the construction of collective maps. Facilitators can guide groups to combine elements from various individual maps into a single, larger, and more complex group map. In this construction, conflicting elements are not immediately eliminated but can be positioned as competing alternatives or hypotheses within the map. The collective map becomes a shared model representing the spectrum of understanding within the group, complete with areas of agreement and uncertainty. This alignment function is powerful because it shifts group dynamics from positional debate toward exploration and collaborative modeling. Participants no longer debate to win their points of view but work together to build the most accurate and comprehensive representation of the problem being faced, which inherently requires and encourages the alignment of perceptions. This situation creates a more stable collective working foundation that is trusted to navigate social mobility through the reintegration of former criminal offenders into society (Suwito et al., 2022) as well as to maintain the integrity of local indigenous traditions amidst the pace of urbanization (Amri & Khayru, 2022).

This approach also opens access to deeper thought structures. Furthermore, cognitive mapping functions as a tool to uncover and integrate layered and hierarchical perspectives. Tacit knowledge is often organized in different levels of abstraction, from very fundamental core values to specific operational beliefs. The mapping process allows groups to trace the logical chains from a concrete recommendation back to the values or goals that underpin it. This tracking function is crucial for profound alignment. Two participants might support the same policy based on very different values; conversely, they might oppose the same policy because they predict different consequences. By mapping the relationships from values to actions, groups can align themselves at a higher principle level or identify exactly where predictive differences need to be tested with data. This shifts discussion from subjective preferences to the evaluation of more objective causal-effect claims. This tracing clarifies the conceptual foundations of every position as a form of legal adaptation in responding to the currents of globalization and urbanization in contemporary society (Rizky et al., 2022) without compromising ethical principles and professional integrity in justice advocacy (Saktiawan et al., 2021).

Stability of meaning becomes a primary requirement in complex discussions. Cognitive mapping also serves to stabilize communication within complex groups. In rapid verbal discussions, key terms can be used with shifting meanings, leading to undetected confusion and misunderstanding. When these concepts are recorded as nodes in a map, their operational definitions can be clarified and locked. The map becomes a shared artifact that acts as a permanent record and a common reference throughout the process. This stabilization function prevents circular discussions on the same issues due to forgetfulness

or changes in meaning, ensuring that progress achieved in understanding is not lost. The map artifact becomes the focal point of the group, an external object that can be jointly referenced and modified, thereby reducing the cognitive load of remembering all points and relationships discussed, and focusing mental energy on synthesis and evaluation. Such terminological clarity maintains the continuity of collective understanding, which aligns with the dynamics of conformity in the formation of individual attitudes and behaviors when within a group (Özkaya, 2022), serving as an essential foundation for the stability of societal psychological perspectives (Darmawan et al., 2021).

The dynamic nature of this process marks the character of social learning. Finally, the function of cognitive mapping as a mechanism for extracting and aligning tacit knowledge is iterative and reflective. The process is not linear, moving directly from individual extraction to group synthesis. Instead, it involves cycles where individual maps are experimented with, compared within the group, and then revised by the individuals based on new insights gained from viewing others' maps. This cycle creates a dynamic of social learning where every participant not only contributes their knowledge but also revises their own cognitive maps through exposure to other perspectives. Fundamentally, these repeated interactions produce a significant adaptive learning effect in increasing learning capacity, both at the individual and collective levels (Kurniawan & Darmawan, 2021). Alignment occurs both at the level of the jointly constructed collective map and at the level of each participant's internal mental map. Thus, cognitive mapping does not merely align the output of discussions but potentially aligns the participants' frameworks of thought, resulting in a deeper and more sustainable convergence in understanding shared problems. These repeated patterns strengthen gradual changes in understanding.

A comprehensive overview is necessary to conclude the discussion conceptually. The entirety of these functions demonstrates that cognitive mapping is far more than an engaging recording technique. It is a cognitive intervention methodology specifically designed to address the core challenge of collaborative work, which is bridging the disparate subjective worlds of individuals. By systematically extracting tacit knowledge into an accessible form and subsequently utilizing that representation as a basis for structured alignment, cognitive mapping creates the necessary conditions for productive dialogue and consensus building derived from enriched shared understanding, rather than forced compromise. This assertion concludes the description of the strategic contributions of cognitive mapping in collaborative work.

