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Agent-based modeling and the emergence of leadership in new teams: optimizing decision making from an ethical leadership perspective

Modelado basado en agentes y el surgimiento del liderazgo en equipos nuevos: optimización de la toma de decisiones desde el enfoque del liderazgo ético

Edelia Guillermina Núñez Barahona[1]

ABSTRACT

Introduction: this article explored how NetLogo algorithms simulate the emergence of leadership in newly formed teams, analyzing both the "public perception" and "identity" of the leader and follower.

Methodology: a probabilistic approach was used to determine whether an individual assumes leadership or concedes it, based on variables such as their self-assessment of their role and others' perceptions of their capabilities. Using an Agent-Based Model (ABM), the dynamics of ethical leadership (EL) and interactions between agents were investigated, providing a theoretical and practical framework for improving decision-making (DM) in changing organizational environments.

Results: the findings demonstrated synergies between ABM and leadership development in teams. In homogeneous environments, leaders emerged slowly, in a distributed manner, and fostered collaboration. In contrast, in hierarchical environments, leaders emerged rapidly, favoring short-term efficiency.

Conclusions: the study suggest that disruptive situations can severely affect the stability of the current leader. However, this also created an opportunity for new leaders to emerge, thus promoting group resilience. On the other hand, it is noted that a lack of ethics in leadership can generate disappointment and mistrust, affecting organizational cohesion and performance.

Keywords: prosocial behavior, organizational dynamics, organizational resilience, computer simulation, complex systems.

RESUMEN

Introducción: este artículo exploró cómo los algoritmos de NetLogo simulan el surgimiento del liderazgo en equipos recién formados, analizando tanto la "percepción pública" e "identidad" de líder y seguidor.

Metodología: con un enfoque probabilístico que determinó si un individuo asume el liderazgo o lo concedió, basado en variables como la autoevaluación de su rol y la percepción de sus capacidades por parte de otros. A través de un Modelo Basado en Agentes (MBA), se investigó la dinámica del liderazgo ético (LE) y las interacciones entre agentes, proporcionando un marco teórico y práctico para mejorar la toma de decisiones (TD) en entornos organizacionales cambiantes.

Resultados: los hallazgos evidenciaron sinergias entre el MBA y la formación del liderazgo en equipos. En entornos homogéneos, los líderes emergieron lentamente, de manera distribuida, y fomentaron la colaboración. En cambio, en entornos jerárquicos, los líderes emergieron rápidamente, favoreciendo la eficiencia a corto plazo.

Conclusiones: el estudio sugiere que las situaciones disruptivas pueden afectar gravemente la estabilidad del líder actual. Sin embargo, esto también generó oportunidad de que emergieran nuevos líderes, promoviéndose así la resiliencia grupal. Por otro lado, se advierte que la falta de ética en el liderazgo puede generar decepción y desconfianza, afectando la cohesión y el desempeño organizacional.

Palabras clave: comportamiento prosocial, dinámica organizacional, resiliencia organizacional, simulación por computadora, sistemas complejos.

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[1]Universidad Nacional Autónoma de Honduras. Tegucigalpa, Honduras.

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INTRODUCTION

Leaders are sources of inspiration and motivation, and they induce change (Lisá et al., 2023). At the same time,

leadership is defined as an artistic and scientific profession that emphasizes connections in the workplace and organizations (Coffie et al., 2023). In this way, leadership is an act of directing, encouraging, and assigning individual or group responsibilities to achieve objectives (Pattali et al., 2024).

In this sense, different approaches to leadership can be identified in the literature; these are styles or forms of behavior, each with its own characteristics, practices, and effects on employee performance and well-being (Meirinhos et al., 2023; Almonawer et al., 2023). Each style has favorable and unfavorable traits, so managers use different styles to achieve change, be globally competitive, achieve organizational goals, and motivate (Pattali et al., 2024).

In particular, ethical leadership deals with values and actions that conform to ethical standards with implications for job performance (Nguyen et al., 2021). In other words, ethical leaders are honest and trustworthy, distinguish themselves by emphasizing ethical standards in their behavior, and promote morality throughout organizational management (Decuypere & Schaufeli, 2021). In this regard, Palanski et al. (2021) state that the study of leadership about business ethics has considerable potential for theoretical advancement and greater practical understanding. Therefore, the interest of academics and professionals in ethical leadership has grown considerably in recent years (P. Li et al., 2021). On the other hand, some authors claim that most studies focus solely on measuring ethical leadership and its association with certain work behaviors (Frazier & Jacezko, 2021). It is argued by researchers that many studies not only confuse concepts but also exclude causal inferences from their behavior (Banks et al., 2021).

