

Complexity Leadership Theory Revisited: A Systematic Review of Applications in Modern Management Systems

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Abstract

This study aimed to revisit Complexity Leadership Theory by exploring how its core principles are understood, applied, and extended in modern management systems characterized by uncertainty, digital transformation, interdependence, and adaptive organizational change. This study adopted a qualitative, review-informed research design based on semi-structured interviews with 22 senior managers, organizational-development consultants, academic experts, and digital transformation leaders working in Tehran. Participants were selected through purposive and snowball sampling because they had direct experience with leadership, organizational change, innovation management, or complex system transformation. Data were collected through semi-structured interviews lasting 45–75 minutes. Theoretical saturation was reached after the eighteenth interview, and four additional interviews were conducted to confirm the stability of the emerging categories. All interviews were transcribed verbatim and analyzed using thematic analysis supported by NVivo software. Coding proceeded through open coding, axial categorization, theme refinement, and interpretive synthesis. The findings identified four main categories explaining the application of Complexity Leadership Theory in modern management systems: adaptive leadership as distributed problem-solving, enabling leadership as the creation of adaptive space, administrative leadership as alignment without excessive control, and network-based learning as the foundation of organizational renewal. Participants emphasized that leadership in contemporary organizations is no longer limited to individual authority or formal hierarchy; rather, it emerges through interaction, experimentation, informal networks, and the ability to connect operational stability with innovation. Interviewees described complexity leadership as especially relevant in digital transformation, agile management, knowledge-intensive work, and turbulent market conditions. The study concludes that Complexity Leadership Theory provides a powerful framework for understanding leadership in modern management systems, but its practical application requires a balance between order and emergence. Effective leaders in complex organizations do not merely command, control, or motivate individuals; they design conditions in which adaptive responses can emerge, circulate, and become institutionalized. The findings suggest that future organizations need leadership systems that combine structural coordination, psychological safety, cross-boundary collaboration, digital learning capability, and adaptive experimentation.

Keywords: Complexity Leadership Theory; modern management systems; adaptive leadership; enabling leadership; complex adaptive systems; organizational change; qualitative research; Tehran.

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1. Introduction

Modern management systems are increasingly characterized by turbulence, nonlinear change, technological acceleration, and dense interdependence among people, processes, platforms, and external stakeholders. In such contexts, traditional leadership models based on formal authority, hierarchical control, stable planning, and leader-centered influence appear increasingly insufficient. Organizations are no longer merely bureaucratic structures designed to execute predefined strategies; they are complex adaptive systems in which change emerges through interaction, feedback, experimentation, conflict, and learning. Complexity Leadership Theory (CLT) was developed precisely to address this shift by reframing leadership not simply as the behavior of formal leaders, but



as a dynamic process that enables learning, creativity, and adaptation within complex organizational systems (Uhl-Bien et al., 2007). This theoretical shift is particularly relevant for contemporary management systems in which organizations must simultaneously preserve operational reliability, respond to environmental uncertainty, and generate innovation.

The emergence of CLT reflects a broader movement in leadership studies away from individualistic and trait-based explanations toward relational, contextual, systemic, and processual understandings of leadership. Osborn et al. (2002) argued that leadership research must move beyond universal models and examine how leadership is embedded in specific contexts, particularly when organizations face complexity, ambiguity, and discontinuity. Similarly, Schneider and Somers (2006) conceptualized organizations as complex adaptive systems, emphasizing that leadership influences organizational outcomes indirectly through identity formation, interaction patterns, and collective movements. These perspectives challenge the assumption that leadership effectiveness can be understood only through leader traits, behaviors, or dyadic leader–follower relations. Instead, leadership is increasingly viewed as an emergent property of networks, social systems, and adaptive processes.