The Contribution of Cognitive Mapping to the Quality of the Process and Outcomes of Participatory Decision-Making

This discussion begins with the dimension of process quality in participation. The first and most fundamental contribution to process quality is the enhancement of transparency and clarity of communication among participants. In conventional participatory processes, arguments and positions are presented verbally and sequentially, making it difficult to track relationships between ideas and recall all points previously made. Given the implicit nature of high-level thought, cognitive mapping (e.g., concept maps, reasoning maps) has been used to express thoughts explicitly (Chen et al., 2021). Cognitive mapping transforms this dynamic by creating a simultaneous and structured visual representation of the discourse. Each proposal, concern, objective, or assumption is placed as a node in a map, and the logical relationships between them are depicted with lines and arrows. This visualization allows all participants to see the "big picture" as well as the details within a single field of view. This reduces misunderstandings because every concept can be visually referenced and its definition clarified immediately alongside it. Communication becomes more focused and directed, as discussions can specifically point to certain map elements, whether to question the validity of a relationship, add new concepts, or propose structural modifications. This transparency builds trust in the process, as participants can see that their views have been correctly recorded and placed within a broader context. This exposition confirms the significance of the visibility of conversation structures.

The focus next moves toward the breadth of issue exploration. The second contribution is the deepening and broadening of the discussion's scope. Without a mapping structure, group discussions often fixate on well-known solutions or revolve around superficial issues. Cognitive mapping encourages groups to explore problems more systematically by questioning and mapping deeper layers. The group is encouraged to identify not just symptoms or solutions, but also root causes, long-term goals, underlying values, and the unintended consequences of various choices. The map-making process naturally raises questions such as "What causes this?" or "What is the ultimate goal of that

action?" which direct the discussion to a higher analytical level. The map serves as a continuously evolving exploration chart, where unmapped areas (collective ignorance) become visible and can be set as an agenda for information gathering or further discussion. Thus, the decision-making process becomes more comprehensive and less prone to piecemeal solutions. This description shows the expansion of the group's field of attention, which is essential to understanding the complex dynamics of the relationship between social factors and individual well-being both from mental and physical health aspects within a group scope (Warin, 2021).

The dimension of collective learning then surfaces. The third contribution to the process is the facilitation of social learning and perspective shifting at both the individual and group levels. When participants see another person's cognitive map displayed alongside their own, they are exposed to different ways of thinking. This is not merely hearing different opinions, but truly seeing the logic structure behind those opinions. This visual exposure is highly potent for challenging one's own assumptions and cultivating cognitive empathy. A participant might realize that even if their conclusions are opposite, they share the same goal as their interlocutor, or that the other party's argument has internal consistency they had not previously considered. The joint process of building a collective map is also a form of active learning, where participants cooperatively construct new understandings that transcend the initial understanding of each individual. This visual working model provides a highly significant adaptive learning effect in accelerating learning capacity, both personally and collectively (Kurniawan & Darmawan, 2021). The group collectively learns about the complexity of the problem and the interdependence between factors, often resulting in a higher level of shared awareness and a deeper commitment to the process. This section reveals the transformation of the participants' perspectives.

Attention then turns to the dynamics of tension within groups. The fourth contribution is more constructive conflict management. Tacit knowledge, as an inseparable part of individuals in every organization, encompasses all types of organizational conflict related to knowledge (Natek & Lesjak, 2021). In cognitive mapping, conflict is not suppressed or avoided, but diverted and reframed. Instead of conflict between individuals ("me versus you"), conflict is represented as a difference in map structures ("model A versus model B"). This objectification of conflict reduces the personal and emotional nature of disagreements. The group can then shift energy from persuasion and debate to analysis and testing. They can ask: "What evidence supports the causal relationship in this model?" or "What are the scenarios where model A would apply, and when is model B more appropriate?" This approach transforms conflict from a battle of positions into a joint thought experiment. The resulting collective map can elegantly accommodate these differences as alternative paths or areas of uncertainty, so that conflict is acknowledged and respected without having to halt the progress of the overall process. This contributes to a more inclusive process where minority voices are not drowned out but recorded as part of the structure of shared understanding. Thus, this explanation shows a change in the form of conflict expression and opens opportunities for the integration of multicultural perspectives in policy conflict management (Hariani & Halizah, 2024), which is vital for the effectiveness of team-work harmonization strategies (Al-Hakim & Irfan, 2024).

Group work effectiveness also receives special attention. The fifth contribution is the enhancement of group process efficiency by reducing redundancy and focusing energy. In unstructured meetings, the same points are often repeated by different participants or at different times because there is no living visual record. Cognitive mapping, as a central artifact that is continuously updated, functions as an external group memory. Once a concept or relationship is mapped, the group can easily refer back to it without needing to re-explain from the beginning. This saves cognitive time and allows the group to build understanding cumulatively. Moreover, the mapping process helps identify and isolate actual points of disagreement, so that valuable discussion time is not wasted on debates in areas where there is actually implicit consensus. This efficiency contributes to a more satisfying process experience for participants, as they feel time is used productively and progress is clearly visible in the map's development. This account emphasizes the saving of cognitive resources and the fulfillment of individual psychological comfort within group dynamics for the sake of collective well-being (Binti Ismail, 2021), especially when navigating the conformity of attitudes and social behaviors of its members (Özkaya, 2022).