In this regard, Banks et al. (2021), after a conceptual analysis based on signal theory, propose their definition of ethical leadership, explaining that values are consistent attributes. They add that leaders must possess traits such as caution, wisdom in decision-making, courage in adversity, and moderation. Finally, they argue that moral emotions (arising from events/entities/goals linked to social well-being) and prosocial values (desire to benefit others) should be included in future studies.

Therefore, an unconventional study is proposed, consisting of an approach that combines Agent-Based Modeling with the Netlogo model that simulates the emergence of leadership in newly formed teams. This means that an individual is perceived as a leader (public perception of leadership). However, it can also be assessed whether the person considers themselves a leader or a follower (leader identity and follower identity) from an ethical leadership perspective. Consequently, the research explores how this synergy can improve the organizational decision-making process. In this regard, the question that motivates the development of this study is posed as follows:

How can a collaborative approach, integrating ethical leadership and agent-based models that simulate the emergence of leadership in new teams, improve innovation in decision-making within the organization?

Similarly, the objective of this study is to analyze the combination of the Agent-Based Model of leadership emergence in new teams through an analysis of the existing literature. To this end, we examined the interactions between agents in a system and the leadership formation dynamics that can influence their collaboration for effective decision-making, as well as the scenarios that influence collaboration for effective decision-making. This approach provides a broad overview of the concepts used to generate the different dynamics within the NetLogo modeling.

In addition to the above, the emerging leadership model offers the opportunity to explore how leaders emerge in teams from dynamic interactions between individuals. In this sense, this article explored three scenarios, based on key variables such as leadership perception, leadership structure (shared or hierarchical), and interaction history. To this end, the following hypotheses were proposed:

- H1: in a homogeneous environment, it is assumed that leaders will emerge more slowly but in a distributed manner, as the initial differences between agents are minimal and the scheme encourages collaboration.
- H2: in a hierarchical environment, it is assumed that leaders emerge quickly among agents with greater initial aptitude, but collaboration among other agents may be limited, which could create divisions within the group.
- H3: the scandal is assumed to affect the current leader severely, and other agents with a good track record emerge as new leaders. The hierarchical dynamics could slow down the process of leadership redistribution.

Finally, an opportunity was identified to replicate studies found on the integration of the MBA in the context of leadership, in this sense of ethics. This modelling will not only allow for a better understanding of shared leadership in decision-making but also empower team members. This setting promotes a collaborative approach that is fundamental to innovation. The relevance of this analysis is not only for academics and leadership professionals but also for any organization seeking to improve its capacity for innovation in decision-making in a dynamic environment.

THEORETICAL FRAMEWORK

Leadership

The leader is the source of inspiration and motivation for followers, inducing change. Therefore, three elements of the Leadership Effectiveness Model are crucial to its study: the leader (including the leader's task and people orientation), the team members (including the technical and psychological maturity of team members), and the context (environmental factors that impact the actions of leaders) (Lisá et al., 2023). Therefore, Fischer et al. (2023) assert that leadership has to do with behavioral elements, actions, and choices to influence others, which contribute to collective goals and still have severe limitations in their measurement.

For their part, Hameduddin & Engbers (2022) assert that leaders influence and increase employee motivation by modeling values, demonstrating skills, and building trust and better relationships with their subordinates. At the same time, leadership is defined as an artistic and scientific profession that emphasizes connections in the workplace and organizations, involves taking responsibility for results, providing strategic guidance, and exploring unconventional thinking (Coffie et al., 2023). Therefore, leaders can increase the effectiveness of their leadership by improving psychological experiences and performance (Lisá et al., 2023).

Finally, leadership is about directing, encouraging subordinates, and assigning responsibilities for the achievement of objectives (Pattali et al., 2024). At the same time, due to the demand for innovation, today's leaders are required to have the competencies and skills to effectively guide their organizations in the successful implementation of artificial intelligence (AI) (Tursunbayeva & Chalutz-Ben Gal, 2024). In this sense, from a practical point of view, AI is often a contemporary leadership issue (Peifer & Terstegen, 2024). In the context of AI use, leadership roles are being transformed by enabling leaders to make more informed and efficient decisions (Peifer et al., 2022).

Reviewing the phenomenon of ethical leadership

Traditionally, ethical leadership is defined as demonstrating normatively appropriate behavior through personal and interpersonal relationships, promoting such behavior through two-way communication, reinforcement, and decision-making. Furthermore, compared to other styles, ethical leadership is a significant and unique predictor of a leader's effectiveness as rated by subordinates and supervisors (Nassif et al., 2021).