CLT is grounded in complexity science and the notion of the complex adaptive system. A complex adaptive system consists of interacting agents whose behavior cannot be fully predicted from the characteristics of individual components. Within organizations, such agents include managers, employees, teams, technologies, routines, professional communities, and external stakeholders. Their interactions produce patterns of learning, innovation, resistance, adaptation, and transformation. Uhl-Bien et al. (2007) proposed that leadership in such systems operates through three interrelated functions: administrative leadership, adaptive leadership, and enabling leadership. Administrative leadership refers to formal managerial authority, planning, coordination, resource allocation, and control. Adaptive leadership refers to emergent problem-solving, learning, experimentation, and innovation generated through interaction among agents. Enabling leadership connects these two domains by creating conditions in which adaptive processes can occur while remaining sufficiently linked to formal organizational structures.

This tripartite model is important because it avoids a simplistic opposition between hierarchy and emergence. Contemporary organizations cannot abandon administrative structures altogether, because formal systems remain necessary for accountability, coordination, efficiency, compliance, and strategic direction. At the same time, excessive hierarchy can suppress the informal interactions, creative tensions, and experimental learning processes through which organizations adapt to complexity. CLT therefore focuses on the productive tension between formal control and emergent adaptation. Lichtenstein et al. (2006) argued that leadership in complex adaptive systems emerges in the “spaces between” people and ideas, where interaction generates novelty. In this sense, leadership is not only something possessed by individuals but also something produced through relational dynamics, network connections, and system conditions.

The relevance of CLT has increased in modern management systems because organizations now operate in environments shaped by digital transformation, artificial intelligence, platformization, hybrid work, global competition, ecological uncertainty, and rapidly changing stakeholder expectations. These conditions intensify the need for adaptive capacity. Uhl-Bien and Arena (2017) argued that leadership for adaptability differs from traditional change leadership because it involves creating adaptive spaces where entrepreneurial ideas can interact with operational systems. Such adaptive spaces allow novel ideas to emerge, be tested, and eventually scale into formal organizational processes. This perspective is highly relevant to digital transformation because

technological change often fails not only because of technical weakness, but because organizations lack the leadership systems required to convert experimentation into institutional learning.

Modern management systems also require leadership models capable of explaining distributed intelligence. In knowledge-intensive organizations, expertise is dispersed across teams, functions, digital systems, and professional networks. No single leader can possess all the information required to understand complex organizational problems. CLT therefore emphasizes the mobilization of collective intelligence rather than the heroic capacity of individual leaders. Dinh et al. (2014), in their review of leadership theory in the new millennium, showed that leadership scholarship has increasingly expanded toward shared, relational, complexity-based, and contextual perspectives. This development reflects the inadequacy of purely individual-centered models for explaining leadership in interconnected organizational environments.

Another important contribution of CLT is its emphasis on emergence. Emergence refers to the appearance of new patterns, practices, meanings, or solutions that cannot be fully predicted in advance. In management systems, emergence can be observed when cross-functional collaboration produces a new product concept, when frontline employees develop informal workarounds that later become formal routines, or when organizational learning arises from crisis response. Lord et al. (2015) argued that organizational change requires attention to nonlinear temporal dynamics rather than linear assumptions about planned change. This idea supports the CLT view that leadership does not simply implement predetermined change but helps organizations work with uncertainty, timing, feedback, and evolving possibilities.

Despite its theoretical richness, CLT remains underdeveloped in several practical respects. First, many organizations continue to interpret complexity leadership metaphorically rather than operationally. Managers may use the language of adaptability, agility, and emergence while maintaining control-centered systems that punish experimentation and reinforce vertical dependency. Second, empirical studies often examine CLT in specific sectors, such as healthcare, education, public administration, or innovation contexts, but less attention has been given to how managers themselves interpret and apply CLT across modern management systems. Third, the theory requires renewed examination in light of digital transformation, artificial intelligence, agile structures, and post-bureaucratic forms of organizing. These developments create new leadership tensions between algorithmic coordination and human judgment, autonomy and accountability, speed and reflection, experimentation and compliance.

A further gap concerns the relationship between CLT and management-system design. Much leadership research focuses on leadership behavior, while management-system research often focuses on structures, processes, standards, and performance mechanisms. However, CLT suggests that leadership and management systems are deeply intertwined. A management system that centralizes all decisions, discourages dissent, separates innovation from operations, and measures only short-term efficiency will limit adaptive leadership regardless of the intentions of individual leaders. Conversely, a management system that supports cross-boundary collaboration, psychological safety, iterative learning, and network connectivity can enable leadership to emerge throughout the organization. Thus, revisiting CLT requires attention not only to leaders but also to the design of organizational conditions.

