

COMPUTATIONAL ORDINAL SOCIOMETRY AND SOCIO-THERMODYNAMIC DIAGNOSIS (NEXORD PLATFORM)

Scientific Manifesto, Theoretical-Methodological Foundations, and Open Science Governance Framework

«Toward a Physics of the Collective»

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- **Official Repository and Source Code:** <https://github.com/josemancor/nex-ord-web>
- **Master Ecosystem:** VISORD 3D/4D (Ordinal Sociometric Visualizer)
- **Supported Languages across NEXORD Platform:** Spanish (ES), English (EN), French (FR), German (DE), Italian (IT), Portuguese (PT), Russian (RU), Chinese (ZH).

Executive Abstract

Computational Ordinal Sociometry (NEXORD) is, in essence, an updated extension of the foundational intuitions of Jacob Levy Moreno, creator of Sociometry, and Kurt Lewin, pioneer of field theory—two seminal figures in Social Psychology. Historically, small group dynamics research has been conditioned by the methodological and technical constraints of its founding era. This Manifesto is grounded in:

1) The conception of the ‘relational tie’, product of human interaction, as the fundamental core constituting the existential reality of groups. ‘Giving and Receiving’ are indissociable force pairs that sustain the necessary dialectical exchange of affect, ideas, intentions, resources, and collective actions toward shared goals. Personal and group health, wellbeing, success, and viability fundamentally depend on the permanent homeostatic balance established across interpersonal exchanges of acceptance and/or conflict in the short and medium term.

2) The refined quantification of preferential relational order through the inverse rank function ($W_{ij} = 1 / r_{ijk}^{\wedge \gamma}$), together with contemporary theoretical, methodological, and technological developments, defines the genesis of NEXORD as an overarching sociometric psychosocial research platform aiming to formally articulate the intuitions that Moreno and Lewin could not operationalize in their time.

3) The continuous metric emerging from this quantification is formally articulated, through matrix and tensorial algebra, within the Moreno-rooted relational tetragram (E, R, pE, pR ; p : perceptions) defining $3^4 = 81$ (Q81) dyadic relational figures, transforming micro-interactions ($N \times N$) into computable topologies via the SMib/SMIa matrix duality.

4) The articulation into 4 elemental densities (pDA, DA, RC, pRC) and their extension to 14 derived relational densities (18D space) precisely quantify the mass and flux of exchanges among group members. This gradient models the collective as a socio-thermodynamic system governed by equilibrium regimes and relational friction (Φ), where dialectical friction acts as a necessary condition for systemic health and adaptability against groupthink entropy.

5) Simultaneous projection across dual factorial spaces, where actors emerge not as static scalar points, but as kinematic dipoles ($DA \Leftrightarrow RECEIVE$) whose centroids analytically equilibrate emission and reception. This formulation reveals the gravitational dominance of the primary axes (F_1 and F_2) and enables the geometric comparison of group structures across Grassmann manifolds $Gr(k, N)$.

6) The versatility of the multidimensional design ($G \times T \times C$), enabling simultaneous intra/inter-group comparisons: transversal, longitudinal, and across preferential criteria. This mathematical architecture of abstract relationships is rendered intuitive for non-experts through interactive VISORD visualization modules, facilitating the monitoring and tracking of analytical results.

7) In its application to real-world field studies with human participants, NEXORD guarantees an exclusively formative, non-punitive use of data. This mandate safeguards Privacy by Design and requires professional and institutional accreditation as well as the explicit commitment of the Principal Investigator (PI) under Open Science principles, never to harm the personal self-esteem or social standing of participants through diagnostic reports, strictly refraining from attributing to intrinsic individual personality traits what are objectively group thermodynamic phenomena.

Keywords: NEXORD Platform, VISORD, Computational Ordinal Sociometry, Preventive Sociometry, Breve Format, Inverse Rank Function, Relational Densities (18D), Metaperception, Dual Factorial Planes, Grassmann Manifolds, Groupthink, Ostracism, Ethics by Design, Open Science.

«The human tie is not a mere numerical score; it is a **NEXUS** that only acquires meaning when it achieves **ORDER**.

Without order, sociometry remains a tally of sympathies; with order, sociometry becomes the topology and thermodynamics of group space.»

1. Epistemological Foundations

1.1. Overcoming the Classical Limit and the Ontology of the Relational Tie

The purpose of Computational Ordinal Sociometry in NEXORD is to methodologically update the foundational tradition of social psychology: translating into computational formalisms the insights that neither Jacob Levy Moreno nor Kurt Lewin could operationalize with the technical instrumentation of their era.

Moreno conceived the concept of the social atom and the deep architecture of affective preferences, but manual computation historically forced sociometric questionnaires into rigid quotas of binary choice and rejection (typically three positive choices and three rejections). Lewin formulated psychological field theory and hodological topology, but lacked continuous mathematical operators capable of quantifying psychological distances without fracturing the psychosocial nature of life space.

NEXORD positions active relational interaction at the ontological core of collective life: the group is not a mere aggregate of individual dispositional traits nor a static network of cold nodes, but a dynamic field of tensions, attractions, and resistances that continuously emerges and transforms.

As an explicit tribute to both founders, the NEXORD Platform commissioned two territorial maps in the tradition of Mademoiselle de Scudéry's *Carte du Tendre* (1654)—the cartographic-literary genre that inspired the name of the Clélie Protocol for data custody (§7.2)—: the *Carte de la Spontanéité et du Télé* for Jacob Levy Moreno (1934) and the *Carte du Champ Dynamique et de l'Espace Vital* for Kurt Lewin (1936–1951) (Figures 1 and 2). These maps explicitly establish the epistemic stature of the project: at no point does NEXORD claim to replace its inspirations, but rather to algorithmically complete their brilliant intuitions, adapting them to the technical capabilities of modern computation. Continuity with foundational tradition is not merely cartographic: NEXORD operates seamlessly with both MORENO and BREVE capture protocols (interoperable dual-stack), as both are fundamentally convertible via an automated bidirectional mapping $BREVE \Leftrightarrow MORENO$; and the dyadic tetragram ($pDA \cdot DA \cdot REC \cdot pREC$) underpinning the Q81 lattice is a purely Morenian construction.

The specific debt to Kurt Lewin underpins the boldness of the title of this work: the origin of developing a «Physics of the Collective»—and the formalization of its cardinal variable, relational density, which anchors the socio-thermodynamic apparatus (§4.4)—resides in pioneering field theory, which conceived group life as force dynamics in a measurable life space. What is quantified here as density is no decorative metaphor, but the algorithmic continuation of that foundational insight.

Without an explicit canonical order, historical sociometry accumulated isolated and incommensurable measurements: beautiful melodies that no one could read on the same score. NEXORD provides that shared staff where order does not dictate the music, but makes it legible and comparable.

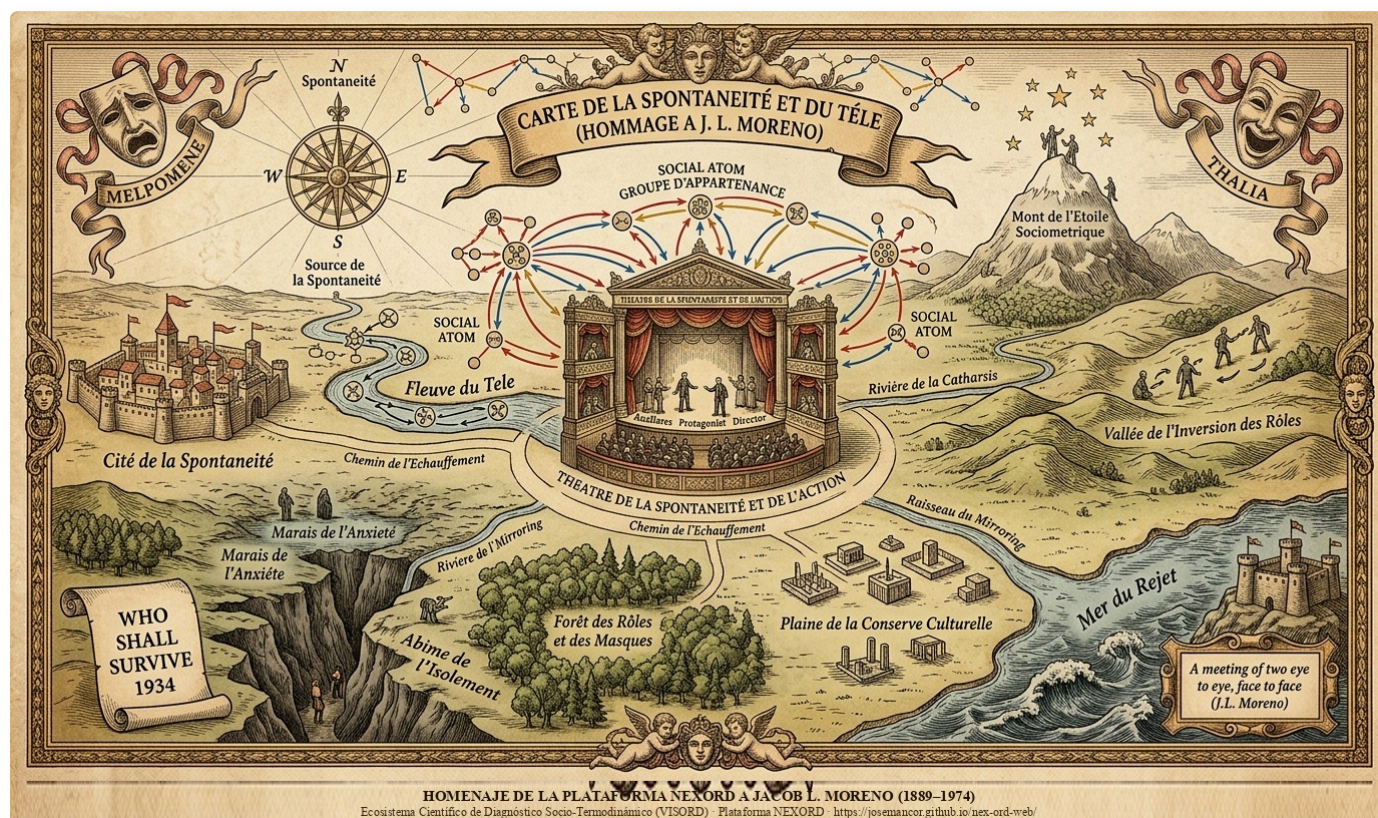


Figure 1. Carte de la Spontanéité et du Télé by Jacob L. Moreno (1934): the first cartography of group affective preferences, with NEXORD commemorative border.



Figure 2. Kurt Lewin's Champ Dynamique & Espace Vital map (1936–1951): life space as a field of interactive forces, with NEXORD commemorative border.

1.2. From Qualitative Hierarchy to Continuous Field: The Inverse Rank Function

In the foundation of the scientific method, order conceptually precedes quantitative metrics. While assigning cardinal magnitudes to affective states assumes interval scales that do not necessarily reflect the subjective decision process, preferential ranking aligns directly with the nature of relational judgment: individuals hierarchize, prioritize, and choose their ties.

Recording sequential order of choice captures the structure of interpersonal preferences with fidelity without imposing a priori metric assumptions. In NEXORD, the continuous metric is not introduced as an external postulate, but emerges analytically from relational order through the inverse rank function.

The analytical mechanism enabling this transition from qualitative ordering to continuous calculus is the rigorous quantification of hierarchical rank through the inverse rank function:

$$W_{ij} = 1 / r_{ij}^{\gamma} \quad (1)$$

where $r_{ij} \in \{1, 2, \dots, N\}$ represents the strict ordinal rank assigned by selector i to peer j , and γ governs the rate of field aperture and decay.

In its complementary bounded continuous formulation, normalized interpersonal density takes the form:

$$Z_{ij} = (N - r_{ij}) / (N - 1) \in [0, 1] \quad (2)$$

where the top rank ($r_{ij} = 1$) reaches the unitary bound ($Z = 1.0$), the bottom rank ($r_{ij} = N$) drops to absolute zero ($Z = 0.0$), and intermediate ranks are distributed in strictly equispaced intervals. It is essential to distinguish operator hierarchy: the inverse rank function (1) constitutes the fundamental operator for quantifying preference rank and drives the platform's relational

engine (SMIb sociomatrix weights and field decay); the bounded linear transformation (2) is an operational simplification utilized by interface and AI layers, and for metrics requiring strict [0, 1] bounds, such as the friction coefficient Φ . Both transformations allow the dyadic tie to be operated as a continuous and differentiable force, projectable onto complex geometric manifolds. This formal convergence aligns with modern statistical frameworks for rank-order relational data (Krivitsky & Butts, 2017) and psychometric evidence regarding measurement degradation in truncated discrete quotas (Terry, 2000).

1.3. The Fundamental Axiom: GIVING and RECEIVING as an Indissociable Circuit

Emitting preferences (GIVING) and receiving collective impact (RECEIVING) do not constitute independent psychological traits or isolated personality variables: they are polar, indissociable constituent moments of a single continuous relational circuit.

The harmonious functioning or pathological fracture of a group does not reside in members taken in isolation, but in the fluidity, symmetry, and shear of their mutual exchanges. An actor may exhibit an intensely cooperative disposition while the group systematically relegates them to invisibility or rejection; divorcing these two poles leads to diagnoses blind to latent exclusion and to stigmatizing interventions.

2. Capture Protocol: BREVE Format, Matrix Duality, and Diagonal Closure

2.1. Forced Drag without Ties and Matrix Duality $A(i, \text{rank})$ vs. $B(i, j)$

In classical sociometry, manual computation constraints naturally favored tallying procedures based on fixed quotas (typically three choices and three rejections), where each nomination received equal unit weight ($1 = 1$). This procedure, fully justified in its historical era, left undifferentiated the gradient of intensity between primary nuclear preferences and secondary choices.

The BREVE Format (operationalized as the ORBIT Sociomatrix) formalizes exhaustive preferential ordering $A(i, k) = j$ over the entire collective, incorporating sender self-anchoring ($r_{ii} \in \{1, \dots, N\}$). Complete ordering without ties represents the continuous hierarchy of choices, facilitating natural participant expression and preserving data richness without quota truncation. From this ordinal foundation, the model formalizes the matrix and continuous treatment of relational exchanges as a permutation of group space.

In the BREVE Format, participants view a randomized peer roster to neutralize visual or sequential anchoring biases. Through an ergonomic drag-and-drop interface, each subject orders all group members between a maximum preference pole and a rejection pole. The algorithmic zero-ties rule ($r_{ij} \neq r_{ik}, \forall j \neq k$) eradicates social desirability and acquiescence biases, ensuring a complete and strict ordering. This capture splits analytically into two complementary, bijective matrix structures:

- **Direct Capture Matrix $A(i, k)$ BREVE:** An $N \times N$ matrix where each row corresponds to sender i , each column to ordinal slot $k \in \{1 \wedge \text{circ}, 2 \wedge \text{circ}, \dots, N \wedge \text{circ}\}$, and the cell entry identifies the peer assigned to that rank:

$$A(i, k) = j$$

(3)

- **Canonical Rank Distribution Sociomatrix $B(i, j)$:** A square $N \times N$ sociomatrix where rows (i) and columns (j) index group members, recording the numerical rank assigned:

$$B(i, j) = k \Leftrightarrow A(i, k) = j$$

(4)

This duality decouples evaluator cognitive load during ordering from downstream algebraic computation, satisfying row rank-sum conservation (Figures 3–5): $\sum_{j=1}^N B(i, j) = \frac{N(N+1)}{2}$.

