

Chapter 11 / Capítulo 11

Health 4.0: management, technology, and transformation of the healthcare sector in Latin America (English version)

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Management of State-Owned Social Enterprises in the Primary Level of the Health Sector in Boyacá, Colombia

Gerencia de las Empresas Sociales del Estado en el Primer Nivel del Sector Salud en Boyacá, Colombia

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ABSTRACT

This chapter addressed the management of State Social Enterprises (ESE) in primary health care in Colombia from a theoretical and practical perspective based on complex systems and hermeneutic phenomenology. The purpose was to present models, tools, and indicators that respond to the real conditions of management in contexts of high uncertainty, precariousness, and institutional diversity. Based on research conducted in the department of Boyacá, it was evident that management practice was characterized by constant tension between the regulatory requirements of the system and the social and territorial dynamics of the environment. The study identified that ESE managers acted as network coordinators, context interpreters, and community leaders, beyond their technical and administrative roles. A chaotic management model was proposed that integrates elements of adaptive leadership, participatory decision-making, organizational learning, and community dialogue. Hybrid indicators were also designed that combined quantitative and qualitative dimensions, along with participatory tools for evaluation and continuous improvement. The case applied in Boyacá validated the relevance of this approach, showing that health management, when understood from a complexity perspective, can become a driver of institutional transformation with high social impact.

Keywords: Health Management; Complex Systems; ESE; First Level; Public Innovation; Hermeneutic Phenomenology.

RESUMEN

Este capítulo abordó la gerencia de las Empresas Sociales del Estado (ESE) en el primer nivel de atención en salud en Colombia, desde una perspectiva teórico-práctica fundamentada en los sistemas complejos y la fenomenología hermenéutica. El propósito fue presentar modelos, herramientas e indicadores que respondieran a las condiciones reales de gestión en contextos de alta incertidumbre, precariedad y diversidad institucional. A partir de una investigación desarrollada en el departamento de Boyacá, se evidenció que la práctica gerencial se caracterizó por una constante tensión entre las exigencias normativas del sistema y las dinámicas sociales y territoriales propias del entorno. El estudio permitió identificar que los gerentes de las ESE actuaron como articuladores de redes, intérpretes del contexto y líderes comunitarios, más allá de su rol técnico-administrativo. Se propuso un modelo caótico de gestión que integra elementos de liderazgo adaptativo, toma de decisiones participativa, aprendizaje organizacional y diálogo comunitario. Asimismo, se diseñaron indicadores híbridos que combinaron dimensiones cuantitativas y cualitativas, junto con herramientas participativas para la evaluación y mejora

continua. El caso aplicado en Boyacá permitió validar la pertinencia de este enfoque, mostrando que la gerencia en salud, cuando se comprende desde la complejidad, puede convertirse en un motor de transformación institucional con alto impacto social.

Palabras clave: Gerencia en Salud; Sistemas Complejos; ESE; Primer Nivel; Innovación Pública; Fenomenología Hermenéutica.

INTRODUCTION

The management of health systems in Latin America has traditionally been marked by structural imbalances, inequities in access, and low efficiency in service delivery. Colombia, despite multiple reforms, has not been immune to these problems. The implementation of Law 100 of 1993, which transformed the state health care model into a mixed system based on insurance and regulated competition, has generated a series of side effects that profoundly impact the functioning of State Social Enterprises (ESE), especially at the primary care level.⁽¹⁾

The first level, responsible for providing primary health care, faces significant challenges: budgetary restrictions, technological limitations, high population demand, structural corruption, and administrative complexities that are multiplied in vulnerable social contexts. In this scenario, first-level ESEs, many of which are located in rural and peripheral areas, operate in conditions of financial and managerial fragility. Yet, they are essential to guaranteeing the right to health for historically excluded communities.⁽²⁾

The management of these organizations, therefore, cannot be approached from traditional linear models. It requires an understanding that integrates the logic of complex systems, recognizing the multiplicity of actors, relationships, and uncertainties that define their dynamics. This approach allows ESEs to be recognized not as rigid structures, but as living systems that self-organize, adapt, and evolve within changing and often adverse environments.⁽³⁾

