

Healthy cellular organizational model and its impact on the productivity of SMEs in Bogotá, D.C., Colombia

Modelo organizacional celular saludable y su impacto en la productividad de las pymes de Bogotá, D.C., Colombia

Modelo organizacional celular saudável e seu impacto na produtividade das PMEs em Bogotá, D.C., Colômbia

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Abstract

Introduction: This article presents the findings of the research project entitled “*Strengthening and Validating the Healthy Cellular Organization Model (MOCEORSA) in SMEs in Bogotá D.C.: Evaluating Its Impact on Organizational Productivity*”, conducted between 2024 and 2025 at Universidad Distrital Francisco José de Caldas.

Problem: Small and medium-sized enterprises (SMEs) face challenges associated with organizational dynamics, market conditions, and globalized environments, requiring rapid adaptation to new systemic organizational models in order to achieve and sustain competitive advantage.

Objective: To determine the impact of the Healthy Cellular Organization Model (MOCEORSA) on the productivity of SMEs in Bogotá, D.C., Colombia.

Methodology: A mixed-method explanatory approach was employed to establish cause-and-effect relationships through the evaluation of both qualitative and quantitative variables.

Results: A total of 66 SMEs in Bogotá were analyzed through nine variables and 36 subvariables. The results revealed a moderate positive relationship ($R = 45.8\%$) between the independent subvariables and the dependent variable. The coefficient of determination (R^2) indicated that the model explains 21% of the variability in organizational productivity. This finding is supported by an F-statistic of 0.749.

Conclusion: The results indicate that the MOCEORSA model constitutes a valid alternative for strengthening organizational productivity, demonstrating a direct impact of the analyzed subvariables on the final outcome.

Originality: The study statistically validates the MOCEORSA model and its relationship with organizational productivity.

Limitations: The limited availability of previous studies restricts comprehensive comparative analyses.

Keywords: Healthy Organizational Model; Cellular Organization (HERO); VUCA Environments (Volatility, Uncertainty, Complexity, and Ambiguity); Work Engagement; Committed and Resilient Organizations; Great Place to Work (GPTW) Cellular Organization.

Resumen

Introducción: Este artículo presenta los hallazgos del proyecto de investigación “Fortalecimiento y validación del modelo de organización saludable tipo celular (MOCEORSA) en las pymes de Bogotá D.C.: evaluación de su impacto en la productividad organizacional”, desarrollado entre 2024 y 2025 en la Universidad Distrital Francisco José de Caldas.

Problema: Las pequeñas y medianas empresas (pymes) enfrentan desafíos asociados con las dinámicas organizacionales, las condiciones del mercado y los entornos globalizados, que exigen una rápida adaptación a nuevos modelos organizacionales sistémicos para alcanzar y mantener una ventaja competitiva.

Objetivo: Determinar el impacto del modelo de organización saludable tipo celular (MOCEORSA) en la productividad de las pymes de Bogotá, D.C., Colombia.

Metodología: Se empleó un enfoque mixto de tipo explicativo para establecer relaciones de causa y efecto mediante la evaluación de variables cualitativas y cuantitativas.

Resultados: Se analizaron 66 pymes de Bogotá mediante nueve variables y 36 subvariables. Los resultados revelaron una relación positiva moderada ($R = 45,8 \%$) entre las subvariables independientes y la variable dependiente. El coeficiente de determinación (R^2) indicó que el modelo explica el 21 % de la variabilidad de la productividad organizacional. Este hallazgo se encuentra respaldado por un estadístico F de 0.749.

Conclusión: Los resultados permiten concluir que el modelo MOCEORSA constituye una alternativa válida para fortalecer la productividad organizacional, evidenciando un impacto directo de las subvariables analizadas sobre el resultado final.

Originalidad: Mediante análisis estadísticos, se valida el modelo MOCEORSA y su relación con la productividad organizacional.

Limitaciones: La escasez de estudios previos limita la realización de comparaciones exhaustivas.

Palabras clave: Modelo Organizacional Saludable; Organización Celular (HERO); Entornos VICA (Volatilidad, Incertidumbre, Complejidad y Ambigüedad); Engagement en el trabajo; Organizaciones comprometidas y resilientes; Organización Celular GPTW (Great Place to Work).

Resumo

Introdução: Este artigo apresenta os resultados do projeto de pesquisa intitulado "Fortalecimento e Validação do Modelo de Organização Celular Saudável (MOCEORSA) em PMEs em Bogotá D.C.: Avaliando seu Impacto na Produtividade Organizacional", realizado entre 2024 e 2025 na Universidade Distrital Francisco José de Caldas.

Problema: As pequenas e médias empresas (PMEs) enfrentam desafios associados à dinâmica organizacional, às condições de mercado e aos ambientes globalizados, exigindo rápida adaptação a novos modelos organizacionais sistêmicos para alcançar e manter vantagem competitiva.

Objetivo: Determinar o impacto do Modelo de Organização Celular Saudável (MOCEORSA) na produtividade de PMEs em Bogotá, D.C., Colômbia.

Metodologia: Uma abordagem explicativa de métodos mistos foi empregada para estabelecer relações de causa e efeito por meio da avaliação de variáveis qualitativas e quantitativas.

Resultados: Um total de 66 PMEs em Bogotá foram analisadas por meio de nove variáveis e 36 subvariáveis. Os resultados revelaram uma relação positiva moderada ($R = 45,8\%$) entre as subvariáveis independentes e a variável dependente. O coeficiente de determinação (R^2) indicou que o modelo explica 21% da variabilidade na produtividade organizacional. Essa descoberta é corroborada por uma estatística F de 0,749.

Conclusão: Os resultados indicam que o modelo MOCEORSA constitui uma alternativa válida para fortalecer a produtividade organizacional, demonstrando um impacto direto das subvariáveis analisadas no resultado final.