Thus, ethical leaders are honest and trustworthy, emphasizing ethical standards in their behavior and promoting them. This moral management can be seen as transactional, that is, drawing attention to the use of communication and the reward system to send signals to guide moral behavior (Decuypere & Schaufeli, 2021). In this sense, it has been shown that passive behaviors of leaders explain the most significant variation in employee workplace deviance, followed by moral, relational, inspirational, and task-oriented behaviors (Sawhney et al., 2023).

Furthermore, it is claimed by experts that the interest of academics and professionals in the field of ethical leadership has grown enormously, with great potential for theoretical advancement and understanding of the subject (P. Li et al., 2021; Palanski et al., 2021). High-impact ethical scandals have occurred in some sectors of industry, making ethical leadership a transcendental issue (Núñez-Barahona & Espinosa-Cristia, 2024).

Finally, although all leadership styles and approaches to change are rooted in a set of values, in order to achieve sustainable and beneficial change, those who promote and adopt particular approaches to leadership and change must provide greater ethical clarity about the approaches they advocate. Consequently, for leaders to have legitimacy, they must act in the interest of the common good through their example (Musaigwa, 2023).

Decision Making and Ethical Leadership Training

The concept of decision-making tasks is broad and extends its relevance to various fields, including social dynamics and team resilience (Leitner, 2025). In line with this, simulations have shown that increasing evidence-based decision-making capacity or information sharing within the organization could reduce poor implementation (Kasman et al., 2023).

On the other hand, it can be fostered through relevant training and intervention programs, by changing attitudinal beliefs and control beliefs regarding ethical behavior (Rahaman et al., 2019). Similarly, Signal Theory suggests that leaders can send ethical signals about their behavior to followers, customers, suppliers, and investors (Banks et al., 2021). Ethical leadership involves the enactment of prosocial values such as the desire to benefit others, combined with expressions of moral emotions that arise from events/entities/goals linked to the well-being of society (P. Li et al., 2021).

For a better explanation of the contextual background of ethical leadership, a conceptual framework was developed that analyzes the roots of organizational ethical leadership based on core orientations. First, the human and justice orientation, which mainly addresses the process of interpersonal influence between a leader and followers. On the other hand, responsibility and sustainability are related to goal setting and decision making. Finally, moderation leverages both the interpersonal influence process and the task-oriented leadership component to set goals and make strategic decisions (Eisenbeiß & Giessner, 2012).

Similarly, six categories were revealed to understand leadership development: self-development, role fulfillment, personal development, leader and organizational development, collective leadership development, and human development (Kjellström et al., 2020). In this regard, findings show that ethical leadership encourages employees to express their ideas and that affective commitment (emotional connection to the organization) acts as a key mediator (Cheng et al., 2022).

Finally, given the importance of ethical leadership as a model that will undoubtedly influence the ethical behavior of members of the organization, the importance of this leadership in effective decision-making is highlighted. Therefore, the association of ethical leadership with the following is identified: organizational commitment (Gillet et al., 2023; Islam et al., 2024; Koay & Lim, 2022); inclusive leadership (Jiang et al., 2023; Younas et al., 2023); abusive supervision (Yang & Xu, 2024); corporate social responsibility (Servaes et al., 2023); creativity (G. Li et al., 2024; Winchester & Medeiros, 2023; Zhao et al., 2023); Supply Chain (Agyabeng-Mensah et al., 2023) and Innovation (Hoang et al., 2023; Mao et al., 2023; X. Liu et al., 2023; Rasheed et al., 2024; Şengüllendi et al., 2024).

Synergy between agent-based modeling, emergence of leadership in newly formed teams, and ethical leadership

Agent-based modeling has been effective in examining organizational dynamics; companies and their bottom-up decision-making processes and incentive mechanisms were studied (Leitner, 2025). It is a methodological tool that allows demonstrating the interactive and dynamic effects of individuals and their behaviors on other individuals in the environment. A particular case applied it using a software development platform to translate an underlying conceptual model of opinion leadership (Anderson & Titler, 2014).

On the other hand, a change in the study of leadership is claimed, which is highlighted by the increase in the study of the emergence of leadership, which represents the bottom-up process by which a stable leadership structure is formed within a group. From this point of view, leadership is not a formal role. Instead, it represents leadership as the process by which others see specific individuals as leaders, regardless of formal designation. This is done with the perspective that all individuals within a group can play the role of leader or follower at various times during which the team completes a task (Acton, 2020). Thus, leadership is configured as a dynamic process in which each member of the organization continuously evaluates the value of the influence they receive, accepting or rejecting it according to their perception and needs (Castro-Ríos & Noguera-Hidalgo, 2022).