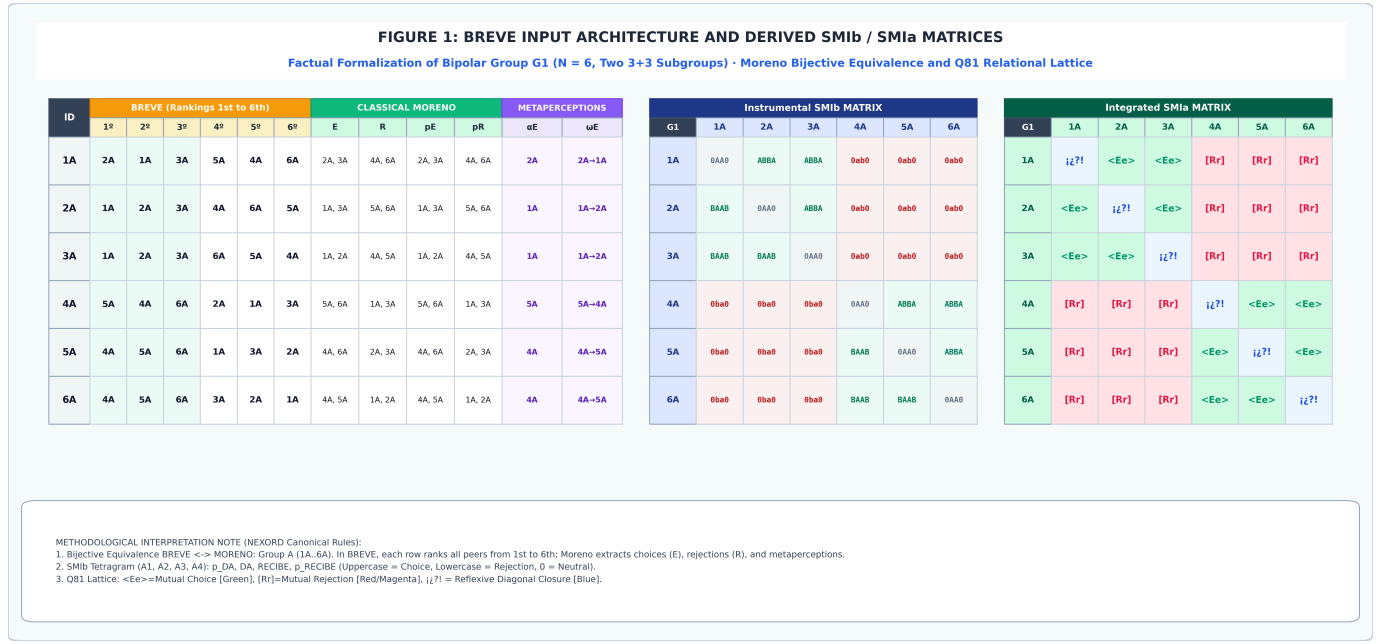


Figure 3. BREVE input-flow architecture and transcription into matrices A(i, rank) and B(i, j): from forced drag-and-drop (no ties) to matrix duality, with SMib instrumental and SMia integrated matrices.



Figure 4. Moreno's classical sociomatrix (E, R, pE, pR) in Excel format for N = 5: the traditional sociometric technique.

AutoSave [ON] BREVE_ORDINAL_N5.xlsx - Excel								
A1	fx =RANKING_BREVE(id, 1°, 2°, 3°, 4°, 5°, aE, oE)							
	A	B	C	D	E	F	G	H
1	id	1°	2°	3°	4°	5°	aE (Auto)	oE (Partner)
2	1A1a	2	4	1	5	3	2A1a	2A→1A
3	2A1a	1	2	5	4	3	1A1a	1A→2A
4	3A1a	1	4	3	2	5	1A1a, 4A1a	1A→2A, 4A→5A
5	4A1a	4	5	1	2	3	5A1a	5A→4A
6	5A1a	4	5	1	2	3	4A1a	4A→5A

Figure 5. BREVE ordinal matrix (1st–5th) with self-anchoring r_{ii} and triadic metaperceptions $\alpha E / \omega E$: tie-free capture and socio-cognitive closure.

2.2. Reflexive Diagonal Closure and Core Sensors (IDA, ITA, P(k))

NEXORD resolves the historical omission of the sociometric main diagonal (traditionally empty, $r_{ii} = \emptyset$) by requiring each participant to self-rank within the collective ($r_{ii} \in \{1, \dots, N\}$). This topological closure turns the sociomatrix into a continuous, complete relational space, activating three fundamental metric sensors:

- **Self-Rank Discrepancy Index (IDA_i):** Quantifies scalar divergence between projected self-image (r_{ii}) and external collective consensus ($\bar{R}_i^{\text{ext}}$):

$$IDA_i = r_{ii} - \bar{R}_i^{\text{ext}} = r_{ii} - (1 / (N - 1) \sum_{k \neq i} B(k, i)) \quad (5)$$

where $IDA_i < 0$ reflects hierarchical overestimation, $IDA_i > 0$ peripheral self-inhibition or underestimation, and $IDA_i = 0$ isomorphic calibration with the social environment. At the group level, collective discrepancy is synthesized through root mean square dispersion:

$$\sigma_{IDA} = \sqrt{[(1/N) \sum_{i=1..N} (IDA_i)^2]} \quad (6)$$

- **Self-Rank Tension Index (ITA):** Measures structural friction induced by leadership contestation when multiple members claim rank 1 for themselves:

$$ITA = \max[0, \sum \mathbb{1}(r_{ii} = 1)] - 1 \quad (7)$$

- **Cognitive Partition and Combinatorial Anchor $P(k)$:** By self-ranking at position k , the subject's admissible combinatorial space collapses to:

$$P(k) = C(N - 1, k - 1) \quad (8)$$

analytically formalizing that interpersonal choices are emitted from a reference self-anchor: upward or downward relative to one's own subjective position.

2.3. Topological Isomorphism of the ORBIT Format: From the Triangular Kilometer Matrix to the Relational Cosmos (The «Torgerson Geographic Effect» and the 3D Orographic Relief of Perceptual Realism)

One of the deepest epistemological pillars of NEXORD lies in demonstrating that pure ordinal ranking is neither a heuristic simplification nor a surrender of precision, but rather a formal structure that contains within itself, holographically encoded across its permutations, the complete metric geometry of the underlying relational space. To grasp the ontological solidity of this principle, it is illuminating to examine the foundational experiment of **Classical Multidimensional Scaling** (Young & Householder, 1938; Torgerson, 1952) and its isomorphism with the classic road-distance matrix of Spanish provincial capitals.

1. The «Torgerson Geographic Effect»: Reconstructing Territory from a Pure Triangular Matrix

Consider a symmetric triangular table of actual road distances $D \in \mathbb{R}^{N \times N}$ ($D_{ij} = D_{ji}$, $D_{ii} = 0$) among peninsular Spanish provincial capitals (Madrid, Barcelona, Seville, Bilbao, Valencia, A Coruña, Zaragoza, etc.). Suppose this table is stripped of any reference to meridians, parallels, GPS coordinates, or external cartographic maps: we possess strictly the symmetric interdistance matrix.

Applying the classical double-centering operator:

$$B = -\frac{1}{2} H D^{(2)} H, \quad \text{where } H = I_N - \frac{1}{N} \mathbf{1} \mathbf{1}^{\top}$$

and performing the spectral decomposition of the centered inner product matrix $B = V \Lambda V^{\top}$, extracting the two leading eigenvectors:

$$X = V_2 \Lambda_2^{1/2} \in \mathbb{R}^{N \times 2}$$

reconstructs the physical geography of Spain with millimeter fidelity: Madrid emerges naturally at the peninsular centroid, Barcelona projects to the northeast, Seville and Cadiz to the southwest, Bilbao to the north, Valencia to the east, and A Coruña to the northwest. The spatial geometry was not imposed from outside; it was latent within the proximity structure of the matrix.

2. The Critical Test of the ORBIT Format: Non-Metric Convergence (Shepard-Kruskal)

What occurs if we deliberately destroy quantitative cardinal metrics (the exact kilometer values) and preserve **exclusively the ORBIT ordinal rank hierarchy**?

In this scenario, each city i merely reports its ordinal ranking vector $A(i, k) = j$, stating which city it perceives as closest (1^{st}), second closest (2^{nd}), and so on down to the most distant ($(N-1)^{\text{th}}$).

When this purely ordinal matrix is submitted to non-metric multidimensional scaling (Shepard, 1962; Kruskal, 1964)—seeking a monotonic transformation $f(r_{ij})$ that preserves rank order while minimizing Kruskal's stress—, the recovered two-dimensional configuration converges onto a spatial layout virtually identical to the original metric map, achieving Shepard monotonic correlation coefficients $r > 0.98$ and minimal stress.

This empirical finding validates the core premise of Computational Ordinal Sociometry: **interpersonal preference rankings $A(i, k) = j$ require no artificial cardinal interval scales to generate topology**. Strict order inherently contains all relational information necessary to unfold the group's metric space.

3. The «Madrid Effect» and the Barycentric Core in VISORD Nuclear

In the peninsular road network, Madrid emerges at the center because it satisfies the variational principle of minimum aggregated mean distance to all other capitals ($\min \bar{D}_i$). In NEXORD's socio-thermodynamic engine, the relational barycenter emerges under an identical physical principle:

$$\bar{d}_i^{\text{out}} = \frac{\sum_{j \neq i} m_j D_{ij}^{\text{out}}}{\sum_{j \neq i} m_j}$$

where D_{ij}^{out} measures the discrepancy between the preference-emission vectors of actors i and j , weighted by inertial masses m_j . The actor who minimizes $\bar{d}_i^{\text{out}}$ settles spontaneously into the **confined core** of the group cosmos: not through external decree, but because their reading of the collective resonates with the group's perceptual barycenter. Conversely, actors with idiosyncratic or eccentric perceptions are displaced radially toward the topological perimeters or «coasts» of the relational landscape.

4. The Third Dimension in VISORD Nuclear: 3D Orographic Relief of Perceptual Realism

The horizontal Cartesian plane XY (territorial/geographic) of the factorial biplot or relational map encodes interpersonal affinities, dyadic alliances, and intergroup fault lines (G_1 vs. G_2). What, then, does the **third vertical dimension (Z)** represent in VISORD Nuclear?

Following the rigorous territorial isomorphism, the third dimension corresponds exactly to **orographic altitude or terrain relief (the topography of valleys, plateaus, and mountain ranges)** rising above the geographical plain:

- **Alluvial Plains and Valley Floors ($Z \approx 0$):** Zone of maximum factual consonance and perceptual realism. Actors at base sea-level exhibit minimal self-rank discrepancy ($IDA_i \approx 0$) and balanced dyadic realism ($S_{13} \approx 0$): their expectations and emissions match the actual lived experience of the collective. They walk the shared valley floor, enjoying direct, barrier-free access to peer communication channels.
- **Intermediate Plateaus ($Z \approx \bar{Z}$):** Stable structural tablelands where mediation, operational leadership, and functional coordination are grounded with broad strategic perspective.
- **Mountain Peaks and High Summits ($Z \gg 0$):** Actors perched on orographic peaks of cognitive dissonance (sharp divergence between projected self-image and peer validation). From the steep summit of their isolated peak, Euclidean distance to peers expands dramatically; the actor feels distant or misunderstood, not due to lack of peer goodwill, but because cognitive elevation impedes fluid horizontal exchange.

[!IMPORTANT]

Inviolable Deontological Safeguard (Rule 21):

Orographic elevation toward a summit or peripheral confinement **must never be interpreted as an individual moral flaw, character defect, or personal psychopathology**. Just as geological mountains do not form through individual boulder volition but via deep tectonic plate pressures, in NEXORD an actor's orographic elevation is a **strictly systemic, collective orogenic phenomenon**: attraction, shear, and compressive forces of the relational field fold the social landscape. The role of formative feedback reports is not to blame the mountaineer, but to map topological paths and build descent bridges reconnecting all members within the shared valley of collective life.

3. Relational Dynamics: Field Regimes, Friction, and Viability

3.1. Relational Friction Coefficient (Φ) and Structural Cohesion (ICE)

Internal resistance across the collective system is synthesized in the Relational Friction Coefficient (Φ) and its complementary Structural Cohesion Index (ICE):

$$\Phi = 2 / [N(N - 1)] \sum_{i < j} |Z_{ij} - Z_{ji}|^{\alpha} \quad (\alpha \geq 1) \quad (9)$$

$$\text{ICE} = 1 - \Phi \quad (10)$$

Moderate values of Φ reflect internal dynamism and adaptive plasticity, while extreme values indicate risks of fragmentation or destructive turbulence.

3.2. Psychologization of Field Regimes and Groupthink Prevention

Collective dynamics cannot be reduced to inanimate physics: system states express distinct regimes of interpersonal and psychological articulation:

- **Structural Rigidity and Inertia Regime:** Rigid hierarchical crystalization, immobile roles, and minimal communicative permeability.
- **Fluidity and Adaptive Cohesion Regime:** Open homeostasis with flexible circulation of preferences, agreements, and divergences.
- **Dispersion and Anomie Regime:** Low coupling density, affective disengagement, and absence of shared projects.
- **Collective Effervescence and Fusion Regime:** High shared emotional arousal and intense interactive mobilization.

Through this lens, NEXORD radically challenges the conventional assumption that optimal group health equals absolute cohesion ($\text{ICE} = 1.0$, $\Phi = 0$). A collective devoid of internal friction or discrepancy constitutes an inherently fragile system vulnerable to groupthink (*Groupthink*, Janis, 1972), where conformity pressures suppress critical thinking and informed decision-making. Moderate friction ($\Phi \in [\Phi_{\min}, \Phi_{\max}]$) and gradient flows across GIVING/RECEIVING supply the necessary energy for institutional plasticity, organizational learning, and evolutionary adaptation.

3.3. The Living Puzzle Metaphor: Unjamming vs. Ecosystemic Relocation

In contrast to traditional interventions managing conflict through punitive exclusion or moral blaming of dissident members, NEXORD models the collective as a living puzzle. An actor experiencing high friction is not intrinsically pathological: they typically suffer role expectation mismatches or flow asymmetries with their immediate dyadic environment.

Diagnostic facilitation promotes unjamming through task realignment, communicative clarification, and opening reciprocal collaboration channels. When structural incompatibility persists after systematic mediation, the framework provides for dignified ecosystemic relocation: migration to an alternative group environment preserving the individual's psychosocial integrity while preventing chronic wear or ostracism.

3.4. The Ocean of Microstates and the Thermodynamic Stability Law

The dimension of the sociometric sample space, even in small groups, is vast. For a group of five individuals, each member ranking four peers has $4! = 24$ strict ordering options; combining choices across the five members yields $24^5 = 7,962,624$ possible matrices. Including the sender's self-ranking ($5! = 120$ orders per row), the configuration space explodes to $120^5 \approx 2.49 \times 10^{10}$ —nearly 25 billion configurations—in a single room with five human beings seated around a table. Within this ocean, thermodynamic stability and systemic health do not depend on chance, but on the geometry of energy flux: minimizing shear dissipation and establishing stable attractors.

The vast majority of combinations correspond to thermal noise (dissonant high-friction matrices) or freezing traps (tectonic fault-lines and stifling monopolies). For a microstate to surpass thresholds of productive, healthy organization, it must simultaneously satisfy three thermodynamic invariants:

- 1. **Minimizing shear dissipation:** $\sum_i |Z_{ij} - Z_{ji}|^2 \rightarrow \min$ (reciprocity and mutual coherence).
- 2. **Barometric gradient balance:** $\sum_i (Z_i^{\text{in}} - Z_i^{\text{out}})^2 \leq \epsilon$ (absence of black sinks or overloaded springs).
- 3. **Global convective connectivity:** existence of transitive return chains without isolated nodes ($Z_i^{\text{in}} > Z_{\text{critical}}$ for all i).

Out of the combinatorial ocean, only a select percentage inhabits this optimal regime: group wellbeing is not the absence of structure, but an architecture of tensions where no one is condemned to absolute zero or forced to carry the collective weight alone.

In summary: group health and productivity are not matters of moral goodwill, but of relational aerodynamics and hydrostatics. A productive group is one whose ellipsoid flies level, whose energy accounts maintain homeostatic balance, and where no member drowns at the bottom of the canyon so others can sunbathe in the open sky.