Originalidade: O estudo valida estatisticamente o modelo MOCEORSA e sua relação com a produtividade organizacional.

Limitações: A disponibilidade limitada de estudos anteriores restringe análises comparativas abrangentes.

Palavras-chave: Modelo Organizacional Saudável; Organização Celular (HERO); Ambientes VUCA (Volatilidade, Incerteza, Complexidade e Ambigüidade); Engajamento no Trabalho; Organizações Comprometidas e Resilientes; Organização Celular Great Place to Work (GPTW).

1. INTRODUCTION

Organizational structures have historically played a fundamental role in providing competitive advantages for small and medium-sized enterprises (SMEs), as they establish order in internal processes and facilitate the implementation of strategic guidelines. However, the demands of today's global environment—characterized by volatility, uncertainty, complexity, and ambiguity (VUCA)—have rendered many traditional organizational structures insufficient. Factors such as adaptability, technological

integration, and organizational culture directly influence organizational performance [1], highlighting the need for innovative organizational models [2], [3].

Within this context, the Healthy Cellular Organization Model (MOCEORSA) emerges as an alternative that prioritizes flexibility, responsiveness to change, and human interactions while strengthening employee commitment through approaches such as work engagement. This concept, supported by positive psychology, emphasizes dimensions such as vigor, dedication, and absorption, which are considered fundamental to optimizing organizational performance [4], [5].

This article aims to validate the Healthy Cellular Organization Model (MOCEORSA) in SMEs located in Bogotá, D.C., Colombia, with the purpose of strengthening the propositions presented by Sáenz Blanco, Mahecha Guzmán et al. in the research article *Health Promotion in the Work Context, Beyond a Healthy Organizational Model* (Mahecha Guzmán et al., 2020a). Specifically, the study seeks to optimize individual skills and capabilities while promoting a vision of competitiveness, productivity, and organizational impact that contributes to sustainable and equitable development in increasingly demanding environments [7].

Currently, the implementation of agile methodologies alone is insufficient. Organizations must redesign their structures to respond effectively to contemporary volatility and emerging challenges. Consequently, organizational management should focus on transforming skills and competencies while strengthening mechanisms that facilitate fluid horizontal communication, promote employee empowerment, and foster a climate of trust supported by shared organizational values [3].

Accordingly, the objective of this research was to determine the impact of the Healthy Cellular Organization Model (MOCEORSA) on the productivity of SMEs in Bogotá, D.C., Colombia. This study responds to the gaps identified in the literature regarding traditional organizational structures by proposing an innovative organizational approach that contributes to improving corporate productivity. Furthermore, the model is directly aligned with the Sustainable Development Goals (SDGs), positioning itself as a strategic tool capable of responding more effectively and agilely to evolving market demands [8].

2. LITERATURE REVIEW

The Healthy Cellular Organization Model is framed within a systemic perspective in which emergence, interdependence, and self-management—essential elements in organizational evolution—play a central role. MOCEORSA is founded on the development of trust and organizational criteria oriented toward culture, collaboration, and

professional development. To achieve this, it builds upon and extends the proposal developed by Silva et al. (2020), which identifies key subvariables associated with organizational productivity, including recognition, leadership, synergy, resilience, and communication, among others [9], [10], [11].

According to the definition of health proposed by the World Health Organization (WHO), which conceives health as a state of complete physical, mental, and social well-being rather than merely the absence of disease, occupational health psychology has evolved toward a psychobiosocial paradigm. This paradigm integrates both the challenges and strengths of the work environment, aligning with positive psychology and contemporary organizational models that implement comprehensive productivity strategies. Within this framework, the concept of Healthy Organizations, proposed by Marisa Salanova in 2008 [12], emphasizes the importance of creating safe and motivating work environments that promote employee well-being as a strategic factor for organizational success. This perspective is supported by Positive Occupational Health Psychology (POHP), which prioritizes human strengths and favorable working conditions to enhance employee well-being [10], [13], [14].

Among these approaches, the HERO (Healthy and Resilient Organizations) model, proposed by Salanova and collaborators in 2012, constitutes a heuristic framework integrating both theoretical and empirical evidence from Positive Occupational Health Psychology, human resource management, and occupational stress research. The HERO model postulates that healthy and resilient organizations are characterized by systematic and proactive efforts to improve organizational performance through the interaction of three interdependent levels: the task, the social environment, and the organization as a whole [15], [16].

The HERO model is structured around three fundamental components: healthy organizational resources and practices, encompassing both work resources and strategies designed to promote employee well-being; healthy employees, characterized by self-efficacy, organizational trust, and work engagement; and healthy organizational outcomes, reflected in superior organizational performance resulting from the interaction between the first two components [15], [17].

Within the framework of the aforementioned approaches, this research focuses on analyzing the interaction between two key components: the influence of healthy organizational practices on employees' health and well-being, and their subsequent impact on job performance. The primary objective is to clarify how organizational initiatives and management practices designed to foster healthy work environments influence both employees' physical and psychological well-being and their work performance. Consequently, the study seeks to establish a clear relationship between

healthy organizational practices and organizational outcomes in terms of occupational health and productive efficiency [1], [2], [18].

Healthy Organizational Practices and Work Engagement

This study examines the relationship between healthy organizational practices promoted by Human Resource Management (HRM) and work engagement, which is defined as a positive psychological state characterized by vigor, dedication, and absorption. Based on the HERO (Healthy and Resilient Organizations) model, the research analyzes how organizational practices such as work-life balance, communication, career development, and equity influence employee health, well-being, and engagement [15].

Although previous studies have demonstrated the relationship between organizational factors and work engagement, a research gap remains regarding the systematic interaction among these practices. This study seeks to address this gap by analyzing the relationships among the variables and subvariables to explain how healthy organizational practices promote work engagement and, ultimately, enhance organizational productivity.