Finally, the use of Agent-Based Models (ABMs) offers organizations the opportunity to explore different leadership styles and approaches to decision-making in a safe and controlled environment. By simulating different scenarios, they can discover which strategies best drive innovation and promote more efficient and collaborative decision-making. This dynamic approach allows teams and systems to learn continuously, adapting and evolving based on feedback and interaction among their members (S.-Y. Wang et al., 2021).

METHODOLOGY

This study adopts a positivist paradigm, using a non-experimental design based on computational models with NetLogo. From a mixed approach, connectivity metrics are analyzed quantitatively, and emerging ethical leadership dynamics are analyzed qualitatively. The correlational scope allows us to identify how hierarchical structure (independent variable) affects behavior and the emergence of leadership in new teams (dependent variable), while the virtual longitudinal design explores how teams adapt to crises.

Agent-based model

The MBA allows for efficient research into the optimization of complex functions. This is done through simulations of the emergence of leadership in newly formed teams as a modeling paradigm that uses autonomous agents to represent and solve complex problems in dynamic systems (Lakmali et al., 2024). This approach allows different scenarios to be simulated and the impact of various actions to be evaluated, enabling leaders to make informed and efficient decisions (Ghaffarzadegan et al., 2024).

In this regard, tasks are assigned within an organization to shape the efficient behavior of agents by examining organizational dynamics (Leitner, 2025). In particular, this NetLogo model simulates the emergence of leadership in newly formed teams.

There are several reasons why MBAs are suitable for organizational studies. First, they allow researchers to control research conditions and, consequently, study causal relationships between variables of interest using computer simulations. Second, they make it possible to investigate large sets of variables and control simultaneous variations in variables and agent behavior (Blanco-Fernández et al., 2023).

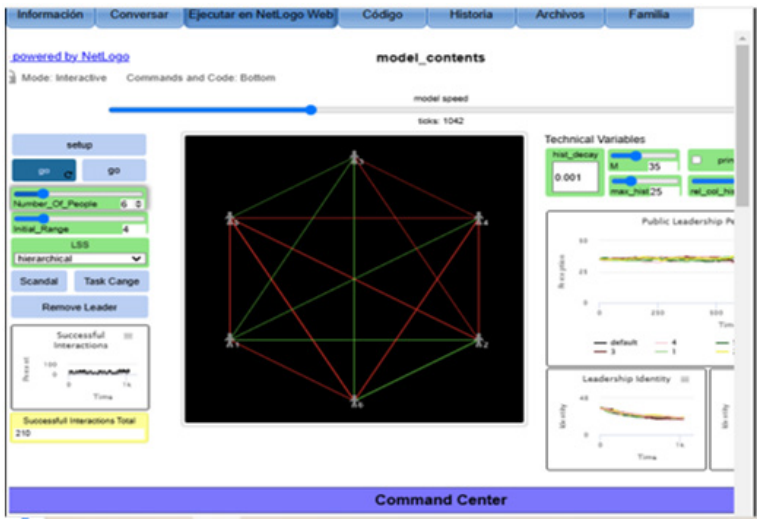
NetLogo ®

NetLogo is a simple programming language suitable for modeling situations in which many individuals interact. For example, in common phenomena in nature, society, or different areas of science, it is suitable for simulating complex evolutionary systems, hundreds or thousands of individuals (people, bacteria, insects, organizations, nodes in a graph, etc.) that interact with each other and with the environment (Antelmi et al., 2022). In this way, it allows us to explore the connection between local interactions at the individual level and the macroscopic patterns that emerge from those interactions. The modeling is constructed using simple language and is even suitable as a first programming language (Sánchez Rodríguez & Ramírez Alatriste, 2023).

Agent-based model of leadership emergence in newly formed teams

This NetLogo model simulates the emergence of leadership in newly formed teams. Within this simulated environment, leadership encompasses both collective vision (when an individual is perceived as a leader) and personal self-image (whether someone considers themselves a leader or a follower) (NetLogo, 2024).

Figure 1.
Interface screen



The figure is a sample of the model screen, which can be opened and explored after installing NetLogo on the computer, to model the emergence of leadership in new teams using an agent-based approach. In the simulation, multiple agents interact according to simple rules to collectively solve complex problems. This model explores how leaders emerge in different scenarios and how their identification influences the coordination and adaptation of the team to the environment. Immediately after starting this model, the model view occupies the right half of the interface (Acton, 2020).