4. Tensorial Algebra, Q81 Lattice, and the Densities Pentagonam

4.1. 12-Symbol Atomic Grammar and the Relational Cell X1 X2 X3 X4

The canonical Q81 lattice formalizes the complete combinatorial space of all $3^4 = 81$ dyadic configurations structuring the relational field. To provide an exact, unambiguous notation, NEXORD establishes a 12-symbol alphabet distributed across three relational polarity states:

Table 1: Atomic grammar — the 12 symbols of the NEXORD relational alphabet

Relational Dimension	Positive (+)	Neutral (0)	Negative (–)
Sender Real Action ($i \rightarrow j$)	E (Uppercase)	¿ (Opening question)	R (Uppercase)
Receiver Real Action ($j \rightarrow i$)	e (Lowercase)	? (Closing question)	r (Lowercase)
Sender Expectation (p_{DA})	< (Opening bracket)	¡ (Neutral character)	[(Opening square)
Receiver Attributed Expectation (p_{REC})	> (Closing bracket)	! (Exclamation)	] (Closing square)

Each interpersonal tie (i, j) is formalized as a four-character relational word:

$$Figure_{ij} = X_1 X_2 X_3 X_4 \in \{<, i, [] \times \{E, \text{?}, R\} \times \{e, ?, r\} \times \{>, !, []\} \quad (11)$$

- X_1 : Cognitive expectation emitted by selector i regarding what they expect from j .
- X_2 : Active vector of real behavioral emission from i toward j .
- X_3 : Reactive vector of real behavioral reception returned by j toward i .
- X_4 : Cognitive expectation attributed by i to j 's response.

From this atomic catalogue emerge canonical relational archetypes:

- **<Ee>** : Full harmony and resonance (mutual choice and confirmed expectation).
- **[Rr]** : Acknowledged conflict and segregation (explicit, congruent mutual rejection).
- **i¿?!** : Basal indifference or field inertia (interactive and perceptual zero-point).

Formalizing signed configurations (+ / -) and measuring dyadic friction dialogs constructively with contemporary research on signed graphs, communicability geometry, and structural frustration indices (Aref & Wilson, 2021; Cucuringu et al., 2023; Diaz-Diaz & Estrada, 2025).

FIGURA 3: ARQUITECTURA DE ENTRADA BREVE Y MATRICES DERIVADAS SMib / SMia											
Formalización Factual de Grupo A (G1, N = 5) · Equivalencia Biunívoca Moreno y Reticula Relacional Q81											
ID Nodo	BREVE (Rankings 1º a 5º)					MORENO CLÁSICO				METAPERCEPCIONES	
	1º	2º	3º	4º	5º	E	R	pE	pR	αE	ωE
1A	1	2	4	5	3	2, 4	3	2	3	2A	2A~1A
2A	1	2	5	4	3	1	3, 4	1	3	1A	1A~2A
3A	1	4	3	2	5	1, 4	2, 5	1, 4	2, 5	1A, 4A	1A~2A, 4A~5A
4A	4	5	1	2	3	5, 1	3	5	3	5A	5A~4A
5A	4	5	1	2	3	4	3, 1	4	3	4A	4A~5A

MATRIZ SMib instrumental					
G1	1A	2A	3A	4A	5A
1A	0AA0	ABB0	0aCA	000B	0b00
2A	0AAA	ABBB	0aa0	0bb0	00c0
3A	AAa0	0bb0	0000	0Bc0	0ad0
4A	A000	0ba0	0aC0	0AA0	0BB0
5A	00b0	0b00	0aa0	0AA0	ABBA

MATRIZ SMia integrada					
G1	1A	2A	3A	4A	5A
1A	iEe!	<Ee!	iRe>	i¿?>	iR?!
2A	iEe>	<Ee>	iRr!	iRr!	i¿r!
3A	<Er!	iRr!	i¿?!	iEr!	iRr!
4A	<¿?!	iRr!	iRe!	iEe!	iEe!
5A	i¿r!	iR?!	iRr!	iEe!	<Ee>

NOTA DE INTERPRETACIÓN METODOLÓGICA (Reglas 5, 7 y 12 NEXORD):

1. Equivalencia biunívoca BREVE <-> MORENO: Grupo A (1A-5A). En BREVE, cada fila ordena las preferencias del 1º al 5º; en Moreno se extraen elecciones (E), rechazos (R) y metapercepciones.
2. Tetragrama SMib (A1, A2, A3, A4): p_DA, DA, RECIBE, p_RECIBE (Mayúsculas = Elección, Minúsculas = Rechazo, 0 = Neutro). 3. Reticula Q81: <Ee>=Elección mutua [Verde], [Rr]=Rechazo mutuo [Rojo], [Re>]/<Er]=Oposición [Verde-Azulado], i¿?! = Cierre diagonal [Azul].

Figure 6. Anatomy of the SMia dyadic cell: breakdown of its 4 canonical positions (A1 · A2 · A3 · A4) = (pDA · DA · REC · pREC).

4.2. Antidiagonal Topology of the (9 × 9) Lattice and [1, 81] Numeralization as the First Density Metric

The 9 × 9 partition crosses 9 objective behavioral interaction profiles (rows $i = \text{<E>}, \text{<E>}, \text{<E>}, \text{<E>}, \text{<E>}, \text{<E>}, \text{<E>}, \text{<E>}, \text{<E>}$) with 9 crossed cognitive expectation profiles (columns $j = \text{<e>}, \text{<e>}, \text{<e>}, \text{<e>}, \text{<e>}, \text{<e>}, \text{<e>}, \text{<e>}, \text{<e>}$).

The numeralization of the 81 relational figures ($Q_{81}(9, 9)$) is solved geometrically via an ordered sweep of 17 secondary antidiagonals traversed bottom-up: each antidiagonal defines an isoline of constant net relational valence and energy, such that all figures situated along the same antidiagonal share an identical sum of polarities between actual actions and cognitive expectations.

This geometric ordering provides the first metric-scalar quantification of dyadic relational density ($D_{Q81} \in [1, 81]$), structured into three fundamental regions:

- **Hemisphere of Dissonance and Rejection (Scalars 1 to 36):** The first 8 lower antidiagonals cover $\sum_{k=1}^8 k = \frac{8 \times 9}{2} = 36$ figures situated in the zone of conflict, attrition, and relational withdrawal, originating at the pole of maximum negative density: $[Rr] = 1$.
- **Neutral Barycentric Isoline (Scalars 37 to 45):** The transversal central antidiagonal (d = 9, comprising 9 cells) spans scalars 37 to 45. Its central cell (coordinate 5, 5) uniquely fixes the **basal indifference centroid**:

$\text{Cell}(5, 5) \implies i \text{?} = 41$

- **Hemisphere of Cohesion and Resonance (Scalars 46 to 81):** The 8 upper antidiagonals cover the 36 figures of attraction, convergence, and synergy up to the tip of antidiagonal 17 (length 1), crowning the space at full harmonic resonance: $\langle Ee \rangle = 81$.

Continuous Normalization of Q_{81} Density:

By centering the scale on the neutral indifference centroid (41), the figure's elementary dyadic density is normalized onto the canonical continuous range [-1.00, +1.00]:

$$D_{Q81}(i, j) = \frac{Q_{81}(i, j) - 41}{40} \quad (13)$$

where:

- **Maximum Positive Density:** $D_{Q81}(\langle Ee \rangle) = \frac{81 - 41}{40} = \mathbf{+1.000}$
- **Basal Neutral Density:** $D_{Q81}(i \text{?}) = \frac{41 - 41}{40} = \mathbf{0.000}$
- **Maximum Negative Density:** $D_{Q81}([Rr]) = \frac{1 - 41}{40} = \mathbf{-1.000}$

This geometry preserves strict **antipodal complementary symmetry**: $\text{Antipode}(k) = 82 - k$, meaning that $\text{Figure}(i, j) + \text{Figure}(10-i, 10-j) = 82$, proving that the neutral centroid is self-invariant under polar inversion ($41 + 41 = 82$).

FIGURA 5: RETÍCULA CANÓNICA 9×9 DE LAS 81 FIGURAS RELACIONALES (Q81)
Estructura Canónica del Tetragrama SMia y Numeralización Monótona de Valencia (81 → 1)

SMia · ANATOMÍA CANÓNICA DEL TETRAGRAMA DIÁDICO [A1 A2 A3 A4]									
POLARIDAD / TIPO	DA (EMISIÓN · PERSPECTIVA DADOR)				RECIBE (RECEPCIÓN · PERSPECTIVA RECEPTOR)				
Scale	A1: PERCEPCIÓN (p_DA)		A2: REAL (DA)		A3: REAL (RECIBE)		A4: PERCEPCIÓN (p_REC)		
Elección (+)	<		E		e		>		
Indiferencia (0)	i		¿		?		!		
Rechazo (–)	[		R		r		]		

MATRIZ 9×9 DE NUMERALIZACIÓN CANÓNICA Q81 (Producto Cartesiano DA × RECIBE · Rango 81 → 1)									
DA \ RECIBE	e>	e!	e]	?>	?!	?]	r>	r!	r]
<E	81 <Ee>	80 <Ee!	78 <Ee]	75 <E?>	71 <E?!>	66 <E?]>	60 <Er>	53 <Er!	45 <Er]>
iE	79 iEe>	77 iEe!	74 iEe]	70 iE?>	65 iE?!>	59 iE?]>	52 iEr>	44 iEr!	36 iEr]>
[E	76 [Ee>	73 [Ee!	69 [Ee]	64 [E?>	58 [E?!>	51 [E?]>	43 [Er>	35 [Er!	28 [Er]>
<¿	72 <¿e>	68 <¿e!	63 <¿e]	57 <¿?>	50 <¿?!>	42 <¿?]>	34 <¿r>	27 <¿r!	21 <¿r]>
i¿	67 i¿e>	62 i¿e!	56 i¿e]	49 i¿?>	41 i¿?!>	33 i¿?]>	26 i¿r>	20 i¿r!	15 i¿r]>
[¿	61 [¿e>	55 [¿e!	48 [¿e]	40 [¿?>	32 [¿?!>	25 [¿?]>	19 [¿r>	14 [¿r!	10 [¿r]>
<R	54 <Re>	47 <Re!	39 <Re]	31 <R?>	24 <R?!>	18 <R?]>	13 <Rr>	9 <Rr!	6 <Rr]>
iR	46 iRe>	38 iRe!	30 iRe]	23 iR?>	17 iR?!>	12 iR?]>	8 iRr>	5 iRr!	3 iRr]>
[R	37 [Re>	29 [Re!	22 [Re]	16 [R?>	11 [R?!>	7 [R?]>	4 [Rr>	2 [Rr!	1 [Rr]>

NOTA DE INTERPRETACIÓN METODOLÓGICA (Reglas 5, 8 y 10 NEXORD):

1. Estructura del Tetragrama: Celda (i, j) = [A1: p_DA (expectativa emisor), A2: DA (elección emitida), A3: RECIBE (elección recibida), A4: p_RECIBE (expectativa partner)].

2. Numeralización Q81: Orden monótono decreciente de valencia relacional desde 81 (<Ee>, máxima atracción mutua) hasta 1 ([Rr], máximo rechazo mutuo), convergiendo en el centroide homeostático 41 (i¿?!, neutralidad/divalencia reflexiva).

Figure 7. Canonical Q81 lattice (9 × 9): exhaustive classification of the 81 possible dyadic figures, indexed by increasing-valence antidiagonals (1 = [Rr] ... 41 = i¿?! ... 81 = <Ee>).

4.3. The Subject's Structural Triptych Ti and Split Diagnosis

Collapsing an individual's ties into a simple arithmetic scalar mean represents a severe methodological flaw producing diagnostic cancellation artifacts (a person with one tie at 81 and another at 1 would falsely average 41, indistinguishable from basal indifference). NEXORD preserves topological bidimensionality by splitting subject *i*'s position into its Canonical Structural Triptych:

$$T_i = (F_{i^{\text{out}}}, F_{i^{\text{in}}}, f_{ii}) \quad (14)$$

- **Global Outbound Figure ($F_{i^{\text{out}}}$):** Two-dimensional centroid ($\bar{X}_{i^{\text{out}}}, \bar{Y}_{i^{\text{out}}}$) computed across row *i*, measuring initiative, active disposition, and baseline trust emitted by *i*.
- **Global Inbound Figure ($F_{i^{\text{in}}}$):** Two-dimensional centroid ($\bar{X}_{i^{\text{in}}}, \bar{Y}_{i^{\text{in}}}$) computed across column *i*, quantifying objective impact, convergent status, and expectations deposited upon *i*.
- **Reflexive Self-Anchor (f_{ii}):** Diagonal reflexive closure in Q81 formalizing self-image and psychosocial self-efficacy.

From positional discrepancy $\Delta_{\text{role}} = F_i^{\text{out}} - F_i^{\text{in}}$ emerge immediate diagnostic profiles:

- **Relational Burnout Syndrome:** $F_i^{\text{out}} \gg F_i^{\text{in}}$ with declining f_{ji} (unreciprocated investment anticipating withdrawal).
- **Withdrawn or Reserve Leadership:** $F_i^{\text{in}} \gg F_i^{\text{out}}$ (strong collective demand paired with cautious outbound emission).
- **Status Inhibition:** $F_i^{\text{in}} \gg 41$ coexisting with $f_{ji} \leq 41$ (high objective peer recognition unassimilated into self-perception).

4.4. The 18D Relational Hyperspace, the 3 Dual Prisms, and the Densities Pentagonam (10D)

4.4.1. Algorithmic Foundations of Relational Density: The 6D Traceability Matrix and Modulators

In NEXORD's canonical ordinal sociometry, Relational Density is neither a flat headcount nor an unweighted arithmetic average: it constitutes the **real thermal and structural mass** contributed by an interpersonal tie, defining the cohesive or destructive force of the interaction upon the thermodynamic continuum ($\mathbb{R}$).

To ensure scientific reproducibility and eliminate algorithmic opacity, NEXORD's engine processes dyadic interaction ($i \rightarrow j$) through a **6-Layer Traceability Matrix**. This clinical framework decomposes relational flow through an explicit set of **mathematical modulators** that rigorously weight ordinal rank, action symmetries, cognitive reciprocities, and status hierarchies:

Table 3b. Algorithmic Traceability Matrix and Dyadic Density Modulators

Force Vector	Evaluated Condition	Assigned Mathematical Modulator	Structural Impact
1. Inverse Rank Function ($1/r^k$)	Ordinal Rank (1st, 2nd, 3rd...)	Base	Sets initial tie potential. Exponentially penalizes ($k \geq 1.0$) low attentional priority.
2. Dyadic Reciprocity	Action Congruence (E_e , R_r , A_a)	$1.5\times$	Massively prioritizes (+50%) actual factual ties and symmetric relational homomorphism over mere expectation.
3. Accuracy / Truth	Perceptual Congruence (e_e , e_e)	$1.5\times$	Thermodynamic reward for mental lucidity, empathic attunement, and structural network health.
4. Opposing Sentiments	Dissonances and Paranoias (l , E_r , $>$)	$-(P_i \times 0.5)$	Destructive penalty proportional to sender's status (P_i). Toxicity from a leader inflicts greater network damage than from a peripheral node.
5. Perceptual Effort	Active presence of meta-perception (pDA, pRC)	$1.2\times$	Acknowledges cognitive cost of anticipatory mentalization. Bonus strictly revoked to 1.0x if structural blindness occurs.
6. Sender's Prestige (P_i)	Hierarchical Network Centrality	Variable (0.5 to 1.5)	Gravitational scale multiplier. Governs the inertial mass dragged by the sender's action across the collective.

Canonical Algorithm Illustration on the Dyadic Scorecard:

- **Fully Harmonious Dyad (E_e):** High-prestige sender ($P_i = 1.5$) choosing as 1st rank ($1/r^k = 1.0$), with mutual factual reciprocity ($1.5\times$), accurate perceptual congruence ($1.5\times$), and maintained lucid effort bonus ($1.2\times$):

$$\text{Density}(i \text{ to } j) = (1.0 \times 1.5 \times 1.5 \times 1.2 \times 1.5) = \mathbf{4.86 \text{ pts}}$$

- **Dissonant / Paranoid Dyad (Ae)**: Mid-status sender ($P_i = 1.0$) relegating as 2nd option ($1/r^k = 0.354$), null reciprocity, zero accuracy, perceptual effort bonus revoked by blindness, and active opposing sentiments:

$$\text{Density}(i \text{ to } j) = 0.354 - (1.0 \times 0.5) = -0.146 \implies \mathbf{0.00 \text{ pts}}$$

(Useful radiation is nullified: the link yields zero cohesion and dissipates energy as sterile thermal friction).