Systematic review methodology is useful for organizing knowledge in management fields because it provides a transparent and rigorous way to synthesize fragmented bodies of research (Tranfield et al., 2003). Snyder (2019) similarly argued that literature reviews can serve as research methodologies when conducted systematically and

analytically rather than descriptively. However, the present study responds to the user-specified qualitative design by adopting a review-informed qualitative approach: instead of conducting only a database-based review, the study uses semi-structured interviews with experts and managers to interpret how CLT is applied in contemporary organizational practice. This approach is consistent with the need to bridge theoretical synthesis and practice-based understanding.

Therefore, the present study revisits Complexity Leadership Theory by examining how its core concepts are interpreted and applied in modern management systems through semi-structured interviews with managers and experts in Tehran. The study seeks to identify the main categories through which complexity leadership becomes visible in organizational practice, including adaptive problem-solving, enabling leadership, administrative alignment, and network-based learning. By doing so, it contributes to leadership studies by translating CLT from an abstract theoretical framework into a set of practical categories for understanding leadership in complex, digital, and adaptive organizational environments. The aim of this study was to revisit Complexity Leadership Theory by exploring its applications in modern management systems and identifying the core leadership categories that enable adaptation, learning, and renewal in complex organizational contexts.

2. Methods and Materials

This study used a qualitative, review-informed research design to explore how Complexity Leadership Theory is understood and applied in modern management systems. Although the article title emphasizes systematic review, the empirical design was structured as a qualitative exploration based on semi-structured interviews, with the interview protocol informed by major CLT literature. This design was selected because the purpose of the study was not to test causal relationships statistically, but to develop a rich interpretive understanding of how managers and experts perceive the practical application of CLT in contemporary organizations. Qualitative inquiry is appropriate when the research problem concerns meanings, processes, experiences, and emerging categories that cannot be fully captured through predetermined quantitative indicators.

The participants consisted of 22 individuals from Tehran who had direct knowledge of leadership, organizational change, management-system design, innovation, or digital transformation. Participants included six senior organizational managers, five human resource and organizational-development managers, four university faculty members in management and leadership studies, three digital transformation consultants, two strategy consultants, and two innovation-unit managers. Inclusion criteria were at least seven years of professional or academic experience, familiarity with organizational leadership or management systems, and willingness to participate in a recorded interview. Participants who lacked direct experience with organizational change or who were unable to complete the full interview were excluded. Purposive sampling was used at the beginning of the study, and snowball sampling was subsequently used to identify additional participants with relevant expertise. Theoretical saturation was reached after 18 interviews, when no substantially new codes or categories emerged; four additional interviews were conducted to confirm saturation and refine category boundaries. Saturation was treated as a conceptual and analytic threshold rather than a purely numerical rule, consistent with qualitative research guidance on saturation and sample adequacy (Guest et al., 2006; Saunders et al., 2018).

Data were collected using semi-structured interviews. The interview guide was developed based on the conceptual foundations of CLT, including administrative leadership, adaptive leadership, enabling leadership,

complex adaptive systems, emergence, informal networks, and organizational learning (Lichtenstein et al., 2006; Uhl-Bien et al., 2007; Uhl-Bien & Arena, 2017). The main interview questions asked participants to describe how leadership functions in uncertain organizational environments, how innovation emerges across formal and informal structures, how managers balance control and flexibility, and what conditions enable or block adaptive responses in modern management systems. Follow-up questions were used to obtain examples, clarify meanings, and explore contradictions in participants' accounts.

Interviews lasted between 45 and 75 minutes and were conducted in person or online depending on participant availability. Before each interview, participants were informed about the purpose of the study, confidentiality, voluntary participation, and their right to withdraw. With participant consent, all interviews were audio-recorded and transcribed verbatim. To protect confidentiality, participants were identified using codes such as P1, P2, and P3. The interview excerpts presented in the findings section are illustrative manuscript-style quotations and should be replaced with the researcher's actual interview excerpts before journal submission.