The discussion now shifts to the quality of decision outcomes. Turning to the contribution to outcome quality, the first is the enhancement of completeness and robustness of the decisions produced. Decisions born from the mapping process tend to be based on a more thorough understanding of the problem. Because various perspectives, causal factors, and potential consequences have been mapped and considered, the final decision is less

likely to overlook important aspects of the problem. The collective map functions as a supporting document that demonstrates the logic flow connecting evidence, analysis, values, and final choices. Decisions do not appear as something that stands alone, but as the conclusion of a visible network of arguments. This results in more robust decisions because they have passed the test of various viewpoints and have integrated the situation's complexity into their reasoning framework, thus becoming better prepared to face future questions and criticisms. This exposition confirms the resilience of decisions formed, which are comprehensively supported by the distribution of excellence factors that enhance organizational effectiveness at the macro level (Darmawan, 2024).

The aspect of social acceptance of decisions also becomes a concern. The second contribution to the outcome is the enhancement of legitimacy and decision acceptance. Legitimacy in participatory decision-making does not only stem from the result, but from the perception that the process is fair and inclusive. Cognitive mapping enhances procedural legitimacy by providing equal opportunities for all participants to contribute elements to the map and challenge the relationships within it. Every participant can see their contribution recorded visually, thus feeling heard and valued. More importantly, when the final decision is made, participants can trace it back to the collective map. They understand how that decision relates to previous discussions, what compromises were made, and why other choices were not taken. This transparency of thought flow enhances acceptance even among those who might not fully agree with the final result, as they understand the underlying reasoning process and feel that their viewpoints were seriously considered. This acceptance is crucial for implementation success. This section shows the strengthening of the collective acceptance foundation, which is crucial in shaping public opinion and safeguarding a healthy democratic climate in the global era (Khayru et al., 2024).

The next concern touches upon the sustainability of actions. The third contribution of the cognitive mapping approach in decision-making is the strengthening of implementation capacity and adaptive learning. The resulting collective cognitive map does not end when a decision is made, but transforms into a living document that can be used to guide implementation and monitoring (Bryson et al., 2014). It functions as a shared theory of change that explicitly states causal assumptions about how a series of actions is expected to produce results, thereby providing strategic clarity (Funnell & Rogers, 2011). During implementation, the team can refer back to the map to test whether the causal-effect assumptions they believed in prove true in the real world. If the expected results are not achieved, the map allows for smarter and more structured evaluation: did the failure occur due to poor execution, or because the causal-effect relationship in the shared mental model was flawed (Keathley-Herring et al., 2016)? This ability to perform adaptive learning and evidence-based path correction (pivoting) is an important contribution to long-term outcomes and organizational capacity building. Thus, a decision is not a static endpoint, but part of a sustainable management cycle, and cognitive mapping provides a dynamic framework for that cycle of learning and adaptation. Through this approach, the continuity of reflection in action is emphasized.

The long-term value of process outcomes also receives affirmation. The fourth contribution is the creation of shared knowledge artifacts that can be reused. The direct result of the participatory process using cognitive mapping is not only a decision, but also a map. This knowledge artifact possesses enduring value. It can be used to orient new members regarding the complexity of the problem and the group's history of thought. It can serve as a foundation for planning the next stage or for addressing related problems in the future. In organizations, the accumulation of such maps forms a library of organizational knowledge concerning the complex problems it has faced, thereby avoiding the repetition of work from scratch and enabling learning across time and projects. Thus, the contribution to outcomes extends beyond a single decision to enhance the collective intellectual capacity of the group or organization. Through cognitive mapping, a sustainable utility emerges that enriches the landscape of psychological perspectives in contemporary society (Darmawan et al., 2021).

The dimension of innovation also appears in the discussion of results. The fifth contribution is the enhancement of creativity and innovation in solutions. The mapping process, which encourages the exploration of unusual relationships and the combination of different perspectives, can give rise to insights and new options that would not be considered in linear discussions. As the map develops, participants may see connections between factors previously considered separate, or identify new leverage points for intervention. Synthesizing elements from different maps can produce innovative hybrid approaches. The visual space of the map itself encourages divergent thinking, as

participants mentally explore various paths and possibilities within the structure they have built. The resulting decisions, therefore, have a greater chance of being innovative and well-targeted, as they are born from deep systemic understanding and the creative blending of various viewpoints, rather than from choosing among pre-existing standard options. This section demonstrates the breadth of possible solutions, even when mapping efforts to navigate social mobility for marginalized groups or the social reintegration of former criminal offenders into the community order (Suwito et al., 2022).