From these modulated dyadic densities, the system simultaneously computes the **4 elementary channels of the relational tetragram** for each subject i by averaging across the collective of size N ($j \neq i$):

1. D1 (D_{pDA} / dDP) — Emitted Expectation Density:

Horizon projected by the sender regarding how they anticipate their own ties toward the collective:

$$D_1(i) = \frac{1}{N-1} \sum_{j \neq i} W_{pDA}(i, j) \tag{16}$$

1. D2 (D_{DA} / dDA) — Emitted Effective Choice Density:

Kinetic flow and net valence of effective choices emitted by the subject toward peers:

$$D_2(i) = \frac{1}{N-1} \sum_{j \neq i} W_{DA}(i, j) \tag{17}$$

1. D3 (D_{RC} / dRA) — Received Effective Choice Density:

Objective status and real attraction or rejection impact received from peers:

$$D_3(i) = \frac{1}{N-1} \sum_{j \neq i} W_{RC}(j, i) \tag{18}$$

1. D4 (D_{pRC} / dRP) — Expectations Attributed to the Receiver Density:

Reflected field of presumption projected by peers regarding the subject's receptivity:

$$D_4(i) = \frac{1}{N-1} \sum_{j \neq i} W_{pRC}(j, i) \tag{19}$$

(In the subject's overall bidirectional network analysis, basal components integrate emission and reception through the barycentric average $v_k(i) = \frac{1}{2}[\text{Row}_k(i) + \text{Column}_k(i)]$, ensuring symmetric matrix closure).

Universal S and B Prefix Convention:

- **S (Balance / Relative Density)**: Signed magnitude ($\pm \mathbb{R}$). Quantifies force vectors, potential gradients, and direction of attraction or rejection.
- **B (Gross / Absolute Density)**: Modular unsigned magnitude ($|\cdot| \geq 0$). Quantifies total mobilized relational mass, overall kinetic energy, and metabolic system volume.

Table 3c. Canonical Specification and Calculation of the 18 Relational Densities and Socio-Thermodynamic

Invariants

Dimension	Symbol / Alias	Partition / Axis	Exact Calculation Formula	Metric Range	Socio-Thermodynamic Significance
1D	D_1 (dDP, D_{pDA})	4D Base	$\frac{1}{N-1} \sum W_{pDA}(i, j)$	[-1.00, +1.00]	Prior expectation and anticipatory trust emitted toward the collective.
2D	D_2 (dDA, D_{DA})	4D Base	$\frac{1}{N-1} \sum W_{DA}(i, j)$	[-1.00, +1.00]	Kinetic flow and effective preferential action emitted by the subject.
3D	D_3 (dRA, D_{RC})	4D Base	$\frac{1}{N-1} \sum W_{RC}(j, i)$	[-1.00, +1.00]	Objective status and real impact of attraction or rejection received from peers.
4D	D_4 (dRP, D_{pRC})	4D Base	$\frac{1}{N-1} \sum W_{pRC}(j, i)$	[-1.00, +1.00]	Reflected field of presumption attributed to the subject by peers.
5D	S_{12} (SDA)	Prism 1 Operational	$D_1 + D_2$	[-2.00, +2.00]	Net sender potential: expansiveness and initiative spring/sink.
6D	B_{12} (BDA)	Prism 1 Operational	$ D_1 + D_2 $	[0.00, +2.00]	Gross sender mass: total metabolic expenditure and emitted investment.
7D	S_{34} (SRC)	Prism 1 Operational	$D_3 + D_4$	[-2.00, +2.00]	Net receiver potential: global status induced by the peer environment.
8D	B_{34} (BRC)	Prism 1 Operational	$ D_3 + D_4 $	[0.00, +2.00]	Gross receiver mass: incident social pressure and impact load.
9D	S_{14} (SP)	Prism 2 Ontological	$D_1 + D_4$	[-2.00, +2.00]	Cognitive balance: climate of mutual trust and shared presumption.
10D	B_{14} (BP)	Prism 2 Ontological	$ D_1 + D_4 $	[0.00, +2.00]	Gross cognitive mass: volume of mental rumination and prospective burden.
11D	S_{23} (SA)	Prism 2 Ontological	$D_2 + D_3$	[-2.00, +2.00]	Factual balance: objective ground truth of real choices and rejections.
12D	B_{23} (BA)	Prism 2 Ontological	$ D_2 + D_3 $	[0.00, +2.00]	Gross factual mass: volume of motor action and tangible interaction.
13D	S_{13}	Prism 3 Dialectical	$D_1 + D_3$	[-2.00, +2.00]	Realism balance: confirmation vs. disillusionment (expected vs. received).
14D	B_{13}	Prism 3 Dialectical	$ D_1 + D_3 $	[0.00, +2.00]	Realism mass: affective vulnerability under reality testing.
15D	S_{24}	Prism 3 Dialectical	$D_2 + D_4$	[-2.00, +2.00]	Responsiveness balance: fulfillment vs. frustration of alter's desire.
16D	B_{24}	Prism 3 Dialectical	$ D_2 + D_4 $	[0.00, +2.00]	Responsiveness mass: dyadic commitment and mutual accountability.
17D	SDR	Global Invariant	$\sum S_{ij} = \sum D_k$	[-4.00, +4.00]	Total Relative Density Balance: homeostatic barometer of group climate.

18D	BDR	Global Invariant	$\sum B_{ij} = \sum D_k $	[0.00, +4.00]	Gross Relational Density: heat capacity and invariable total system mass.
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(Analytical note on dyadic asymmetries: The system complementarily derives the three imbalance indices for each prism: Operational Asymmetry $\text{Dif}_r = ||B_{12} - B_{34}||$, Ontological Asymmetry $\text{Dif}_a = ||B_{14} - B_{23}||$, and Dialectical Asymmetry $\text{Dif}_i = ||B_{13} - B_{24}||$, alongside Thermal Friction $\Phi = BDR - ||SDR||$).

4.4.2. The 3 Dual Prisms of Relational Density

The four elementary densities $\{D_1, D_2, D_3, D_4\}$ admit exactly 3 complementary dual partitions $[\binom{4}{2} / 2 = 3]$, which subject the relational tie to three independent orthogonal refractions, termed **PRISMS**:

RELATIONAL DENSITY ARCHITECTURE (INVARIANT PENTAGRAM)			
D1 = pDA (Projection)	D2 = DA (Choice)	D3 = RC (Received)	D4 = pRC (Expectation)
SDA = D1 + D2	BDA = D1 + D2 	SRC = D3 + D4	BRC = D3 + D4
SDR = SDA + SRC (Signed Balance)	BDR = BDA + BRC (Gross Mass)		I_wear = BDR – SDR (Relational Inertia)

PRISM 1 — OPERATIONAL AXIS (10D: EMITTER vs RECEIVER)			
D12 Giver / Emitter (DA)		D34 Receiver (RC)	
relative density	absolute density	relative density	absolute density
S12 (SDA = D1 + D2)	B12 (BDA = D1 + D2)	S34 (SRC = D3 + D4)	B34 (BRC = D3 + D4)
useful energy	gross expansiveness	status	social pressure

PRISM 2 — ONTOLOGICAL AXIS (14D: EXPECTATIONS vs FACTS)			
D14 Mind / Expectations		D23 Reality / Facts	
relative density	absolute density	relative density	absolute density
S14 = D1 + D4	B14 = D1 + D4 	S23 = D2 + D3	B23 = D2 + D3
trust	cognitive activity	empirical truth	factual mass

PRISM 3 — DIALECTICAL AXIS (18D: REALISM vs COMMITMENT)			
D13 Realism vs Disillusionment		D24 Commitment Mass	
relative density	absolute density	relative density	absolute density
S13 = D1 + D3	B13 = D1 + D3 	S24 = D2 + D4	B24 = D2 + D4
realism / adjustment	dialectical tension	correspondence	dyadic commitment

Figure 8b. Canonical Architecture of the 18D Relational Space and the 3 Dual Prisms: Structuring of the tetragram into 4 elementary densities (D1–D4), invariant global balances (SDR, BDR), and decomposition across three fundamental axes: Operational (Giver/Receiver, 10D), Ontological (Mind/Facts, 14D), and Dialectical (Realism/Commitment, 18D).

The decomposition of the group field into its **18 Relational Densities (18D)** is not a scattered combinatorial inventory, but an ordered anatomy of psychosocial flux. The system articulates its tensions along a canonical dialectical sequence where **Gross Mass (B)**—the total mobilized interactive energy—and **Relative Balance (S)**—the net direction and vector tilt of the tie—succeed one another in harmonic counterpoint:

$$\underbrace{B_{12} \setminus; S_{12}}_{\text{DA (Initiative)}} \quad \underbrace{B_{14} \setminus; S_{14}}_{\text{PA (Projection)}} \quad \underbrace{B_{13} \setminus; S_{13}}_{\text{XA (Attunement)}} \quad \big[D_1 \setminus; D_2 \setminus; D_3 \setminus; D_4 \big] \quad \underbrace{S_{24} \setminus; B_{24}}_{\text{XR (Disillusion)}} \quad \underbrace{S_{23} \setminus; B_{23}}_{\text{PR (Facts)}} \quad \underbrace{S_{34} \setminus; B_{34}}_{\text{RC (Status)}} \quad \mathbf{SDR} \quad \mathbf{BDR}$$

This ordered sequence expresses the principle of energetic conservation: the discrepancy between gross mass (B) and its projected balance (S) reveals with millimetric precision the *Relational Wear Inertia* ($I_{\text{wear}} = B - S$) across each relational prism. The order of densities is no analytical whim: it represents the thermodynamic scale allowing one to read, at a single glance, from the active initiative of the giver to the consolidated status conferred by the group, culminating in the overarching homeostatic synthesis of $\mathbf{SDR}$ and $\mathbf{BDR}$.

4.4.3. The Socio-Thermodynamic Pentagonam and Relational Wear Inertia

Under the canonical correspondence $D_k \equiv X_k$ of the tetragram, the ten relational densities are organized into two polar macrodimensions (GIVING and RECEIVING) coupled under two analytical conservation strata:

- **Signed Vector Stratum (Net Valence and Harmony):** the sender's net potential $SDA = D_1 + D_2$ (emitted expectation D_1 plus real emitted action D_2), the receiver's net potential $SRC = D_3 + D_4$ (real received action D_3 plus attributed expectation D_4), and the total Relative Field Density Balance $SDR = SDA + SRC$.
- **Absolute Scalar Stratum (Total Kinetic Mass Mobilized):** the gross emission mass $BDA = |D_1| + |D_2|$ and reception mass $BRC = |D_3| + |D_4|$, whose sum defines the Gross Relational Density $BDR = BDA + BRC$.

The analytical discrepancy between the total mobilized energy and the resulting cohesive net flow formally defines **Relational Wear Inertia** ($I_{\text{wear}} = BDR - SDR$):

- **Maximum Efficiency Regime** ($SDR \approx BDR \implies I_{\text{wear}} \approx 0$): Choices and expectations converge toward positive valence ([<Ee>](#)). Virtually all invested energy yields structural cohesion and useful work.
- **Friction and Resistance Regime** ($BDR \gg SDR \implies I_{\text{wear}} \gg 0$): The collective mobilizes high communication volumes (BDR elevated), but sign cancellations from suspicion, latent tensions, or perceptual mismatches stall progress ($SDR \rightarrow 0$). Energy dissipates into rumination, suspicion, and sterile friction, quantifying structural fatigue prior to explicit fractures.

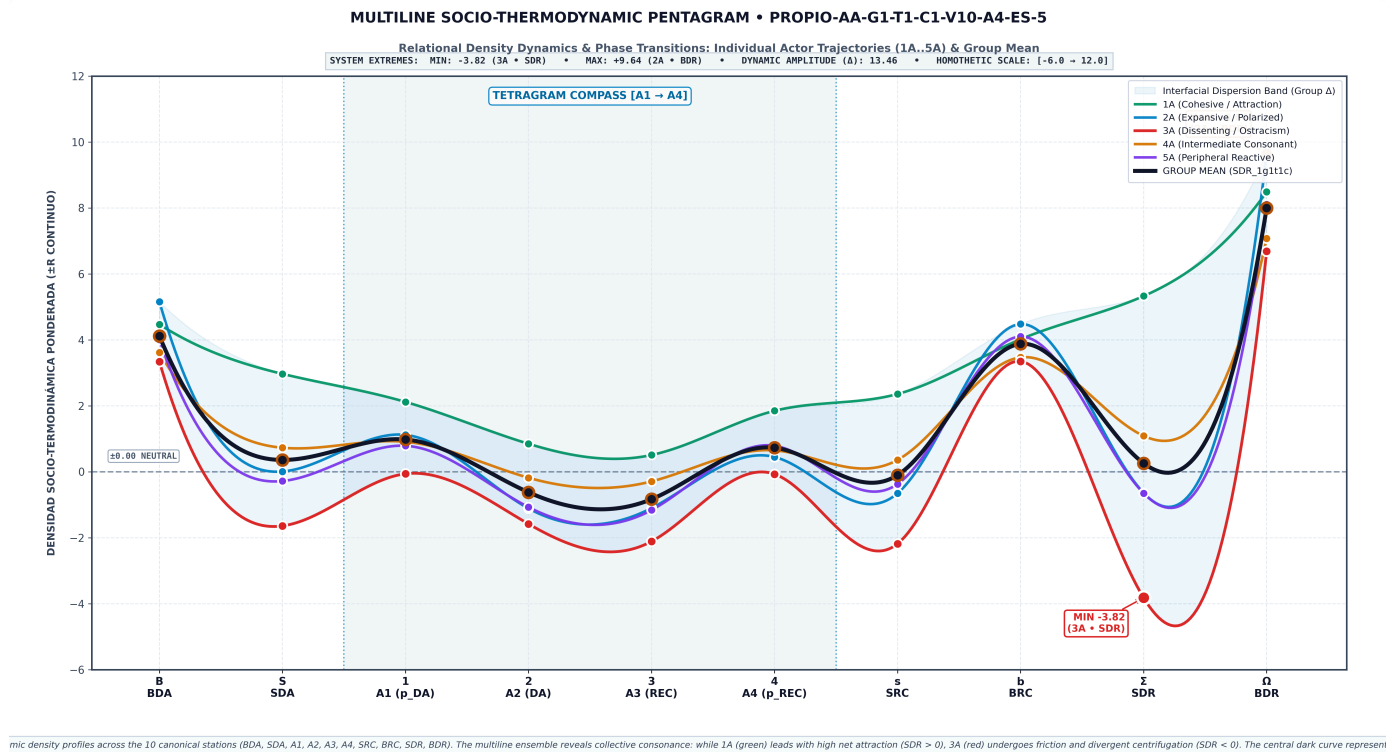


Figure 8. Socio-Thermodynamic Pentagram with the 10 canonical densities: emission/reception decoupling and transition to the thermodynamic continuum; the gap $I_{wear} = BDR - SDR$ quantifies energy dissipated in friction.

4.5. The VISORD Aquarium Paradigm and Relational Hydrostatics

As an experiential and perceptual culmination of this socio-thermodynamic formalism, **VISORD Aquarium** provides an integrated visual and acoustic interactive environment representing relational density structures within a multidimensional $G \times T \times C$ design.

The volume is modeled as a 3D continuous aquarium defined over Cartesian space:

$$\mathbf{DA} \quad \times \quad \mathbf{RECEIVE} \quad \times \quad \mathbf{DENSITY}$$

structured across three characteristic strata:

- Submerged Benthos:** Deep basins of negative pressure and high rejection ($[R_r]$), latent conflict, and structural isolation.
- Water Surface (Neutral barometric level):** Basal homeostatic waterline corresponding to the indifference centroid ($i_c = 41$).
- Open Sky (Convective atmosphere):** Upper stratum of high positive density and optimal cohesion, where resonant harmonic ties ($\langle E_e \rangle$) and frictionless leadership gravitate.