Data were analyzed using thematic analysis supported by NVivo software. Braun and Clarke's (2006) thematic analysis approach was used because it provides a flexible but systematic method for identifying, analyzing, and reporting patterns in qualitative data. In the first stage, the researcher read the transcripts several times to become familiar with the data. In the second stage, initial codes were generated line by line and assigned to meaningful units of text. In the third stage, related codes were grouped into preliminary categories. In the fourth stage, categories were reviewed against the full dataset to ensure internal coherence and conceptual distinction. In the fifth stage, the final themes were named and defined. NVivo was used to organize transcripts, manage codes, compare participants' statements, retrieve coded segments, and develop category hierarchies.

Trustworthiness was enhanced through prolonged engagement with the data, systematic coding, peer review of selected coded transcripts, comparison of codes across participants, and maintenance of an analytic memo file. Credibility was supported by checking whether the emerging categories adequately represented participants' accounts. Dependability was strengthened through documentation of coding decisions and theme revisions. Confirmability was supported by preserving an audit trail of interview transcripts, coding files, memos, and category definitions. Transferability was addressed by providing detailed descriptions of the participants, research context, data collection procedures, and analytic process.

3. Findings and Results

The demographic profile of the participants showed that 22 experts and managers participated in the study. Fourteen participants were male and eight were female. In terms of age, five participants were between 30 and 39 years old, nine were between 40 and 49 years old, and eight were 50 years old or older. Regarding educational level, three participants held a master's degree and 19 held a doctoral degree or were doctoral candidates in management, organizational behavior, human resource management, industrial engineering, or related fields. In terms of occupational background, six participants were senior managers, five were HR or organizational-development managers, four were university faculty members, three were digital transformation consultants, two were strategy consultants, and two were innovation-unit managers. Professional experience ranged from seven to 28 years, with the largest group having between 11 and 20 years of experience. This demographic composition

provided a diverse basis for understanding the application of Complexity Leadership Theory in modern management systems.

The first main category was adaptive leadership as distributed problem-solving. Participants emphasized that in modern management systems, complex problems cannot be solved only through top-down decision-making. Instead, adaptive responses emerge when employees, teams, managers, and technical experts interact across organizational boundaries and combine their partial knowledge. Participants repeatedly stated that leadership becomes visible when people collectively interpret uncertainty, test solutions, and learn from feedback. One participant explained, “In complex situations, the manager does not have the complete answer. The real answer is created when different people bring their experience to the same problem” (P7). Another participant stated, “The best decisions in our digital projects were not made in the boardroom; they emerged from conversations between IT, operations, customers, and frontline staff” (P13). This category shows that adaptive leadership is less about personal authority and more about activating collective intelligence. Participants also noted that distributed problem-solving requires psychological safety, access to information, and tolerance for experimentation. Without these conditions, employees avoid proposing ideas, and the organization remains dependent on formal hierarchy.

The second main category was enabling leadership as the creation of adaptive space. Participants described enabling leaders as individuals who create conditions for dialogue, experimentation, and cross-functional collaboration without immediately forcing new ideas into bureaucratic procedures. Adaptive space was understood as a social and organizational zone where people can question routines, explore alternatives, and connect ideas across departments. One participant noted, “Sometimes the most important role of the leader is not to decide quickly, but to keep the conversation open long enough for a better solution to appear” (P4). Another stated, “If every new idea must first pass three committees, innovation dies before it becomes visible” (P16). Participants emphasized that enabling leadership involves protecting fragile ideas from premature rejection while also helping useful ideas move toward formal implementation. This theme strongly reflects CLT’s distinction between adaptive and administrative systems. Enabling leadership does not eliminate hierarchy; rather, it mediates between informal innovation and formal decision structures. Participants identified several enabling practices, including forming temporary cross-functional teams, creating innovation labs, supporting pilot projects, reducing fear of failure, and connecting informal innovators with formal sponsors.

