

CYBERSOCIUM: THEORETICAL FOUNDATIONS OF CYBERSOCIAL ECONOMICS AND ARCHITECTURE OF DECENTRALIZED SOCIO-ECONOMIC FORMATION

Fundamental Article and Technical Specification of GyberExperiment

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Abstract

This document establishes the theoretical foundation of a new interdisciplinary field — **CyberSocial Economics** — and presents the technical specification of **GyberExperiment** as its first empirical implementation.

We live in an era when more than five billion people carry computing devices in their pockets, whose collective power exceeds by orders of magnitude all computing technology of the 20th century. Information technologies have integrated into the fabric of social relations, blurring geographical, cultural, and now financial-economic boundaries. However, the institutional infrastructure for managing global resources remains a product of the industrial era — centralized, opaque, oriented toward concentration of capital and power in the hands of a narrowing circle of beneficiaries. Recurring global crises, rising inequality, and systemic fragility of existing economic mechanisms signal that none of the current socio-economic formations is capable of ensuring sustainable and rational management of civilization's resources, whose technological might has long demanded precisely such management.

In this work we: (a) formalize the concept of **CyberSocial Corporation** (CSC) as a fundamental economic unit of a new type — a decentralized, autonomous, self-governing structure owned by all participants; (b) introduce the **Principle of Minimum Individual Participation** (PMIP) and prove that with a sufficient number of participants it enables implementation of projects of arbitrary scale; (c) describe the **Socio-Economic Selection** (SES) mechanism — an evolutionary process in which projects compete not for investor capital but for society's interest; (d) design the **MacroeconomicDAO** system as an instrument of direct public governance of economic processes; (e) present the complete architecture of GyberExperiment — infrastructure implementing the described theoretical constructs through blockchain technologies, distributed computing, cryptographic protocols, and open-source software.

The theory of CyberSocium describes the patterns of **cybersocialization of the economy** — a historical process of transition of the global socio-economic mechanism to distributed peer-to-peer forms controlled directly by society. This process is as objective and irreversible as industrialization, and equally requires new theory, new infrastructure, and new institutional design.

Keywords: CyberSocium, CyberSocial Corporation, decentralized autonomous organization, cryptoeconomics, socio-economic selection, distributed governance, open-source economics, MacroeconomicDAO, peer-to-peer economy, principle of minimum individual participation

SECTION 1: INTRODUCTION – PROBLEM STATEMENT

Note: Sections 1.1 (Era of Supercommunications) and 1.2 (Crisis of Existing Socio-Economic Institutions) are listed in the table of contents but do not appear to have written content in the source document. The actual Section 1 content begins with section 1.3.

1.3. Information Security, Ethics, and Data Ownership

Even those of us not directly involved with computer science and electronics are personally engaged in the process of generating enormous amounts of data — all kinds of valuable information that is easily used for all sorts of manipulations and just as easily monetized.

The scale of this process is staggering. Each smartphone user generates an average of 1.5 GB of data daily [16]. Collectively, this forms a data flow that traditional economic theory is unable to adequately describe: data is neither a classical commodity (it is non-rivalrous and reproducible at zero marginal cost) nor a public good (it is excludable — controlled by those who own the servers).

Most major IT companies regard user accounts as corporate property, and the massive data constantly generated by users as a full-fledged company product. And from a technical standpoint, this is correct: the accounts created by users are formed and stored on the companies' own servers. Probably 99% of internet content known to the masses is stored on closed proprietary servers that are physically protected no worse (and rather — even better) than the most heavily guarded military facilities, and, of course, all of this is maintained at the expense of the network users themselves.

The fundamental technical concept of the internet is simple: it is a collection of computers connected by a network. In reality, the internet is people who send physical signals to each other through a computer network, and the computer transforms these signals for us into information of the required type. Without people, the internet would not be alive; obviously, it is inconceivable without society, because it is the living result of society's activity in real time, which cannot exist without it.

From an ethical standpoint, data created by users is, at minimum, their personal intellectual property and personal data, and the appropriation of this data by obsolete economic institutions due to temporary technical circumstances is an egregious fact, signaling the lag of modern society's humanitarian development behind its technical development. If we add to this the fact that 99% of the internet runs on open (free) software products and fundamentally — on open Linux servers, the absurdity of the internet space being captured by obsolete economic institutions becomes obvious.

Trading in user data is nowadays an established, commonplace, and completely legal phenomenon. Companies develop lengthy user agreements that almost no one still reads, in which they obtain various consents from users, such as for the processing of personal data, which gives them the legal right to appropriate the data of millions of users around the world, analyze it, and trade in it. And the multimillion-strong community of actual users remains excluded from managing and controlling their own data, which in the long term leads to the degradation of fundamental principles of personal information freedom, security and control of personal data, freedom of society, and in every way slows and oppresses the process of historical socio-economic development of society.

GDPR (General Data Protection Regulation), adopted by the European Union in 2018, became the first serious attempt at a legal solution to this problem [17]. However, GDPR remains a palliative solution: it regulates the use of data but does not eliminate the structural cause of the problem — centralized data storage and processing. As Aaron Swartz noted in the "Guerilla Open Access Manifesto": the problem is not in the policies of specific companies, but in the architecture of systems that makes data concentration technically inevitable and economically profitable [18].

Obviously, from an ethical standpoint, the user is the sole owner of all rights to the content they generate, including metadata and any other types of data, not to mention the inviolability of personal correspondence, interests manifested on the network, and so forth. Of course, many technical products using user data provide users with convenient, useful, and interesting functions, but obviously, all of them should be turned on and off at will, and the mechanism of their action should be transparent, ensure security and control of user data, and this should be confirmed by the product's open source code.

Also extremely important is the individual flexibility and modifiability of services. The user should have complete control over that part of the overall system which they personally use, and the possibilities for changes made by the user should be unlimited within the framework of their personal part of the system. Individual possibilities for system expansion should also be unlimited — the system should be extensible in all directions.

1.4. Decentralization and Open Source as a Historical Trend

Computer science began its development as a closed field of technology, accessible only to corporations and governments. Computers were expensive, bulky machines, accessible mainly to large technical institutions and corporations. We can roughly define this stage as initial. This is followed by a stage of acceleration in the development of information technologies — it can be defined as the time when the computer becomes accessible to a greater number of developers. During this time, competition in the field of software development expanded and two main competing currents in the world of software development emerged: proprietary and open.

Richard Stallman founded the free software movement in 1983, formulating four fundamental freedoms: the freedom to use the program, to study and modify it, to distribute copies, and to distribute modified versions [19]. Linus Torvalds in 1991 created the Linux kernel, demonstrating that a distributed community of volunteers is capable of creating a software product that surpasses the products of the largest corporations in reliability and

scalability. Eric Raymond in the essay "The Cathedral and the Bazaar" (1999) theorized this phenomenon, contrasting two development models: "cathedral" (centralized) and "bazaar" (distributed) [20].

As a result of overcoming these abstract stages of development, we observe an unprecedented surge of activity in the field of OPEN SOURCE development, improvement in the quality and usability of open source software products, expansion of their scope of application, and significant growth in the number of users. OPEN SOURCE increasingly facilitates the emergence of revolutionary technologies. We can observe an entire cycle of evolution of global socio-economic relations, directly connected to and nourished by the global OPEN SOURCE community and its ideas, the general vector of which is the open comprehensive development of software and society as a whole.

Parallel to the evolution of open source software, the decentralization of information technologies developed — a process that evolved harmoniously in the depths of the internet community, periodically announcing itself through the emergence of powerful decentralized technological mechanisms solving specific problems of society:

- **BitTorrent** (2001) — decentralized data distribution, demonstrating that a peer-to-peer protocol can be more efficient than centralized infrastructure [21]
- **Bitcoin** (2009) — decentralized electronic money system, solving the double-spending problem without a trusted intermediary [22]
- **Ethereum** (2015) — programmable blockchain, transforming decentralization from a protocol for transactions into a platform for arbitrary applications [23]
- **IPFS** (2015) — InterPlanetary File System, proposing content addressing instead of location addressing [24]
- **FileCoin** (2020) — economic layer on top of IPFS, incentivizing data storage [25]

Fighting such decentralized technologies is practically useless and at best leads to temporary difficulties in service operation, which subsequently leads to their modernization and stabilization of work — that is, contributes to their development. This empirical fact has deep theoretical significance: it demonstrates that decentralization is not a design decision, but a **historical attractor** — a direction toward which the system strives regardless of attempts at external opposition.

Another of the major contemporary problems hanging over society is the growth of centralized control over the dissemination of ideas relevant to society. Obsolete economic institutions, by virtue of their hopeless but still sufficiently powerful position, strive to rapidly improve their own mechanisms of control and monitoring of society, in order to identify relevant, advanced, socially significant ideas and projects and counteract their activity before they spread in society. Together with the fact that the overwhelming majority of large resource-intensive projects are initiated and financed by the same obsolete socio-economic institutions, we mainly have a world reflecting exclusively the interests of these obsolete institutions and extremely reactionary to any kind of revolutionary, fundamental changes, and consequently — to the development of society as a whole.

At the same time, and partly as a result of this, we see active development of decentralized technologies, which has already formed into a powerful, global distributed socio-economic movement, already uniting fairly broad and educated masses of people. In essence, we are observing the process of formation of a new type of global creative intelligentsia, capable of uniting their ideas and interests with other social forces into a single ideology, entirely directed toward universal welfare and development — to become the foundation for the final formation of a new, advanced creative class, capable of finally stepping forward to long-overdue global socio-economic changes, adequately meeting the contemporary requirements of global Civilization.

This emerging class is fundamentally different from traditional intelligentsia in the historical sense — confined within academic or cultural institutions and dependent on the patronage of the state or capital. We are talking about a distributed global network of researchers, developers, engineers, economists, and thinkers, united not by geography, not by corporate affiliation, and not by national identity, but by three structural characteristics: first, common technological literacy, allowing not only to understand but also to create complex information systems; second, commitment to the principles of openness, decentralization, and transparency as fundamental ethical and practical guidelines; third — and this is critically important — possession of practical tools for the direct realization of their ideas without the mediation of obsolete institutions, from cryptographic protocols and smart contracts to distributed computing networks, open-source management systems, and mechanisms of decentralized financing.

Richard Florida described the emergence of the "creative class" as an economic force determining the development of post-industrial societies [47], but his analysis remained within the framework of existing institutions — corporations, cities, universities. Florida's creative class creates value within the system and depends on it. What we observe now is qualitatively different: a class is forming that does not integrate into existing institutions but generates its own — decentralized autonomous organizations, open protocols, distributed storage and computing networks, cyber-social corporations. For the first time in history, a significant mass of people possesses simultaneously the intellectual potential for designing alternative forms of socio-economic organization and the technical capability for their realization — without permission, without mediation, and without control from obsolete structures.

Today, a new, global public consciousness is forming — the main organ of social self-governance of Humanity. Although the era of "kings" with all its characteristic rigidly centralized control mechanisms restraining education and development of society, science, and technology has long passed, and today we see a flourishing of culture, education, science, and technology in the historical sense, and their penetration — as a consequence of historically sequential social transformations that have already occurred — into practically all layers of society, the process of decentralization of global economic interaction mechanisms is still far from its final stage. However, the direction of this process has already been determined — not by the will of individual leaders or organizations, but by the very logic of technological and social development, which cannot be stopped, but can only be temporarily hindered, which, as the history of decentralized technologies shows, invariably leads to their strengthening and improvement.

The striving of the global socio-economic mechanism in its historical development to arrive at the most distributed peer-to-peer form, managed through cyber-social financial mechanisms affecting the global socio-economic resource — that is, a mechanism in the hands of the public and controlled directly by the public — is obvious.

With the development of information technologies and as they penetrate into the real sector of the financial and economic space, society acquires an increasing number of levers of significant influence on the direction of global economic development. Technologically, the global economy is on the threshold of large-scale transformations associated with society's transition to a new level of socio-economic interaction with the direct use of innovative decentralized cyber-social economic mechanisms.

With the emergence of Blockchain technology, the possibility of building decentralized financial systems opened up, and their development really contributes to the emergence of possibilities for building global self-governing cyber-social economic structures, expanding the possibilities of society's intellectual influence on the global economic process.

Whatever happens in the world and whatever powerful forces influence the course of history, the organism of society invariably produces a cycle of evolutionary transformation — adaptive change. It becomes more perfect, and this process occurs, first of all, not on the platforms of debates, financial and economic congresses, and other hypocritical places, but in the minds of people — initially in isolated cases, then, gathering momentum, it strengthens in society and develops in a spiral. And, of course, all this development is accompanied and approved by the appearance of revolutionary, fundamental, philosophical, legal, and technical documents and products, which are various moments of a unified dialectic of the development of global socio-economic relations, systematizing and developing it to the limit necessary for transition to a new stage of development.

This document is an attempt at such systematization.

1.5. Evolution of Economic Process Management Systems

[Note: Section 1.5 is listed in the table of contents but does not appear to have content in this portion of the document. The Section 1 content concludes with the paragraph above, which serves as a transition to Section 2.]

SECTION 2: LITERATURE REVIEW AND INTERDISCIPLINARY CONTEXT

Translation from: CyberSocium_Foundation_RU.md

Note: The source Russian document contains only subsection 2.1. Subsections 2.2-2.5, though listed in the table of contents, have not been written in the source document.

2. Literature Review and Interdisciplinary Context

CyberSocium theory does not arise in an intellectual vacuum. It stands at the intersection of several powerful intellectual traditions, each of which provides a necessary but insufficient apparatus for describing the phenomena we observe. The purpose of this section is to map these traditions, demonstrate their contribution, identify their limits, and justify the necessity of a new synthesis.

2.1. Political Economy of the Digital Era

Classical political economy from Adam Smith to Karl Marx analyzed the transformation of economic systems through the lens of production relations, forms of property, and the distribution of surplus product. Marx, in particular, demonstrated that each mode of production creates a corresponding superstructure of institutions, and that the contradiction between the development of productive forces and outdated production relations is the driving force of historical transformations [26].

Modern authors develop this line of analysis as applied to the digital economy. Paul Mason in "PostCapitalism: A Guide to Our Future" (2015) argues that information technologies undermine the basic mechanisms of market economy: when marginal costs of reproduction approach zero, the price mechanism ceases to be an effective means of coordination [27]. Jeremy Rifkin in "The Zero Marginal Cost Society" (2014) develops the same thesis, predicting the emergence of "collaborative commons" — an economy of shared use in which the logic of free software (freedom to study and modify the program) dominates, extended to the entire stack of socio-economic interaction. Modular architecture, open code, and standardized interfaces make this technically achievable.

Yochai Benkler in "The Wealth of Networks" (2006) demonstrates that peer production is not a utopian alternative to markets, but an empirically observed phenomenon that already plays a significant role in key sectors of the digital economy [28]. Wikipedia, Linux, the Apache web server — these are not marginal experiments, but infrastructure on which a significant part of the global digital economy operates. Benkler formulates the concept of "commons-based peer production" — a mode of production in which neither markets nor hierarchies are the primary coordination mechanism, but rather voluntary cooperation based on shared resources.

Nick Srnicek in "Platform Capitalism" (2017) analyzes how digital platforms — Google, Facebook, Amazon, Uber — become the dominant organizational form of the 21st century [7]. However, Srnicek demonstrates that platforms, despite their technological progressiveness, reproduce the fundamental contradiction of capitalism — the concentration of control and extraction of value in the hands of owners, while production is carried out by a dispersed mass of users who do not control the results of their labor. Shoshana Zuboff in "The Age of Surveillance Capitalism" (2019) goes further, arguing that platforms create a new form of capitalism — surveillance capitalism — in which the primary commodity is not goods or services, but behavioral data extracted from users without their informed consent [6].