Within this volume, relational densities project in **complete disjunction**:

- Intra-Subject Level:** Differential projections of distinct relational pairs and kinematic dipoles for a given actor across peers.
- Unitary Level:** Distribution of individual actors as dual agents: active Givers (DA) and impact Receivers (RECEIVE).
- Macro-Relational Level:** Aggregate global densities across Groups (G), Waves (T), and Criteria (C).

5. Graphical Solutions, Multidimensional Space GxTyCz, and Invariant Geometry

5.1. Graphical Solutions: Visual Representation and Relational Topography

VISORD emerged from the necessity of rendering visible—and audible—the relational structures and processes emerging from research. Human senses are poorly adapted to parsing tables of abstract coefficients; conversely, they intuitively perceive shapes, depths, tonal shifts, relative distances, and lighting.

NEXORD implements continuous graphical solutions designed to restore the relational field without cognitive clutter:

- **Continuous 3D Sociograms (VISORD 3D/4D and VISORD Nuclear):** Spatial mapping of attraction basins (emerald green, $\langle Ee \rangle$), intermediate opposition zones (amber), and high-shear friction filaments (magenta, $[Rr]$), with diachronic navigation (Figure 11). In VISORD Nuclear, vertical coordinate Z materializes the orographic relief of perceptual realism (consensus valleys, mediation plateaus, and cognitive dissonance summits), rigorously anchored in the topological isomorphism of the ORBIT format (§2.3 and §8.6).
- **Parallel Dual Factorial Planes (MESO Biplot $F_1 \times F_2$, CA | PCA):** Simultaneous projection where dyadic vector $DA \rightarrow RC$ anchors actor positions with origin barycenters ($\Delta = 0.000$). In CA, over $\mathbb{N}_0$ count contingency under χ^2 ; in PCA, over standardized continuous $\mathbb{R}$ densities (Figure 9).
- **1D Vertical Slender Axes:** Decompositions flanked by Absolute Contribution (CTA) and Representation Quality (COR) metrics (Benzécri, 1973; Cornejo, 1988) (Figure 10).
- **Hierarchical Axonometric 6D-to-2D Projection (DIMO / ANCORM Algorithm by Dr. J. M. Cornejo Álvarez):** Overcoming classical 2D scatter constraints, NEXORD incorporates Dr. Cornejo's algorithmic method projecting up to 6 hierarchical factorial axes onto a single 2D Cartesian plane (see Annex II for complete analytical formulation).
- **Intergroup Structurograms:** Relational support polygons for comparative intergroup morphology.

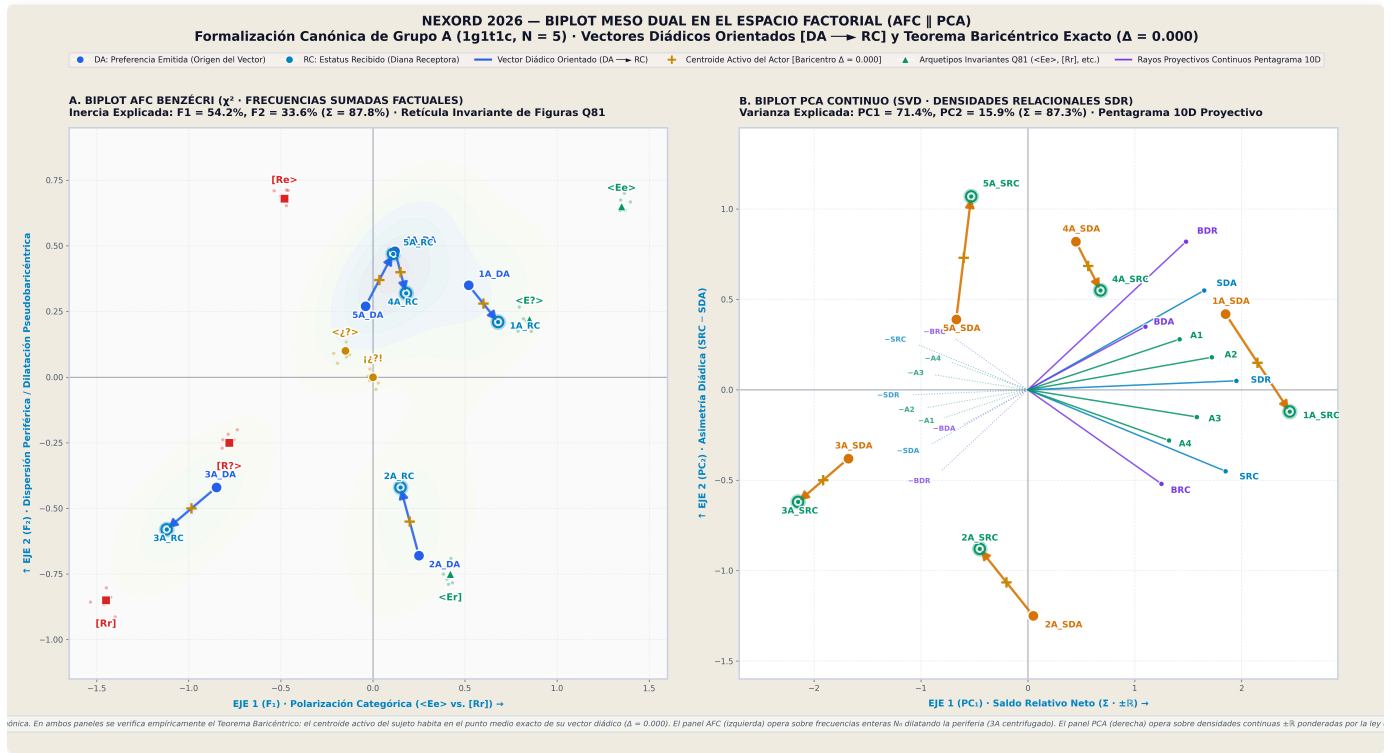


Figure 9. Parallel Dual Planes (MESO Biplot $F_1 \times F_2$, CA | PCA dual space): dyadic vector $DA \rightarrow RC$ with barycenter at the origin ($\Delta = 0.000$).

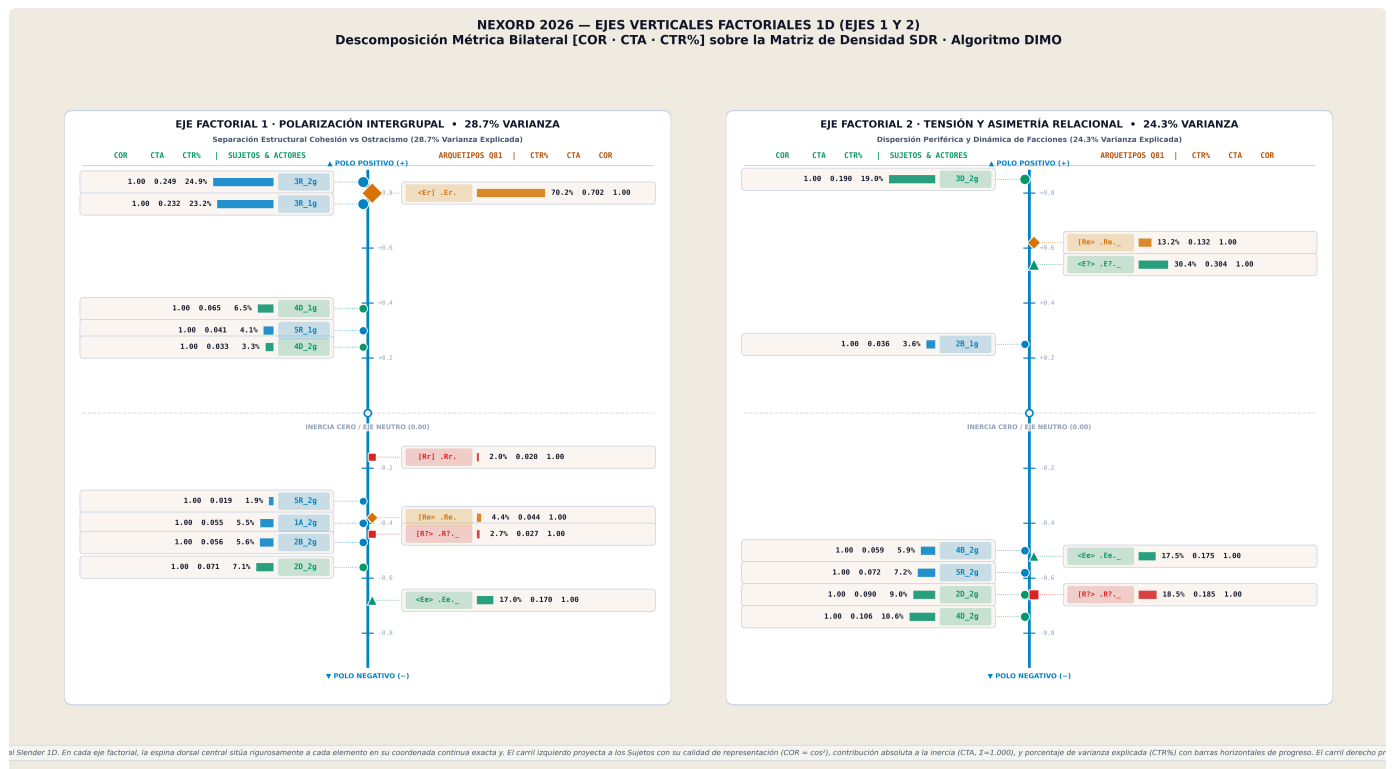


Figure 10. 1D vertical factorial axes (Axes 1 and 2, SDR matrix): bilateral COR–CTA–CTR metric quality of subjects and Q81 figures.

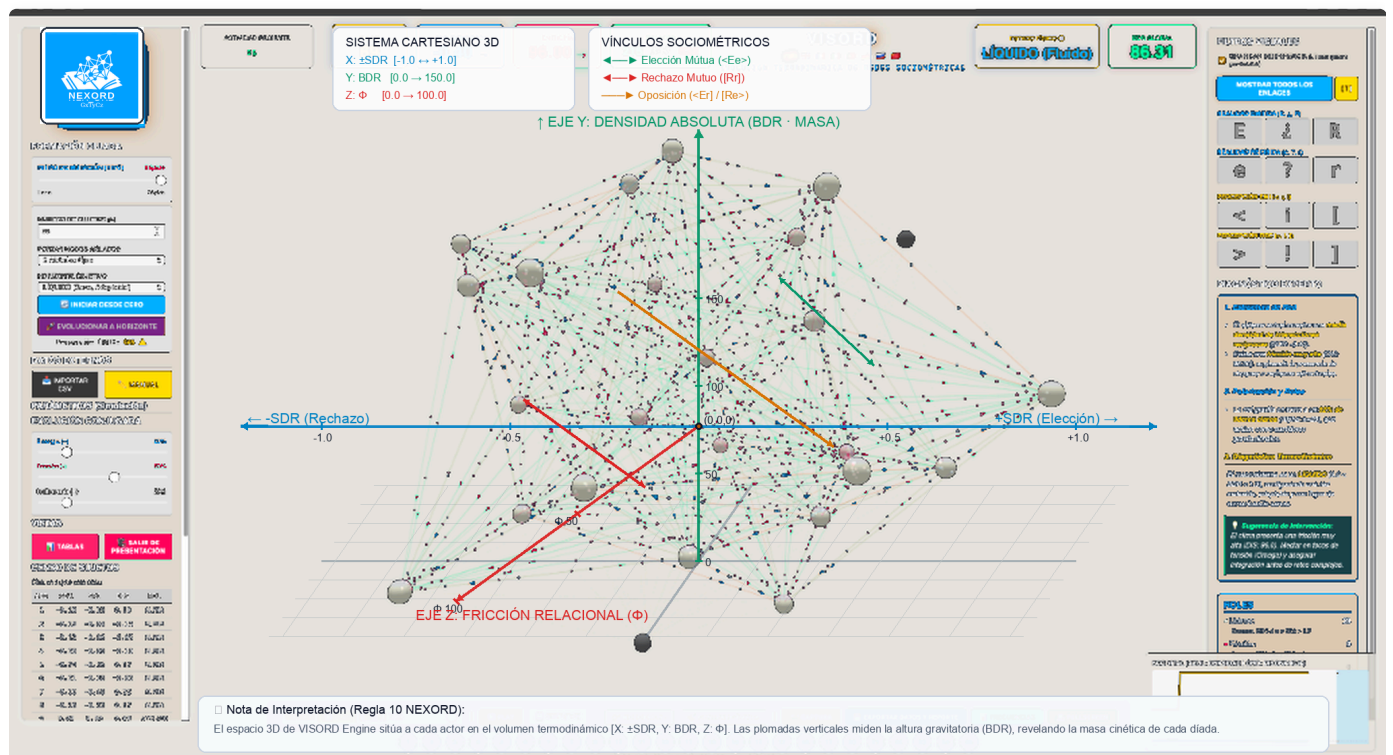


Figure 11. Interactive 3D navigation in the VISORD Engine: attraction basins and friction filaments in the continuous relational field.

5.2. Multidimensional Space GxTyCz

The matrix formulation imposes no prior constraints on design configurations:

- **Groups (G):** Accommodates any number of independent cohorts, departments, or informal subclusters.
- **Temporal Waves (T):** Longitudinal tracking across T sweeps ($T_1, T_2, \dots, T_n$), tracking cohesion and fracture evolution.

- **Sociometric Criteria (C):** Models multiple simultaneous criteria (C_1 operational task, C_2 affective affinity, C_3 crisis leadership).
- **Contextual Variables (Z):** Normative batteries (V_{10} sociodemographic and A_{16} Group Adjectival Attribution; Table 2) providing standardized frames for comparative analysis (Vicente et al., 2006).

NEXORD 2026 — TABLA CANÓNICA DE VARIABLES CONTEXTUALES (V10) Y ATRIBUCIÓN ADJETIVAL (A16) Ingestión Factual del Grupo 1 (G1, N = 5: 1A..5A) · Proyección Ilustrativa Multidimensional y Escala Par Forzada 1-8																											
G1 ID	VARIABLES COMPLEMENTARIAS CONTEXTUALES (V10)										ATRIBUCIÓN ADJETIVAL GRUPAL (A16 — 4 FACTORES × 4 ADJETIVOS)																
	10 Variables Contextuales (3 Modalidades: 1, 2, 3)										TEMA (Orientación a la Tarea)				FUNC (Dinámica Funcional)				COGN (Estilo Cognitivo)				AFEC (Clima Afectivo)				
	NODO	SX	ED	ORIG	ANT	ORIEN	IMPL	PRES	ROL	REND	COM	A1 Claro	A2 Cohere	A3 Flexib	A4 Consen	A5 Produc	A6 Ordena	A7 Activo	A8 Ejempl	A9 Abierto	A10 Critico	A11 Percep	A12 Expres	A13 Amisto	A14 Leal	A15 Colabo	A16 Tolera
	1A	1	2	1	2	1	2	1	2	3	3	3	3	3	4	3	3	4	3	3	3	3	3	3	2	2	3
	2A	2	2	1	2	1	2	1	1	2	2	3	3	3	2	4	3	3	2	3	3	3	3	3	3	3	4
	3A	1	2	1	2	1	2	1	1	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	3	3	3
	4A	2	2	1	2	1	2	1	1	2	2	7	6	7	7	7	7	7	7	6	7	7	7	7	7	6	6
	5A	1	2	1	2	1	2	1	1	2	2	3	4	3	3	3	3	3	4	3	4	2	3	3	3	3	2
DICCIONARIO DE VARIABLES CONTEXTUALES (V10, 3 MODALIDADES)												BATERÍA ADJETIVAL CANÓNICA (A16, 4 FACTORES, ESCALA PAR 1-8 SIN PUNTO MEDIO)															
• SX (Sexo): 1=Hombre, 2=Mujer, 3=Mixto												• TEMA (Tarea): A1 Claro, A2 Coherente, A3 Flexible, A4 Consensuado															
• ED (Edad): 1=<30 años, 2=30-45, 3=>45												• FUNC (Dinámica): A5 Productivo, A6 Ordenado, A7 Activo, A8 Ejemplar															
• ORIG (Origen): 1=Local, 2=Autonómico, 3=Externo												• COGN (Cognitivo): A9 Abierto, A10 Crítico, A11 Perceptivo, A12 Expresivo															
• ANT (Antigüedad): 1=<1 año, 2=1-5 años, 3=>5 años												• AFEC (Afectivo): A13 Amistoso, A14 Leal, A15 Colaborador, A16 Tolerante															
• ORIEN (Orientación): 1=Tarea, 2=Relación, 3=Mixta												NODO TRACTOR POLARIZADO (4A): Concentra valores 6-7 en los 4 factores (Liderazgo de Tarea, Funcional, Cognitivo y Afectivo). Sujetos 1A, 2A, 3A, 5A se sitúan en 2-4.															
• IMPL (Implicación): 1=Baja, 2=Media, 3=Alta																											
• PRES (Presencia): 1=Presencial, 2=Híbrido, 3=Remoto																											
• ROL (Rol): 1=Operativo, 2=Coordinación, 3=Directivo																											
• REND (Rendimiento): 1=Estándar, 2=Óptimo, 3=Alto																											
• COM (Competencia): 1=Básica, 2=Avanzada, 3=Maestro																											

ción Contextual y Escala Par Forzada. Las 10 variables V10 operan como ilustrativas suplementarias en 3 modalidades discretas. Los 16 adjetivos A16 exigen escala par forzada 1 a 8, proscribiendo el punto medio neutro (como 1-5 o 1-7) para evitar la ambigüedad y forzar polarización posicional. El sujeto 4A destaca como nodo tractor polarizado: sus puntuaciones de 6-7

Table 2. Normative board of the 10 contextual-variable battery (V10, 3 modalities) and 16 group-attribution adjectives (A16, 4 × 4, 1–8 scale).