The study also proposes the adoption of healthy organizational models as an innovative leadership strategy, supported by the PDCA (Plan–Do–Check–Act) cycle as a framework for continuous improvement. Furthermore, it recommends implementing the World Health Organization (WHO) model, which integrates four key dimensions for promoting organizational well-being: the physical work environment, the psychosocial work environment, personal health resources, and organizational involvement in the community [14], [19].

Additionally, this research highlights the importance of employee engagement and emphasizes the need for a comprehensive understanding of the components of the proposed organizational models to achieve a stable and healthy work environment. The findings are expected to provide valuable guidance for leaders of small and medium-sized enterprises seeking to optimize resource management, improve organizational performance, and strengthen long-term business sustainability.

Implementing a Healthy Organizational Model: A Strategic and Cyclical Approach to Organizational Well-being

The adoption of healthy organizational models has emerged as an innovative leadership strategy focused on employee well-being while optimizing organizational resources and processes. This approach promotes a profound transformation of organizational culture, reflected in the organization's mission, vision, and core values, and generally requires an implementation period of three to five years.

To facilitate this transition, this study proposes adapting the PDCA (Plan–Do–Check–Act) model as an iterative framework for continuous improvement [17]. Through periodic evaluation and the implementation of successive improvements, this model aligns with the dynamic and evolutionary nature of healthy organizational models.

Creating a stable and healthy work environment requires the implementation of effective mechanisms and organizational procedures that guide employee behavior and organizational practices. Accordingly, this study proposes adopting the World Health Organization (WHO) model, which integrates four key dimensions for promoting organizational well-being: the physical work environment, the psychosocial work environment, personal health resources, and organizational involvement in the community [19], [20]. **Figure 1** illustrates this proposed framework.

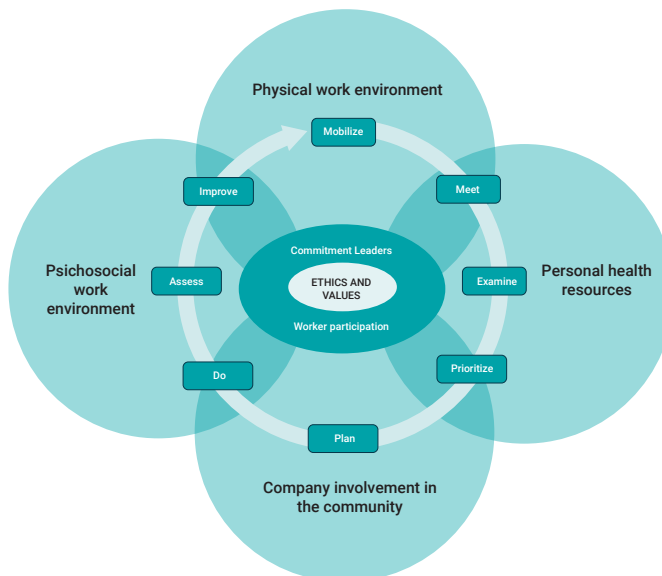


Figure 1. Healthy organizations.

Source: Marisa Salanova Soria, “Organizaciones Saludables y Desarrollo de Recursos Humanos,” [12], E. N. Gutiérrez-Bolaño, M. Bermúdez-Lugo, J. Moreno-Chaparro, and O. B. Guzmán-Suárez, “Estrategias de transformación en organizaciones saludables,” [14]

Transition to Healthy Workplaces: A Planned and Collaborative Approach

To ensure the success of this transition, it is important to assign responsible individuals to oversee the process, generate periodic reports, and maintain ongoing communication with employees. Implementing a model requires a participatory approach and proactive management, with collaboration and effective communication, and maintaining a cycle as specified in Figure 2.

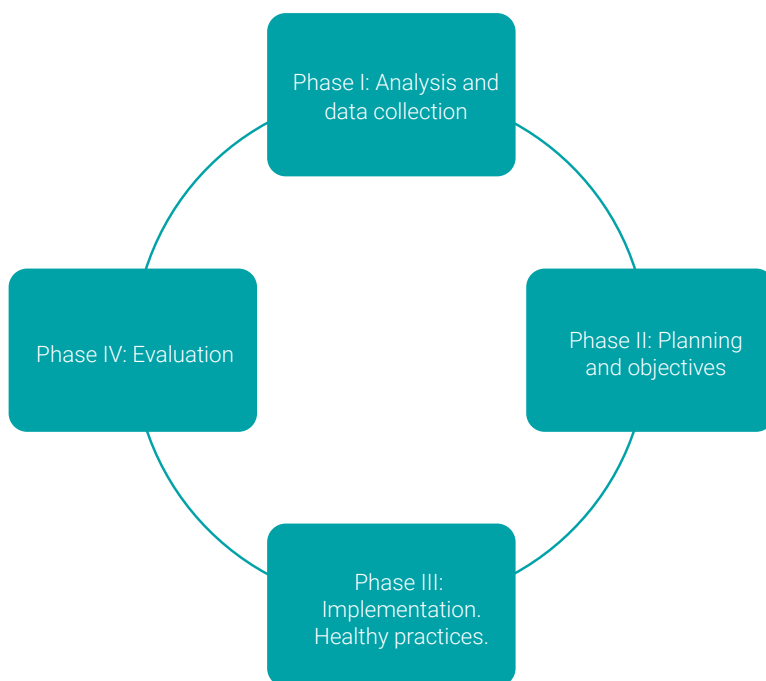


Figure 2. Healthy Organizations.

Source: Marisa Salanova Soria, “Organizaciones Saludables y Desarrollo de Recursos Humanos,” [12], E. N. Gutiérrez-Bolaño, M. Bermúdez-Lugo, J. Moreno-Chaparro, and O. B. Guzmán-Suárez, “Estrategias de transformación en organizaciones saludables,” [14]

Cellular Organization and Healthy Organizational Models: A Transition Towards Agility and Organizational Wellbeing

This study explores the evolution of organizational structures toward cellular models, characterized by autonomous and interdependent units that foster agility and efficiency. The importance of continuous innovation and comprehensive knowledge management is highlighted.

