



WP13 — sOS Research Lab: Executive Summary

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Social Operative System — A Governance Architecture for Complex Societies

Abstract

Contemporary governance institutions — states, parliaments, markets, electoral systems — were designed in the 18th and 19th centuries for societies of lower complexity, lower speed, and lower interdependence. Today, digitization, global economic interdependence, cultural plurality, technological acceleration, and climate disruption have produced a structural mismatch between the complexity of our societies and the governance technology we inherited. sOS (Social Operative System) is a scientific research program that treats governance as a designable social technology. It proposes a distributed governance architecture built on personal AI, data sovereignty (UILL/Solid), decentralized autonomous organization (DAO), smart contracts, and stigmergic coordination mechanisms. The sOS Research Lab, a non-profit scientific association based at the University of Barcelona, executes this program through a four-phase plan (2026–2031) with a 4-scientist team amplified by AI agents, an open-source model (CC BY-SA 4.0 / MIT), and a public, traceable budget (€775K–€1,332K MVP). This executive summary presents the complete sOS research program for an international scientific, policy, and technology audience.

1. The Problem: Governance Is Obsolete

The institutions that govern human societies were designed for a world that no longer exists. Representative democracy, bureaucratic administration, and market regulation emerged in the 18th and 19th centuries — periods of lower informational speed, less cultural diversity, weaker global interdependence, and simpler technological landscapes.

Five structural conditions have transformed the social system:

Dimension	What It Means	Example
Interdependence	Actions in one domain cascade unpredictably across others	A financial decision in New York affects employment in Barcelona

Diversity	Populations differ in values, languages, interests, and identities	One-size-fits-all policies generate friction in multicultural societies
Speed	Technology, information, and social change outpace institutional adaptation	Generative AI transforms industries before regulation exists
Scale	Problems span local, national, and global levels simultaneously	Climate change has no single competent authority
Non-linearity	Small inputs produce large, unexpected effects	A single tweet can trigger a global social movement

These conditions are not temporary. They are permanent structural features of 21st-century society. The dominant governance model — centralized representation — becomes a computational bottleneck: too many interdependencies, too many perspectives, too much information to process through a small number of centralized decision-makers.

This is not a failure of specific politicians or parties. It is a structural mismatch between the complexity of the society we have and the governance technology we inherited (sOS doctoral thesis, 2023; WP0–WP2).

2. The Core Idea: Governance Is a Social Technology

sOS makes one foundational move: governance is a social technology. Institutions, rules, representation systems, decision procedures, markets, and states are human-designed artifacts for coordination. Like any technology, governance can be:

- Useful in one context and obsolete in another.
- Designed, not merely inherited.
- Adapted to new conditions.
- Improved through scientific understanding, data, and iterative experimentation.

This shifts the central question: from "who governs?" to "how do we govern ourselves?" — treating governance as a scientific and social engineering problem, not only a political one.

"Governance is a form of social technology that can be designed and optimized similarly to physical technologies." — sOS doctoral thesis

3. What sOS Is: Five Architectural Principles

sOS (Social Operative System) is a governance architecture for high-complexity societies. It is organized around five architectural principles:

3.1 Distributed Coordination, Not Centralized Command

Governance does not require a central authority deciding for everyone. Multiple agents — individuals, organizations, AI systems — coordinate their actions through shared information environments, without a single controller. This does not mean "no rules." It means rules that emerge from and adapt to data, combined with auditable redistribution of resources and responsibilities.

3.2 Stigmergy: Coordination Through Digital Traces

In nature, stigmergy is how ants coordinate: they leave pheromone traces, and other ants modify their behavior based on those traces. No ant commands another. The environment becomes the coordination medium. sOS formalizes stigmergy for human societies through data, labels, and registries. Individual actions leave computable traces that form a shared information environment, enabling emergent coordination without top-down control.

3.3 Labels: Making Complexity Computable

Labels are structured digital markers that formalize contexts, capacities, needs, actions, and interdependencies. They allow complex social information to be legible to distributed systems without reducing every decision to a centralized hierarchy. Labels are assigned and verified collectively, not by a single authority.

3.4 Personal AI, Collective Intelligence

Each person in sOS has access to a personal AI agent that understands their context, filters relevant information, and helps them participate in governance decisions without requiring infinite attention. Your AI serves you. You control it. Collective intelligence emerges from the interaction of augmented individuals, not from a single central AI making decisions for everyone.

3.5 Data Sovereignty and the UILL

The UILL (Unique Information Library Ledger) is a personal data ledger based on the Solid protocol. Each individual controls their own information. Data does not belong to platforms, governments, or corporations. You decide what to share, with whom, under what conditions, and for how long. Individual data sovereignty is the foundation of collective coordination.