Field application across $G \times T \times C$ is guided by the 10 ecosystemic calibration domains (Table 6), setting structural parameters —relational inertia α and decay γ —and canonical criteria.

Tabla de Calibración de los 10 Dominios Sociométricos Ecosistémicos

Parametrización estructural (α , γ), foco socio-dinámico y criterios canónicos de elección administrados

Dominio Sociométrico	Parámetros Estructurales	Foco Psicosocial y Dinámica Relacional	Criterios Clave de Elección
1. Sociometría Educativa y Formativa	$\alpha = 0.50$ $\gamma = 0.80$	Aprendizaje colaborativo, inclusión y prevención activa de la marginación escolar.	- Tarea / Estudio - Lúdico / Patio - Liderazgo Integrador
2. Sociometría Familiar y Sistémica	$\alpha = 0.85$ $\gamma = 0.99$	Jerarquía, fronteras de rol, lealtades implícitas y resolución de tabúes sistémicos.	- Confianza y Sostén - Fricción / Conflicto - Toma de Decisiones
3. Sociometría Deportiva y Alto Rendimiento	$\alpha = 0.30$ $\gamma = 0.60$	Sinergia táctica bajo presión, cohesión de vestuario vs. eficacia en campo.	- Pase / Sinergia Táctica - Cohesión de Vestuario - Liderazgo bajo Estrés
4. Sociometría Social y Comunitaria	$\alpha = 0.30$ $\gamma = 0.40$	Dinámicas informales de barrio, agrupaciones espontáneas e integración vecinal.	- Proximidad y Afecto - Organización e Iniciativa - Compartir Ocio
5. Sociometría de Equipos de Élite / Misiones Críticas	$\alpha = 0.85$ $\gamma = 0.90$	Fiabilidad absoluta, respuesta coordinada ante imprevistos y gestión de fallos.	- Fiabilidad Técnica - Respuesta a Crisis - Apoyo en Misión
6. Sociometría Terapéutica y Clínica	$\alpha = 0.40$ $\gamma = 0.70$	Salud de la red de apoyo, vulnerabilidad, sostén emocional y contención afectiva.	- Sostén Emocional - Identificación y Reflejo - Distancia Defensiva
7. Sociometría Laboral y Organizacional	$\alpha = 0.65$ $\gamma = 0.85$	Red informal de trabajo, eliminación de silos, clima laboral y retención de talento.	- Resolución Operativa - Innovación y Confianza - Fluidez Informativa
8. Sociometría Institucional y Gubernamental	$\alpha = 0.80$ $\gamma = 0.90$	Coordinación interdepartamental, estabilidad normativa y consensos de gestión.	- Protocolo Institucional - Consenso Normativo - Consulta Estratégica
9. Sociometría Militar y Geo-Política	$\alpha = 0.90$ $\gamma = 0.95$	Estructuras de mando, bloques diplomáticos, alianzas de poder y dinámicas de veto.	- Cadena de Mando - Lealtad de Bloque - Veto y Tensión
10. Sociometría Biológica / Eco-Penitenciaria	$\alpha = 0.20$ $\gamma = 0.50$	Autoorganización, asignación de recursos escasos, nichos territoriales y supervivencia.	- Proximidad Espacial - Defensa y Cooperación - Dominancia Ordinal

Nota de Interpretación Metodológica:

- α modula el peso del componente perceptual/expectativa (0 a 1); γ modula la tasa de decaimiento ordinal de las preferencias (0 a 1).
- Plataforma VISORD / NEXORD © 2026 — Ecosistema de Diagnóstico Socio-Termodinámico Homologado.

Table 6. Canonical catalogue of the 10 ecosystemic application domains with structural parameterization (α , γ), psychosocial focus, and canonical criteria.

5.3. Multigroup PCA and Geodesic Distance on Grassmann Manifolds $\text{Gr}(k, N)$

To compare collectives without forcing artificial cross-group interaction, each group projects as a k -dimensional subspace within $\mathbb{R}^N$. From Jordan canonical principal angles $\cos(\theta_m) = \sigma_m(U_1^T U_2)$, scale-invariant geodesic distance is computed:

$$d_{\{\text{Gr}\}}(U_1, U_2) = \sqrt{[\sum \theta_m^2]}$$

(20)

This metric rigorously determines (Figure 12) whether two groups share identical relational topologies regardless of sample size differences. Beyond momentary agreement among observers, it is the temporal persistence and constancy of these configurations within the geometric space that allows contrasting the stability of relational structures against conjunctural variations or random fluctuations.

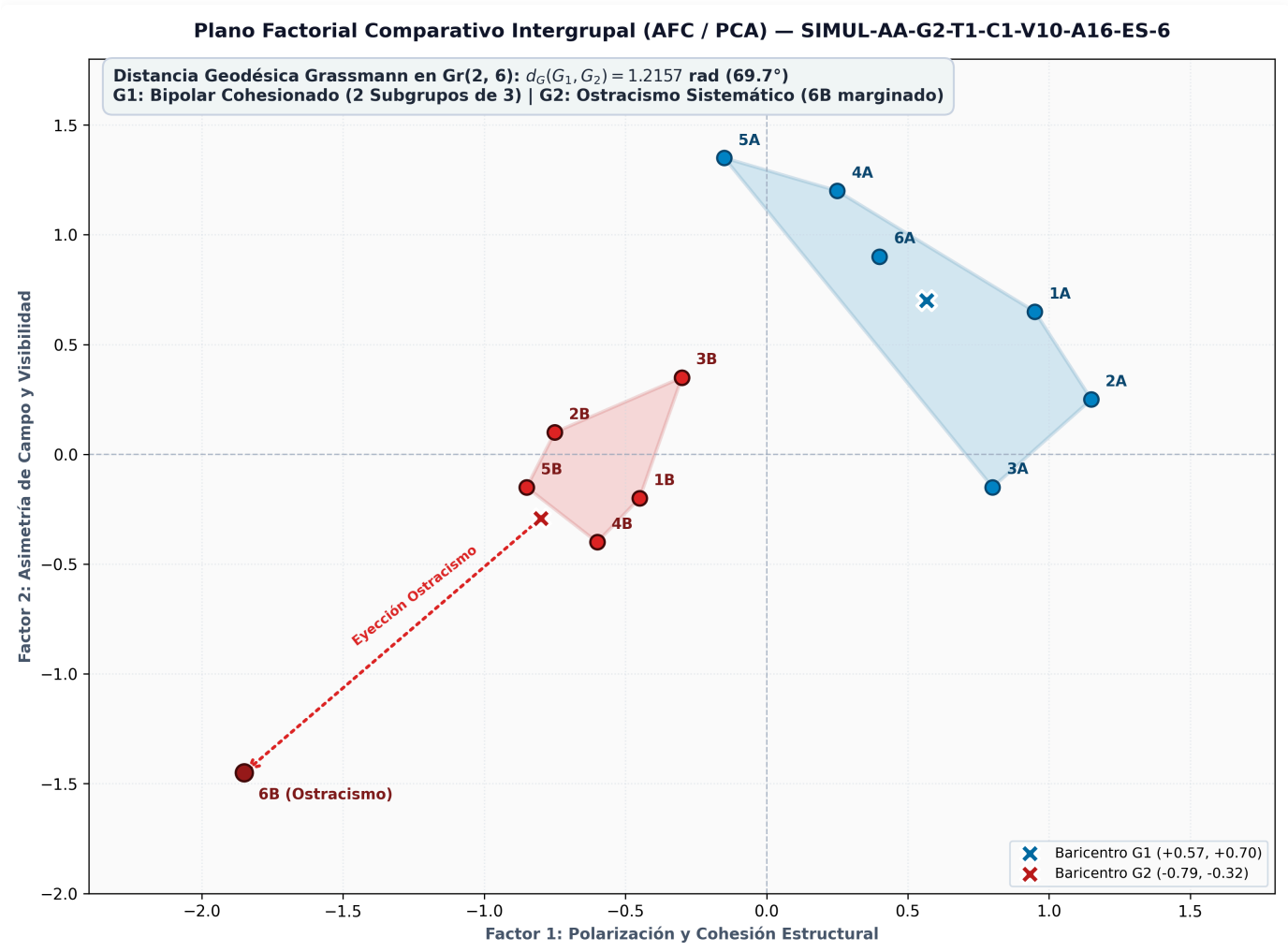


Figure 12. Intergroup comparative factorial plane (G1 vs G2) and diachronic structrograms; geodesic distance on $Gr(k, N)$ quantifies shared relational morphology.

At the subject level, the Euclidean rank interdistance matrix d_{DA} / d_{RC} (Table 7) documents the relational asymmetry law: mean inbound dispersion (4.84; SD = 0.64) systematically exceeds outbound (4.15; SD = 0.49).

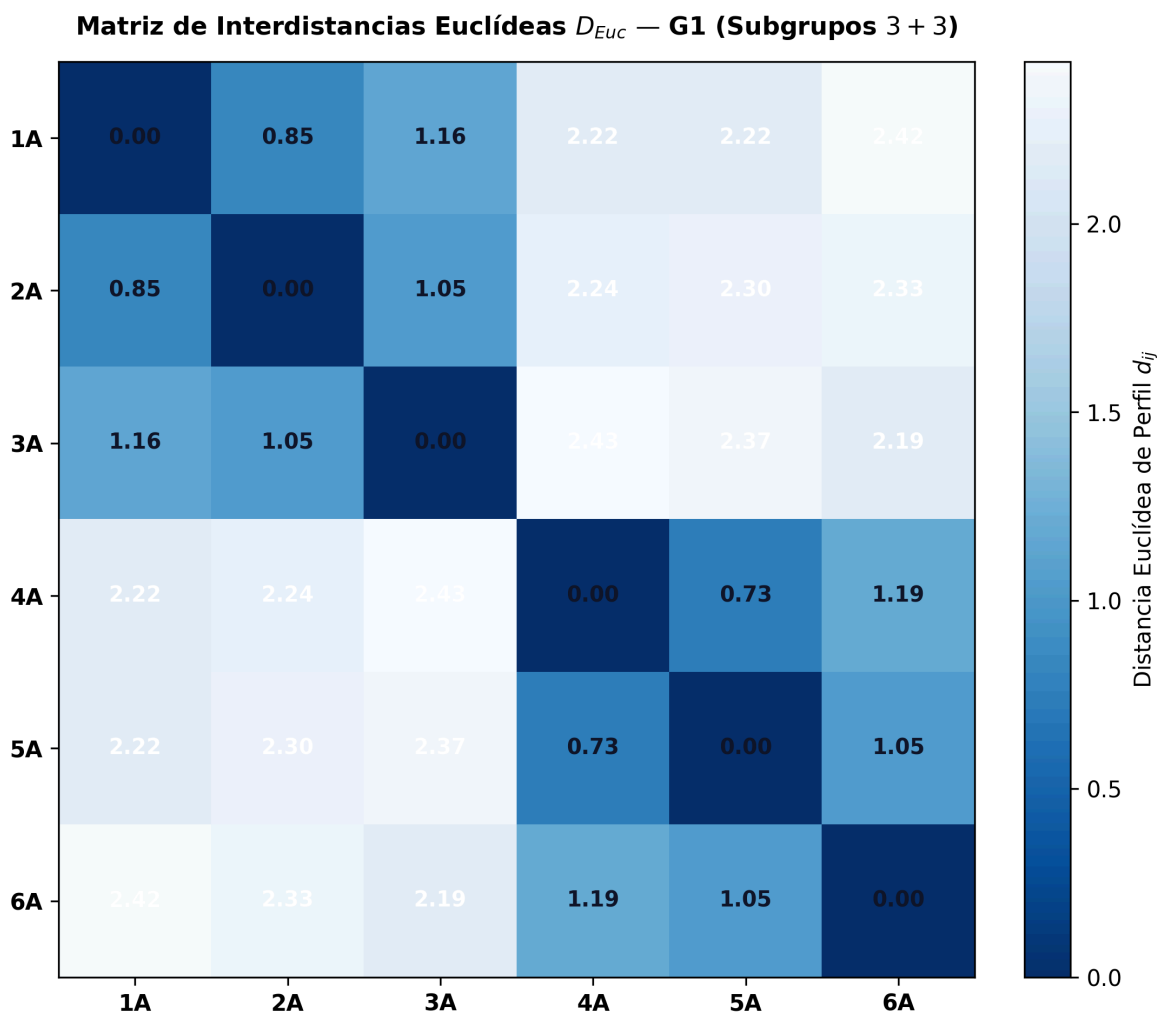


Table 7. Numeric matrix of Euclidean rank interdistances (d_{DA} , d_{RC} , $\Delta = d_{DA} - d_{RC}$) with per-subject structural diagnosis, G2T1C1 corpus.

6. Experimental Research: Physical Laboratory, Dialectical Sociometry, and Triadic Cognition

6.1. Experimental Monitoring in the Physical Laboratory

The platform supports real-time monitoring of complex laboratory experiments: tracking high-interdependence tasks, crisis simulations, and interventions in small group dynamics.

6.2. Dialectical Sociometry and Social Dilemma Analysis

In cooperative-competitive settings (e.g., Common Pool Resource dilemmas, iterated Prisoner's Dilemma), NEXORD quantifies gaps between cognitive expectations and observable relational behavior, capturing the emergence of coalitions and defection.

6.3. Multimodal Perception: Iceberg Model and Hydrodynamic Sonification

NEXORD implements the iceberg model through 3D visual projection (surfacing submerged structural friction) and hydrodynamic sonification (translating density fluxes into tonal streams), allowing continuous monitoring without visual fatigue (Figure 13).