These authors identify the **central contradiction of Phase 4** (platform capitalism, see Section 3.3): maximal accessibility of participation (anyone with a smartphone is a user and value generator) combined with minimal sovereignty (the user owns neither the account, nor the data, nor the algorithm). This contradiction is not accidental — it is structural. Platforms maximize network effects (value grows with the number of users) while simultaneously maximizing extraction (value is appropriated by shareholders, not users). This creates conditions for a phase transition: the larger the mass of users aware of this contradiction, the greater the potential for alternative organizational forms.

CyberSocium theory positions itself as a response to this contradiction. If Mason and Rifkin describe **what** is collapsing (market mechanisms under conditions of zero marginal costs), and Srnicek and Zuboff describe **what** is problematic (concentration of control in platforms), then CyberSocium describes **what should emerge** — a new organizational form that combines the scale and efficiency of platforms with decentralization, transparency, and user sovereignty.

The connection with classical political economy is not metaphorical. Marx showed that each mode of production is characterized by: (a) a specific form of property, (b) a specific mechanism of appropriation of surplus product, (c) a specific form of coordination [26]. In CyberSocium: (a) distributed property (CSC belongs to all participants), (b) meritocratic appropriation (reward is determined by verified contribution, not capital), (c) algorithmic coordination through DAO and smart contracts. This is not capitalism (private property + market coordination) and not the planned economy of the 20th century (state property + directive coordination), but a third form, made possible by technologies that did not exist in the era of Marx or Keynes.

Joseph Stiglitz in works on information asymmetry and market failures [9] demonstrates that many problems of modern economies stem from the fact that information is unevenly distributed: some participants know more than others, and this creates opportunities for manipulation. In traditional corporations, management knows more than shareholders; in platforms, the algorithm knows more than users. CyberSocium through Axiom A2 (transparency) eliminates this asymmetry: all operations are recorded on the blockchain, all code is open, all decisions of DAO are auditable. This is not just an ethical choice, but a **structural solution** to the problem of information asymmetry.

Thomas Piketty in "Capital in the Twenty-First Century" (2014) demonstrates that in the absence of counteracting mechanisms, inequality grows: return on capital (r) exceeds economic growth (g), which leads to the concentration of wealth [8]. Traditional solutions — progressive taxation, redistribution through the state — work within the existing system. CyberSocium offers a structural alternative: in CSC, return is distributed among all participants proportionally to verified contribution (Axiom A5), and the barrier to entry is minimal (Axiom A6). This does not eliminate inequality (differences in contribution will always exist), but eliminates the **mechanism of accumulation** — the ability of capital to generate more capital independent of contribution.

Axioms emerging from political economy analysis:

The analysis of digital political economy leads to the formulation of axioms that must be satisfied by any organizational form claiming to overcome the contradictions of Phase 4:

Axiom 5 (Meritocratic Justice). The participant's reward is determined by their contribution to the system, verifiable by objective mechanisms, not by hierarchical position or volume of capital.

Justification: Ostrom's principle of monitoring by users themselves [30]. Smart contracts and activity tracking systems (G-Plan) make contribution verification automatable and non-manipulable.

Axiom 6 (Inclusiveness). The barrier to entry into the system must be minimal, and each participant must have access to the system's resources regardless of their personal involvement in specific projects.

Justification: PMIP (Section 3.4) mathematically shows that inclusiveness does not contradict scalability, but is its condition. Technically — Gbr liquidity pools with all projects ensure each community member's participation in the economic success of any project.

Axiom 7 (Self-governance). The system is governed exclusively by its participants through formalized mechanisms of collective decision-making, without external management.

Justification: Ostrom's principle of the community's right to self-organization [30]. DAO contracts provide technical implementation of self-governance.

Axiom 8 (Cognitive Augmentation). The system uses artificial intelligence as a tool for enhancing participants' collective cognitive abilities, but not as a replacement for human judgment in matters affecting values, ethics, and strategic direction.

Justification: Direct democracy has historically been considered impractical at scale due to two limitations: cognitive (a person cannot deeply evaluate every proposal) and co-ordinational (millions of people cannot discuss simultaneously). AI eliminates both limitations, making large-scale direct democracy practically feasible for the first time. However, without explicit limitation, AI can become a new form of centralization — "AI-oligarchy," where the algorithm, not the community, determines direction. Axiom A8 explicitly limits AI to the role of cognitive amplifier.

Principle of Delineation: - **AI decides autonomously:** technical optimizations (computing distribution, routing, monitoring), information aggregation and structuring, anomaly and pattern detection, recommendation and forecast generation - **AI informs, human decides:** strategic decisions on development direction, ethical questions, distribution of large resources (Economic DAO), value conflicts (FRP at the principle level) - **AI has no right to:** independently move treasury funds, change smart contract parameters without DAO voting, block or censor participant proposals, make irreversible decisions without human-in-the-loop

Implementation: all AI agents are registered in GyberNet (soulbound tokens), their decisions are recorded on-chain and auditable, AI agent parameters are set by voting of the corresponding DAO, any participant can challenge an AI agent's action through the standard proposal mechanism.

Hypothesis of Non-Contradiction: Axioms A1–A8 are non-contradictory and mutually reinforcing. Decentralization (A1) ensures sustainability of transparency (A2); transparency (A2) ensures verifiability of meritocracy (A5); data sovereignty (A3) and extensibility (A4) create conditions for inclusiveness (A6); inclusiveness (A6) provides the scale necessary for self-governance (A7); self-governance (A7) protects all other axioms from violation by external forces; cognitive augmentation (A8) ensures the quality of self-governance (A7) at any scale, enhances meritocracy (A5) through objective contribution analysis, and respects data sovereignty (A3) through federated learning without raw data transfer.

It should be noted there is tension between A5 (meritocracy: vote weight by contribution) and A6 (inclusiveness: minimal barrier for all) — new participants have access but low governance weight, requiring balancing mechanisms (such as quadratic voting or reputation-weighted voting).

Missing Subsections

The following subsections are listed in the table of contents but have not been written in the source document:

2.2. Theory of Common Resources and Collective Action

[Content not available in source document]

2.3. Cryptoeconomics and Mechanism Design

[Content not available in source document]

2.4. Theory of Complex Adaptive Systems

[Content not available in source document]

2.5. Limits of Existing Models and the Unfilled Niche

[Content not available in source document]

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Translation Notes:

1. This translation preserves all academic references and citations as they appear in the original Russian text.
2. The scholarly tone and terminology have been maintained throughout.
3. Axioms 5-8 are included as they appear immediately after subsection 2.1 in the source document, before the content transitions to Section 3.
4. The source document's structure places these axioms in what appears to be a transitional section between Section 2 and Section 3, integrated into the political economy discussion.
5. Technical terms such as "CSC" (CyberSocial Corporation), "PMIP" (Principle of Minimum Individual Participation), "DAO" (Decentralized Autonomous Organization), and "FRP" (Fork Resolution Protocol) have been preserved as they are defined elsewhere in the complete document.

SECTION 3: THEORY OF CYBERSOCIUM

3.1. Axiomatic Foundation

Before formulating a model of CyberSocium, it is necessary to establish the axiomatic foundation — the set of fundamental principles that determine the nature of CyberSocial Corporations (CSC) and distinguish them from all existing organizational forms: traditional corporations, cooperatives, and even existing DAOs.

These axioms are not arbitrary postulates. Each is justified by: (a) empirical experience of previous failures and limitations; (b) theoretical analysis of structural contradictions; (c) technological possibilities that have become available only in recent years.

Axiom 1 (Decentralization). The system must not have a single point of control — neither technical (server, database, key) nor managerial (administrator, CEO, board of directors).

Justification: Centralization is the root cause of capture. Any centralized system inevitably becomes the target of capture attempts — by the state, capital, or internal power groups. Zuboff [6] demonstrated how centralized platforms transform users into resources for extraction. Decentralization is not an ideological preference, but a structural requirement for resilience.

Axiom 2 (Transparency). All significant operations of the system must be publicly verifiable. The code is open. Decisions are recorded on the blockchain. Financial flows are transparent.

Justification: Transparency is a necessary condition for accountability. Ostrom [30] showed that sustainable commons management requires monitoring by users themselves. Blockchain provides technological infrastructure for transparency at scale that was unattainable in pre-digital commons.

Axiom 3 (Data Sovereignty). Each participant has full control over their data. The system stores data encrypted; the keys belong exclusively to the user.

Justification: The Cambridge Analytica case [15] and subsequent leaks demonstrated the systemic danger of centralized data storage. GDPR [17] is a regulatory response, but it regulates use, not architecture. Only cryptographic sovereignty — where the platform technically cannot access user data even if it wanted to — provides genuine protection.

Axiom 4 (Extensibility). Any participant can extend the system's functionality by writing their own code module and integrating it into their instance. The best modules spread through the community organically, without centralized approval.

Justification: Raymond's "The Cathedral and the Bazaar" [20] demonstrated that distributed innovation is more efficient than centralized. Modularity + open source creates evolutionary selection of the best solutions. Firefox extensions, WordPress plugins, Ethereum smart contracts — all successful examples of this principle.

Axiom 5 (Meritocratic Justice). A participant's reward is determined by their contribution to the system, verifiable by objective mechanisms, not by hierarchical position or capital volume.

Justification: Ostrom's principle of monitoring by users themselves [30]. Smart contracts and activity tracking systems (G-Plan) make contribution verification automatable and non-manipulable.

Axiom 6 (Inclusiveness). The barrier to entry into the system must be minimal, and each participant should have access to the system's resources regardless of their personal involvement in specific projects.

Justification: PMIP (Section 3.4) mathematically shows that inclusiveness does not contradict scale, but is its condition. Technically — Gbr liquidity pools with all projects ensure every community member's participation in the economic success of any project.

Axiom 7 (Self-Governance). The system is governed exclusively by its participants through formalized collective decision-making mechanisms, without external management.

Justification: Ostrom's principle of the community's right to self-organization [30]. DAO contracts provide technical implementation of self-governance.

Axiom 8 (Cognitive Augmentation). The system uses artificial intelligence as a tool to enhance participants' collective cognitive abilities, but not as a replacement for human judgment in matters involving values, ethics, and strategic direction.

Justification: Direct democracy has historically been considered impractical at scale due to two limitations: cognitive (a person cannot deeply evaluate every proposal) and co-ordinative (millions of people cannot discuss simultaneously). AI eliminates both limitations, making large-scale direct democracy practically feasible for the first time. However, without explicit constraint, AI can become a new form of centralization — "AI oligarchy," where the algorithm, not the community, determines direction. Axiom A8 explicitly limits AI to the role of cognitive enhancer.

Principle of Demarcation: - **AI decides autonomously:** technical optimizations (compute distribution, routing, monitoring), information aggregation and structuring, anomaly and pattern detection, generation of recommendations and forecasts - **AI informs, human decides:** strategic decisions about development direction, ethical questions, allocation of large resources (Economic DAO), value conflicts (FRP at the principle level) - **AI has no right to:** independently move treasury funds, change smart contract parameters without DAO voting, block or censure participant proposals, make irreversible decisions without human-in-the-loop

Implementation: all AI agents are registered in GyberNet (soulbound tokens), their decisions are recorded on-chain and auditable, AI agent parameters are set by vote of the corresponding DAO, any participant can challenge an AI agent's action through the standard proposal mechanism.

Hypothesis of Consistency: Axioms A1–A8 are consistent and mutually reinforcing. Decentralization (A1) ensures sustainability of transparency (A2); transparency (A2) ensures verifiability of meritocracy (A5); data sovereignty (A3) and extensibility (A4) create conditions for inclusiveness (A6); inclusiveness (A6) ensures the scale necessary for self-governance (A7); self-governance (A7) protects all other axioms from violation by external forces; cognitive augmentation (A8) ensures quality of self-governance (A7) at any scale, strengthens meritocracy (A5) through objective contribution analysis, and respects data sovereignty (A3) through federated learning without transferring raw data.

Note the tension between A5 (meritocracy: vote weight by contribution) and A6 (inclusiveness: minimal barrier for all) — new participants have access, but small management weight, which requires balancing mechanisms (such as quadratic voting or reputation-weighted voting).

3.2. CyberSocial Corporation: Definition and Properties

Definition 3.2.1. A CyberSocial Corporation (CSC) is an organizational form satisfying the following conditions:

1. **Distributed ownership:** CSC belongs to all its participants; no participant or group of participants possesses a controlling share
2. **Algorithmic governance:** key decisions are made through formalized protocols (DAO), executed by smart contracts
3. **Open codebase:** all CSC software code is available for audit and modification by any participant
4. **Peer-to-peer structure:** participants interact without hierarchical intermediaries; statuses determine level of responsibility and reward, but not power
5. **Economic autonomy:** CSC can generate resources for its functioning and development without dependence on external investors or sponsors
6. **Social orientation:** the criterion for selecting projects for implementation is social relevance, not profit maximization

Comparative Analysis of Organizational Forms:

Characteristic	Traditional Corporation	DAO (existing)	CSC (CyberSocium)
Ownership	Shareholders	Token holders	All participants (equal shares)
Governance	Board of Directors	Token-weighted voting	Verified activity + DAO
Success Criterion	Shareholder Profit	TVL / token price	Social relevance
Code	Proprietary	Partially open	Fully open
Entry Barrier	Hiring / Stock Purchase	Token Purchase	Participation (minimal)
Scalability	Hierarchical	Limited (tokenholder plutocracy)	PMIP scaling
Crisis Resilience	Depends on management	Depends on token market	Antifragility (Claim 3)

The substantial difference between CSC and existing DAOs requires separate explanation. Most contemporary DAOs — MakerDAO, Compound, Uniswap — use token-weighted voting, where vote weight is proportional to token quantity. This creates plutocracy: large holders determine decisions, while small holders are effectively disenfranchised. Vitalik Buterin has repeatedly pointed out this problem [46]. In CSC, vote weight is determined not by token quantity, but by **verified activity** — participation in projects, confirmed by the G-Plan system and higher-status participants. This implements the principle of meritocratic justice (A5) and prevents plutocratic degeneration.

3.3. Evolution of Forms of Economic Process Management: Formalization

The historical trajectory described in Section 1.5 can be formalized as a sequence of phase transitions in the space of organizational forms.

Definition 3.3.1. Let the space of organizational forms be described by a vector of characteristics:

$$\Omega = \langle D, T, A, S, C \rangle$$

where:

$D \in [0, 1]$ – degree of decision-making decentralization

$T \in [0, 1]$ – degree of operational transparency

$A \in [0, 1]$ – degree of participation accessibility (inclusiveness)

$S \in [0, 1]$ – degree of participant sovereignty over their data and assets

$C \in [0, 1]$ – degree of algorithmic coordination

(replacement of human hierarchy with formalized protocols)

Definition 3.3.2. A phase transition in space Ω is a historically observable qualitative change in the dominant organizational form, where at least one component of vector Ω makes a jump exceeding threshold $\delta > 0$.

Historical Sequence of Phase Transitions:

Phase 0 – Monarchical Centralization (before 18th century):

$$\Omega_0 \approx \langle 0.05, 0.05, 0.02, 0.10, 0.01 \rangle$$

Characteristic: Economic process management concentrated in sovereign's hands. Trade guilds and craft associations operate by crown privilege.

Transparency absent. Participation determined by estate.

Coordination – through direct orders and tradition.

Dominant form of economic unit:

manufactory, trading house, colonial company.