ODD Protocol

The ODD protocol is a protocol that provides an overview of how modeling is performed and develops the dynamics for which it was programmed (Sánchez Rodríguez & Ramírez Alatriste, 2023). This protocol is then used to describe how the model was used in NetLogo and how the dynamics between agents are simulated:

ODD (Overview, Design concepts, Details) of the Agent-Based Model: The Emergence of Leadership in Newly Formed Teams

Overview

The agent-based model implements a swarm search algorithm for the numerical optimization of real-valued constraint functions. Its objective is that in each round, two turtles are randomly selected to interact. Each individual can claim leadership (propose to lead) or concede it (agree to let the other lead). The probability that an individual will claim or concede leadership depends on multiple variables, including how much an individual considers himself a leader or a follower, what others think of him, and how suitable he perceives the other person to be as a leader.

Design Concepts

Agents: each agent has a location (x, y) in the landscape and an action that indicates their aptitude for leading or being led. Agents can be of two types:

- Leader: Agent who claims or proposes leadership.
- Follower: Agent who follows a leader, concedes, or lets another lead.

How it works and its variables

In each round, two turtles are randomly selected to interact. Each individual can claim leadership (propose to lead) or concede it (agree to let the other lead). The probability that an individual will claim or grant leadership depends on multiple *variables*, including how much an individual considers themselves a leader or a follower, what others think of them, and how capable they perceive the other person to be as a leader.

Only if there is reciprocity, that is, if the claim and concession of those two individuals match (i.e., a claim is reinforced by a concession from the other person), do we have a successful interaction. With each successful interaction, the leadership identity of the person who claimed grows, which has an impact on future interactions.

Details on How to Use It

Determine the number of people using the corresponding slider and decide whether all people are equally suited to become leaders or not by modifying the Initial Range. Through the leadership structure scheme (LSS) drop-down menu, you can also change whether leaders agree to share leadership (shared) or not (hierarchical).

Someone with a shared scheme would give up leadership even if they claimed it themselves. Someone with a hierarchical scheme would not. Additionally, the user can select a hierarchical scheme + status comparison that prevents people from giving up leadership when they claim it themselves, except if the other person has a higher leadership status (public perception of leadership) than themselves. The configuration sets up the model, and Go allows the simulation to start indefinitely or only one tick at a time.

More technical variables

histdecay: each person gains or loses points in an interaction, and memories of these interactions affect future behavior. With each tick, history decays according to the value set in the interface.

M: this is the mean value of the initial distributions. The fact that we start higher or lower is not a psychological issue; however, in the underlying beta distribution, a higher M decreases the range of the probability distribution and makes it more pronounced.

Maxhist: this is the maximum amount of dyadic history, public or private, that can be reached. As these histories approach this limit, their growth becomes smaller.

The among-seasoning (impression reasoning) determines whether you can verify interactions through impressions.

Relcolhist determines whether individuals build their perception of leadership on the dyadic interactions they had with a person (0) or the collective leadership history of the individual (1).

Events to test

What happens if a scandal causes all the turtles to view the current leader as someone with a poor leadership history in the group? What happens if the task is changed and, therefore, leadership expectations change? What happens if the current leader is removed? Can there be a leader in a group of 8 or more individuals?

RESULTS

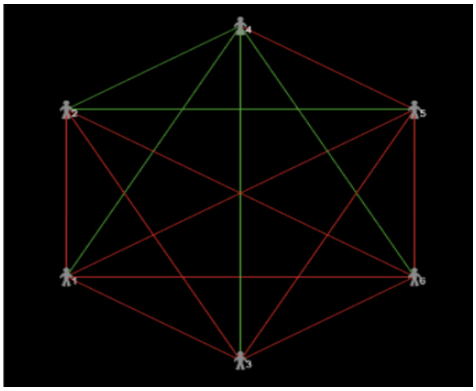
Below are the results of simulations carried out in NetLogo with a sample of 10 people. The emerging leadership model presented here offers the opportunity to explore how leaders emerge in teams from dynamic interactions between individuals. Three scenarios were explored based on key variables such as leadership perception, leadership structure (shared or hierarchical), and interaction history. We observe how agents manage to coordinate and adapt to their environment, with global behaviors such as efficiency, creativity, or chaos emerging from local interactions following simple rules. It should be noted that this model does not impose leaders, but instead allows us to observe how specific individuals emerge as natural guides based on three key factors:

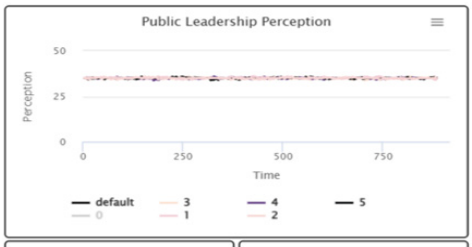
- Leadership perception: who is seen as a leader by the group?
- Power structure: are decisions collaborative or centralized?
- History of interactions: how have members interacted in the past?