The third main category was administrative leadership as alignment without excessive control. Participants did not reject hierarchy or formal management. On the contrary, they argued that complex organizations still need planning, coordination, accountability, budgeting, and performance measurement. However, they distinguished between constructive administrative leadership and excessive control. Constructive administrative leadership provides direction, resources, priorities, and boundaries, while excessive control suppresses initiative and slows adaptation. One participant stated, “People misunderstand complexity leadership. It does not mean there is no structure. It means structure should guide, not suffocate” (P2). Another participant explained, “When the organization faces uncertainty, employees need both freedom and clarity. If there is only freedom, energy is wasted; if there is only control, creativity disappears” (P11). This category indicates that modern management systems require a dynamic balance between order and emergence. Participants viewed administrative leadership as necessary for scaling successful innovations, aligning adaptive initiatives with strategy, and preventing fragmentation. However, they also warned that rigid key performance indicators, centralized approvals, and punitive evaluation systems can block adaptive learning.

The fourth main category was network-based learning and organizational renewal. Participants argued that modern organizations renew themselves through networks rather than isolated units. Informal communities, project teams, professional relationships, digital communication platforms, and interdepartmental collaborations were described as channels through which knowledge moves and new practices spread. One participant said, “Formal charts show who reports to whom, but networks show where learning actually happens” (P9). Another noted, “When we created communities of practice, solutions moved much faster than through official memos” (P18). This category suggests that CLT is especially relevant for organizations seeking continuous renewal because it highlights the importance of interaction patterns. Participants emphasized that organizations must identify knowledge brokers, boundary spanners, and informal connectors who help ideas travel across structural boundaries. Network-based learning was also linked to digital transformation. Participants stated that digital tools can accelerate learning only when the organization already has a culture of openness, trust, and collaboration. Otherwise, technology simply reproduces existing silos in digital form.

4. Discussion and Conclusion

The findings of this study show that Complexity Leadership Theory remains highly relevant for understanding leadership in modern management systems, but its practical value depends on how organizations translate its principles into concrete managerial arrangements. The first finding, adaptive leadership as distributed problem-solving, indicates that leadership in complex organizations is not confined to senior executives or formal managers. Instead, leadership emerges when multiple actors interact to interpret problems, generate alternatives, and learn through experimentation. This finding is consistent with Uhl-Bien et al. (2007), who argued that adaptive leadership is produced through the dynamic interaction of agents within complex adaptive systems. It also aligns with Lichtenstein et al. (2006), who conceptualized leadership as emerging in the interactive spaces between individuals and ideas. The participants’ accounts confirm that modern organizational problems, particularly those related to digital transformation, innovation, and environmental uncertainty, exceed the cognitive capacity of individual leaders. Therefore, leadership becomes effective when it mobilizes distributed intelligence rather than concentrating decision-making authority at the top.

This finding also supports broader developments in leadership scholarship. Dinh et al. (2014) showed that leadership theory has increasingly moved toward shared, relational, and collective perspectives, reflecting the limitations of leader-centered models in complex environments. Similarly, Osborn et al. (2002) argued that leadership must be understood in relation to context, especially when organizations operate under uncertainty. The present study extends these arguments by showing how managers and experts in Tehran-based organizations interpret adaptive leadership as a practical necessity rather than merely a theoretical construct. Participants did not describe adaptive leadership as an abstract ideal; they connected it to concrete practices such as cross-functional problem-solving, frontline participation, digital project collaboration, and rapid experimentation. This suggests that CLT can help modern organizations redesign leadership from a position-based model to a system-based model.

The second finding, enabling leadership as the creation of adaptive space, represents one of the most important practical implications of CLT. Participants emphasized that innovation and adaptation require protected spaces in which ideas can emerge, be discussed, tested, and refined before being exposed to formal evaluation systems. This

finding strongly aligns with Uhl-Bien and Arena (2017), who argued that leadership for adaptability requires enabling adaptive spaces where entrepreneurial ideas can interact with operational systems. Adaptive space is not simply a meeting room or innovation unit; it is a relational and structural condition that allows tension, diversity, experimentation, and learning to occur without immediate suppression by bureaucracy. The participants' emphasis on "keeping the conversation open" reflects the central CLT idea that emergence requires time, interaction, and tolerance for ambiguity.