In line with this, this research is based on a doctoral thesis that adopted Ilya Prigogine's postulates on complex systems as its theoretical basis, combined with Martin Heidegger's phenomenological hermeneutic approach to interpret the meaning of managerial experiences in the hospital context of the department of Boyacá, Colombia.^(4,5) The study provides relevant empirical findings that highlight both the challenges and opportunities present in the administrative management of ESEs, from a perspective that prioritizes relational, adaptive, and dialogical aspects.

The purpose of this chapter is to translate these findings into practical decision-making and continuous-improvement tools to strengthen the sustainability of ESEs. It is based on the conviction that complexity-centered management not only improves administrative indicators but also helps ensure equitable, high-quality access to health services.

The structure of this chapter includes a theoretical contextualization of health management within the complexity paradigm, a presentation of tools and models applicable to the real-world environment of ESEs, an analysis of a practical case study from the department of Boyacá, and a final section on conclusions. All content is supported by field data and qualitative evidence, allowing the reader not only to understand the challenges of public health management but also to access concrete proposals for institutional innovation in complex environments.

DEVELOPMENT

Conceptual framework of health management

Health management can be understood as the set of strategic, organizational, and operational processes aimed at ensuring that health services are provided efficiently, equitably, and promptly with quality.⁽⁶⁾ This field encompasses both the management of human, financial, and technological resources and institutional coordination with regulatory systems and social expectations regarding the right to health.⁽⁷⁾

Historically, management approaches in the health sector have evolved from mechanistic and hierarchical models, typical of Taylor's scientific management and Weber's bureaucratic approach, to more integrative models focused on the user, transformational leadership, organizational innovation, and social sustainability.⁽⁸⁾ Early approaches conceived of health organizations as service factories, where control, standardization, and efficiency were the pillars. Today, however, it is recognized that health systems operate in highly dynamic environments, with multiple actors, interests, and interdependent variables, forcing a rethinking of traditional paradigms.

In the Colombian context, particularly in State Social Enterprises (ESE), management cannot be reduced to a technical-administrative function. It is also a political and social function, involving decisions in contexts of power, inequality, citizen expectations, and regulatory requirements. Public health managers must respond to multiple logics: guaranteeing health outcomes, meeting financial goals, satisfying users, and harmonizing with public policies that are often unstable or contradictory.

From this perspective, health management requires competencies that transcend technical expertise. It involves leadership, negotiation, contextual reading, emotional intelligence, and strategic vision, which demand more comprehensive training models and more flexible, participatory organizational structures.

Approach from complex systems

Complex systems theory offers a more appropriate conceptual framework for understanding the dynamic and multidimensional nature of the health system. This paradigm recognizes that social phenomena—such as the provision of health services—cannot be fully explained by linear, predictive, or deterministic models. On the contrary, these systems exhibit properties such as self-organization, non-linearity, emergence, adaptability, and orderly chaotic behavior, known as chaordic.⁽⁹⁾

Applied to health sector organizations, this approach views ESEs as living systems that constantly evolve in response to environmental changes. Their functioning is not the result of centralized decisions but rather of multiple interactions among internal and external actors, whose decisions, perceptions, emotions, and values influence organizational outcomes. Thus, decision-making cannot be based solely on cause-and-effect models but requires recognizing patterns, networks of relationships, and emerging processes.⁽¹⁰⁾

Ilya Prigogine, one of the leading theorists of complexity, introduced the concept of dissipative structures, i.e., open systems that move away from equilibrium to adapt and evolve in contexts of high uncertainty.⁽¹¹⁾ SEEs, especially in territories with high social vulnerability such as Boyacá, operate under conditions of unstable budgets, conflicts among actors, frequent regulatory changes, and variable social demands. Therefore, the chaordic approach—a blend

of chaos and order—becomes a powerful interpretive tool for explaining why these entities, despite their limitations, manage to survive, reorganize, and, in many cases, innovate in the face of adversity.