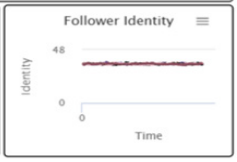
By simulating scenarios with these variables, it was discovered that agents self-organize following simple rules (e.g., imitating the most efficient, negotiating roles). From these micro-interactions, macro patterns emerge, such as collective efficiency (tasks completed quickly), creativity (innovative solutions), or even chaos (lack of coordination). Context is crucial: hierarchical teams are fast in crises, but collaborative teams innovate more in uncertain environments.

Table 1.
Scenario 1: Emerging Leadership in Homogeneous Teams (the perception of leadership)

Configuration:
Initial_Range: Set to a low range (e.g., 0.1) to simulate similar abilities among agents.
LSS (Leadership Structure Scheme): Shared, to allow agents to share leadership according to the needs of the group.
hist_decay, "memory of past interactions that fade over time": Set to 0.1, so that past interactions have less weight on future behavior.
relcolhist: Set to 0 (dyadic), so that leadership perceptions are based on interactions between specific peers.





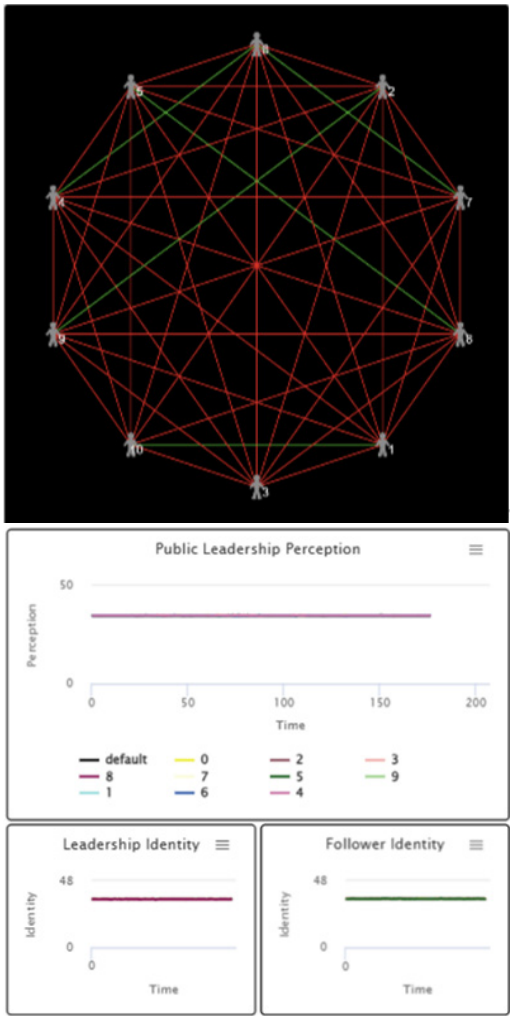


In this first scenario, there is a uniform distribution of interactions between agents, evidenced by a nodal structure where each individual connects predominantly with specific peers (dyadic configuration). This network reflects shared leadership, with no central nodes accumulating privileged connections, suggesting an absence of dominant figures and equal influence among members. These results support the initial hypothesis: in homogeneous teams (with similar skills, roles, and interpersonal dynamics), leadership emerges gradually and is distributed through dyadic microinteractions.

This pattern not only highlights the importance of relational equity in building collective leadership but also suggests an implicit ethical approach: by ensuring symmetrical opportunities for influence, a system is favored where decision-making is decentralized and enriched by multiple perspectives (Van Roekel, 2023; Y. Wang & Jin, 2023).

Table 2.
Scenario 2: Emerging Leadership in Hierarchical Teams (rigid structure)

The model parameters were configured to simulate a hierarchical leadership scenario with heterogeneous initial skills:
Initial_Range (0.5): Establishes significant variation in initial leadership skills among agents, replicating individual differences observed in real teams (e.g., previous experience or personality traits).
Leadership Structure Setting (LSS) - Hierarchical: Prevents the exchange of leadership roles, forcing a vertical structure where a centralized leader makes decisions without negotiation, typical of traditional military or corporate environments.
Hist decay (0.5), "memory of past interactions that fades over time": Assigns a moderate-high weight to past interactions, simulating that agents remember previous behaviors (e.g., a leader who failed in a crisis gradually loses influence, not immediately).
Relcolhist (1 - Collective): Leadership perceptions are based on accumulated group history, not individual evaluations. This reflects organizational cultures where reputation is built collaboratively (e.g., academic teams or agile startups).