The cellular model of a healthy organization is presented as an alternative to traditional hierarchical systems. This approach promotes the constant evolution of the organization, emphasizing the interactions between stakeholders and their environment. Its implementation implies a profound transformation in organizational culture, aimed at creating a healthy and productive work environment. In line with this model's cellular analogy, each part is systemically articulated, making the whole function perfectly, and its expression is equated with harmony and constant growth[21]. Figure 3.

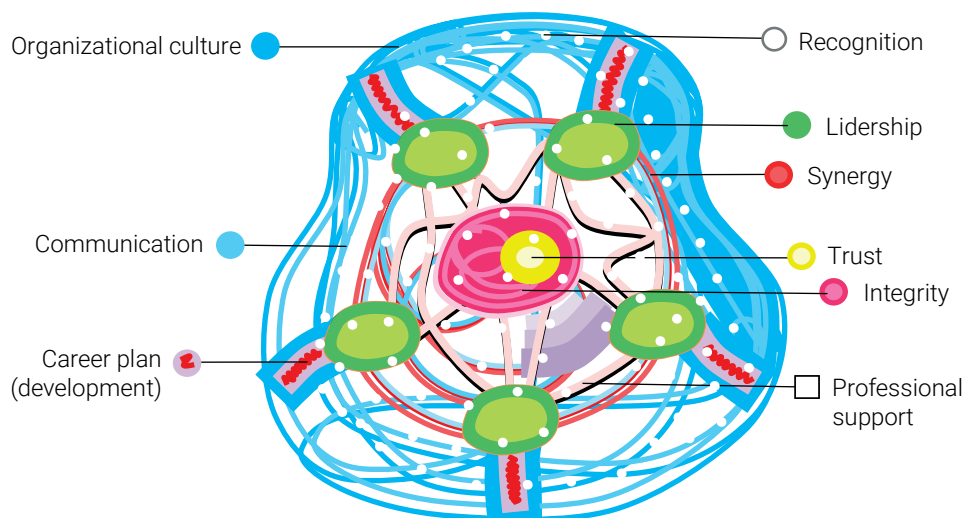


Figure 3. Healthy cellular organizational model

Source: Own work.

For the present study, the analysis of the organizational model explored a horizontal structure, based on collaborative decision-making and the development of a shared vision. This model seeks to foster a work environment where participation and collaboration drive organizational effectiveness and well-being. This approach also expanded the scope of the previous study on the variables analyzed by M002E Guzmán in 2020 [9], which were: Figure 4

- **Organizational culture:** Milestones, myths, rituals, and shared beliefs.
- **Development:** Resource-sharing practices for competency development.
- **Professional support:** Consideration and promotion of employee work.
- **Recognition:** Humanistic appreciation of the individual in their work role.
- **Teamwork:** Collaboration and fraternity toward common goals.
- **Synergy:** Joint work for coordinated achievements.

- **Integrity:** Coherence between values and actions.
- **Communication:** Effective interactions between organizational actors.



Figure 4. MOCEORSA Model

Source: Own work.

According to scientific discernment, each subvariable has the following description [22]:

ORGANIZATIONAL CULTURE (Cell Wall)

The cell wall functions as the protective structure of the cell. Within the organizational context, it represents organizational norms, mission, vision, corporate identity, employee relationships, and organizational values.

Organizational culture constitutes a fundamental pillar for achieving objectives in business, educational, and personal contexts. It encompasses the structuring and coordination of resources, processes, and people to optimize organizational efficiency and accomplish strategic goals. An effective organizational culture promotes clarity, defines responsibilities, and encourages collaboration, all of which are essential elements for achieving organizational success.

RECOGNITION (Mitochondria)

Mitochondria are the organelles responsible for transforming nutrients into energy through cellular respiration. Analogously, in organizations, recognition represents the mechanisms through which employees are motivated and empowered. This dimension emphasizes the importance of positive role models, collaboration among teams, recognition of individual and collective contributions, and the development of employee loyalty and organizational commitment.

LEADERSHIP (Cytoplasm)

The cytoplasm performs multiple cellular functions, including energy generation and acting as a protective barrier against H_2O molecules. Likewise, organizational leadership provides the environment in which organizational processes are coordinated and developed. According to John R. French and Bertram Raven (1959), leadership power may be coercive, reward-based, legitimate, referent, expert, or informational. Furthermore, the acceptance of diversity and the ability to inspire, motivate, and influence others are critical factors for achieving organizational objectives. Consistent ethical behavior is equally essential for effective decision-making.

SYNERGY (Endoplasmic Reticulum)

The endoplasmic reticulum is responsible for the synthesis of proteins and lipids. Within organizations, synergy represents the integration of collective efforts and coordinated actions, supported by persistence, passion, and organizational pride. It reflects the degree to which employees identify with the organization and align their professional roles with both organizational objectives and personal aspirations.

TRUST AND RESILIENCE (Cilia and Flagella)

Cilia and flagella are cellular appendages composed of microtubules that provide mobility. In organizational terms, they symbolize self-confidence, flexibility, achievement orientation, perseverance, and resilience, all of which enable organizations and employees to adapt successfully to changing environments.

INTEGRITY (Nucleus)

The nucleus maintains genetic integrity and regulates cellular activity. Within organizations, integrity encompasses ethical behavior, competitive effectiveness and

efficiency, conflict resolution, and the prevention and control of corruption. This dimension serves as the central mechanism guiding organizational decision-making and governance.