This approach not only describes the reality of healthcare organizations but also guides managerial action toward new forms of leadership. The ability to build collective meaning, foster collaboration, manage tensions, and adapt to the unexpected is valued more than simply complying with static indicators or procedural manuals. In Prigogine's words, the future is not written: organizations can self-construct through their relational and adaptive decisions.⁽¹¹⁾

Therefore, applying the principles of complexity in health implies rethinking management as an art of navigating between order and chaos, where flexibility, collective intelligence, and continuous learning are essential for institutional sustainability.

Heidegger's hermeneutic phenomenology applied to health management.

The choice of hermeneutic phenomenology as a methodological approach responds to the need to understand not only objective administrative facts, but also the meaning they have for those who experience them in their daily practice. This perspective allows us to explore the experiences, perceptions, and meanings constructed by the actors involved in the management of ESEs, recognizing that reality is not limited to its quantifiable dimensions, but is constituted from lived experience.⁽¹²⁾

Martin Heidegger, in his work *Being and Time*, proposed an ontology of "being-in-the-world" (*Dasein*) that understands human beings as situated, interpretive entities committed to their environment. From this perspective, the manager of an ESE is not an isolated subject who applies neutral administrative techniques, but a being who exists in a context laden with meaning, affected by social tensions, structural limitations, and ethical demands. Their experience of managing public health cannot be separated from the world they inhabit, nor from the others with whom they interact.⁽⁴⁾

This approach allows us to understand that managerial decisions do not emerge solely from rational calculation, but from processes of interpretation, intuition, internal dialogue, and affectivity. In the case of the ESEs in Boyacá, the testimonies collected show that managers constantly face ethical dilemmas, political pressures, budgetary tensions, and emotional responsibilities linked to the care of human life. These elements are not mere "noise" in management, but essential components of being-in-management.

From a holistic perspective, the manager is seen as a complex subject, influenced by their personal history, values, ties to the community, and understanding of the institution they lead. This view recognizes management as a situated, contingent, and profoundly human practice, in which the concepts of leadership, power, responsibility, and social sensitivity assume an existential dimension.

Thus, hermeneutic phenomenology becomes a bridge to understanding not only what managers do, but how they experience it, how they give it meaning, and how these understandings affect their daily practices and the evolution of their organizations. This methodology allows for a more authentic reading of power dynamics, internal conflicts, emerging learnings, and the sense of purpose that drives those who lead in contexts of high uncertainty.

Context of the Colombian healthcare system

The Colombian health system has undergone profound transformations since the enactment of Law 100 of 1993, which established the insurance model as the backbone of the General Social Security System for Health (SGSSS). This model was based on regulated competition between health promotion entities (EPS) and payment for services to provider institutions (IPS), including ESEs.⁽²⁾

Law 100 marked a turning point by introducing market logic into a field traditionally managed by the state. Although the objective was to expand coverage and improve efficiency, the results have been mixed. On the one hand, a high rate of population enrollment was achieved; on the other, inequalities in access, quality, and timeliness of service were accentuated. In addition, the model encouraged fragmentation of the system, with multiple intermediaries and administrative burdens that complicated institutional management.⁽¹³⁾

Within this system, State Social Enterprises (ESE) play a crucial role in primary care, especially in rural and semi-urban areas. These entities are responsible for ensuring basic health services under conditions of high social vulnerability, limited resources, and growing community demands. At this level, primary health care must not only be effective but also culturally relevant, continuous, and community-centered.⁽¹⁴⁾

The study conducted in the department of Boyacá revealed particularities that make the context a living laboratory for health management from a complexity perspective. The ESEs in this department operate in environments with budgetary constraints, deteriorated infrastructure, difficulties in hiring human talent, and limited financial autonomy.