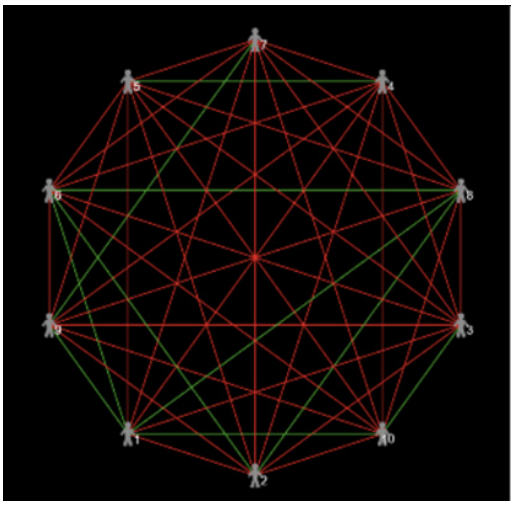
The images show a structure in which some nodes quickly stand out due to their larger size or number of connections. This pattern suggests a rigid hierarchy within the team, where leaders emerge quickly and establish a centralized structure of influence. This demonstrates their ability to concentrate on team interactions. The rest have less connectivity and, in many cases, are relegated to peripheral positions.

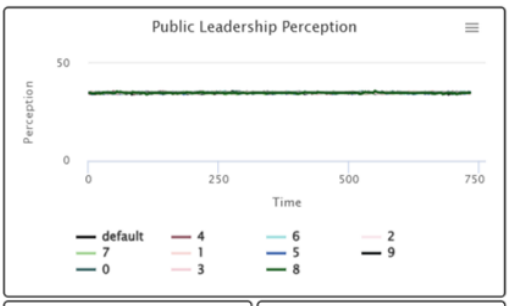
The visual results are consistent with the hypothesis proposed for this scenario, highlighting that in hierarchical teams, leadership is not distributed evenly but is concentrated in a small number of key agents who guide group dynamics. Hierarchical rigidity can conflict with ethical leadership, as it prioritizes a few at the expense of equal participation. Findings highlight how the lack of agreed-upon definitions, objectives, and goals for distributed leadership limits its adoption (Lizier et al., 2024).

Table 3

Scenario 3: Emerging leadership after a disruptive event (the story of interactions)

Initial_Range: Set to a medium range (e.g., 0.3) to simulate moderate differences in initial leadership abilities.
LSS: Hierarchical + Status, so that agents only grant leadership to individuals with a higher leadership status.
hist_decay, "memory of past interactions that fades over time": Set to 0.2, so that perceptions of leadership change slowly.
Disruptive event: Introduce a manual change to the model after a few ticks (e.g., drastically reduce the leadership perception of a specific agent to simulate a scandal).
relcolhist: Set to 1 (collective), so that leadership perceptions are based on the cumulative leadership history of the group.





The images in the third scenario reveal a significant alteration in the leadership network structure following the impact of a scandal, disruptive event, or crisis. A previously prominent node with a greater number of connections and weight loses visibility and prominence. This change indicates a decline in the perception of that agent's leadership within the group. Simultaneously, other nodes begin to gain connections and weight, reflecting the emergence of new leaders in response to the fall of the central node.

The results support the hypothesis that disruptive events, such as a scandal, can rapidly transform the leadership structure when there is a loss of trust or legitimacy in previously established leaders (Abiodun, 2024). There is an ethical challenge to maintaining trust and legitimacy in leadership in the face of critical situations. In addition, the ability of teams to adapt and redistribute influence ethically is highlighted.

DISCUSSION

The findings confirm that leadership is an evolutionary process of collective selection in which followers grant legitimacy to the leader (Lizier et al., 2024). This issue is particularly relevant in contemporary organizational contexts characterized by horizontality and digitalization. In this regard, the contrast with the literature suggests that organizational agility significantly influences digital transformation and dynamic capabilities (Zhang et al., 2023).

Agent-based simulation was used to observe where specific behavioral properties are granted to simulated agents. This is achieved through the analysis of internal influences from other agents, based on the perceived usefulness of influences from other agents in the organization, regardless of status and hierarchy. Along these lines, the findings confirm a direct positive impact of shared leadership on the performance of agile project teams and an indirect impact on project efficiency and effectiveness, consistent with the findings of other authors (Hofman et al., 2023).