PROFESSIONAL SUPPORT (Golgi Apparatus)

The Golgi apparatus is responsible for processing, packaging, and distributing the cell's chemical products, functioning as the cellular secretion center. Similarly, professional support within organizations focuses on fostering employee empowerment, developing social and interpersonal skills, strengthening personal responsibility and problem-solving capabilities, and promoting organizational change.

CAREER PLAN DEVELOPMENT (Plastids)

Plastids are organelles unique to plant cells that are responsible for photosynthesis and the production and storage of various chemical compounds. In the organizational context, this component represents career development through the identification of professional growth opportunities, the establishment of clear objectives, the strengthening of employee competencies, and the promotion of individual commitment toward continuous development.

COMMUNICATION (Cell Membrane)

The cell membrane forms the boundary of the cell and regulates the exchange of substances with the external environment. Likewise, organizational communication regulates the flow of information within and outside the organization. This dimension emphasizes communication direction, message clarity, and the identification of communication barriers, which may be linguistic, physical, or technological. Organizational leaders should recognize the individual needs of employees to ensure continuous, effective, and transparent communication among all organizational members and with external stakeholders, including customers.

Strengthening the Healthy Cellular Organization Model (MOCEORSA) in VUCA Environments

The relevance of the MOCEORSA model within VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) environments lies in its capacity to respond effectively

to rapid change, uncertainty, complex interrelationships, and informational ambiguity [23]. The model conceptualizes organizations as living systems engaged in continuous interaction with their environment (Mahecha Guzmán et al., 2020). Incorporating the VUCA perspective strengthens this approach by facilitating more adaptive, flexible, and resilient organizational management [24].

Accordingly, the present analysis demonstrates the applicability of the MOCEORSA model in Colombian SMEs, highlighting its potential to strengthen organizational resilience, improve productivity, and enhance long-term business sustainability.

3. MATERIALS AND METHODS

To determine the impact of the **Healthy Cellular Organization Model (MOCEORSA)** on the productivity of SMEs in Bogotá, D.C., Colombia, a model validation analysis was conducted using descriptive and inferential statistical methods. The study categorized the principal variables and subvariables, examining both their individual effects and their integrated relationships based on the organizational framework proposed by **Mahecha Guzmán (2020)**.

Population and Sample

The research considered information obtained from the **National Administrative Department of Statistics (DANE)** and the ranking of the most profitable SMEs in Colombia during the 2020 period. The target population consisted of **336 SMEs** located in Bogotá, D.C. From this population, a representative sample of **66 SMEs** from different economic sectors was selected using the business registry of the **Bogotá Chamber of Commerce (CCB)**. A population-based sampling approach was adopted.

The parameters used to determine the representative sample size were a confidence level of **95%** ($Z = 1.96$), a probability of success of **p = 5.65%** (representing SMEs from different economic sectors to identify the impact of the variables across diverse organizational contexts), a probability of failure of **q = 94.35%**, and a maximum allowable error of **d = 5%**. Based on these parameters, the calculated sample size was **n = 66**.

Where:

- N** = Population size.
- Z** = Confidence level.
- p** = Probability of success.
- q** = Probability of failure.
- d** = Maximum allowable error.

Data were collected using a five-point Likert-scale questionnaire administered through an online survey directed to SME owners, managers, and executives. This instrument enabled the structured collection and measurement of data within a relatively short period.

The **National Administrative Department of Statistics (DANE)** is the official Colombian institution responsible for producing, analyzing, and disseminating national statistical information, including economic censuses and business records, thereby supporting the reliability of the data used in this study.

At the qualitative level, the analysis included absolute and relative frequencies, as well as trend analysis. At the quantitative level, the study employed the **Cross-Correlation Matrix**, the **Vester Matrix**, and the **Potential Direct Impact Matrix (MIDP)** using **MICMAC** software. These analytical tools enabled the identification of key variables according to their levels of influence and dependence within a Cartesian influence–dependence map. Finally, the relationships among the study variables were modeled using **Multiple Linear Regression (MLR)** [25]–[28].

Observaciones editoriales

Se realizaron únicamente mejoras de estilo y precisión:

- **“Model (MOCEORSA)”** → **“Healthy Cellular Organization Model (MOCEORSA)”** (primera aparición).
- **“finding a representative sample”** → **“determine the representative sample size”** (terminología estadística).
- **“online form”** → **“online survey”** (más académico).
- **“SME managers and directors”** → **“SME owners, managers, and executives”** (más natural en inglés científico).
- **“implemented with MICMAC software”** → **“using MICMAC software”**.

- **“identify key variables based on their influence and impact” → “according to their levels of influence and dependence”,** que es la terminología propia de MICMAC.
- **“Multiple Linear Regression”** se deja completo y se añade **(MLR)** por consistencia metodológica.

Basic characteristics of the companies in the sample. Table 1.

Chart 1.

Variable	Main categories	Frequency	% of sample	% of the population (N=336)
Economic sector	Services / Commerce / Manufacturing / ICT	66	100%	19,6%
Size	Small / Medium	66	100%	19,6%
Annual sales range	Low / Medium / High	66	100%	19,6%
Productivity (reported profits)	Low / Medium / High	66	100%	19,6%

Source: Own work based on DANE and Bogotá Chamber of Commerce

Tools:

The software used was EasyFit, Minitab, and SPSS-IBM v30.0. Data modeling was performed using Multiple Linear Regression. Finally, a bibliometric analysis was conducted using VOSviewer, based on Scopus, to support the results of the model's impact on organizational productivity, aligned with the Sustainable Development Goals (SDGs)[8], [29].

Definition, categorization, and characterization of study variables.