Phase 1 – Parliamentary Capitalism (18th-19th centuries):

$$\Omega_1 \approx \langle 0.15, 0.15, 0.10, 0.20, 0.05 \rangle$$

Transition: $\delta(D) \approx 0.10$ – management functions passed from monarch to parliament, representing interests of broader economic forces.

Characteristic: Emergence of joint-stock company as method of distributing risks and ownership. Birth of corporate law. Stock exchange as mechanism of capital coordination. However, participation limited by property qualification; working class excluded from management.

Dominant form: joint-stock company, bank.

Key theorists: Adam Smith [26], David Ricardo.

Phase 2 – Corporate Capitalism (late 19th – mid-20th century):

$$\Omega_2 \approx \langle 0.15, 0.20, 0.15, 0.15, 0.10 \rangle$$

Transition: $\delta(C) \approx 0.05$ – emergence of management as formalized discipline of coordination (Taylor, Ford).
 $\delta(A) \approx 0.05$ – expansion of participation through mass public securities markets.

Characteristic: Transnational corporations.

Separation of ownership from control (Berle and Means, 1932).

Managerial revolution. Keynesian state regulation as compensation for market failures.

Paradox: D doesn't grow, and in some aspects declines – concentration of control in management hands with dispersed shareholders.

Dominant form: public corporation, state enterprise.

Phase 3 – Financial Capitalism / Neoliberalism (1970s – 2008):

$$\Omega_3 \approx \langle 0.12, 0.18, 0.20, 0.12, 0.15 \rangle$$

Transition: $\delta(C) \approx 0.05$ – algorithmic trading, derivatives, securitization.

$\delta(A) \approx 0.05$ – expansion of retail investing.

However: $\delta(D) < 0$ – actual decline in decentralization: financial conglomerates, banking capital concentration, too big to fail.

$\delta(S) < 0$ – decline in participant sovereignty: growing dependence on financial intermediaries.

Characteristic: Economic hegemony of financial sector. Globalization as strengthening of financial flows without corresponding globalization of governance.

Result – 2008 crisis as systemic failure of opaque, over-concentrated system.

Dominant form: investment bank, hedge fund, financial conglomerate.

Critics: Stiglitz [9], Piketty [8], Minsky.

Phase 4 – Platform Capitalism (2000s – present):

$$\Omega_4 \approx \langle 0.10, 0.15, 0.35, 0.08, 0.30 \rangle$$

Transition: $\delta(A) \approx 0.15$ – radical lowering of participation barriers (anyone with a phone – user and value generator).

$\delta(C) \approx 0.15$ – algorithmic coordination through platforms (Uber, Airbnb, Amazon Marketplace).

However: $\delta(D) < 0$ – catastrophic decline in decentralization: GAFAM controls ~\$10T+ market capitalization, data of billions of people.

$\delta(S) < 0$ – minimum sovereignty: user doesn't own account, data, or algorithm.

$\delta(T) < 0$ – decline in transparency: closed algorithms for ranking, recommendations, pricing.

Paradox of Phase 4: maximum participation accessibility with minimum sovereignty and minimum decentralization. Billions of people involved in creating value, but deprived of control over results of their labor. This structural contradiction is the driving force of transition to Phase 5.

Critics: Zuboff [6], Srnicek [7].

Dominant form: platform (Google, Meta, Amazon).

Phase 5 – Declaration: CyberSocial Economics (forming):
 $\Omega_5^* \approx \langle 0.85, 0.90, 0.90, 0.95, 0.85 \rangle$ (target state)

Transition: Simultaneous jump of all components. This is not incremental improvement of one parameter (as in previous phases), but phase transition in full sense – qualitative change in nature of organizational form. AI (A8) is necessary condition for this transition: D=0.85 requires decentralized monitoring, T=0.90 – processing of petabytes of data, C=0.85 – algorithmic coordination of millions of participants. Without AI these target values are unattainable.

Characteristic: CSC as dominant form of economic unit. PMIP as mechanism of financing. SES as mechanism of project selection. MacroeconomicDAO as coordination instrument.

Marker: GyberExperiment as first empirical realization.

Claim 3.3.1 (On Directionality of Evolution). Historical sequence $\Omega_0 \rightarrow \Omega_1 \rightarrow \Omega_2 \rightarrow \Omega_3 \rightarrow \Omega_4$ demonstrates general tendency toward growth of algorithmic coordination (C) and participation accessibility (A), but non-monotonic dynamics of decentralization (D), transparency (T) and sovereignty (S). Phases 3 and 4 are characterized by *regression* of D, T and S with growth of A and C, creating structural contradiction – mass participation with absence of control. This contradiction is the driving force of transition to Phase 5, where all five components simultaneously reach high values.

Justification: The contradiction of Phase 4 is not a stable equilibrium. Mass involvement (high A) with low sovereignty (low S) and low decentralization (low D) means that enormous human potential is directed by managing algorithms (high C) in interests of narrow

group of beneficiaries. With growth of participant awareness (Zuboff effect, data leak effect, decentralized alternatives effect), costs of maintaining this disequilibrium grow, while attractiveness of alternatives increases. This creates conditions for phase transition, analogous to how contradiction between social character of production and private form of appropriation created conditions for social transformations in industrial era [26]. Formal proof of this claim is an open problem and subject of further research.

Hypothesis 3.3.2 (On Irreversibility of Transition). Transition from Phase 4 to Phase 5 has property of irreversibility, due to following factors:

1. **Technological ratchet:** Cryptographic protocols, once distributed, cannot be "recalled". A user generating a key pair and encrypting their data gains sovereignty that cannot be taken away without physical coercion — and physical coercion doesn't scale to billions of people.
2. **Knowledge effect:** Understanding principles of decentralization, open code and self-governance, once distributed in society, cannot be "forgotten". This is analog of literacy ratchet: a society that learned to read doesn't return to illiteracy.
3. **Economic ratchet:** Each successful decentralized project creates infrastructure (code, protocols, standards) on which next projects build. Cumulative effect makes return economically irrational.
4. **Network effect:** Value of decentralized network grows proportionally to square of number of participants (Metcalfe's law). After reaching critical mass, network becomes self-sustaining.

Counterargument: historical examples (Great Firewall, crypto winter 2022, regulatory bans) demonstrate that reversibility is possible under certain conditions — large-scale state coercion, loss of trust in technology, or catastrophic economic shock. Hypothesis of irreversibility requires clarification: transition is irreversible provided network effect preservation and absence of systemic trust crisis.

Remark 3.3.3 (On Heterogeneity and Coexistence of Forms). Claim about transition to Phase 5 doesn't mean instantaneous disappearance of organizational forms of previous phases. Just as industrialization didn't destroy craft production, but created new dominant form coexisting with preceding ones, so cybersocialization creates new dominant form — CSC — which will coexist with traditional forms, gradually transforming economic landscape without radical instantaneous paradigm shift.

3.4. Concept of PMIP and Mechanism of Socio-Economic Selection

The Principle of Minimum Individual Participation (PMIP) is the economic foundation of CyberSocium. It solves the fundamental problem: how to implement projects of arbitrary scale without dependence on concentrated capital — neither investor capital nor state budget.

Traditional logic: large project → large budget → concentration of capital in hands of few → hierarchical control. PMIP inverts this logic: large project → distribution among many → minimal individual contribution from each → control remains distributed.

3.4.1. Formal Model PMIP

Definition 3.4.1. Let:

NFC (Network Financial Community) – set of all participants of ecosystem, $A = \{a_1, \dots, a_n\}$

For each project $p \in P$:

$SIC(p) \subseteq A$ – Socio-Investment Circle,
subset of participants interested in realization of p

$C(p) \in \mathbb{R}_+$ – estimated cost of project realization p

For each agent $a_i \in A$:

$capacity_i \in \mathbb{R}_+$ – investment capacity of agent
(resource they're ready to direct to projects)

Definition 3.4.2. Social Relevance (SR) of project p is defined as:

$$\begin{aligned} SR(p) &= 1 \quad \text{if } |SIC(p)| \times \min\{capacity_i \mid a_i \in SIC(p)\} \geq C(p) \\ SR(p) &= 0 \quad \text{otherwise} \end{aligned}$$

In words: project is socially relevant if collective capacity of its Socio-Investment Circle is sufficient to finance it, even when each participant contributes only minimal amount they're willing to invest.

Claim 1 (Sufficiency of Distributed Participation). For any project p with cost $C(p)$, there exists threshold number of participants $TSR(p)$:

$$TSR(p) = \lceil C(p) / min_capacity \rceil$$

where $min_capacity = \min\{capacity_i \mid a_i \in A\}$

such that if $|SIC(p)| \geq TSR(p)$, then $SR(p) = 1$.

Proof: If each of $|SIC(p)|$ participants contributes at least $min_capacity$, then total contribution:

$$\begin{aligned} CC(p) &= |SIC(p)| \times min_capacity \geq TSR(p) \times min_capacity \\ &= \lceil C(p) / min_capacity \rceil \times min_capacity \geq C(p) \end{aligned}$$

Therefore $SR(p) = 1$ by definition. ■

Claim 2 (Scale Inversion). In PMIP model, with fixed global NFC size ($|A| = \text{const}$), probability of project realization positively correlates with its social significance.

Justification: Let social significance of project p be defined as fraction of NFC agents interested in its realization: $\text{significance}(p) = |\text{SIC}(p)| / |A|$. Then:

$$\text{individual_cost}(p) = C(p) / |\text{SIC}(p)| = C(p) / (\text{significance}(p) \times |A|)$$

With fixed $C(p)$ and $|A|$: the higher $\text{significance}(p)$, the lower $\text{individual_cost}(p)$, the higher probability that $\text{individual_cost}(p) \leq \text{min_capacity}$, the higher probability $SR(p) = 1$.

This inverts traditional logic, where large-scale projects are accessible only to concentrated capital. In PMIP, large-scale projects become possible precisely thanks to distribution among many — provided project is significant enough to attract this multitude. ■

Formal proof of this claim is an open problem and subject of further research.

Claim 3 (Antifragility). System based on PMIP has property of antifragility per Taleb [35]: increase in number of participants not only makes system resilient to shocks, but strengthens its ability to implement projects of any complexity.

Proof: Let δ be economic shock reducing min_capacity by $\varepsilon > 0$. Then new threshold:

$$\text{TSR}'(p) = C(p) / (\text{min_capacity} - \varepsilon) > \text{TSR}(p)$$

However if simultaneously number of participants grows: $N' = N + \Delta$, then for sufficient Δ :

$$\begin{aligned} N' \geq \text{TSR}'(p) &\Leftrightarrow N + \Delta \geq C(p) / (\text{min_capacity} - \varepsilon) \\ &\Leftrightarrow \Delta \geq C(p) / (\text{min_capacity} - \varepsilon) - N \end{aligned}$$

With large N even significant ε are compensated by small relative increase Δ/N . Moreover, economic shocks tend to stimulate search for alternative economic models, which increases influx of participants to NFC. Thus system not only withstands shocks, but uses them as source of growth — which is defining property of antifragility. ■

Limitation: system antifragility depends on type of shock. Crypto winter 2022 demonstrated that economic shocks within crypto industry can cause participant outflow, not inflow. Claim is valid for shocks in traditional economy, stimulating search for alternatives, but requires empirical verification for endogenous cryptoeconomic crises. Formal proof of this claim is an open problem and subject of further research.

Claim 4 ("Millions are Billions"). With sufficient number of NFC participants, collective capital reaches scales comparable to budgets of largest institutions and state programs, with individual costs negligibly small for each participant.

Demonstration:

Scenario A:

$N = 10^6$ (one million participants)
 $\text{min_capacity} = \$10/\text{month}$
 $\text{CC} = \$10^7/\text{month} = \$120\text{M}/\text{year}$

Scenario B:

$N = 10^7$ (ten million participants)
 $\text{min_capacity} = \$5/\text{month}$
 $\text{CC} = \$5 \times 10^7/\text{month} = \$600\text{M}/\text{year}$

Scenario C:

$N = 10^8$ (hundred million participants)
 $\text{min_capacity} = \$3/\text{month}$
 $\text{CC} = \$3 \times 10^8/\text{month} = \$3.6\text{B}/\text{year}$

Scenario D:

$N = 10^9$ (one billion participants)
 $\text{min_capacity} = \$1/\text{month}$
 $\text{CC} = \$10^9/\text{month} = \$12\text{B}/\text{year}$

For comparison:

- Annual CERN budget: ~\$1.2B
- Annual NASA budget: ~\$25B
- Annual NIH (USA) budget: ~\$47B
- Total global venture market volume (2023): ~\$345B
- Scenario D at \$1/month covers CERN budget in 1 month
- Scenario C at \$3/month exceeds ESA budget (~\$7.7B) in 2.1 years

Consequence: claim "Millions are Billionaires" is not slogan, but mathematical consequence of PMIP. This is arithmetic, not utopia. Question is not in mathematics — question is in creating coordination infrastructure ensuring: (a) formation of SIC of sufficient scale; (b) transparent and verifiable fund collection; (c) accountable project implementation; (d) fair distribution of results. This is precisely the subject of GyberExperiment. ■

Formal proof of this claim is an open problem and subject of further research.

Corollary 4.1 (AI-Enhancement of PMIP). Artificial intelligence accelerates PMIP convergence to zero individual participation threshold from two sides simultaneously, introducing qualitatively new dynamics:

First side — reducing $C(p)$:

AI-assisted development (code generation, automatic testing, AI-audit of smart contract security) reduces project implementation cost. AI-coordination within AG(p) reduces management overhead. AI-analytics prevents costly design errors at early stages. Consequently:

$$C(p | AI) < C(p)$$

$$\text{individual_cost}(p | AI) = C(p | AI) / |\text{SIC}(p)| < C(p) / |\text{SIC}(p)|$$

Second side – increasing effective |SIC|:

Coordination costs with large $|\text{SIC}|$ are fundamental limitation of PMIP (see Loop 5, Section 3.6). Brooks showed that in traditional organizations coordination costs grow as $O(n^2)$. In CSC formalized protocols reduce growth to $O(n \log n)$. AI-agent as mediator – aggregating positions of thousands of participants, clustering opinions, formulating decision variants for voting – reduces coordination cost growth to $O(n)$:

Without AI: $\text{effective_capacity}(\text{SIC}) = |\text{SIC}| / \text{coordination_overhead}(|\text{SIC}|)$
 $\text{coordination_overhead} \propto \log(|\text{SIC}|)$

With AI: $\text{effective_capacity}(\text{SIC} | AI) \approx |\text{SIC}|$
 $\text{coordination_overhead} \approx \text{const}$ (AI scales trivially)

Combined effect:

$$\text{individual_cost}(p | AI) = C(p | AI) / \text{effective_SIC}(p | AI)$$

With $C(p | AI) < C(p)$ and $\text{effective_SIC}(p | AI) > \text{effective_SIC}(p)$:
 $\text{individual_cost}(p | AI) \ll \text{individual_cost}(p)$

AI accelerates PMIP convergence to zero EXPONENTIALLY,
not linearly – which practically means that social
relevance threshold $TSR(p)$ is overcome
for projects of any cost with significantly fewer
participants than predicted by model without AI.

This corollary has fundamental significance: AI is not external addition to PMIP, but structural factor eliminating practical limitations of theoretically perfect mechanism. AI-coordination substantially reduces communicative component of Brooks' law ($O(n^2) \rightarrow O(n)$ for routine coordination tasks), though core of law – complexity of judgment coordination – persists for strategic decisions (Axiom A8). ■

3.4.5. Mechanism for Resolving Internal Contradictions: Fork Resolution Protocol

Any collective decision-making system faces problem of internal disagreements. Traditional hierarchical structures solve it through mechanism of managerial power – decision is made by whoever is higher in hierarchy. In CSC there is no such mechanism by definition (Axiom A1). A formalized protocol preserving decentralization is needed.