The first scenario highlights distributed and emergent leadership, which shows the uniform distribution of interactions between agents and the predominant dyadic configuration in relationships. The absence of outstanding nodes indicates that leadership is not concentrated in a central figure but is distributed evenly among members, which is consistent with studies that advocate shared leadership as a practical approach in contexts of equal skills and roles (Pearce & Conger, 2003).

This interpretation reinforces the hypothesis that, in homogeneous teams, leadership tends to emerge gradually and collectively. This type of configuration fosters an ethical dynamic, as each agent has similar opportunities to influence decisions, aligning with the principles of inclusive and ethical leadership (Coleman & Taylor, 2023; Kessi et al., 2025).

On the other hand, analysis of the second scenario reveals a hierarchical structure where specific nodes stand out significantly, assuming dominant leadership roles. This pattern reinforces the hypothesis that, in hierarchical teams, leadership tends to be concentrated in a small number of individuals.

The emergence of hierarchy favors short-term efficiency in decision-making but can limit inclusion and diversity of perspectives; that is, heroic leadership cannot meet the expectations placed on leadership (Gichuhi, 2021). In this sense, the concentration of leadership raises important ethical implications; therefore, strategies to mitigate risks should be considered, encouraging feedback and leadership rotation.

On the other hand, the third scenario shows how a disruptive event, such as a scandal, can significantly transform the leadership structure within a team. The loss of prominence of a previously central node, accompanied by the emergence of new nodes with greater connectivity, highlights the group's ability to adapt and redistribute influence when trust in established leaders is eroded (Mehmood & Lawa, 2025). This result shows that unethical leadership can lead to disappointment and mistrust among followers, leading to a lack of interest and commitment, which negatively impacts results and organizational effectiveness (Keselman & Saxe-Braithwaite, 2021).

The dynamic reconfiguration observed in the network reflects a resilience mechanism in teams, where the leadership structure adjusts to maintain group functionality. Therefore, flexibility in leadership dynamics is crucial for coping with critical events, a topic widely discussed in the context of transformational, ethical, and adaptive leadership. However, the emergence of new leaders in response to these challenges suggests that teams have an intrinsic capacity to redistribute influence ethically, promoting equity and resilience (Gichuhi, 2021).

The following values are suggested: (1) engage in accuracy, transparency, and accountability; (2) foster deliberative dialogue; (3) prioritize safety; (4) support justice, fairness, and equity; and (5) engage in an ethics of care and manage ethical tensions. Based on the data analyzed, leaders should have relevant experience for the crisis or ensure that such experience is present among crisis management team members. Therefore, the creation of formal ethics committees composed of diverse stakeholders is also critical to navigating the tensions inherent in crises (B. F. Liu et al., 2022).

CONCLUSIONS

The integration of the Agent-Based Model (MBA) with the Emergence of Leadership in New Teams (SLE) and Ethical Leadership (LE) was analyzed. This allowed for the execution of complex scenario simulations and the evaluation of the impact of various decisions. The model identified leadership with a collaborative approach as essential for innovation in decision-making and adaptation to dynamic environments, where each agent in the organization continuously evaluates the usefulness of the influence they receive from their leader and accepts or rejects it.

This analogous dynamic in the natural selection of influences suggests that organizations can cultivate resilience by fostering two pillars. First, transparent feedback systems where hierarchies are subject to collective scrutiny, for example, through digital platforms for real-time leader evaluation. Second, ethical development programs that transcend indoctrination, focusing on modeling behaviors that are visible and consistent with the organization's stakeholders.

Finally, for future lines of research, we identify an opportunity to explore how these configurations affect specific problem-solving and performance on complex tasks. We can also consider how hierarchies affect long-term team performance. In addition, we can explore interventions that balance power dynamics in these contexts and how power and legitimacy dynamics influence leadership reconfiguration after disruptive events.

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AUTHOR CONTRIBUTIONS
Conceptualization: Edelia Guillermina Núñez Barahona.
Data curation: Edelia Guillermina Núñez Barahona.
Formal analysis: Edelia Guillermina Núñez Barahona.
Fund acquisition: Edelia Guillermina Núñez Barahona.
Research: Edelia Guillermina Núñez Barahona.
Methodology: Edelia Guillermina Núñez Barahona.
Project management: Edelia Guillermina Núñez Barahona.
Software: Edelia Guillermina Núñez Barahona.
Supervision: Edelia Guillermina Núñez Barahona.
Validation: Edelia Guillermina Núñez Barahona.
Visualization: Edelia Guillermina Núñez Barahona.
Writing – original draft: Edelia Guillermina Núñez Barahona.
Writing – review and editing: Edelia Guillermina Núñez Barahona.