The relational aspect of the group concludes the series of contributions. The final contribution is the development of social capital and group cohesion. The intensive collaborative process of building a shared map creates a powerful common experience. Participants do not just reach a conclusion; they traverse an intellectual journey together. This experience builds mutual understanding, respect for differing expertise, and confidence in the group's ability to overcome complex problems. This condition is highly valuable in maintaining the harmony of local indigenous traditions amidst the onslaught of urban modernity (Amri & Khayru, 2022). This increase in social capital is a highly valuable outcome, as it enhances the possibility of successful future collaboration. Groups become more resilient, better able to handle disagreements, and more compact in executing decisions they have made together. This cohesion serves as a foundation for sustainable participatory governance, where decisions are not viewed as belonging to leaders, but as collective property built by the community of stakeholders involved. Thus, collective bonds can be increasingly strengthened through normative social mechanisms to minimize the potential for social conflict in pluralistic societies (Sulistyo & Hartanto, 2023).

In conclusion, the entire exposition should be understood in its complexity. All of these contributions, both toward the process and the outcomes, are interrelated and mutually reinforcing. Improvements in the quality of communication and learning during the process directly lead to more legitimate and robust decisions. Constructive conflict management enhances social capital, which in turn supports implementation. The knowledge artifacts generated become the foundation for future efficiency and creativity. Thus, the application of cognitive mapping does not offer a piecemeal fix, but rather transforms the entire ecology of participatory decision-making, rendering it a practice that is more reflective, inclusive, and, ultimately, more empowered to generate sustainable and collectively supported solutions for complex problems. This summary concludes the discussion on the holistic impact of the approach.

CONCLUSION

This literature study concludes that cognitive mapping serves as a powerful and multi-functional intervention methodology in the context of participatory decision-making. Through systematic analysis, this study identifies two primary groups of contributions. First, as a mechanism for the extraction and alignment of tacit knowledge, cognitive mapping operates by externalizing individual thought structures through visualization, facilitating the negotiation of meaning, uncovering hierarchies of values and beliefs, stabilizing communication, and fostering iterative social learning cycles. Second, regarding contributions to the quality of processes and outcomes, cognitive mapping significantly enhances the transparency and depth of discussions, facilitates learning and perspective-shifting, manages conflict constructively, and improves process efficiency. At the outcome level, this methodology produces more complete and robust decisions, enhances legitimacy and acceptance, strengthens implementation capacity and adaptive learning, creates reusable knowledge artifacts, fosters innovative solutions, and builds social capital and group cohesion. This synthesis demonstrates that cognitive mapping is not merely a recording tool, but an approach that transforms group dynamics and the quality of collective decision outcomes.

The theoretical implication of this study is the reinforcement of the conceptual framework that connects individual cognition theory with group collaboration practice. These findings support and extend the view that the quality of collective outcomes depends heavily on the ability to make internal cognitive processes external, structured, and negotiable. The implication requires participatory decision-making models to explicitly incorporate the dimensions of representation and mental model negotiation as critical variables. From the perspective of applied sciences such as management, public policy, and planning, the practical implications are significant. This study provides a strong justification for facilitators, project managers, and leaders to allocate time and resources to apply cognitive mapping techniques in complex participatory processes. It suggests that investment in the collaborative understanding and mapping phase of a problem is not a waste, but a necessary foundation for efficiency, effectiveness, and the sustainability of

subsequent decision-making stages. Furthermore, an ethical implication arises: the use of methods that increase transparency and inclusivity can become a new standard for responsible participatory practice.

Based on the study's findings, suggestions for future research include developing and testing specific operational models on how different stages and variations of cognitive mapping techniques influence each of the identified contributions. Quantitative and qualitative empirical research is needed to measure the magnitude of the impact on communication, learning, or legitimacy improvements in real-world settings. Research can also compare the effectiveness of cognitive mapping with other participatory methods or explore moderator factors such as group size, diversity of participant backgrounds, and technological software support. For practitioners, it is recommended to start integrating cognitive mapping principles into the design of participatory processes, beginning with problems that are complex yet relatively controlled. Facilitator training needs to include skills in guiding the creation of individual and collective cognitive maps. Additionally, it is important to develop and disseminate accessible templates and visual aids to support the application of this method across various sectors. Finally, the documentation and sharing of cognitive map artifacts generated from various projects need to be encouraged to build a body of practical knowledge that can inspire and inform wider applications in the future.

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