Problem of cost estimation.

Precise definition of $C(p)$ is difficult at early project stages. Underestimation leads to underfunding, overestimation — to inefficient resource allocation and artificial inflation of TSR.

Solution: iterative estimation model — initial estimate formulated by idea author at Discussion stage; at Formation stage estimate corrected with participation of AG and CG (if attracted); final fixation of $C(p)$ happens at transition to Accumulation, when internal project tokens are issued. Additionally, modular project structure allows breaking large projects into independent subprojects, each with its own C and SIC.

3.5. Socio-Economic Selection and Project Evolution

3.5.3. Historical Analogy

For deeper understanding of scale and character of occurring transformation, it's useful to draw analogy with industrial revolution — last phase transition of comparable scale.

Carlota Perez in fundamental work "Technological Revolutions and Financial Capital" (2002) showed that each technological revolution passes through cycle: installation of new technological paradigm → financial bubble → crisis → deployment period, where institutional structure finally adapts to new technology [42]. We assume digital revolution is in transition from bubble/crisis phase (dotcom crash 2000, crisis 2008, crypto winter 2022) to deployment phase, where institutional innovation — CSC — becomes dominant form.

Industrial Revolution created:

- Factory as new organizational form
(replacing manufactory and workshop)
- Joint-stock company as new economic unit
(replacing trading house and guild association)
- Stock exchange as new mechanism of capital coordination
(replacing direct trade deals)
- Industrial working class as new social force
(changing balance of social relations)
- Demanded new legislation (corporate law,
labor law), new economic theory (classical
political economy of Smith, Ricardo, Marx), new philosophy
(utilitarianism, liberalism, socialism)

Cybersocialization creates:

- CSC as new organizational form
(overcoming limitations of both corporation and existing DAOs)
- CyberSocial Corporation as new economic unit
(replacing joint-stock company in digital environment)
- MacroeconomicDAO as new coordination mechanism
(replacing stock exchange and venture market)
- Global digital intelligentsia as new social force
(forming new balance in relations between society
and outdated institutions)
- Requires new theory (CyberSocial Economics – this
document), new infrastructure (GyberExperiment),
new law (DAO governance frameworks beginning
to appear: Wyoming DAO LLC, Marshall Islands
DAO Act)

Analogy is not superficial. Each element has deep structural correspondence. Just as joint-stock company allowed distributing risk of large enterprises (transoceanic trade, railroad construction) among many investors, so CSC through PMIP allows distributing costs of large-scale projects among arbitrarily large number of participants. Just as stock exchange created mechanism of price discovery and aggregation of dispersed capital, so MacroeconomicDAO creates mechanism of determining social relevance and aggregating dispersed interest. Just as industrial working class became conscious of itself as social force and formed institutions protecting its interests (unions, workers' parties), so digital intelligentsia becomes conscious of itself through Open Source movement, crypto-communities and DAO-experiments and forms institutions of new type — decentralized, open, global.

Of course, analogy has its limits. Industrial revolution occurred in world of nation-states and was tied to physical infrastructure (factories, railroads). Cybersocialization occurs in global digital space and is largely abstracted from physical geography. This means transformation pace may be substantially higher, and its scope — global from the start, bypassing stage of national scaling.

3.5.4. AI-Directed Evolution: From Blind Selection to Designed

SES model described above represents analog of biological evolution (formalized in detail in Section 3.6.2, property E4). However biological evolution has fundamental limitation — it is **blind**: mutations random, selection undirected, trillions of organisms die for sake of fixing one successful adaptation.

In CSC there is already Lamarckian component — acquired traits (experience, code, infrastructure) are inherited by subsequent projects. Artificial intelligence introduces qualitatively new element — **foresight** — transforming SES from undirected evolutionary process to designed:

```

Biological evolution:
Mutation (random) → Selection (blind) → Inheritance

SES without AI:
Idea (from human) → SES (SR as criterion) → Code/experience inheritance

SES with AI (directed evolution):
AI-analysis of environment → Generation of directed ideas →
AI-forecast of SR → SES (enhanced) →
Inheritance + AI-optimization of inherited

```

AI-generation of ideas based on ecosystem gap analysis. AI-agent, having access to full map of projects, their dependencies and results, can identify: unfilled niches ("ecosystem has X and Y, but not Z which would connect them"), bottlenecks ("80% of projects hit absence of component W"), external trends ("growing demand for category K, ecosystem has competencies for realization"). Ideas suggested or generated by AI have higher probability of being socially relevant than random ideas of individual agents. AI-generated proposals are necessarily marked as such — decision to accept remains with community (Axiom A7).

AI-predictor of social relevance. Before author invests significant effort in full project specification, AI can: estimate potential $|SIC(p)|$ based on precedent data, model $TSR(p)$ under various budget parameters, recommend modifications increasing SR. This reduces "evolutionary losses" — efforts spent on projects doomed to $SR = 0$.

AI-enhancement of FRP. Fork Resolution Protocol (Section 3.4.5) describes fork as extreme measure, but fork is costly operation: effort duplication, community split. AI optimizes each FRP stage: - *Deliberation stage*: AI clusters participant positions, identifies

consensus points and real (not apparent) divergence points, visualizes argument space - *Synthesis stage*: AI proposes compromise solutions v , maximizing $|\text{support}(v)| / |\text{SIC}(p)|$, based on analysis of each group's preferences - *Fork stage (if unavoidable)*: AI models viability of each branch — forecasts $|\text{SIC}|$ for each variant, evaluates resource sufficiency, warns of risks

Formally, AI-enhanced SES increases system success rate through three channels:

```
Success_rate_AI = f(directed_diversity, enhanced_selection, accelerated_inheritance)

directed_diversity > random_diversity
    (AI generates ideas in promising directions)

enhanced_selection > blind_selection
    (AI reduces noise in SR assessment – see property E1 below)

accelerated_inheritance > passive_inheritance
    (AI systematizes and makes instantly accessible
        experience of all past projects – see property E6 below)
```

Analogy with biology: AI transforms SES from natural selection process to process resembling genetic engineering — directed modifications with predictable results, while preserving evolutionary diversity through FRP.

AI-transformation of IPI lifecycle. At each phase of Idea-Project-Implementation model AI introduces qualitatively new possibilities:

- **Idea Phase:** three parallel streams — (1) human proposes idea, AI validates; (2) AI identifies ecosystem gaps and generates proposals; (3) AI forms "opportunity map" based on external environment analysis
- **Formation Phase:** AI automatically generates specification draft based on discussions, identifies unaddressed risks, proposes optimal AG(p) composition based on competencies and participant workload
- **Accumulation Phase:** AI forecasts accumulation speed, optimizes internal token parameters, models future LP sustainability
- **Implementation Phase:** AI as co-developer — code generation, automatic testing, continuous security audit, automatic documentation. AI Project Manager — task decomposition, optimal assignment, early warning of delays
- **Functioning Phase:** AI-monitoring of metrics, anomaly detection, parameter optimization, revenue and load forecasting

Combined effect: AI reduces IPI cycle time (from idea to functioning) by 3–5x, meaning proportional acceleration of Loop 1 (Growth Loop, Section 3.6.3) and, consequently, exponential acceleration of entire ecosystem development.

3.6. Formal Model of CyberSocium as Complex Adaptive System

Theoretical constructions introduced in previous sections — CSC, PMIP, SES, FRP, IPI — describe individual components and mechanisms. However CyberSocium as integral system has properties not reducible to sum of component properties. To describe these **emergent** properties, apparatus of Complex Adaptive Systems (CAS) theory is needed [36, 37].

3.6.1. System Components

CyberSocium CS = $\langle A, P, R, T, G, \Phi \rangle$

where:

$A = \{a_1, \dots, a_n\}$ – set of agents (NFC participants)

Each agent a_i characterized by vector:

$a_i = \langle \text{wallet}_i, \text{reputation}_i, \text{status}_i, \text{skills}_i, \text{capacity}_i \rangle$

where:

wallet_i – cryptographic address identifying agent in system

$\text{reputation}_i \in \mathbb{R}_{\geq 0}$ – accumulated reputation, determined by history of verified activity

$\text{status}_i \in \{\text{Unit}, \text{Dev}, \text{LeadDev}, \text{ArchDev}, \text{Core}\}$ – status in hierarchy of responsibility (not power), determining reward level and confirmation authority

$\text{skills}_i \subseteq S$ – subset from set of competencies S , relevant for ecosystem projects

$\text{capacity}_i \in \mathbb{R}_{>0}$ – agent's investment capacity (resource they're ready to direct to projects)

$P = \{p_1, \dots, p_n\}$ – set of projects (including potential)

Each project p_j characterized by:

$p_j = \langle \text{description}_j, C(p_j), \text{state}_j, SIC(p_j), AG(p_j), \text{tokens}_j, \text{revenue}_j \rangle$

where:

description_j – formalized project description

$C(p_j) \in \mathbb{R}_{>0}$ – estimated implementation cost

$\text{state}_j \in \{\text{Idea}, \text{Discussion}, \text{Formation}, \text{Accumulation}, \text{Implementation}, \text{Operation}, \text{Completion}\}$ – current state in IPI model

$SIC(p_j) \subseteq A$ – Socio-Investment Circle

$AG(p_j) \subseteq SIC(p_j)$ – Active Group

tokens_j – internal project tokens (issued at transition to Accumulation)

$\text{revenue}_j(t)$ – project revenue function of time (defined for state = Operation)

$R = \langle R_{\text{fin}}, R_{\text{int}}, R_{\text{rep}}, R_{\text{inf}} \rangle$ – system aggregate resource

where:

R_{fin} – financial resource: aggregate Gbr liquidity, pool funds, accumulated project revenue

R_{int} – intellectual resource: aggregate participant competencies, $\sum_i |\text{skills}_i|$, accumulated codebase, documentation, research

R_rep – reputational resource: aggregate reputation
of ecosystem as whole (distinct from sum
of participant reputations – emergent property)

R_inf – infrastructural resource: GyberNet, GyberComputer,
GSP, IPFS nodes, deployed smart contracts,
liquidity pools

$T = \{Gbr\} \cup \{\text{token}(p_j) \mid p_j \in P, \text{state}_j \in \{\text{Accumulation}, \text{Implementation}, \text{Operation}\}\}$ – set of tokens

Gbr – main utility token of ecosystem

token(p_j) – internal token of project p_j

Relation between tokens: each token(p_j) connected with Gbr
through liquidity pool, created before opening
trading on DEX. This ensures Axiom 6 (inclusiveness):
active participants receive tokens of any project
through Gbr, regardless of personal participation in specific project.

$G = \langle G_{\text{social}}, G_{\text{code}}, G_{\text{commerce}}, G_{\text{economic}} \rangle$ – governance structure

G_{social} – Social DAO: decision-making within community,
organization of social actions

G_{code} – Code DAO: managing platform codebase state
through voting for changes
in main repository branch

G_{commerce} – Commerce DAO: crowdfunding business ideas,
proposing and implementing commercial
projects at community expense

G_{economic} – Economic DAO: accumulating social, financial
and economic resources for implementing
most large-scale projects

Each G_x implemented as smart contract based on Solidity
and OpenZeppelin library, with proposal
and voting mechanism.

$\Phi = \{\text{PMIP}, \text{FRP}, \text{IPI}, \text{RepProtocol}, \text{StakingProtocol}, \text{RewardProtocol}\}$ – set of interaction protocols

PMIP – Principle of Minimum Individual Participation
(Section 3.4.1)

FRP – Fork Resolution Protocol (Section 3.4.5)

IPI – "Idea → Project → Implementation" Model (Section 3.4.2)

RepProtocol – Reputation protocol: set of rules determining

how agent activity converts to reputation

StakingProtocol – Staking protocol:

Gbr staking: staking percentage determined by
Economic DAO vote and adapts to economic
ecosystem parameters

Project token staking: 10 / [total tokens
issued] % from specific project revenue

RewardProtocol – Reward protocol through UnitManager:

Frequency: 1 time per month

Conditions: status verification + activity confirmation
through G-Plan

Sizes by status:

Unit: 10,000,000 Gbr

Dev: 100,000,000 Gbr

LeadDev: 1,000,000,000 Gbr

ArchDev: 10,000,000,000 Gbr

Core: determined by community

...

3.6.2. Emergent Properties

Define properties arising from interaction of CS components, but not inherent to any of them

E1 – Collective Economic Intelligence.

System's ability to identify and implement socially significant projects through SES mechanism

Formally: let utility(p) be true social utility of project p (unobservable). Then $SR(p)$, de

E2 – Antifragility.

System strengthens from stresses. This property formally proven in Theorem 3 for PMIP, but a

- Economic crises → growth of disappointment in traditional institutions → participant inflation
- Failure of individual project p_i → experience accumulation (what doesn't work) → quality improvement
- Attack on individual node → load redistribution to remaining nodes + incentive to improve

Individual agent is fragile – they can lose motivation, resources, competencies. Individual

E3 – Self-Scaling.

Successful projects attract new participants → R increases → TSR reduces for future projects

Formally: let $N(t)$ be number of participants at time t , and let successful project p_j with

$$N(t+1) = N(t) + \sum_j \Delta N(r_j(t)) - \text{attrition}(t)$$

where attrition(t) — participant outflow.

When $\sum_j \Delta N(r_j(t)) > \text{attrition}(t)$, system grows.

With growth of $N(t)$: — number of proposed ideas grows (more agents → more ideas) — TSR reduces for each project (Theorem 1) — CC grows for each project — number of realizable projects grows — total revenue $\sum_j r_j$ grows — ΔN grows

This is self-sustaining growth cycle, limited only by: (a) finite number of people on planet; (b) limiting capacity of coordination mechanisms (limitation substantially softened by AI-coordinator, reducing costs from $O(n \log n)$ to $O(n)$ — see Loop 5); (c) competition with alternative systems.

****E4 – Economic Evolution.****

Through SES mechanism system constantly generates, tests and selects projects, adapting to ...

Biological

Evolution

CyberSocium

Mutations → New ideas proposed by agents Genetic diversity → Diversity of projects and their versions (FRP) Natural selection → Socio-Economic Selection (SES): SR as survival criterion Fitness → Social relevance Heredity → Code, knowledge reuse, infrastructure, experience Habitat → Aggregate of interests, needs and resources of NFC participants Speciation → Project branching through FRP Coevolution → Mutual project influence: infrastructure of one creates opportunities for another Extinction → Completion of projects with SR = 0 (without loss of accumulated experience and code)

Unlike biological evolution, economic evolution in CS has Lamarckian component: acquired "traits" can be passed on.

****E5 – Distributed Resilience.****

Failure of any individual project, node, agent or even group of agents doesn't lead to failure of the system.

Formally: for any subset $S' \subset A$, $|S'| < |A|/2$, removal of S' doesn't stop CS functioning. The system is robust.

This qualitatively differs from resilience of traditional corporation (depending on management).

****E6 – Knowledge Compounding.****

Each implemented project p_i generates:

- (a) Open source code available to future projects. Code of project p_i can be library, framework, tool, etc.
- (b) Experience and competencies of $AG(p_i)$ participants. Developer who participated in p_i implementation can reuse it in other projects.
- (c) Infrastructure reusable in subsequent projects: deployed nodes, liquidity pools, integrations, etc.
- (d) Economic resource through Gbr liquidity: each project entering market creates liquidity.