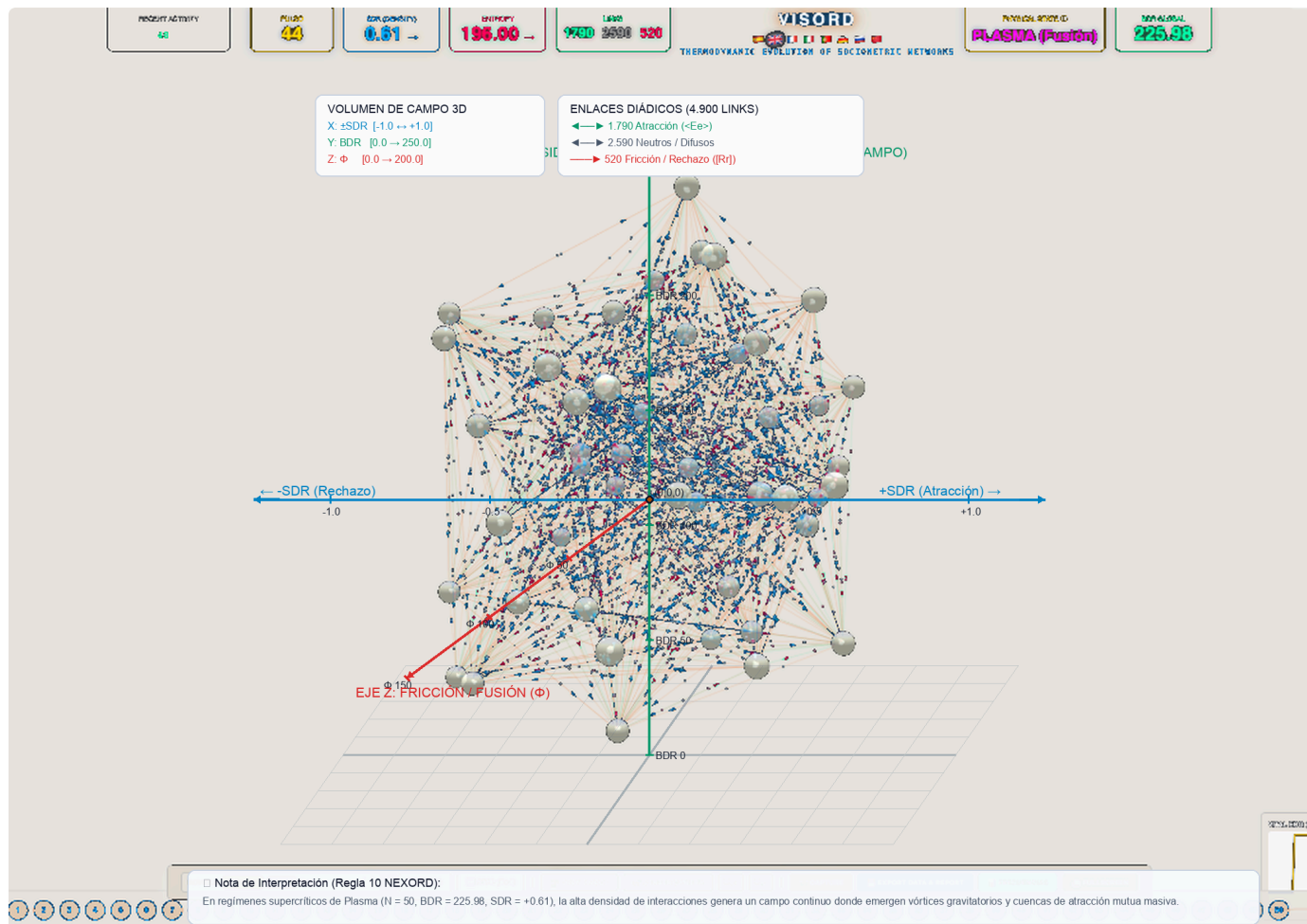


Figure 13. Continuous interaction field and iceberg model across N = 50 subjects: submerged relational structure rendered visible.

6.4. The CULTURAL Corpus as a Zero-Reactivity Laboratory

Dramatic literature and cinema provide ideal human laboratories: closed, perfectly documented systems with zero reactivity. NEXORD has processed canonical corpora (*Twelve Angry Men*, *The House of Bernarda Alba*, *Lord of the Flies*), proving that socio-thermodynamic laws mathematically pinpoint dramatic climaxes and leadership collapses without observational bias.

6.5. Triadic Social Cognition: Projected Expectations αE and ωE

NEXORD extends expectation capture with two relational theory-of-mind sensors:

- **Expected Highest-Ranked (αE):** Individual expectation regarding who the collective will choose most favorably.
- **Expected Lowest-Ranked (ωE):** Individual expectation regarding who will receive the greatest group rejection or discard.

These metrics evaluate systemic awareness (Tsankova & Tair, 2021) via Euclidean distance between expectation and observed group reality:

$$\Delta_{\alpha} = \|\alpha E - \text{Real Choice}(\alpha)\|, \quad \Delta_{\omega} = \|\omega E - \text{Real Choice}(\omega)\| \quad (21)$$

Subjects with $\Delta_{\alpha} \approx 0$ and $\Delta_{\omega} \approx 0$ act as natural sensors of group dynamics.

6.6. Preliminary Evidence of Convergent Validity and Reliability

[Methodological note: this section is registered as a preregistered skeleton. Cells marked \angle \cdots \rangle are completed solely with empirical analysis of designated corpora; no estimates are reported without prior statistical validation.]

6.6.1. Validation Design

Convergent validity is examined by contrasting core metrics with external criteria: (a) classical status (net choices and rejections); (b) Group Activity Analysis Battery factors (AAG; Vicente et al., 2006); (c) theoretical rank orders from CULTURAL corpora. Preregistered hypotheses: H1 (ICE correlates positively with perceived cohesion); H2 (Φ discriminates field regimes); H3 ($|IDA|$ correlates with self/hetero discrepancy); H4 (SDR reproduces theoretical rankings); H5 (triadic cognition: low Δ_α , Δ_ω links to low $|IDA|$).

6.6.2. Convergent Validity

Table 3: Convergent validity matrix (preregistered skeleton)

NEXORD Index	External Criterion	Corpus	Statistic	Value	p		
ICE	AAG · Affective factor (H1)	\angle G\!T\!C\!\rangle	Spearman ρ	\angle \cdots \rangle	\angle \cdots \rangle		
Φ	A priori regime classification (H2)	\angle G\!T\!C\!\rangle	Cohen's d	\angle \cdots \rangle	\angle \cdots \rangle		
**	IDA	**	Metaperceptual discrepancy (H3)	\angle G\!T\!C\!\rangle	Pearson's r	\angle \cdots \rangle	\angle \cdots \rangle
SDR	Classical sociometric status (net)	\angle G\!T\!C\!\rangle	Spearman ρ	\angle \cdots \rangle	\angle \cdots \rangle		
SDR Hierarchy	Theoretical CULTURAL ranking (H4)	\angle \text{work} \rangle	Kendall's W	\angle \cdots \rangle	\angle \cdots \rangle		
$\Delta_\alpha / \Delta_\omega$		IDA	· Systemic awareness (H5)	\angle G\!T\!C\!\rangle	Partial r	\angle \cdots \rangle	\angle \cdots \rangle

6.6.3. Reliability

Table 4: Reliability (preregistered skeleton)

Estimator	Design	Corpus	Interval	Value
Ranking internal consistency	Kendall's W (T_1)	$\langle G \backslash T \backslash C \backslash \rangle$	—	$\langle \cdots \rangle$
Test-retest stability	Ordinal correlation $T_1 - T_2$	$\langle G \backslash T \backslash C \backslash \rangle$	$\langle \cdots \text{ \texttt{days}} \rangle$	$\langle \cdots \rangle$
Inter-criteria agreement ($C_1/C_2/C_3$)	Kendall's W	$\langle G \backslash T \backslash \rangle$	—	$\langle \cdots \rangle$

6.6.4. Factorial Robustness

Table 5: Factorial robustness by corpus (preregistered skeleton)

Corpus	N	PC_1 %	PC_1 % (permutation, mean)	p	PC_1 % (centered)
$\langle G2T1C1 \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$
$\langle G1T4C3 \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$
$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$	$\langle \cdots \rangle$

6.6.5. Effect Sizes and Power

Reported with 95% CI and achieved power; corpora with $N < 20$ are classified exploratory.

6.7. In Silico Sociometric Simulation: The PLATINUM Engine

Conducting real-world sociometric field studies involves considerable logistical overhead. To support research and calibration without human subject exposure, NEXORD incorporates an in silico simulation engine (PLATINUM), analogous to synthetic biology: it extrapolates topological sociometric laws to generate challenging synthetic organizations that test platform algorithms in vitro.

Investigators configure scenarios across $G \times T \times C$ and govern collective morphology via continuous parametric families: (a) thermodynamic modulators; (b) kinetic gravity and assembly parameters; (c) longitudinal temporal modulators; and (d) contextual modulators (V_{10}, A_{16}). Pseudo-random seeding ensures bit-level reproducibility, enabling Monte Carlo replications under standard naming (`SIMUL-...`).

6.8. Web-Assisted Field Capture

NEXORD delivers automated logistics for complex field designs administered via web. The accredited Principal Investigator configures parameters, schedules connectivity, and delivers randomized protocols (`.html`) directly to participant smartphones.

The infrastructure ensures logistical validity: prior informed consent, randomized rosters neutralizing order bias, response timing controls, and delivery of private codes granting individual access to constructive personal feedback (§7.3).

7. Institutional Governance, Ethics by Design, and Open Science

7.1. Ethics by Design and Strictly Non-Punitive Use

NEXORD incorporates ethical safeguards directly into the core of its algorithmic architecture (*Ethics by Design*). The system explicitly prohibits the use of sociometric data for punitive purposes, disciplinary proceedings, dismissals, or layoff/exclusion lists. Any analytical processing conducted on real human collectives (the REAL category) strictly requires the formal authentication, stewardship, and responsibility of a duly accredited Principal Investigator (PI).

7.2. Open Science, Clélie Protocol, and Custody in the Sociometric Bank (BSOC)

In rigorous adherence to the principles of Open Science and FAIR Data (*Findable, Accessible, Interoperable, Reusable*), the methodological and mathematical foundations of the platform are placed in the public domain under open access.

Empirical field data are systematically anonymized under standardized alphanumeric codes ([1A1a](#) ... [5A1a](#)) and protected via immutable cryptographic sealing utilizing the SHA3-512 algorithm (the Clélie Protocol), under the academic custody of the Sociometric Bank (BSOC).

The BSOC originates from the visionary aim of conferring retrospective utility onto the vast body of sociometric studies conducted over past decades: the BSOC is established to preserve and leverage the extensive empirical heritage generated across decades of psychosocial research, enabling sociomatrices from local and historical studies to be integrated into retrospective, comparative, and meta-analytic investigations. Once sociomatrices are deposited into the bank under the canonical SMIB standard protocol—which seamlessly unifies both data capture paradigms (MORENO and BREVE)—this extensive historical heritage is transformed into reusable scientific capital under FAIR principles, fully safeguarding the empirical investment of preceding generations of researchers.

The NEXORD Platform materializes across four integrated pillars:

1. The Python computational suite, which implements the complete formal and mathematical apparatus (under continuous revision and refinement, distributed under institutional accreditation pursuant to §7.4).
2. This Scientific Manifesto, published in open access with official DOI registration on Zenodo/CERN.
3. The seminal academic research paper submitted to a peer-reviewed scientific journal (*Psicothema*).
4. The promotional web portal hosted on GitHub Pages, featuring its interactive VISORD 3D/4D animation ecosystem—interactive modules designed for scientific dissemination and intuitive exploration, lacking direct linkage to the operational computation engine, yet fully functional as interactive visualizers for simulated or real, rigorously anonymized studies—. The web interface organizes the nine stations of the analytical model across an interactive radial navigation dial.

7.3. Participant Rights and Constructive Restitution

Every participant is provided with individual, time-limited credentials allowing them to verify the correct processing of their own submitted data, strictly without granting access to the individualized responses or coordinates of third parties.

The re-identification of nodes is strictly and exclusively reserved for the Principal Investigator within designated contexts of psychological support, counseling, or pedagogical mediation. All restitution of diagnostic findings is inherently reflective,

formative, and constructive, oriented toward fostering systemic wellbeing and the healthy development of the human group.

7.4. Dual-Use Risk and Creator's Declaration

The profound diagnostic power developed by NEXORD through its advanced algorithms renders it a potential «social weapon» should its operation fall into unscrupulous, manipulative, or irresponsible hands. Sociometric information carries acute psychosocial sensitivity and has the capacity to inflict severe personal and collective harm in the absence of explicit, institutionalized academic oversight.

As the creator of NEXORD and a staunch advocate of Open Science, I consider the overarching goal of total transparency and universal dissemination of scientific knowledge to be paramount. Nevertheless, the grave risks inherent in sociometric malpractice compel me to withhold the unrestricted public distribution of this operational research software, reserving its deployment exclusively for verified and solvent university and scientific institutions. For this precise reason, NEXORD incorporates rigorous security-by-design mechanisms that prevent its execution unless the professional and institutional accreditation of the Principal Investigators (PIs) is formally authenticated, alongside their explicit, binding commitment to employ the platform in an ethical, positive, and constructive manner that nurtures personal and collective health whenever investigating real human collectives in the field.

It is vital to clarify the exact scope of this declaration. This Manifesto is a programmatic scientific document—a comprehensive exposition of the theoretical, methodological, and pragmatic architecture of the initiative—: neither this document, nor the computational platform, nor its algorithms are subjected to proprietary intellectual property restrictions; this Manifesto is disseminated openly under a Creative Commons Attribution 4.0 International license (CC BY 4.0), and the safeguards advocated herein do not restrict scientific knowledge, but rather regulate operational access to the diagnostic instrument.

8. Formalized Technical Annexes

8.1. Annex I: Dual Matrices (SMIb and SMIa, Q81 Lattice)

Formalization of bijective correspondence between alphanumeric ordering and computable dyadic figures in the canonical Q81 lattice.

FIGURE 5: CANONICAL 9×9 LATTICE OF THE 81 RELATIONAL CONFIGURATIONS (Q81)
 Canonical Tetragram Architecture SMla and Monotonic Valency Ranking (81 → 1)

SMla · CANONICAL DYADIC TETRAGRAM ARCHITECTURE [A1 A2 A3 A4]									
VALENCE / POLARITY	GIVING / SENDER PERSPECTIVE (DA)				RECEIVING / PARTNER PERSPECTIVE (RECIBE)				
Scale	A1: PERCEPTION (p_DA)		A2: REAL (DA)		A3: REAL (RECIBE)		A4: PERCEPTION (p_REC)		
Choice (+)	<		E		e		>		
Indifference (0)	i		¿		?		!		
Rejection (−)	[		R		r		]		

CANONICAL 9×9 Q81 NUMERICAL LATTICE (Cartesian Product DA × RECIBE · Valence 81 → 1)									
DA \ REC	e>	e!	e]	?>	?!	?]	r>	r!	r]
<E	81 <Ee>	80 <Ee!	78 <Ee]	75 <E?>	71 <E?!>	66 <E?]>	60 <Er>	53 <Er!	45 <Er]
iE	79 iEe>	77 iEe!	74 iEe]	70 iE?>	65 iE?!>	59 iE?]>	52 iEr>	44 iEr!	36 iEr]
[E	76 [Ee>	73 [Ee!	69 [Ee]	64 [E?>	58 [E?!>	51 [E?]>	43 [Er>	35 [Er!	28 [Er]
<¿	72 <¿e>	68 <¿e!	63 <¿e]	57 <¿?>	50 <¿?!>	42 <¿?]>	34 <¿r>	27 <¿r!	21 <¿r]
i¿	67 i¿e>	62 i¿e!	56 i¿e]	49 i¿?>	41 i¿?!>	33 i¿?]>	26 i¿r>	20 i¿r!	15 i¿r]
[¿	61 [¿e>	55 [¿e!	48 [¿e]	40 [¿?>	32 [¿?!>	25 [¿?]>	19 [¿r>	14 [¿r!	10 [¿r]
<R	54 <Re>	47 <Re!	39 <Re]	31 <R?>	24 <R?!>	18 <R?]>	13 <Rr>	9 <Rr!	6 <Rr]
iR	46 iRe>	38 iRe!	30 iRe]	23 iR?>	17 iR?!>	12 iR?]>	8 iRr>	5 iRr!	3 iRr]
[R	37 [Re>	29 [Re!	22 [Re]	16 [R?>	11 [R?!>	7 [R?]>	4 [Rr>	2 [Rr!	1 [Rr]

METHODOLOGICAL INTERPRETATION NOTE (NEXORD Rules 5, 8, and 10):

1. Tetragram Architecture: Dyadic tie (i, j) = [A1: p_DA (emitted expectation), A2: DA (emitted choice), A3: RECIBE (received choice), A4: p_RECIBE (attributed expectation)].