Convergence of approaches: complexity and phenomenology in health management

The management of health organizations, particularly in contexts as variable and uncertain as Colombia's, requires an articulation of approaches that transcends conventional theoretical frameworks. In this sense, the integration of complex thinking with hermeneutic phenomenology represents an epistemological and methodological innovation that allows for a deeper, more relational, and situated understanding and transformation of management practice.

Complex systems theory, from Prigogine's perspective, provides the basis for understanding ESEs as dynamic and open systems in constant transformation that cannot be reduced to independent components or controlled by rigid planning mechanisms.⁽¹¹⁾ This vision breaks with deterministic logic and advocates an understanding of institutional change as an emergent process, the product of multiple interactions and relationships that self-organize around internal and external tensions.

For its part, hermeneutic phenomenology—inspired by Heidegger—provides access to the meanings actors attribute to their management experience. Rather than focusing solely on quantifiable results or standardized procedures, this approach explores how managers experience and understand their role, their ethical dilemmas, their relationships with their environment, and their personal projection within the organization. The concept of being-in-the-world translates, in this context, into being-in-the-institution, being-with-others, and being-for-the-community, giving management an existential dimension that is often invisible in technical literature.⁽⁴⁾

The convergence between both approaches—complexity and phenomenology—allows for a management focused on both the network of institutional relationships and the subjectivity of the manager. From this dual perspective, the manager is not only a rational decision-maker, but also an interpreter of changing realities, a mediator of conflicts, and an actor who constructs meaning in chaotic environments. This combined paradigm recognizes that solutions are not imposed from above or derived from manuals, but emerge from dialogue, situated interpretation, and continuous learning through experience.

Compared to traditional management models—based on operational efficiency, hierarchical control, and predictability—this approach reveals their limitations. In complex contexts such as the Colombian health system, mechanistic models tend to fail because they are unable to adapt to emerging issues, cultural diversity, social pressures, and institutional uncertainty. While control and planning systems are necessary, they become insufficient when faced with political volatility, territorial inequality, ethical dilemmas in clinical decision-making, and a lack of stable resources.⁽¹²⁾

A mechanistic approach, focused exclusively on performance indicators, can lead to bureaucratic overload, deterioration of the organizational climate, and moral burnout among teams. This model also reduces managers' ability to innovate, experiment, or react creatively to unexpected events. In contrast, the combined approach proposed here—complexity + phenomenology—does not seek to prescribe universal recipes, but rather to generate conditions for reflection, institutional adaptability, and the collective construction of the meaning of management.

In short, the convergence between complexity and phenomenology enables a new way of thinking about management: not as a closed system of technical decisions, but as a relational, ethical, and evolutionary field, where uncertainty is not an obstacle but an opportunity for learning, innovation, and organizational transformation.

Practical tools, models, and indicators for health management from a complexity approach

The transition from theory to practice in the management of ESEs, especially at the primary care level, requires the design of tools that respond to the real conditions of institutional functioning. From the perspectives of complex systems and hermeneutic phenomenology, these tools must go beyond an exclusively technical view of management and open to a deeper, more contextualized understanding that recognizes the constant interaction among structural, subjective, and relational factors.

The study conducted in Boyacá found that the management of ESEs does not easily fit into classic management-by-objectives models. Structural uncertainty, the multiplicity of actors, budgetary constraints, and the ethical demands of public health services require adopting flexible, adaptive approaches that are open to learning. Within this framework, a chaordic management model is proposed that reflects the dynamic balance between institutional order and the chaos inherent in vulnerable social contexts. This model, shown in figure 11.1, articulates key elements, including adaptive leadership, team self-organization, participatory decision-making, emergent outcome evaluation, continuous organizational learning, and active dialogue with community actors. At the center of the model is the shared organizational purpose, understood as the guiding principle that gives meaning and direction to institutional actions.