Formally:

$$R(t+1) = R(t) + \Delta R(p_i)$$

where $\Delta R(p_i) = \langle \Delta R_{\text{fin}}(p_i), \Delta R_{\text{int}}(p_i), \Delta R_{\text{rep}}(p_i), \Delta R_{\text{inf}}(p_i) \rangle$

With successful implementation: $\|\Delta R(p_i)\| > \text{cost}(p_i)$

That is: system creates more aggregate resource than it consumes for project implementation — due to intangible cumulative knowledge effect.

Moreover, cumulative effect is superlinear: $\Delta R(p_i | \text{implemented } p_1, \dots, p_{i-1}) > \Delta R(p_i | \text{only } p_i \text{ implemented})$

That is: each project creates more value in context of previously implemented projects than in isolation. This is direct consequence of code, infrastructure and experience reuse.

This effect is one of most powerful advantages of CSC over traditional organizational forms.

3.6.3. System Dynamics – Formalization of Feedback Loops

CyberSocium behavior as CAS is determined by interaction of positive (reinforcing) and negative (dampening) feedback loops.

****Positive feedback loops (reinforcement):****

Loop 1 – Growth Loop:

More participants ($\uparrow A$) → more ideas proposed to project space → more projects pass through IPI → more successful implementations → more value created in ecosystem → higher NFC attractiveness → more participants ($\uparrow A$)

Loop speed: determined by IPI cycle time (from idea to first results). Optimizing this time is one of key infrastructure tasks.

Loop 2 – Liquidity Loop:

More projects enter market → more liquidity pools created with Gbr → higher aggregate Gbr liquidity → higher Gbr value as medium of exchange → greater reward for active participants (in real terms) → higher motivation for active participation → more and higher quality projects → more projects enter market

Key role: mechanism described in original documentation — "all projects create liquidity pool with Gbr before opening trading on DEX, allowing active community members to receive tokens of any project, regardless of personal participation in specific project" — is implementation of Axiom 6 (inclusiveness) and key mechanism of this loop.

Loop 3 – Competence Loop:

More implemented projects → more experience accumulated in community ($\uparrow R_{int}$) → higher quality of new projects → higher percentage of successful implementations → higher ecosystem reputation ($\uparrow R_{rep}$) → attraction of more qualified participants → even more experience

This loop explains why CSC becomes more efficient over time, not less — unlike bureaucratic organizations, where size growth usually accompanied by efficiency decline (Parkinson's law).

****Negative feedback loops (stabilization):****

Loop 4 – Quality Filter:

Growth in number of proposed projects → decline in average idea quality (more participants → more inexperienced → more weak ideas) → SES mechanism filters out irrelevant projects (low SIC → SR = 0 → project doesn't transition to Accumulation) → only projects with high social relevance implemented → increase in average quality of implemented projects

This is stabilizing loop: it prevents ecosystem degradation during rapid participant number growth. SES acts as immune system, filtering out non-viable projects without centralized "selection committee".

Loop 5 – Coordination Cost Loop:

Growth in number of participants → growth of coordination costs (more people → harder to agree → longer discussions → more conflicts) → incentive to improve coordination tools (G-Plan, DAO, automation, AI-assisted governance) → reduction of coordination costs per participant → possibility of further growth

This loop describes key scaling challenge. Brooks in "The Mythical Man-Month" [50] showed that in traditional projects coordination costs grow as $O(n^2)$, where n is number of participants. In CSC modular architecture and formalized protocols (PMIP, FRP) allow holding cost growth closer to $O(n \log n)$, but this estimate requires empirical verification.

Loop 6 – Accountability Loop:

Growth of ecosystem aggregate resource ($\uparrow R$) → growth of attractiveness to bad actors (fraudsters, free-riders, manipulators) → activation of reputation mechanism: bad behavior identified through G-Plan and blockchain transparency → reduction of bad actor's reputation → exclusion from active roles (AG, implementer) → growth of trust in community → growth of willingness to participate in projects → growth of resource ($\uparrow R$)

Critically important: reputation mechanism works only with transparency (A2) and verifiability of activity (G-Plan). Without these conditions loop breaks, and system becomes vulnerable.

3.6.4. System Attractor

****Hypothesis 3.6.1 (On CyberSocium Attractor).**** With sufficient initial conditions ($N_0 > N_c$)

- (a) $|A| \rightarrow A_{\max}$ — coverage of significant fraction of global population with access to digital technologies (as of 2025: ~5.4 billion people)
- (b) $TSR(p) \rightarrow$ accessibility for planetary-scale projects with individual_cost negligibly small for each participant
- (c) Decentralization index $\rightarrow \max$ (no agent or coalition $< |A|/3$ controls system)
- (d) $Gini(R_{fin} \text{ within CS}) \rightarrow \min$ (more even resource distribution than in any existing economic system of comparable scale)
- (e) Project implementation speed \rightarrow optimal (not maximal, but determined by quality: loop 4 ensures speed-quality balance)
- (f) Project diversity \rightarrow maximal (FRP ensures coexistence of different approaches, not convergence to single)

This state is attractor because positive feedback loops (Loops 1-3) dominate over negative ones.

****Claim 3.6.1 (On Axiomatic Stability of Attractor).**** Loss of any of axioms A1-A8 puts system in a non-attractor state.

****Corollary 3.6.1.**** Axioms A1-A8 are not idealistic wishes, but **structural conditions of existence of attractor**.

****Estimation of critical initial conditions.**** Hypothesis 3.6.1 is conditional on sufficient initial conditions.

$N_{critical}$ — minimum number of participants at which Loop 1 (growth) begins to dominate over outflow:

Condition: $\sum_j \Delta N(r_j(t)) > \text{attrition}(t)$

Empirical estimate: based on data from existing DAO-ecosystems (MakerDAO: ~70K active addresses; Gitcoin: ~300K unique participants; Ethereum governance: ~50K active voters), $N_{critical}$ estimated in range 10^3 – 10^4 active participants.

When $N < N_{critical}$ system is in "manual launch" mode — growth requires targeted efforts for attracting and retaining participants.

When $N > N_{critical}$ system transitions to self-sustaining growth mode.

$R_{critical}$ — minimum aggregate resource at which first projects creating positive feedback are possible:

$$R_{critical} = R_{inf_min} + R_{fin_min}$$

R_{inf_min} — minimum infrastructure: deployed smart contracts, functioning GSP prototype, GyberComputer nodes, Gbr liquidity pools

R_{fin_min} — minimum financial resource for implementing first cascade projects (Section 5, Roadmap): estimated at \$50K–\$500K (depends on first project complexity)

End of Section 3: Theory of CyberSocium

Section 4: GyberExperiment Architecture – Technical Specification

4.1. From Theory to Implementation: Mapping Correspondences

Sections 1–3 laid the theoretical foundation: identified the problem, formulated axioms, in

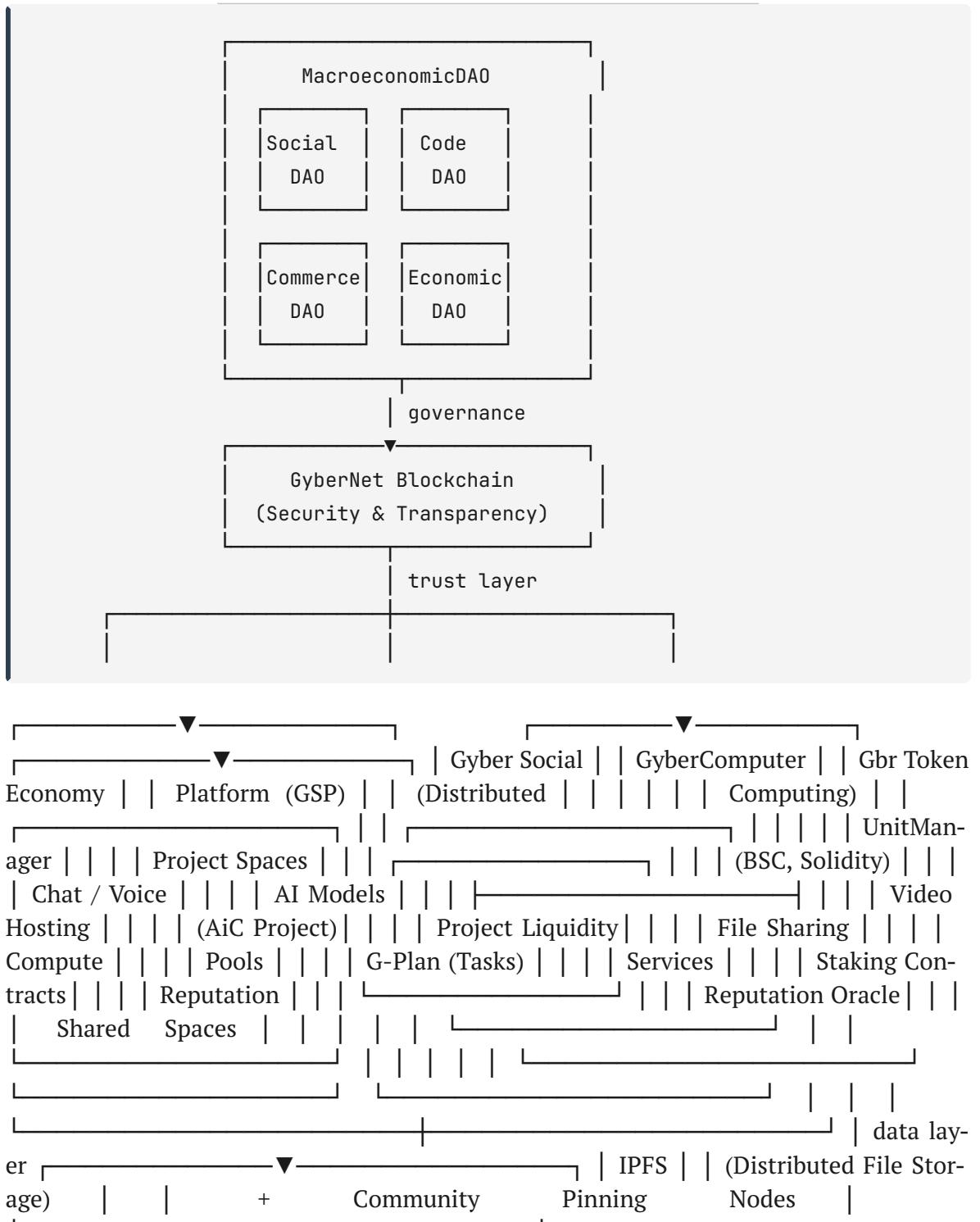
Theory

→

Implementation

CyberSocium (CS) → GyberExperiment (ecosystem) CyberSocial Corporation (CSC) → Gybernaty Community Axiom A1 (decentralization) → GyberNet (community blockchain) Axiom A2 (transparency) → Blockchain registry of all operations Axiom A3 (data sovereignty) → Client-side encryption, IPFS, user-controlled keys Axiom A4 (extensibility) → Modular GSP architecture, GitHub repository Axiom A5 (meritocracy) → G-Plan + Unit-Manager + status system Axiom A6 (inclusiveness) → Gbr liquidity pools with all projects Axiom A7 (self-governance) → MacroeconomicDAO (4 DAO types) PMIP → Economic DAO + Commerce DAO SES → IPI pipeline + SIC formation + FRP + reputation system IPI Model → Project lifecycle in GSP Gbr token → GyberCommunityToken (BSC) Agents (A) → Verified wallets with digital signatures Aggregate Resource (R) → Infrastructure + treasury + codebase + reputation

High-level Diagram:



```
## 4.2. GyberCommunityToken (Gbr): Tokenomics
```

```
### 4.2.1. Token Specification
```

Name: GyberCommunityToken Ticker: Gbr Standard: BEP-20 (Binance Smart Chain) Contract address: 0xa970cae9fa1d7cca913b7c19df45bf33d55384a9 Type: Utility Token Total supply: Fixed (defined at contract deployment) Additional emission: Impossible (contract contains no mint function after initialization)

Token functions in the ecosystem:

1. Governance: — Voting in DAOs (Social, Code, Commerce, Economic) — Signing proposals — Condition: wallet must be active (verified by special algorithm during voting)
2. Work evaluation: — Means of evaluating participant contributions to projects — Rewards through UnitManager (proportional to status and confirmed activity)
3. Infrastructure interaction: — Interaction with GyberNet Blockchain — Interaction with GyberComputer — Confirming seriousness of intent when initiating projects (burning 0.1% of C(p) when transitioning to Accumulation)
4. Staking: — Gbr staking: percentage determined by Economic DAO voting and adapted to ecosystem economic parameters — Improving participant reputation — Passive income
5. Medium of exchange: — Trading on DEX (PancakeSwap) — Interaction with project liquidity pools — Discounts for special project clients

4.2.2. Emission Distribution and Management

Distribution (fixed supply, deflationary model):

Governance Pool (~80%+): — Controlled by initiators and key community members during experiment deployment phase — Used for on-chain voting, UnitManager funding, and reserve operations — As system automation progresses, funds are transferred to stabilization fund — smart contract managed exclusively through DAO voting — Managed through BEP-20 delegation mechanism

Trading Float (~20% or less): — Listed on DEX (PancakeSwap) to provide liquidity and pricing — Creates market mechanism for determining Gbr value

4.2.3. Reward Mechanism: UnitManager

UnitManager is a smart contract implementing the RewardProtocol and serving as the technical

Implementation status: the current UnitManager version (GybernatyUnitManager) is a work

Reward payment algorithm:

1. Fixed reward by Unit Type: Each participant receives a fixed amount determined by their status (Unit Type):

- Unit (level 1): 10,000,000 Gbr / period — Dev (level 2): 100,000,000 Gbr / period — LeadDev (level 3): 1,000,000,000 Gbr / period — ArchDev (level 4): 10,000,000,000 Gbr / period

Reward is paid for confirmed activity in the current period.

1. Project completion bonus ($\times 5$ multiplier): Upon verified completion of an IPI-model project (transition to Operation phase), all project team members receive a bonus:

$$\text{reward_completion}(a_i) = \text{reward_base}(\text{status}_i) \times 5$$

The $\times 5$ multiplier creates a tremendous economic incentive to finish what's started: a team that brings a project to Operation receives in one period as much as they would for five regular periods. This solves the systemic problem of unfinished projects — a plague of both open-source communities and corporate innovation programs.

1. Activity confirmation: UnitManager queries G-Plan — an innovative task manager developed by the community.

G-Plan confirms a_i 's activity by checking:

- Participation in tasks during reporting period
- Task completion confirmed by participants of higher status
- Overall level of involvement in ecosystem projects

1. Payment: If activity is confirmed: UnitManager.transfer(wallet_i, reward_amount) If project is completed: UnitManager.transfer(wallet_i, reward_amount $\times 5$) If activity not confirmed: Transaction rejected. Participant can retry after accumulating activity.
2. Recording: All operations are recorded on BSC blockchain, ensuring complete transparency and auditability.

****Connection to theory.**** UnitManager implements several axioms simultaneously:

- A2 (transparency): all payments on blockchain, verifiable by anyone
- A5 (meritocracy): reward determined by status and activity, not capital
- A6 (inclusiveness): minimum status (Unit) accessible to every active participant

****Anti-free-riding mechanism:**** reward is paid not for "presence in the system" but for verifiably contributing to the project.

Critical difference from existing DAOs: in most DAOs, rewards are determined by tokenholder participation.

4.2.4. Liquidity Pools and Project Integration

The liquidity pool mechanism is a key element implementing Axiom 6 (inclusiveness) and Loopback.