4. The Five-Module Architecture

sOS is built as five integrated modules (thesis §14.1-17.4), each addressing a specific structural problem:

Module	Function	Problem Solved
1. Hybrid Model	Human-machine governance: human domain proposes and validates, machine domain links and computes	Democratic deficit, AI governance vacuum
Redundant validation	Multiple humans score 0-10; machine computes S^2 variance for consensus (§14.3.2)	Centralized single-point validation
2. UILL / Solid	Personal data sovereignty pods — Unique Information Library Ledger (§15)	Data colonialism, extractive platform economy
3. DAO	Decentralized Autonomous Organization with six-function smart contract bureaucracy: Propose, Validate, Delegate, Execute, Save/Compute, Finance (§14.3)	Institutional capture, opaque governance
4. Social Machine	Data computing matrix transforming data into actionable knowledge (§16)	Complexity crisis, science-society disconnect
5. dApp Marketplace	Decentralized application ecosystem (§17.4)	Extractive platform economics

5. The Research Program

Beyond the technical architecture, sOS is a scientific research program on how data can capture individual and social reality to improve governance.

5.1 Three Dimensions of the Individual

sOS models each person across three interconnected dimensions:

Dimension	What It Captures	How	What It Reveals
Physical	Movement, location, activity, spatial patterns	GPS, wearables, IoT, smartphones	Socioeconomic status, occupational patterns, lifestyle, habits
Virtual	Online presence, digital interactions, content consumption	Social media, browsing history, purchases, digital footprint	Interests, social connections, behavioral patterns, ideological exposure
Cognitive	Mental states, emotions, stress, values	EDA sensors, cardiovascular sensors, self-reports, AI interaction	Location/activity stress, emotion prediction, mental well-being

5.2 From Habits to Social Predictability

The central scientific mechanism:

1. Capture habits across all three dimensions
2. Compare individuals — differences and commonalities reveal patterns
3. Predict trajectories — changes in habits, preferences, behaviors
4. Design ad hoc policies — based on evidence, not ideology

"Information about social behavior is obtained by comparing the habits of individuals. By comparing data between individuals and analyzing their differences and commonalities, habits and trajectories can be predicted." — 19 Conclusions, PhD thesis

5.3 Seven Classification Models

sOS integrates multiple models to make human complexity computable without reducing it:

Model	What It Classifies	sOS Application
OCEAN	Personality traits	Understanding individual differences in participation
Thinking Fast and Slow (Kahneman)	System 1 (fast) vs. System 2 (deliberative)	Designing governance interfaces that activate System 2
Framing Theory	Cognitive frames and multiple realities	Capturing diversity of perspectives
Homo Ludens (Huizinga)	Game and simulation dynamics	Modeling social "rules of the game"
Cognitive Balance (Heider)	Cognitive equilibrium in relationships	Predicting stress and conflict in social interactions
Social Capital (Putnam, Bourdieu)	Networks, trust, reciprocity norms	Measuring social fabric health
sOS Labels	Contexts, capacities, needs, actions	Making social complexity computable and verifiable

6. The sOS Research Lab

6.1 Identity

sOS Research Lab is a non-profit scientific and technological association based at the University of Barcelona (Avinguda Diagonal 696, office 320). It is the legal, organizational, and scientific vehicle for developing, experimentally validating, and deploying sOS.

6.2 Governance

The Lab governs itself through three complementary layers:

- Legal association — statutes, board, Spanish regulatory compliance
- Pi control plane — a human-AI operating system coordinating specialized agents (Codex, ChatGPT Pro, Diffusion, SEO, Research, Budget, Steward...) under redundant review protocols
- DAO — a Decentralized Autonomous Organization for open, transparent, token-based scientific governance (Phase 2, 2027–2029)

The way we govern ourselves is the first experiment of sOS.

6.3 Team

A 4-scientist team amplified by AI agents — 1/9 of the headcount of an equivalent traditional project, delivering 5 modules instead of 1:

Role	sOS Layer	MVP Allocation
Research Lead / PI (Joan Huerva Subirachs)	Hybrid Governance, Research Program, Ethics, Public Voice	15 PM
Senior Full-Stack Engineer	UILL/Solid, Web, Dashboards, DevOps, Smart Contracts	15 PM
AI/ML + Data Engineer	Social Machine, LLMs, Metrics, Data Pipelines, Personal AI	13 PM
Governance Researcher	DAO, Pilot Execution, Deliberation, Evaluation, Working Papers	15 PM

6.4 Operating Principles (CUDO/Merton)

The Lab adopts Mertonian scientific norms:

- Communism of knowledge — knowledge for collective decisions must be common, accessible, transparent
- Universalism — proposals evaluated by coherence and evidence, not ideological affiliation
- Disinterestedness — research oriented toward knowledge advancement and social progress
- Organized skepticism — every decision subject to permanent review