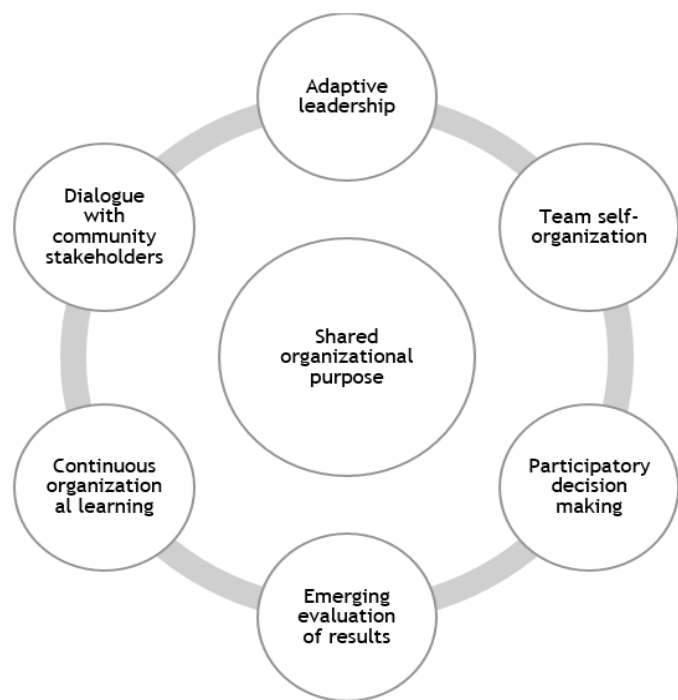


Figure 11.1. Chaordic management model for first-level ESEs

Complementary to this model, a set of hybrid indicators combining quantitative and qualitative dimensions is proposed. This proposal arises from the need to evaluate not only the achievement of numerical goals, but also the quality of relationships, user perception, organizational climate, and the legitimacy of management decisions.

As shown in table 11.1, these indicators are organized by key dimensions of institutional management, such as access, efficiency, human capital, institutional governance, and innovation in administrative processes. For example, in the access dimension, in addition to the traditional percentage of consultations attended compared to those scheduled, it is proposed to collect the community’s level of satisfaction with the timeliness of care. In the field of efficiency, the analysis of budget execution is complemented by staff perceptions of transparency in resource use. Thus, each numerical indicator finds its counterpart in an interpretive indicator that provides a more complete view of the institutional reality.

Table 11.1. Examples of hybrid indicators for ESEs at the first level				
Dimension	Quantitative Indicator		Interpretive Indicator	
Access	% of consultations attended	vs. scheduled	Community satisfaction	with timeliness
Efficiency	% of annual budget execution		Perception of transparency in the use of resources	
Human capital	Staff turnover rate		Perceived organizational climate	
Institutional governance	Number of effective board meetings		Community leader involvement	
Innovation in management	Number of administrative processes restructured		Degree of ownership of organizational change	

In addition to these instruments, three participatory tools were identified as valuable for strengthening the evaluation and continuous improvement processes. First, dynamic stakeholder maps enable the identification and updating of the power, cooperation, and conflict relationships among the various agents involved in the provision of health services. Second, institutional field journals, where administrative staff can record findings, difficulties, good practices, and emerging alerts. That said, deliberative dialogue rounds are proposed: biannual meetings between clinical and administrative staff and community representatives to collectively analyze challenges and propose organizational adjustments. These tools not only improve the quality of internal management but also strengthen the social legitimacy of ESEs by promoting participation, recognizing local knowledge, and jointly constructing solutions.

The tools proposed here seek to guide managerial action in complex contexts, promoting an integrative approach that articulates hard data with lived experiences, institutional planning with contextual adaptability, and administrative control with ethical commitment. Rather than imposing new bureaucratic burdens, the aim is to build capacities for critical reading of the environment, informed decision-making, and continuous organizational innovation.

Case study: Complex management in a first-level ESE in Boyacá, Colombia

The department of Boyacá, located in Colombia's Andean region, has a diverse territorial and social configuration that poses particular challenges for the management of primary health care. In this territory, ESEs face multiple tensions: geographical, budgetary, cultural, institutional, and regulatory. The doctoral research on which this chapter is based used several first-level ESEs in the department as its case study to understand how management is exercised in contexts marked by complexity, structural uncertainty, and fragmentation of the health system.