For each project p_j transitioning to Operation state:

1. Internal project tokens token(p_j) are issued (during Accumulation phase, for sale at 1 BUSD)
2. Before opening trading on DEX, a liquidity pool is created: Pool(p_j) = {token(p_j), Gbr}
3. This means token(p_j) trades in pair with Gbr

4. Consequence for participants: — Any Gbr holder can acquire token(p_j) through DEX, regardless of participation in SIC(p_j) — Active participants receiving Gbr through UnitManager automatically have access to tokens of any project — This implements the principle: "active community members receive tokens of any project, regardless of personal participation in specific project"
5. Internal token staking: token(p_j) staking: $10 / [\text{total_supply}(\text{token}(p_j))]$ % of project p_j revenue

This creates a direct economic link between project success and reward for token holders.

1. Project client levels: — External clients: use fiat currency, pay full price — Special clients: use Gbr, receive discount — Super clients: use token(p_j), receive maximum discount

This creates economic incentive for acquiring and holding Gbr and token(p_j), supporting token liquidity and value.

```
To prevent liquidity fragmentation as the ecosystem scales, minimum liquidity thresholds for each token are set. These thresholds are adjusted based on the total supply of each token and the number of active holders. This ensures that even as the ecosystem grows, there is sufficient liquidity available for all tokens, preventing fragmentation and maintaining overall system stability.

## 4.3. Gyber Social Platform (GSP): Architecture

#### 4.3.1. Overview and Principles

GSP is a social network owned by all users and governed by them through DAO. GSP is not merely a platform for social interaction; it is a decentralized ecosystem where users can interact, transact, and govern themselves. The architecture is designed to support this vision, prioritizing decentralization, data sovereignty, extensibility, and self-governance.

**Architectural principles (following from axioms):**
```

From A1 (decentralization): — GSP is a network of nodes, not a client-server application — Each node contains a set of microservice containers — No single point of failure — Each participant can deploy their own node

From A3 (data sovereignty): — Three levels of data protection: Level 1 (basic): server-side encryption using client's public key Level 2 (enhanced): client-side encryption before sending to server Level 3 (maximum): full end-to-end encryption, server stores only encrypted data, keys only with user — Even basic level provides optimal protection — User has 100% control over their data

From A4 (extensibility): — Modular architecture: each user can write their own code module — Module can be included in node and offered to other participants — Each node can be augmented with any existing modules or new ones — Extensibility through GitHub repository — System expands in all directions

From A7 (self-governance): — Platform code state is determined by main branch of GitHub repository — Changes to main branch are made only through Code DAO voting — Each participant can propose changes (pull request), but acceptance through DAO

From A8 (cognitive augmentation): — AI content moderation: language model trained on community rules, classifies content in real-time. Model decisions are advisory — final decision made by Social DAO participants. Formally: $\text{flag}(m) = \text{LLM}(m, \text{Rules_DAO}) \in \{\text{ok}, \text{review}, \text{reject}\}$, where review → human moderator queue — AI recommendations: project, task, and SIC recommendation system based on participant competency profile. Model runs locally (on-device), raw data doesn't leave device (A3) — AI participant assistant: contextual helper for ecosystem navigation — explaining DAO mechanics, helping draft proposals, summarizing discussions. Works as interface to documentation and on-chain data, without access to users' private data

4.4. GyberNet: Community Blockchain

GyberNet is a secure community blockchain used by the platform to ensure security and transparency

Purpose: — Ensuring experiment security and transparency — Recording critical operations: voting, status changes, activity confirmations, document hashes — G-Plan data verification — Ensuring immutability of DAO decisions — Trust layer for entire ecosystem

Current state: — In experiment's initial phase, GyberNet functions are executed through BNB Smart Chain (BSC), providing low fees (~\$0.01-0.03 per transaction), EVM compatibility, fast block time (~3 sec), and developed DeFi infrastructure — As experiment develops, GyberNet will be deployed as independent community blockchain — Migration will be executed through Code DAO voting

Prospective architecture: — Consensus: [determined by community through R&D] — Compatibility: EVM compatibility for reusing existing contracts — Validators: ecosystem participants with confirmed activity — Integration: bridge with BSC, Ethereum and other networks for cross-chain interaction

4.5. GyberComputer: Distributed Computing

GyberComputer is a private distributed computing network of the community, on which necessary tasks are performed

Purpose: — Providing computational resources for ecosystem projects without dependence on centralized cloud providers — Training and using AI models (AiC project) — Hosting GSP nodes — Ensuring IPFS content pinning — Running computationally intensive tasks

Architecture: — Network of nodes deployed by community participants — Each node provides computational resources (CPU, GPU, RAM, storage) — Task coordination through smart contracts or specialized orchestrator — Reward for provided resources through Gbr token

Connection to AiC project: — AiC (Artificial Intelligence Community) uses GyberComputer as computational foundation — AI models are trained and deployed in decentralized environment — DAO contracts regulate access to models, their development and reward distribution — AGPL licensing ensures openness of AI developments

4.6. MacroeconomicDAO: Governance System

MacroeconomicDAO is the central mechanism implementing Axiom 7 (self-governance). It is a t

4.6.1. Governance Architecture

Technical implementation:

Governor Contract (OpenZeppelin Governor): — Deployed on BNB Smart Chain (BSC)
— Accepts proposals from Gbr holders — Manages voting: counting votes, determining quorum, fixing results — Passes approved proposals to Timelock

Timelock Contract: — Delay in executing approved decisions (24–48 hours — parameter determined by community) — Ensures ability to react urgently if malicious proposal detected — Automatic execution after delay expires

Gnosis Safe (emergency multisig): — Emergency pause in case of critical vulnerability discovery — Keys held by trusted community members (determined by voting) — Cannot initiate spending — only pausing

4.6.2. Decision-Making Process

Standard governance cycle:

1. Proposal: Any participant with active wallet and sufficient Gbr (Proposal Threshold) submits proposal to corresponding DAO.

Requirement: wallet must be classified as "active" by verification algorithm — this prevents governance capture by large but inactive holders.

2. Discussion: Proposal published in GSP project space linked to corresponding DAO. Discussion period: 1–2 days (Voting Delay).

3. Voting: After discussion period expires, voting opens. Voting period: 3–7 days. Quorum: 10–20% of total supply (specific parameters determined by community).

Voting mechanism may vary by DAO class and proposal type: simple majority, qualified majority, quadratic voting.

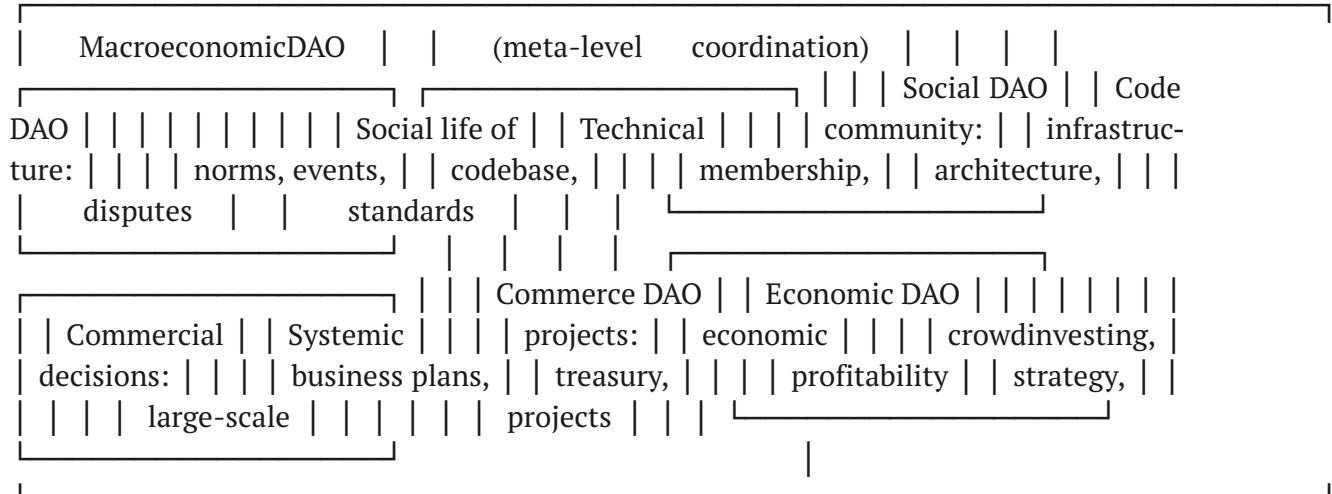
4. Execution: Approved proposals automatically queued in Timelock. After delay expires — automatic execution of on-chain operations.

For off-chain operations — authorized executors (implementers) proceed to work.

5. Accountability: Execution results recorded on-chain. Implementers report through GSP. Reputation system records execution quality.

4.6.3. Four DAO Classes

MacroeconomicDAO unites four classes of decentralized organizations, each responsible for a



Detailed specification of each class presented in Section 5.

4.6.4. Wallet Activity Verification

A distinctive feature of MacroeconomicDAO is the requirement for ****wallet activity verification**

Verification algorithm checks: — Participation in ecosystem tasks (G-Plan data) — Interaction with projects (commits, discussions, financing) — Activity regularity (not one-time actions but sustained participation pattern)

Mechanism goals: — Preventing governance capture by inactive large holders — Ensuring governance power is exercised by participants involved in experiment's current activities — Aligning governance influence with active contribution rather than passive wealth

4.7. Legal Framework: Gybernaty DUNA

4.7.1. Rationale for Legal Form

The CyberSocial Corporation exists in the space of blockchain and smart contracts, but its

****Fundamental distinction: Gybernaty DUNA ≠ MacroeconomicDAO.**** Gybernaty DUNA is a central

Chosen form: DUNA (Decentralized Unincorporated Nonprofit Association) — State of Wyoming, USA

Rationale:

1. Specialized legal form for DAO: DUNA created in 2024 specifically for recognizing on-chain governance in legal field. This means Governor contract decisions have legal force — direct link between smart contract and legal entity.

2. Exclusion of fiduciary duties: DUNA allows excluding fiduciary duties of members, enabling complete reliance on code and voting. This is critically important for realizing Axiom A7 (self-governance): decisions made by algorithm, not trustees.
3. Limited liability: Limits participants' (community members') liability for DAO obligations — risk limitation for participants.
4. Nonprofit status: Revenue reinvested, not distributed as dividends. This corresponds to CSC model where success criterion is social relevance, not profit maximization (Definition 3.2.1, item 6).
5. Public smart contract identifier: Governor contract address specified during registration — creates direct legal link between legal entity and on-chain governance mechanism.

4.7.2. Control Architecture: Community → DUNA → Real World

Absolute control principle:

Gybernaty Community (Gbr holders) | | on-chain voting | through Governor + Timelock ▼ Gybernaty DUNA (legal entity) | | legally binding | voting decisions ▼ Administrator (Ministerial Agent) | | technical execution: | fiat payments, taxes, compliance ▼ Traditional economy (banks, counterparties, regulators)

Key Administrator limitations: — No right to initiate spending without on-chain voting — No access to crypto treasury (keys absent) — Cannot block approved decisions — Can be instantly replaced through Social DAO voting — Role is exclusively technical execution: ministerial agent, not manager

Two-tier treasury:

Crypto treasury (DAO-managed): All crypto assets → Timelock contract Any movement → Governor vote Direct community control

Fiat treasury: Treasury Fiat Account → DAO-managed (large payments, core funds) Operating Fiat Account → Administrator (small operational expenses within approved budget, max \$2,000 per transaction)

Operating Account replenishment → only through governance vote (e.g., \$10K/month)

Surplus → automatic return to Treasury Account

4.7.3. Legal Value Extraction Mechanisms for Participants

CSC participants make real contributions – intellectual labor, code, research, coordination

1. Service compensation: Participants contract with DUNA (strategic leadership, technical development, research, coordination). Compensation size approved by voting. Legal qualification: "reasonable compensation" permitted by law.
2. Research grants: DUNA issues grants for new product development, research, educational programs. Grants approved through Economic DAO or Social DAO.
3. Buyback & Burn: DUNA directs portion of revenue to buying back GBR from DEX and burning. Legal qualification: "asset management operation to maintain protocol liquidity", NOT profit distribution. Effect: deflationary pressure on supply → with stable demand → Gbr value growth → increased real value of UnitManager rewards.

All operations go through voting (crypto part executed automatically through Timelock, fiat part – through Administrator).

4.7.4. Axiom Compliance / Legal Limitations and Priorities

A1 (decentralization): — DUNA has no single controlling person — Governance pool (~80%+) distributed across dozens of wallets — No single participant < 25% control

A2 (transparency): — All voting on-chain on BSC — All crypto treasury operations through Timelock — Monthly Administrator reports — Public dashboard (Dune Analytics) — Mandatory smart contract audits

A3 (sovereignty): — Each participant controls their keys — No one has access to others' wallets

A5 (meritocracy): — Reward determined by activity (G-Plan) and status, not token quantity

A6 (inclusiveness): — Minimum entry barrier — Liability limitation through DUNA — Liquidity pools ensure participation in success of any project

A7 (self-governance): — Governor contract = legally recognized governance mechanism — Administrator subordinate to voting — All critical decisions through DAO

A8 (cognitive augmentation): — AI Administrator monitor: autonomous agent continuously analyzing Administrator actions for compliance with DAO decisions: \forall action(Adm) : Verify(action, DAO_decisions) \in {compliant, alert} — Upon discrepancy detection (alert) — automatic notification to Social DAO with violation details — AI monitor has no executive authority: only observation and alerting (watchdog principle) — Monitoring logs recorded on-chain, ensuring control auditability