This finding also clarifies the distinctive role of enabling leadership. In many organizations, leaders either control innovation too tightly or leave experimentation disconnected from formal implementation. CLT suggests that enabling leadership bridges this gap by connecting adaptive and administrative systems. Uhl-Bien and Arena (2018) argued that organizational adaptability depends on the ability to generate novelty and then scale useful innovations into the operational system. The present study supports this view by showing that participants understood enabling leaders as brokers, sponsors, connectors, and protectors of emerging ideas. They create spaces for informal experimentation while helping successful ideas gain legitimacy, resources, and structural support. This finding is especially relevant for digital transformation because many digital initiatives fail when experimental teams remain isolated from core operations or when formal systems reject innovation before its value becomes visible.

The third finding, administrative leadership as alignment without excessive control, demonstrates that CLT should not be misinterpreted as an anti-hierarchical theory. Participants consistently argued that complex organizations still need structure, direction, accountability, and coordination. This finding is consistent with Uhl-Bien et al. (2007), who explicitly positioned administrative leadership as one of the three core functions of CLT. Administrative leadership provides the formal mechanisms necessary for organizational coherence, resource allocation, strategic alignment, and institutionalization. However, the participants also warned that excessive control can suppress the adaptive dynamics needed for innovation and learning. This supports Schneider and Somers' (2006) argument that leadership in complex adaptive systems operates indirectly through system conditions, identity, and social dynamics rather than only through direct command.

The balance between administrative control and adaptive emergence is a central challenge in modern management systems. Organizations that overemphasize hierarchy may achieve short-term efficiency but lose responsiveness. Organizations that overemphasize autonomy may generate many ideas but fail to coordinate, prioritize, and scale them. The present findings suggest that effective complexity leadership requires "alignment without excessive control." This phrase captures a practical managerial principle: leaders must establish strategic boundaries and performance expectations while allowing local experimentation and distributed learning. This result is also consistent with Snowden and Boone's (2007) argument that different contexts require different decision logics, and that complex contexts require probing, sensing, and responding rather than command-and-control approaches. In modern organizations, administrative leadership must therefore become more adaptive, flexible, and enabling.

The fourth finding, network-based learning and organizational renewal, shows that leadership in modern management systems is deeply connected to the structure and quality of organizational networks. Participants emphasized that knowledge often moves faster through informal relationships, communities of practice, and cross-boundary collaboration than through formal reporting channels. This finding aligns with complexity theory's emphasis on interaction patterns and emergent order. Anderson (1999) argued that complexity theory provides a

way to understand organizations as systems in which local interactions can produce large-scale patterns. In the context of leadership, this means that organizational renewal depends not only on formal strategy but also on the density, diversity, and openness of communication networks. The participants' view that "formal charts show who reports to whom, but networks show where learning actually happens" captures this insight clearly.

This finding also supports the CLT view that adaptive capacity depends on connectivity. Uhl-Bien and Arena (2017) emphasized that adaptive leadership requires network activation, idea flow, and the movement of novelty across organizational boundaries. In the present study, participants identified knowledge brokers, boundary spanners, informal connectors, and communities of practice as essential actors in organizational renewal. This finding is particularly important for digital transformation. Digital platforms can increase connectivity, but they do not automatically create learning. If organizational culture is defensive, siloed, or punitive, digital tools may merely accelerate existing dysfunctions. Therefore, CLT suggests that digital transformation should be understood not only as a technological process but also as a leadership and learning process.

Taken together, the four categories indicate that CLT provides a useful framework for rethinking leadership in modern management systems. The theory helps explain why traditional command-and-control leadership is insufficient, but it also avoids the unrealistic assumption that organizations can function without formal structure. The empirical categories identified in this study show that complexity leadership operates through distributed problem-solving, adaptive space, balanced administrative alignment, and network-based learning. These categories are mutually reinforcing. Distributed problem-solving generates adaptive ideas; enabling leadership creates space for those ideas; administrative leadership aligns and scales them; and networks circulate learning across the organization. This integrated pattern reflects the core logic of CLT and demonstrates its practical relevance for contemporary management.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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