The Cellular Model of Healthy Organization (MOCEORSA) is composed of 9 variables and 36 subvariables. The definition and selection of variables for the validation of MOCEORSA followed the previous study by [6], which proposes: organizational culture, recognition, leadership, synergy, trust and resilience, integrity, professional support, career development, and communication. Each of these variables in turn includes four (4) defined subvariables established through questions (36 subvariables in total). Each is designed to assess specific areas of organizational dynamics. Chart 2

Chart 2. Variables and subvariables for the validation of the MOCEORSA model

VARIABLE	DEFINITION MOCEORSA	CATEGORIZATION	SUBVARIABLE
ORGANIZATIONAL CULTURE	Cell Wall "Protect the Cell"	Scale	Organizational norms Company identity Employee relationships Company values
RECOGNITION	Mitochondria "This is where nutrients are transformed into energy in a process called respiration."	Scale	Company leaders Team collaboration Recognition specifications Loyalty
LEADERSHIP	Cytoplasm "It has the function of producing energy and acting as a barrier against H2O molecules"	Scale	Power Acceptance of diversity Ability to inspire Ethical and consistent conduct
SYNERGY	Endoplasmic Reticulum "Synthesis of proteins and lipids"	Scale	A combination of efforts and actions Persistence Passion Pride
TRUST AND RESILIENCE	Cilia and Flagella "Cellular Motility"	Scale	Self-confidence Flexibility Achievement orientation Perseverance
INTEGRITY	Core "Genetic Integrity"	Scale	Ethics Competitive effectiveness and efficiency Conflict resolution Corruption prevention and control
PROFESSIONAL SUPPORT	Golgi Apparatus "Distribution and shipment of chemical products within the cell. It is the cell's secretion center."	Scale	Empowerment Development of social skills Strengthening self-responsibility and problem-solving abilities Motivating change
CAREER PLAN DEVELOPMENT	Plastids "Production and storage of different chemical compounds. Photosynthesis function"	Scale	Identifying development opportunities Clarity of objectives Strengthening skills Employee willingness
COMMUNICATION	Cell Membrane "Regulatory function of the entry and exit of substances. It is the layer that encloses the cell."	Scale	Communication Management Clarity of the Message Communication Barriers Flexibility of Communication Channels

Source: Own work

RESULTS

Descriptive analysis:

The 66 participating SMEs answered a total of 2,376 questions on the questionnaire. Of these, 2,235 responses referred to the scales: somewhat agree, agree, and strongly agree. Following the above, the order of the subvariables by degree of perception was 1) trust and resilience, 2) integrity, 3) recognition, 4) professional support, 5) synergy, 6) communication, 7) organizational culture, 8) career development, and 9) leadership. In this analysis, some subvariables shared the same position when calculating the mean. Chart 3.

Chart 3. Frequency of responses issued by SMEs with a positive inclination on the Likert scale 5, 6 and 7

Item	Variable	Number of Responses	Average
1	Trust and resilience	257	97
2	Integrity	253	96
3	Recognition	250	95
4	Professional support	249	94
5	Synergy	247	94
6	Communication	246	93
7	Organizational culture	245	93
8	Career development plans	245	93
9	Leadership	243	92
Total		2235	

Source: Own work.

To quantitatively validate the impact of each variable and subvariable, descriptive statistics and nonparametric tests were applied, considering the intrinsic characteristics of the dataset. However, to model the relationship between the independent variables and the dependent variable—productivity, measured as the declared profit value (in millions of Colombian pesos)—and to explain the relationships among them, a data normalization and linearization process was performed. The procedure initially consisted of conducting a cross-correlation analysis for each of the model's subvariables to explore the dataset, identify significant associations, and prepare the data for subsequent statistical modeling.

As part of this procedure, a **Cross-Correlation Matrix** was constructed to present the Pearson correlation coefficients among the 36 subvariables of the model. This

matrix enabled the identification of strong ($r > 0.70$), moderate ($0.40 \leq r \leq 0.69$), and weak ($r < 0.40$) associations, facilitating the selection of the most influential variables for subsequent analysis using the **MICMAC** method and **Multiple Linear Regression (MLR)**.

The correlation analysis of the variables and subvariables revealed the following:

Strong correlations

- **Organizational Culture:** strong correlations were identified between the subvariables *organizational norms* and *company identity*.
- **Leadership:** a strong relationship was observed between the subvariables *ability to inspire* and *ethical conduct and consistency*.
- **Integrity:** strong correlations were found between the subvariables *ethics, prevention and control of corruption*, and *competitive efficiency and effectiveness*.
- **Professional Support:** a strong relationship was identified among the subvariables *empowerment generation, development of social skills*, and *strengthening of self-responsibility*.
- **Communication:** strong correlations were observed between the subvariables *communication direction, message clarity*, and *communication channel flexibility*.

The variables **Recognition** and **Career Development** also exhibited consistently strong correlations across their four subvariables. Within the **Career Development** dimension, the subvariables *competency development* and *employee willingness* showed particularly high correlation values.

Moderate correlations

- **Synergy:** moderate correlations were identified between the subvariables *combination of efforts and actions, persistence*, and *passion for work*.
- **Trust and Resilience:** the strongest moderate correlations were observed among the subvariables *self-confidence, flexibility, achievement orientation*, and *perseverance*.

Continuing the analysis of the potential influence of the variables and subvariables within the **MOCEORSA** model, the **Potential Direct Impact Matrix (PDIM)** prospective analysis identified **12 of the 36 subvariables** as exhibiting the highest levels of influence and indirect dependence. These subvariables demonstrated key

explanatory behavior with respect to variations in the dependent variable (organizational productivity). These findings provide initial empirical evidence supporting the applicability of the **MOCEORSA** cellular systemic approach to SMEs. **Figure 3.**

Chart 3. Subvariables selected using the PDMI method

VARIABLE	SUBVARIABLES
ORGANIZATIONAL CULTURE	Organizational norms Corporate identity
LEADERSHIP	Power Ability to inspire Ethical and consistent conduct
INTEGRITY	Ethics Competitive effectiveness and efficiency
PROFESSIONAL SUPPORT	Empowerment Development of social skills Strengthening self-responsibility and problem-solving abilities
COMMUNICATION	Clarity in the message Flexibility of communication channels

Source: Own work.