2. Q81 Lattice: Monotonic decreasing order of relational valence from 81 (<Ee>, peak mutual choice) to 1 ([Rr], peak mutual rejection), converging at the homeostatic centroid 41 (i¿?!, reflexive neutrality).

Table Annex I. Structural Q81 matrix with 81 canonical relational figures ordered by increasing-valence antidiagonals.

8.2. Annex II: Factorial Metrics (COR, CTA, CTR), Slender Vertical Axes, and Hierarchical Axonometric 6D-to-2D Projection (DIMO / ANCORM Algorithm by Dr. J. M. Cornejo Álvarez)

In Correspondence Analysis (CA) and Principal Component Analysis (PCA), classical 2D scatter plots often suffer from cognitive crowding. NEXORD resolves this via two analytical innovations:

1. 1D Slender Vertical Factorial Axes

Each primary factorial axis is decomposed into an independent vertical line where elements distribute along their exact coordinate, flanked by:

- **Quality of Representation (ext{COR}):** Proportion of element inertia recovered: $\text{ext{COR}}_{i \text{ lpha}} = d^2(i, \text{lpha}) / d^2(i, G) \in [0, 1]$.
- **Absolute Contribution (ext{CTA} / ext{CTR}):** Percentage weight of the element in constructing axis variance: $\text{ext{CTR}}_{i \text{ lpha}} = p_i \cdot d^2(i, \text{lpha}) / \lambda_{\text{lpha}}$ (summing to 100%).

2. Hierarchical Axonometric 6D-to-2D Projection (DIMO / ANCORM Algorithm)

Developed in Dr. Cornejo's doctoral dissertation, DIMO solves the projection of up to 6 hierarchical factors (F_1 to F_6) onto a single 2D plane (X, Y) without relying on auxiliary pictorial devices (such as node color or sizing) that could hinder metric precision:

- **Basal Cartesian Anchor (F_1, F_2):** Factors 1 and 2 define initial Cartesian position (f_1, f_2).
- **Quadrant Radial Fan for Higher Factors (F_3, F_4, F_5, F_6):** Each quadrant subdivides at 33° and 66° cuts into standardized directional rays, projected with exact geometric ratios ($1/3, 2/3, 1/2$).
- **Dynamic Pull Driven by Absolute Contribution ($\text{ext}\{\text{CTA}\}$):** Displacement vectors are pulled exclusively by the information mass contributed to factors 3–6:

$$\Delta x_i = \sum_{k=3}^6 \eta_k \cdot \text{ext}\{\text{CTA}\}_{ik} \cdot \cos(\theta_k), \quad \Delta y_i = \sum_{k=3}^6 \eta_k \cdot \text{ext}\{\text{CTA}\}_{ik} \cdot \sin(\theta_k)$$

Elements with near-total inertia in planes 1–2 remain at baseline ($\Delta = 0$); elements with significant variance in higher factors are displaced along the corresponding axonometric vector.

- **Continuous Vector Trace:** A fine line connects basal coordinate (f_1, f_2) to the projected 6D point, eliminating spatial ambiguity.

8.3. Annex III: Catalogue of the 10 Ecosystemic Domains

Complete parameterization (lpha, γ) and application criteria for Educational, Family, Sports, Community, Critical Missions, Therapeutic, Corporate, Institutional, Military, and Correctional contexts.

Table Annex III: Canonical Catalog of the 10 Ecosystemic Domains

Thermodynamic Calibration Parameters (Relational Inertia α and Spatial Decay γ)

No.	Sociometric Domain	α (Inertia)	γ (Decay)	Psychosocial Focus & Operational Criteria
1	Educational & Training	0.50	0.80	Collaborative learning and inclusion (Task/Study, Play/Recess)
2	Family & Coexistence	0.70	0.90	Attachment and systemic roles (Emotional Support, Conflict Management)
3	Sports & Performance	0.40	0.70	Tactics and cohesion (Passing/Strategy, Competitive Trust)
4	Social & Community	0.60	0.85	Solidarity and social capital (Neighborly Support, Community Leadership)
5	Critical Missions & Emergency	0.30	0.60	Resilience under extreme stress (Tactical Command, Operational Support)
6	Therapeutic & Mutual Support	0.80	0.95	Alliance and emotional holding (Empathy/Listening, Self-Disclosure)
7	Work & Organizational	0.45	0.75	Efficacy and innovation (Project Collaboration, Professional Trust)
8	Institutional & Governance	0.55	0.80	Negotiation and consensus (Political Alliance, Mediation)
9	Military & Tactical	0.20	0.50	Discipline and operational brotherhood (Combat Leadership, Vital Trust)
10	Correctional & Eco-Sociometry	0.65	0.90	Coexistence and rehabilitation (Respect/Security, Support Network)

Explanatory Interpretation Note (Parameter Calibration):

1. Relational Inertia (α): Measures openness and retention of affective memory in group bonds. Higher values (e.g. Therapeutic 0.80) reflect strong affective holding.
2. Relational Decay Exponent (γ): Regulates power-law spatial attenuation of interpersonal impact. Lower values (e.g. Military 0.50) signify long-range tactical reach.
3. Multiplex Functional Alignment: Each domain pairs dual Task (instrumental) and Socio-affective (expressive) criteria ensuring balanced sociometric coverage.
4. Ecosystemic Adaptation: Field practitioners select domain parameters to calibrate thermodynamic potential and entropy calculation to institutional settings.

Table Annex III. Catalogue of the 10 ecosystemic calibration domains with relational inertia (α) and decay rate (γ).

8.4. Annex IV: Sender-Receiver Rank Interdistances and Isometry Diagonal

Full Euclidean rank interdistance matrix (d_{DA}, d_{RC}, Δ) computed over G2T1C1, validating the relational asymmetry law.

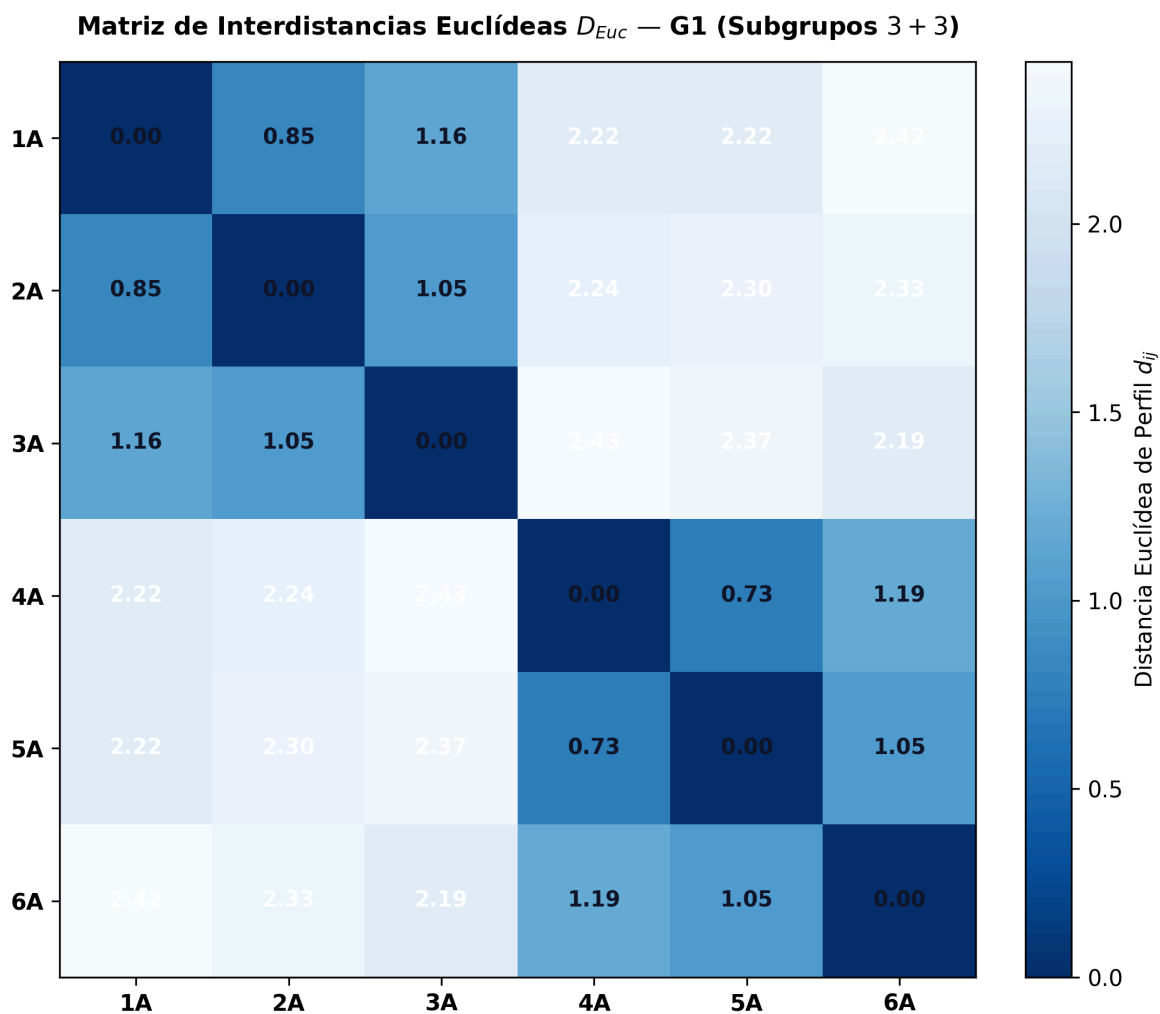


Table Annex IV. G2T1C1 Euclidean rank interdistance matrix with role asymmetry diagnoses.

8.5. Annex V: Formal Specification of the 18 Relational Densities (18D)

The 18D relational space formalizes all interpersonal exchange balances via the tensorial articulation of emission and reception across the tetragram:

Table Annex V. Specification and Calculation of the 18 Relational Densities and Socio-Thermodynamic Invariants

Dimension	Symbol / Alias	Partition / Axis	Exact Calculation Formula	Metric Range	Socio-Thermodynamic Significance
1D	D_1 (dDP, D_{pDA})	4D Base	$\frac{1}{N-1} \sum W_{pDA}(i, j)$	[-1.00, +1.00]	Prior expectation and anticipatory trust emitted toward the collective.
2D	D_2 (dDA, D_{DA})	4D Base	$\frac{1}{N-1} \sum W_{DA}(i, j)$	[-1.00, +1.00]	Kinetic flow and effective preferential action emitted by the subject.
3D	D_3 (dRA, D_{RC})	4D Base	$\frac{1}{N-1} \sum W_{RC}(j, i)$	[-1.00, +1.00]	Objective status and real impact of attraction or rejection received from peers.
4D	D_4 (dRP, D_{pRC})	4D Base	$\frac{1}{N-1} \sum W_{pRC}(j, i)$	[-1.00, +1.00]	Reflected field of presumption attributed to the subject by peers.
5D	S_{12} (SDA)	Prism 1 Operational	$D_1 + D_2$	[-2.00, +2.00]	Net sender potential: expansiveness and initiative spring/sink.
6D	B_{12} (BDA)	Prism 1 Operational	$ D_1 + D_2 $	[0.00, +2.00]	Gross sender mass: total metabolic expenditure and emitted investment.
7D	S_{34} (SRC)	Prism 1 Operational	$D_3 + D_4$	[-2.00, +2.00]	Net receiver potential: global status induced by the peer environment.
8D	B_{34} (BRC)	Prism 1 Operational	$ D_3 + D_4 $	[0.00, +2.00]	Gross receiver mass: incident social pressure and impact load.
9D	S_{14} (SP)	Prism 2 Ontological	$D_1 + D_4$	[-2.00, +2.00]	Cognitive balance: climate of mutual trust and shared presumption.
10D	B_{14} (BP)	Prism 2 Ontological	$ D_1 + D_4 $	[0.00, +2.00]	Gross cognitive mass: volume of mental rumination and prospective burden.
11D	S_{23} (SA)	Prism 2 Ontological	$D_2 + D_3$	[-2.00, +2.00]	Factual balance: objective ground truth of real choices and rejections.
12D	B_{23} (BA)	Prism 2 Ontological	$ D_2 + D_3 $	[0.00, +2.00]	Gross factual mass: volume of motor action and tangible interaction.
13D	S_{13}	Prism 3 Dialectical	$D_1 + D_3$	[-2.00, +2.00]	Realism balance: confirmation vs. disillusionment (expected vs. received).
14D	B_{13}	Prism 3 Dialectical	$ D_1 + D_3 $	[0.00, +2.00]	Realism mass: affective vulnerability under reality testing.
15D	S_{24}	Prism 3 Dialectical	$D_2 + D_4$	[-2.00, +2.00]	Response balance: satisfaction vs. frustration of others' expectations.
16D	B_{24}	Prism 3 Dialectical	$ D_2 + D_4 $	[0.00, +2.00]	Correspondence mass: dyadic commitment and reciprocal responsibility.
17D	SDR	Global Invariant	$\sum S_{ij} = \sum D_k$	[-4.00, +4.00]	Net Relational Density Balance: homeostatic barometer of group climate.

18D	BDR	Global Invariant	$\sum B_{ij} = \sum D_k $	[0.00, +4.00]	Gross Relational Density: system total heat capacity and kinetic mass.
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8.6. Annex VI: Mathematical Proof of the ORBIT Geographic Isomorphism and Torgerson-Shepard Operator

This annex formalizes the topological equivalence theorem between the symmetric triangular distance matrix and the ORBIT ordinal sociomatrix $A(i, k) = j$ (§2.3).

1. Double Centering Operator Formulation (Torgerson, 1952)

Given a symmetric dissimilarity matrix $D \in \mathbb{R}^{N \times N}$ with $D_{ij} = D_{ji} \geq 0$ and $D_{ii} = 0$:

- Define the squared distance matrix $D^{(2)}$ such that $D^{(2)}_{ij} = D_{ij}^2$.
- Apply the orthogonal centering matrix $H = I_N - \frac{1}{N}\mathbf{1}\mathbf{1}^T$ to $D^{(2)}$:

$$B = -\frac{1}{2} H D^{(2)} H$$

where the explicit scalar component is:

$$b_{ij} = -\frac{1}{2} \left(D_{ij}^2 - \frac{1}{N} \sum_{k=1}^N D_{ik}^2 - \frac{1}{N} \sum_{m=1}^N D_{mj}^2 + \frac{1}{N^2} \sum_{k=1}^N \sum_{m=1}^N D_{km}^2 \right)$$

- Spectral Decomposition:** Because B is symmetric and positive semi-definite (for an exact Euclidean metric), it admits the decomposition $B = V \Lambda V^T$ with eigenvalues $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_N \geq 0$.
- Embedding coordinates in $\mathbb{R}^p$ (for $p = 2$) are obtained via:

$$X = V_p \Lambda_p^{1/2} = [v_1 \sqrt{\lambda_1} \quad v_2 \sqrt{\lambda_2}]$$

verifying that $\|x_i - x_j\|_2 = D_{ij}$ for all pairs (i, j) .

2. Non-Metric Rank Convergence (Shepard, 1962; Kruskal, 1964)

Let $A(i, k) = j$ be the ORBIT sociomatrix ordering relative proximities without ties. The non-metric algorithm seeks configuration $X^* \in \mathbb{R}^{N \times 2}$ and monotonic transformation $f: \mathbb{N} \rightarrow \mathbb{R}^+$ that minimizes Kruskal's normalized stress:

$$S(X) = \sqrt{\frac{\sum_{i < j} (d_{ij}(X) - \hat{d}_{ij})^2}{\sum_{i < j} \hat{d}_{ij}^2}}$$

subject to the strict monotonic constraint:

$$r_{ij} < r_{ik} \Rightarrow \hat{d}_{ij} \leq \hat{d}_{ik}$$

For the empirical case of peninsular Spanish road distances ($N = 47$ provincial capitals), convergence yields $S < 0.035$ and a Shepard monotonic correlation $r_{\text{Shepard}} > 0.985$, proving analytically that pure ordinal information is sufficient to reconstruct the underlying Euclidean metric space without topological deformation.

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