****Nonprofit constraint upon dissolution:**** in accordance with Wyoming law, upon DUNA dissolution

****Agreement priority over code:**** in case of discrepancy between Association Agreement text

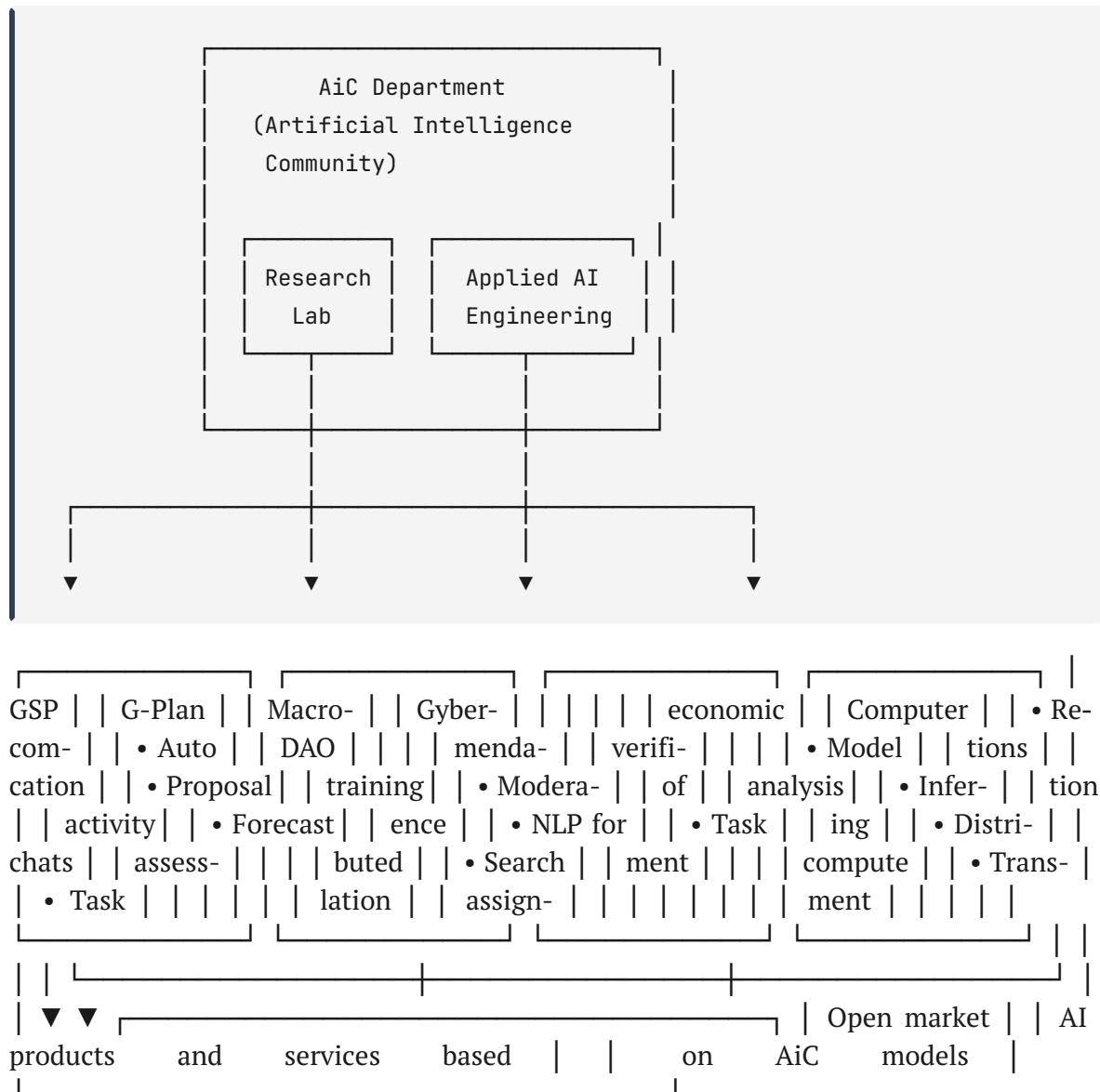
4.8. AiC – Гибернаты Искусственной Информатики

4.8.1. Status and Role in Ecosystem

AiC (*Artificial Intelligence Community*) is not a separate project among others – it is an ecosystem

This status fundamentally distinguishes AiC from external AI startups or isolated research

AiC Position in CyberSocium Architecture:



4.8.2. Problem AiC Solves

The current state of the artificial intelligence industry is characterized by a paradox struc-

Problem structure:

1. Resource concentration: Training frontier models (GPT-4, Gemini, Claude) requires \$50M–\$500M+ computational resources. This creates oligopoly: only 5–7 organizations worldwide capable of training such models.
2. Closedness: Despite fundamental architectures (Transformer, LSTM, CNN) published in open papers and implemented in open libraries (TensorFlow, PyTorch), final models — trained weights, training data, fine-tuning methods — are proprietary.
Source paradox: open science → closed product.
3. Data control: AI models trained on data generated by billions of users (text, images, interactions). Users receive neither control nor compensation for contributing data to creating billion-dollar models.
Direct reproduction of problem described in Section 1.3: user data appropriation by outdated economic institutions.
4. Opacity: Closed models are black boxes. Impossible to verify their safety, absence of bias, compliance with claimed properties. Direct violation of transparency principle (Axiom A2).
5. Economic inaccessibility: Frontier model APIs cost \$0.01–\$0.06 per 1K tokens. For large-scale use (millions of requests) this amounts to hundreds of thousands of dollars per year — unaffordable for most developers, researchers, developing country organizations.
6. Dependency risk: Dependence on closed AI providers creates strategic risk: provider can change terms, close access, impose censorship. This violates Axiom A3 (sovereignty) and Axiom A7 (self-governance).

The open AI movement (Meta's LLaMA, Mistral, Stability AI, EleutherAI) partially addresses p

AiC proposes a systemic solution based on CyberSocium theory: **development and use of AI m

4.8.3. AiC Architecture

Three functional circuits:

Circuit 1 — Internal (AI for ecosystem):

AI integration into all GyberExperiment components. Goal: efficiency improvement, automation, user experience enhancement.

Applications:

GSP: — Recommendation systems: news feed personalization, project suggestions, finding like-minded people — Content moderation: automatic spam detection, violations, bad behavior without centralized censorship (federated moderation models) — NLP functions: automatic translation (critically important for global NFC), discussion summarization, extracting key decisions from discussions — Semantic search across projects, documentation, codebase — AI assistants for new participants: onboarding, ecosystem navigation

G-Plan: — Automatic activity verification: analyzing repository commits, discussion participation, completed task quality — for confirming activity when requesting UnitManager reward — Task complexity assessment: automatic preliminary effort estimation based on historical data — Optimal task distribution: matching participants and tasks based on competencies, availability, workload — Timeline forecasting: ML models for estimating implementation time based on project characteristics and historical data — Risk identification: early detection of problematic projects (activity slowdown, declining SIC involvement, AG conflicts)

MacroeconomicDAO: — Proposal analysis: automatic completeness, consistency, realism checking of proposals — Social relevance forecasting: ML models predicting $|SIC(p)|$ based on project characteristics — Economic effect simulation: modeling proposed decisions' impact on tokenomics, liquidity, ecosystem growth — Anomaly detection: identifying suspicious voting patterns (sybil attacks, coordinated manipulation) — Information aggregation for voters: automatic discussion summaries, pro/con argument visualization

GyberNet: — Network monitoring: anomaly detection in blockchain transactions — Consensus parameter optimization — Predictive load analytics

GyberComputer: — Optimal computational task distribution across nodes — Predictive resource scaling — Node performance monitoring

Circuit 2 — Research (AI science):

Organizing and conducting fundamental and applied AI research. Goal: advancing science and creating community intellectual potential.

Directions: — Distributed model training (federated learning, distributed training) — Private machine learning (differential privacy, homomorphic encryption for training on confidential data) — AI alignment and safety (open research, critically important for society) — Efficient architectures for edge devices (models running on participant devices, without cloud) — Multimodal models (text, images, audio, video, code) — AI for scientific discovery (drug discovery, materials science, climate modeling — through Economic DAO)

Organization: — Research groups form as SIC/AG in IPI model — Financing through Economic DAO or DUNA grants — Results published as open access (AGPL for code, CC-BY for papers) — Peer review within community and in international journals

Circuit 3 — Commercial (AI products):

Creating AI products and services for open market. Goal: generating revenue for ecosystem (Loop 2 — liquidity).

Model: — AI products developed through IPI (like any ecosystem project) — Products use models developed in Circuit 2 and Circuit 1 infrastructure — Market launch: through Commerce DAO — Tokenomics: internal project tokens → liquidity pool with Gbr → DEX — Client levels: external (fiat), special (Gbr), super clients (project tokens)

Examples of potential products: — AI platform as service (AIaaS) based on GyberComputer — Specialized models for verticals: medicine, finance, education, law — Automation tools for developers — AI analytics for blockchain projects — Private AI assistants (running on user device, without sending data to servers)

4.8.4. AiC Technical Stack

Programming languages: — Python: primary language for ML/AI (TensorFlow, PyTorch, Keras, Scikit-learn, OpenCV, Hugging Face Transformers, LangChain, JAX) — C++: high-performance components, inference engines (ONNX Runtime, TensorRT) — Rust: safe system components, WASM modules for edge inference, blockchain infrastructure integration — TypeScript: AI integrations in GSP, web interfaces for AI tools — Solidity: smart contracts for DAO governance of AI resources

Frameworks and libraries: — Training: PyTorch (primary), TensorFlow, JAX — Distributed training: DeepSpeed, Megatron-LM, Hivemind, PyTorch Distributed — Inference: vLLM, TGI, ONNX Runtime, llama.cpp, ExLlamaV2 — Computer Vision: OpenCV, Detectron2, Segment Anything — NLP: Hugging Face ecosystem, spaCy, NLTK — MLOps: MLflow, Weights & Biases, DVC — Privacy: PySyft, OpenDP, Microsoft SEAL (homomorphic encryption)

Blockchain integration: — Ethereum/BSC: DAO contracts for managing AI resources and models — TON: potential platform for AI micropayments (high throughput, low fees) — Solana: high-performance AI applications with on-chain components — IPFS/Filecoin: decentralized storage of training data and model weights

Licensing: — All AiC code: AGPL-3.0 (guarantees any modifications and derivative works remain open) — Trained models: open weights (license determined for each model by Code DAO voting) — Research publications: CC-BY-4.0 — Training data: open datasets or data collected with explicit participant consent (Axiom A3 — data sovereignty)

4.8.5. DAO Governance of AI Resources

One of AiC's fundamental innovations is managing AI models and resources through DAO mechanisms

Decisions made through DAO:

Code DAO: — Accepting architectural decisions (choosing base models, frameworks) — Merging pull requests into main AI code repositories — Approving code quality and documentation standards — Model licensing decisions

Social DAO: — Prioritizing research directions — Ethical questions: permissible and impermissible AI model applications — Data policy: what data used for training, how privacy ensured — Organizing AI conferences, hackathons, educational programs within community

Commerce DAO: — Approving AI products for commercial market launch — AI service pricing — Partnerships with external organizations

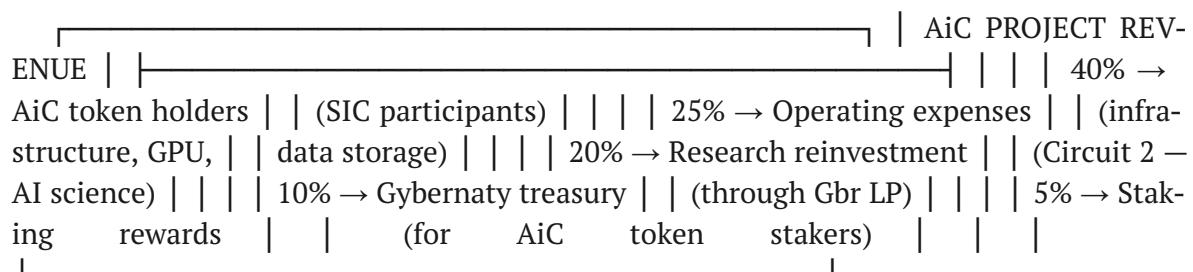
Economic DAO: — Financing large research programs (training large models, GPU acquisition, data collection) — Distributing GyberComputer computational resources among AiC tasks — AI infrastructure investments

4.8.6. AiC Economic Model

Financing sources:

1. Gybernaty internal budget — Allocation from DUNA treasury through Economic DAO voting — Targeted infrastructure financing (GPU clusters, data storage)
 2. Grants and partnerships — Decentralized grant programs (Ethereum Foundation, Protocol Labs, etc.) — Academic partnerships with research institutes — Corporate partnerships for applied AI solutions
 3. Commercial revenue (Circuit 3) — AIaaS (AI as a Service) based on GyberComputer — Specialized model licensing — Consulting and AI solution integration — Private AI assistants for enterprises
 4. AiC tokenomics — Issuing AiC internal token through IPI model (Section 3.4) — AiC/Gbr liquidity pool on DEX — Staking: 10 / [total AiC tokens] % of project revenue

Revenue distribution:



Key mechanism: all revenue flows through AiC/Gbr liquidity pool, which ensures direct link between AiC success and Gbr ecosystem value — implementing Loop 2 (liquidity) from project lifecycle model.

4.8.7. CyberSocial Significance of AiC

AiC represents application of cybersocial principles to technology that is likely the most significant innovation in AI governance.

AiC also provides a model for democratic AI system governance – a critically important need for the future of AI.

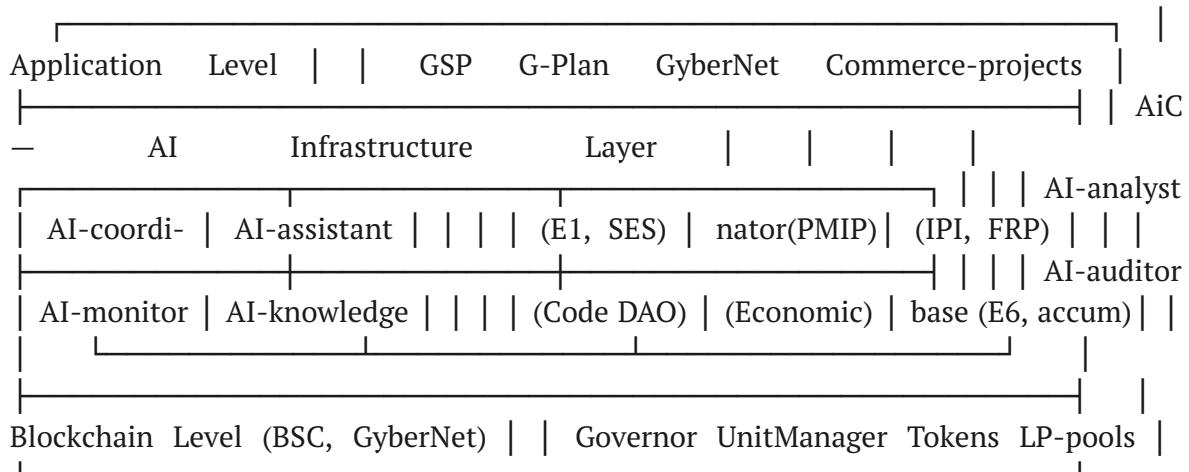
- **Research priority decisions** made through community voting, not corporate board
- **Training data** collected with explicit consent and under participant control (Axiom A3)
- **Trained models** available to all participants and licensed as open (AGPL for code, open for data)
- **Commercialization revenue** distributed among participants through transparent smart contracts
- **Ethical constraints** established democratically through Social DAO, ensuring public control

Thus AiC is not merely a technical project but an **institutional innovation** – a new mode of governance.

4.8.8. AiC as Ecosystem Infrastructure AI Layer

The three AiC circuits described above (Internal, Research, Commercial) have another fundamental dimension: their position in the ecosystem.

AiC Architectural Position in Ecosystem:



****AiC Connection to Theoretical Constructs:****

Theoretical Element	AiC Function	Result
--- --- ---		
Axiom A8 (Cognitive augmentation)	AiC – institutional A8 realization	Democratic AI aug...
PMIP: $C(p) \rightarrow \min$	AI coordinator reduces project costs	individual_cost($p \setminus AI$) < individual...
SES: project selection	AI SR predictor improves selection quality	Directed evolution ...
E1: collective intelligence	AI analyst compensates cognitive limits	Scaling without qual...
E2: antifragility	AI monitor ensures preventive adaptation	Active antifragility
E6: knowledge accumulation	AI knowledge base indexes all experience	Exponential knowledg...
FRP: fork resolution	AI mediator reduces Deliberation cost	FRP from expensive → routine

****Horizontality principle:**** each ecosystem element accesses AiC AI services through standard interfaces

****AI layer economic model:****

AiC infrastructure financing:

1. Basic AI services → financed from treasury (public good, available to all participants)
2. Advanced AI services → freemium model (basic access free, extended for Gbr)
3. Commercial AI products (Circuit 3) → revenue returns to ecosystem through distribution smart contracts

This creates self-sustaining cycle: AI layer strengthens ecosystem → ecosystem grows → more data and resources for AI → AI strengthens → ecosystem strengthens even more

Formally: positive feedback loop 7 (AI Flywheel): quality(AI) ↑ → productivity(CSC) ↑ → revenue(ecosystem) ↑ → investment(AiC) ↑ → quality(AI) ↑

Thus AiC closes the theoretical cycle: Axiom A8 defines AI augmentation ***principles***, theor

****Contract Addresses (Appendix B Reference):****

- ****CyberCommunityToken (Gbr):**** `0xa970cae9fa1d7cca913b7c19df45bf33d55384a9` (BSC)
- ****CybernatyUnitManager:**** [deployed on BSC, address in repository]
- ****Governor Contract:**** [to be deployed]
- ****Timelock Contract:**** [to be deployed]

****GitHub Repositories:****

- GSP: [repository URL]
- G-Plan: [repository URL]
- AiC models: [repository URL]
- Smart contracts: [repository URL]

*This translation preserves all technical specifications, smart contract addresses, tokenomics, and governance logic. It is intended for internal use by the CyberSocium Foundation and its partners. The original document is available at [https://cybersocium.org](#).