According to the above, the MIDP analysis excluded some subvariables from the original model. However, at the researcher's discretion, and in order to give the model greater representativeness and validity, seven additional subvariables were incorporated. The decision was based on three criteria: (1) their level of influence and interdependence identified in the Cross Correlation Matrix, (2) their frequency of appearance in the qualitative response patterns, and (3) their theoretical relevance within models of healthy organizations (HERO, GPTW, and MOCEORSA). Thus, Chart 5 presents the final set of subvariables used in this modeling, ensuring conceptual coherence and empirical relevance. Chart 5

Chart 5. Subvariables selected by the researcher

VARIABLE	SUBVARIABLES
RECOGNITION	Loyalty Combination of efforts and actions
SYNERGY	Persistence Pride
TRUST AND RESILIENCE	Flexibility
DEVELOPMENT OF CAREER PLANS	Skills development Employee readiness

Source: Own work.

Subsequently, after data normalization and linearization, and once the assumptions required for parametric statistical modeling were satisfied, the relationship between the independent subvariables and the dependent variable was analyzed. The results showed a moderate positive correlation ($R = 45.8\%$) between the subvariables and organizational productivity. Although this value does not indicate high explanatory power, it suggests that the proposed model constitutes a valid alternative for strengthening the organizational productivity framework proposed by Mahecha Guzmán et al. (2020), as well as other organizational models such as GPTW and HERO.

The coefficient of determination (R^2) indicates that the model explains approximately 21% of the variability in SME productivity. Although this percentage represents a moderate level of explanatory power, it is considered meaningful in organizational research, where productivity is influenced by numerous observable and unobservable factors. Consequently, future studies should incorporate additional explanatory variables to improve the predictive and explanatory capacity of the model.

Regarding the statistical evaluation criteria, R^2 values ≥ 0.40 were considered indicative of moderate explanatory relationships, whereas values between 0.10 and 0.30 are commonly reported in multivariate organizational models. Furthermore, a positive and statistically significant F-statistic confirms the overall goodness-of-fit of the regression model, while Variance Inflation Factor (VIF) values below 5 indicate the absence of problematic multicollinearity among the predictor variables. All these statistical criteria were satisfied in the present study, indicating that the regression estimates were not biased by excessive intercorrelations among the independent subvariables.

Figure 5. Results of the multiple linear regression model

Summary of model b						
Model	R	R Squared	Adjusted R-squared	Standard error of the estimate	Change in R squared	Change in F
1	,458	,210	-,070	1,00413	,210	,749
Summary of model b						
Model	gl1	gl2	Statistical Sig. Change in F			
1	17	48	,738			

a. Predictors: (Constante), VAR0036, VAR0021, VAR0016, VAR0001, VAR0018, VAR0031, VAR0027, VAR0009, VAR0034, VAR0013, VAR0014, VAR0022, VAR0025, VAR0002, VAR0032, VAR0012

b. Dependent variable: VARDEPENDIENTE

Source: Own work.

In the analysis and modeling of MOCEORSA using multiple linear regression, the behavior and impact of the subvariables were evaluated, identifying five with positive Beta values. These were: (VAR0002) Business Identity X1 ($\beta_1 = 0.190$ or 19%), (VAR0021) Ethics X2 ($\beta_2 = 0.176$ or 17.6%), (VAR0034) Clarity in the message X3 ($\beta_3 = 0.081$ or 8.1%), (VAR0001) Organizational norms X4 ($\beta_4 = 0.028$ or 2.8%) and (VAR0027) Self-responsibility and problem-solving capacity X5 ($\beta_5 = 0.012$ or 1.2%). The above indicates, within the model, that an increase of one additional unit in actions to control these subvariables in the SME is significantly associated with a mostly moderate percentage increase in productivity.

The remaining subvariables showed negative Beta coefficients such as: X6 Persistence ($\beta_6 = -0.289$ or -28.9%), X7 Collaborator's Disposition ($\beta_7 = -0.283$ or -28.3%), X8 Flexibility ($\beta_8 = -0.202$ or -20.2%), X9 Strengthening Competencies ($\beta_9 = -0.114$ or -11.4%), X10 Ethical Performance Coherence ($\beta_{10} = -0.098$ or -9.8%), X11 Flexibility of Communication Channels ($\beta_{11} = -0.091$ or -9.1%), X12 Pride ($\beta_{12} = -0.037$ or -3.7%), X13 Combination of Efforts and Actions ($\beta_{13} = -0.032$ or -3.2%), X14 Generating Empowerment ($\beta_{14} = -0.022$ or -2.2%), X15 Power ($\beta_{15} = -0.019$ or -1.9%), X16 Competitive Effectiveness and Efficiency ($\beta_{16} = -0.016$ or -1.6%), and X17 Development of Social Skills ($\beta_{17} = -0.008$ or -0.8%). These values indicate that failure to control these variables negatively affects performance and productivity in SMEs.