6.5 Open Licensing

- Content: CC BY-SA 4.0 (copyleft — knowledge must remain open)
- Code: MIT license (permissive — more adoption = more common good)

7. The Economic Model

sOS replaces the extractive platform economy with a distributed model where value returns to those who generate it. Four economic roles coexist within the DAO:

Role	What You Do	What You Earn
Worker	Execute verifiable tasks (validate, compute, produce)	Proportional compensation
Client / Data Provider	Contribute personal data under consent from your Solid pod	Proportional compensation
Investor	Provide capital to the DAO	Proportional return + 3% bonus + foundational return (0.1%–0.4%)
Fundraiser	Secure external funding (EU grants, philanthropy)	PM for preparation work + 2%–5% success fee (DAO-voted)

DAO tokens are internal governance and coordination instruments, not speculative assets. They are non-transferable between individuals (thesis §15.3.3).

Two funding mechanisms:

- Operational self-financing — democratic: each member decides what % of their funds goes to operations
- Foundational return — non-democratic, permanent, for initial builders who put up the first capital

8. Execution Plan

Phase	Period	Key Milestones	Budget
Phase 0 — Stabilization	2026	Legal association, WP coherence audit, canonical manifesto (ES/CA/EN), mission/values/objectives, regulatory monitoring	—
Phase 1 — Lean Pilot	2026–2027	AI/Data Sandbox Barcelona (streetlight data pilot), WP8/WP9/WP13, first public channels, 20–50 participants	€303K–€452K
Phase 2 — MVP	2027–2029	Expanded sandbox, operational DAO (1,000 members), WP10/WP11/WP14, ambassador program, institutional collaborations (Barcelona, Catalonia, EU)	€775K–€1,332K
Phase 3 — Full Platform	2029–2031	Validated governance infrastructure, European Data Spaces integration, international expansion, WP12/WP15/WP16, 5,000+ participants	€1,268K–€2,250K

MVP Realistic breakdown: Personnel (€430K–€585K), Legal & Lobbying (€98K–€189K), Technology (€45K–€100K), One-off (€57K–€162K), Public Growth (€14K–€61K), Operations (€12K–€32K), Contingency 18% (€118K–€203K).

The budget is public and traceable. Every euro documented.

9. Legal and Regulatory Framework

sOS is designed for compliance with the European regulatory stack from day one:

Regulation	Domain	sOS Relevance
AI Act	AI risk classification and oversight	Personal AI agents, Social Machine recommendations
MiCA	Crypto-asset markets	DAO token governance
GDPR	Data protection	UILL/Solid data sovereignty
Data Act	Data sharing and access	Interoperability between data spaces
eIDAS	Electronic identification	Digital identity for DAO participation
NIS2	Cybersecurity	Distributed infrastructure security

Regulatory monitoring is active from month 3 (Phase 0). sOS complements the EU's AI infrastructure and regulatory framework by providing citizen-centric distributed coordination mechanisms — it complements, not corrects.

10. What sOS Is Not

sOS is not...	Because...
A political ideology	It provides a governance architecture, not prescribed policies
A political party	It does not run for elections; it collaborates with public administration
Techno-solutionism	Technology expands the space of possible governance, not replaces human judgment
A cryptocurrency project	DLT and tokens are coordination infrastructure, not speculative instruments
A centralized AI government	Personal AI agents serve individuals; there is no "AI government"
A finished product	It is a research program — iterative, experimental, open to revision

11. The Central Question

sOS begins from a question, not an answer:

How can we organize ourselves better for contemporary challenges, and how can current technologies help us develop new forms of governance?

The research program is the answer-in-progress. The working papers are the evidence. The sandbox is the test. The DAO is the governance of the research itself.

12. Get Involved

sOS Research Lab is an open research program. Participation does not require ideological adherence. It requires informed engagement.

- Researchers: Propose experiments, publish results, contribute to the scientific corpus of governance as social technology.
- Technologists: Build open infrastructure — distributed AI, Solid pods, smart contracts, shared data environments.
- Citizens: Participate in the Barcelona Sandbox. Your everyday experience with governance is our most valuable data.
- Institutions: Collaborate. sOS complements public administration with citizen coordination mechanisms that increase legitimacy and adaptability.
- Organizations: Contribute sectoral expertise. Distributed governance needs knowledge from all domains: health, energy, mobility, education, environment.

Website: socialbigdata.io | Contact: hi@socialbigdata.io Location: Universitat de Barcelona, Avinguda Diagonal 696, office 320, Barcelona

References

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Working Paper 13 — sOS Execution Series. Native English. This executive summary is the primary international-facing document for the sOS Research Lab. It should be read alongside the canonical "What is sOS?" document and the sOS Research Lab Manifesto.