One of the main findings is that management in Boyacá's ESEs is not based on a single, technical model but rather on an adaptive, situated, and deeply relational practice. The managers interviewed describe their experience as a constant negotiation between the regulatory demands of the system, the actual conditions of the territory, and the social expectations of the communities. This reality forces institutional leaders to operate simultaneously on multiple levels: administrative, political, community, clinical, and ethical. Such multiplicity is in line with the principles of complex systems, where decisions are not derived from linear logic, but from the continuous interaction between interdependent variables, which are often unpredictable.

The phenomenological-hermeneutic analysis revealed significant categories, including "being strategic in the midst of chaos," "the manager as a bridge between worlds," and "silent leadership." These categories reflect how managers construct meaning for their role not only through the fulfillment of operational goals, but also through their commitment to the territory, the dignity of users, and the ethical sustainability of the system. In this context, management becomes an act of constant interpretation, where each decision involves an analysis of consequences, values, and legitimacy. Thus, the manager does not act as an executor of administrative manuals, but as an interpreter of multiple realities in constant transformation.

From an institutional perspective, the study found that many top-level ESEs operate with deficit budgets, limited infrastructure, and a lack of specialized human resources. However, innovative practices not documented in official channels were also observed, including informal alliances with community leaders, functional reorganization of staff based on demand, and adaptation of administrative processes using basic digital solutions, such as spreadsheets or instant messaging. These practices do not arise from the implementation of imported models,

but from situated learning and institutional creativity in the face of precariousness.

A fundamental aspect was the community's role. In Boyacá, ESEs function as central social structures in territories where the state has little presence. The population not only demands medical care, but also listening, accompaniment, and institutional presence. This makes managers visible figures who are often judged more for their human responsiveness than their technical skills. This role exposes leaders to high levels of pressure, but also allows them to build social trust, which becomes intangible organizational capital. As a result, management decisions must consider not only efficiency, but also the sustainability of the link with the community.

The case analysis also identified structural limitations imposed by the insurance model, including the EPS's intermediation of financial resources, payment delays, excessive billing procedures, and limited absolute administrative autonomy. Despite these barriers, managers develop containment and adaptability mechanisms that enable them to maintain basic operations, albeit at high risk of professional and emotional burnout. The profile of a successful manager in this context is not defined exclusively by technical knowledge, but by the ability to read the context, lead by listening, and manage the unpredictable with integrity and a long-term vision.

CONCLUSIONS

The purpose of this chapter has been to offer a practical, situated view of the management of ESEs at the primary care level in Colombia, grounded in complex systems and hermeneutic phenomenology. Based on the case study conducted in Boyacá and the selected theoretical frameworks, it has been shown that public health management cannot be reduced to the technical execution of procedures; rather, it must be understood as a deeply relational, adaptive, and meaningful practice. The figure of the manager emerges not only as an administrator of resources but also as an ethical agent, an interpreter of the environment, and an articulator of institutional, community, and political dynamics.

This analysis has enabled the identification of specific tools and models that can be used by first-level managers, especially in contexts where uncertainty, structural precariousness, and social complexity predominate. The chaordic management model, hybrid indicators, and the proposed participatory tools contribute to more contextualized, inclusive, and sustainable decision-making. These instruments seek to strengthen the institutional capacity of ESEs, not through regulatory rigidity, but through collective intelligence and openness to emerging local innovation processes. Similarly, the case of Boyacá shows that, despite budgetary and structural limitations, it is possible to sustain meaningful management practices when working with purpose, understanding of the territory, and reflective leadership.

This chapter contributes to the debate on health administration and innovation in the 21st century, proposing an alternative perspective that challenges linear approaches and promotes a management paradigm sensitive to the reality of public health systems. In a national context where ESEs face growing financial, regulatory, and social challenges, it is essential to move toward forms of management that recognize the complexity of the environment, value the lived experience of its actors, and favor the construction of public institutions that are more resilient, fair, and close to the communities they serve.

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