Chart 6. Beta coefficients, tolerance values, and multicollinearity assessment

Model 1 Subvariables	Coefficients ^a						
	Non-standardized coefficients		Standardized coefficients	t	Statistical Significance	Collinearity statistics	
	B	Error Dev.	Beta			Tolerance	VIF
(Constant)	-0,026	0,129		-0,199	0,843		
Organizational norms	0,028	0,148	0,028	0,186	0,853	0,711	1,406
Corporate Identity	0,184	0,153	0,190	1,206	0,234	0,662	1,510
Power	-0,017	0,143	-0,019	-0,120	0,905	0,667	1,500
Ethical Performance and Consistency	-0,097	0,177	-0,098	-0,548	0,586	0,515	1,941
Combination of Efforts and Actions	-0,033	0,159	-0,032	-0,208	0,836	0,686	1,458
Persistence	-0,272	0,147	-0,289	-1,847	0,071	0,671	1,491
Pride	-0,035	0,126	-0,037	-0,276	0,784	0,897	1,115
Flexibility	-0,197	0,133	-0,202	-1,488	0,143	0,896	1,116

(continúa)

Model 1 Subvariables	Coefficients ^a						
	Non-standardized coefficients		Standardized coefficients	t	Statistical Significance	Collinearity statistics	
	B	Error Dev.	Beta			Tolerance	VIF
Ethics	0,169	0,147	0,176	1,150	0,256	0,703	1,423
Competitive Effectiveness and Efficiency	-0,016	0,152	-0,016	-0,102	0,919	0,683	1,464
Generate Empowerment	-0,023	0,174	-0,022	-0,130	0,897	0,587	1,704
Development of Social Skills	-0,008	0,151	-0,008	-0,052	0,959	0,723	1,383
Self-responsibility and problem-solving ability	0,013	0,162	0,012	0,079	0,937	0,716	1,396
Skills Strengthening	-0,105	0,129	-0,114	-0,811	0,421	0,828	1,208
Collaborator's Disposition	-0,271	0,162	-0,283	-1,674	0,101	0,577	1,732
Clarity in the message	0,082	0,144	0,081	0,570	0,571	0,823	1,215
Flexibility of Communication Channels	-0,083	0,133	-0,091	-0,623	0,536	0,767	1,304
a: Dependent variable productivity							

Consequently, the complementary analysis conducted using **VOSviewer** identified a connection between the empirical findings and the theoretical framework, strengthening the model from a cellular systemic perspective and aligning it with the assumptions underlying the proposed hypotheses. Furthermore, it provided new insights into the applicability of the model. The validation of these results constitutes an initial methodological contribution that can be refined in future studies to achieve greater statistical significance and explanatory power.

This software facilitated the visualization of the relationships and co-occurrence patterns among the subvariables identified in previous research. The standardized beta coefficients indicate that the productivity variable and the corporate identity subvariable exhibit an effect of 19%, while ethics demonstrates an effect of 17.6%. Likewise, message clarity and productivity show a significant relationship, with an effect of 8.1%. Finally, organizational norms exhibit an effect of 2.8%, whereas both self-responsibility and problem-solving ability show an effect of 1.2%.

4. DISCUSSION AND CONCLUSIONS

This study evaluated the impact of the Cell-Type Healthy Organization Model (MOCEORSA) on the productivity of 66 SMEs in Bogotá, D.C., identifying a moderate positive relationship ($R = 45.8\%$) between the model's subvariables and the dependent variable, organizational productivity, with an explanatory power of 21% ($R^2 = 0.21$). Although these values do not indicate high explanatory power, they are consistent with findings reported in studies of organizational models operating in complex environments, where productivity is influenced by multiple structural, cultural, and market-related factors.

From a theoretical perspective, the principal contribution of MOCEORSA lies in its cellular analogy applied to organizational design. Each variable and subvariable is conceived as a vital organizational component (e.g., nucleus, membrane, mitochondria, and Golgi apparatus), whose interaction determines the overall "health" of the system. This approach extends traditional healthy organization models, such as HERO and GPTW, by explicitly incorporating the interdependence among organizational variables, the concept of systemic equilibrium, and the need to regulate the intensity of specific organizational factors, such as persistence and flexibility, to prevent counterproductive effects.

From an empirical perspective, the subvariables with the greatest positive effects were corporate identity, ethics, and message clarity. These findings reinforce the premise that a strong organizational culture, supported by explicit values, ethical practices, and effective communication channels, constitutes a structural foundation for organizational productivity. Conversely, the subvariables with negative standardized beta coefficients, including persistence, employee willingness, and excessive flexibility, demonstrate that simply increasing the intensity of specific organizational characteristics is insufficient. When these characteristics are not managed in a balanced manner, they may generate organizational rigidity, dispersion of efforts, or loss of strategic focus, thereby negatively affecting organizational performance.

From a practical perspective, MOCEORSA provides SMEs with an intervention framework that enables organizations to prioritize concrete strategic actions, including: (1) strengthening corporate identity through consistent organizational norms and shared values; (2) consolidating integrity and transparency systems that reduce corruption risks; and (3) designing internal communication strategies that ensure clear and consistent messages aligned with organizational objectives. These recommendations are particularly relevant in VUCA environments, where volatility and uncertainty require organizational structures that are both agile and resilient while maintaining a clear strategic purpose and strong organizational cohesion.

Regarding its applicability, although the present study focused on SMEs located in Bogotá, D.C., the systemic and scalable nature of MOCEORSA suggests that the model can be adapted to different geographical and sectoral contexts. Service organizations, educational institutions, public organizations, and large corporations could benefit from the cellular organizational logic proposed by the model, provided that its variables and subvariables are adjusted to their specific structural and cultural characteristics. Future research should evaluate this transferability by expanding the sample size and incorporating longitudinal analyses to assess the model's medium- and long-term effects.

The principal limitations of this study include the sample size ($N = 66$) and the focus on a single city, both of which restrict the generalizability of the findings. In addition, the novelty of MOCEORSA limits the possibility of direct quantitative comparisons with other established organizational models. Nevertheless, these limitations are characteristic of pioneering research and establish a future research agenda aimed at refining the model, incorporating additional explanatory variables, and integrating emerging analytical approaches, such as artificial intelligence and big data analytics, for the continuous monitoring of organizational performance indicators.

In summary, MOCEORSA represents an original contribution to the field of healthy organizations by combining conceptual rigor, a systemic perspective, and practical applicability for SMEs operating in VUCA environments. Its implementation has the potential to promote the development of more resilient, ethical, and productive organizational ecosystems, aligned with the Sustainable Development Goals, particularly those related to decent work, economic growth, and the reduction of inequalities.

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