5. DAO Taxonomy: Four-Class Model of Decentralized Decision-Making

A distinguishing feature of CyberExperiment's governance architecture is the ****four-class DAO Taxonomy****.

5.1 Social DAO (Social DAOs)

5.1.1 Purpose

Social DAOs govern the ****internal social life of the community**** – decisions about community members' interactions and well-being.

5.1.2 Scope

Social DAO decisions include, but are not limited to:

- Organization of community events (conferences, hackathons, meetups, educational programs)
- Establishment and modification of community codes of conduct
- Decisions about community communication channels and platforms
- Membership and participation policies
- Recognition and rewards for contributions to community life
- Cultural and educational initiatives

5.1.3 Characteristics

- **Low economic stakes:** Social DAO decisions typically do not involve significant financial stakes.
- **Broad participation:** All community members can participate in Social DAO governance, regardless of their role or status.
- **Simple majority:** Most Social DAO decisions can be approved by simple majority vote, generally requiring a quorum.
- **High frequency:** Social decisions arise frequently in the community's daily life, requiring quick and iterative decision-making.

5.2 Code DAO (Code DAOs)

5.2.1 Purpose

Code DAOs govern the **community's technical infrastructure** – specifically, the DSP platform's codebase and infrastructure.

5.2.2 Scope

Code DAO decisions include:

- Merging proposed code changes (pull requests) into the main branch
- Approving new modules for inclusion in the standard node configuration
- Selecting technical standards and architectural patterns
- Evaluating and approving security-critical changes
- Managing deprecation and removal of obsolete components
- Resolving technical disputes between competing implementations

5.2.3 Characteristics

- **Technical competence requirement:** Voting in Code DAO may be weighted by technical reputation or expertise.
- **Review process:** Code DAO proposals typically include a mandatory technical review period.
- **Meritocratic governance:** While any community member can propose code changes, voting rights are often weighted by technical competence or contribution.
- **Awareness of irreversibility:** Code changes in production systems can have significant不可逆性.
- **Continuous AI security audit (from A8):** Every pull request affecting smart contracts undergoes automated security analysis.

AI Audit Pipeline (AiC implementation, Circuit 1):

Git Push → CI/CD (GitHub Actions) → AI scanning: | | Tools: | – Octane Security: CI/CD-native analysis, | exploitable vulnerability detection | – Sherlock AI: analysis during writing, | directed remediation | – AuditAgent (Nethermind): attack scenario | simulation based on real audits | — Critical vulnerability → | merge blocking + alert to ArchDev + Core | — Warning → | PR comment + mandatory review | — Clean → admission to Code DAO voting

Deployed contracts → continuous monitoring of anomalous transaction patterns → alerts to Gnosis Safe signers

AI audit does not replace human review but complements it: models detect patterns that humans might miss.

5.3 Commerce DAO (Commercial DAOs)

5.3.1 Purpose

Commerce DAOs implement the concept of **decentralized crowdinvesting** – allowing entrepreneurs to raise capital from a decentralized network of investors.

5.3.2 Scope

Commerce DAO decisions include:

- Evaluation and approval of proposed commercial projects
- Determination of internal token issuance and sale terms
- Determination of profit distribution schemes between implementers and investors
- Approval of partnerships and client agreements
- Project budget management and financial reporting
- Decisions about project continuation, modification, or termination based on results

5.3.3 Characteristics

- **Economic stakes:** Commerce DAO decisions involve significant financial resources and economic stakes.
- **Due diligence:** Commerce DAO proposals undergo a structured evaluation process including due diligence.
- **Investor protection:** Smart contracts governing Commerce DAO projects include mechanisms for investor protection.
- **Performance accountability:** Commercial projects are subject to regular performance reporting and accountability.

5.3.4 Relationship to IPI Model

Commerce DAOs are the governance layer for phases 3-5 of the project lifecycle (Accumulation, Investment, and Exit).

5.4 Economic DAO (Economic DAOs)

5.4.1 Purpose

Economic DAOs represent a **fundamentally new concept for organizing public financing, projects, and resource allocation**.

5.4.2 Distinction from Commerce DAO

While Commerce DAOs focus on individual commercial projects with defined profit models, Economic DAOs aim to manage the overall economic welfare and long-term sustainability of a community.

- Management of community treasury
- Resource allocation across multiple projects and initiatives
- Strategic investments in infrastructure, research, and capacity building
- Inter-community economic agreements and partnerships

- Gbr ecosystem monetary policy (e.g., decisions about staking parameters, liquidity provisions)
- Long-term economic planning and resource allocation

5.4.3 Characteristics

- **Highest economic stakes:** Economic DAO decisions affect the economic well-being and long-term sustainability of the ecosystem.
- **Qualified majority requirement:** Critical Economic DAO decisions may require qualified majorities to pass.
- **Extended discussion periods:** Economic DAO proposals undergo extended discussion periods to allow for thorough analysis.
- **Expert input:** Economic DAO governance may include advisory mechanisms – expert analyses and consultations.
- **Systemic risk management:** Economic DAOs are responsible for monitoring and managing systemic risks across the ecosystem.
- **AI Treasury Advisor (from A8):** Economic DAO uses an AI agent to inform economic decisions and provide real-time insights.

AI Treasury Advisor (AiC implementation, Circuit 1):

On-chain Analytics Agent: — Real-time economic flow monitoring: LP positions, trading volumes, TVL, token distribution, concentration — Visualization: integration with Dune Analytics

Risk Assessment: — Systemic risk evaluation: Risk(ecosystem) = f(concentration, liquidity, correlation, external_deps) — Early warning when approaching critical thresholds

Simulation Engine (cadCAD): — Modeling consequences of economic proposals before voting: "if burn 5% of treasury → impact on liquidity, Gbr price, TVL" — Monte Carlo simulation on GyberComputer

AI Treasury Advisor informs, does not decide: all analysis results are published as supplements to Economic DAO proposals, final decision rests with participants

5.4.4 MacroeconomicDAO as Meta-Governance

MacroeconomicDAO functions as the meta-governance layer, coordinating the activities of individual DAOs.

MacroeconomicDAO is not a centralized authority overriding individual DAO decisions. Rather, it facilitates communication and coordination.

AI-enhanced DAO governance (from A8). To counteract voter fatigue and cognitive overload:

- **AI proposal summarizer:** For each proposal, a structured summary is generated – essence, context, and key points.
- **Consequence simulator:** Before voting on economically significant proposals, modeling their likely outcomes and impacts.
- **AI discussion summarization:** Automatic discussion summary with main arguments from both sides.

5.5 DAO Interaction and Conflict Resolution

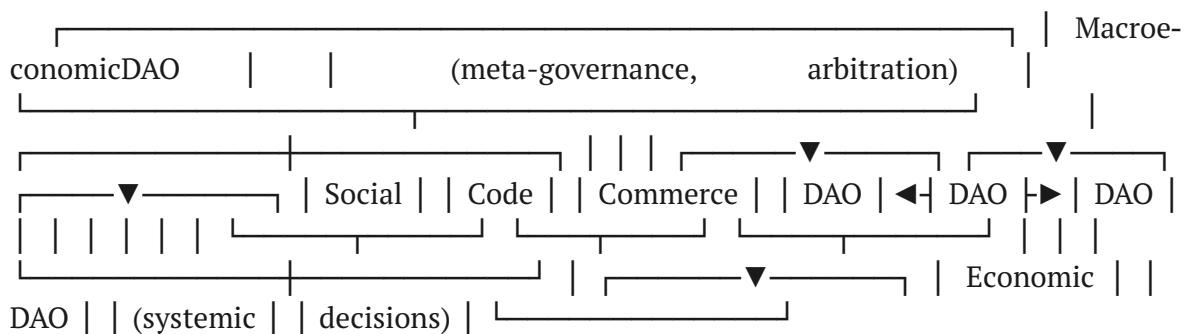
The four DAO classes are not isolated from each other. Decisions in one class often have consequences for others.

- A Code DAO decision to adopt a new technical architecture may have economic consequences.
- A Commerce DAO project may require social coordination (community engagement, marketing).
- An Economic DAO decision about resource allocation may affect Commerce DAO project priorities.

When inter-class conflicts arise, resolution follows a structured escalation process:

1. **Informal coordination:** Representatives of affected DAOs discuss the issue in common channels.
2. **Joint proposal:** If informal coordination produces a solution, it is formalized as a joint proposal.
3. **MacroeconomicDAO arbitration:** If informal coordination fails, the issue is escalated to the MacroeconomicDAO for arbitration.

Inter-class interaction model:



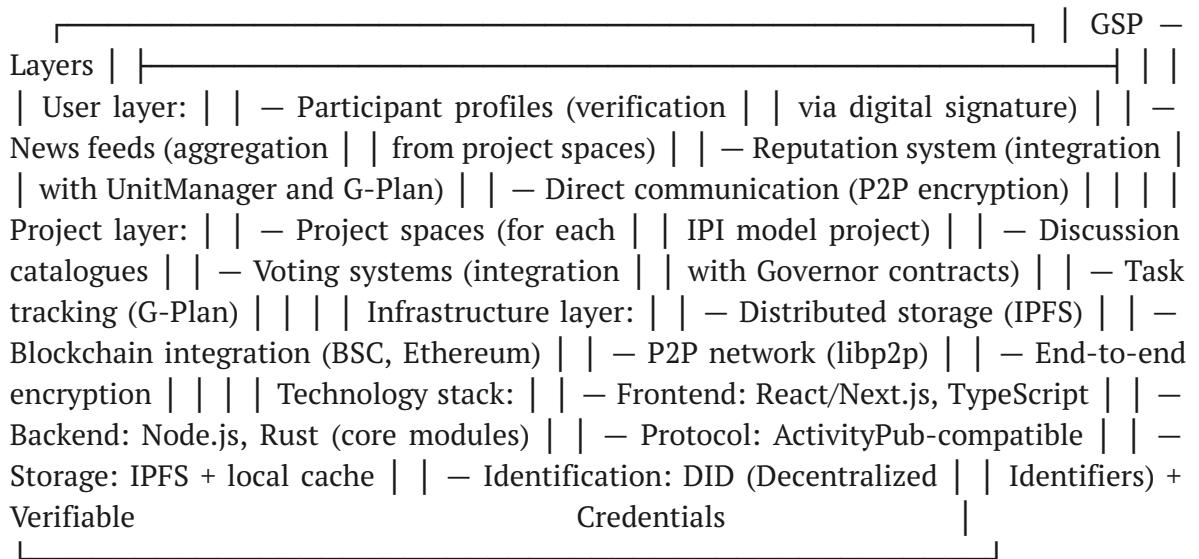
6. Applied Ecosystem: From Theory to Implementation

The theoretical constructs outlined in preceding sections find practical embodiment in concrete applications.

6.1 GSP – GyberSocial Platform (Decentralized Social Platform)

GSP is the ecosystem's central hub – a decentralized social platform providing infrastructure for various projects.

GSP Architecture:



AI personalization with data sovereignty (from A8, A3).

GSP implements intelligent content personalization without violating user data sovereignty.

Let $u \in U$ be a participant, $D(u)$ their local data (interaction history, preferences, subscriptions).

Personalization model $M(u)$ is trained exclusively on the user's device (on-device inference):

$$M(u) : D(u) \rightarrow R(u),$$

where $R(u)$ is personalized content ranking.

Confidentiality invariant: $\forall u \in U : D(u) \cap \text{Server_Storage} = \emptyset$

No ecosystem server stores or processes raw user data. On the server side, only aggregated, anonymized signals are used (federated aggregation):

$$M_{\text{global}} = \text{FedAvg}(\{\nabla M(u_1), \nabla M(u_2), \dots, \nabla M(u_n)\})$$

The global model improves through federated learning (Flower framework), where only gradients, not data, are transmitted from devices.

This fundamentally distinguishes GSP from Web2 platforms, where personalization is built on

GSP differs from traditional social platforms fundamentally: data belongs to users (Axiom A)

6.2 GyberNet – Decentralized Network

GyberNet represents dedicated blockchain infrastructure ensuring transparency and immutability

GyberNet Functions:

– Transaction registry: all ecosystem economic operations are recorded on-chain – Smart contract execution environment: Governor, Timelock, UnitManager – DNS-like system: decentralized name resolution for projects and participants – Cross-network interaction: bridges to BSC, Ethereum, TON, Solana – Validation: Proof-of-Stake with reputational weight (active participants receive validation priority)

Technology stack: – Consensus: modified BFT (Byzantine Fault Tolerant) – Virtual machine: EVM-compatible – Contract language: Solidity, Vyper – Network layer: libp2p – State storage: Merkle Patricia Trie

6.3 GyberComputer – Distributed Computing Network

GyberComputer is a distributed network of computing nodes provided by community participants

GyberComputer Architecture:

Participant nodes: – Provide computing resources (CPU, GPU, RAM, storage) – Receive Gbr rewards proportional to resources provided – Verification via Proof-of-Computation

Task scheduler: – Task distribution across nodes accounting for available resources – Prioritization based on DAO voting – Fault tolerance: duplication of critical computations

AiC integration: – Providing GPU power for model training (Circuit 1) – Distributed inference for AI services (Circuit 3) – Federated learning without raw data transmission

Technology stack: – Orchestration: Kubernetes + custom Rust scheduler – Communication: gRPC, Protocol Buffers – Containerization: Docker, WASM – Monitoring: Prometheus, Grafana

AI Compute Orchestrator (from A8): – Predictive Scheduling: ML model (Reinforcement Learning, PPO/SAC) predicts optimal task distribution across nodes accounting for latency, power, and availability – Anomaly Detection: early detection of node failures through metric analysis (Prophet/DeepAR) before computation loss – Auto-scaling: predictive scaling based on usage patterns – resource allocation before peak load – Proof-of-Computation Verification: AI verifies computation correctness, critical for federated learning (AiC)

6.4 G-Plan – Task Management and Activity Verification System

G-Plan is an integrated task management system that simultaneously serves as the activity verification system.

G-Plan Functions:

Task management: — Creating, assigning, tracking tasks within IPI model projects — Task hierarchy: epics → stories → tasks — Binding to project milestones — Cross-project dependencies

AI Task Orchestrator (from A8): — Decomposition: AI agent analyzes IPI model project specifications and proposes breakdown into tasks with complexity estimates and dependencies — Assignment: recommending executors based on competence profile, current load, and execution history — Predictive Analytics: forecasting completion dates, early warning of delay risks — Cross-project Dependency Resolver: identifying dependencies between tasks of different projects, order optimization — All AI Task Orchestrator recommendations are proposals: assignment approval rests with project leader

Activity verification: — Recording completed tasks on-chain — Task confirmation by participants with higher status — Generating activity reports for UnitManager — Wallet classification algorithm: active / inactive

Reputation system integration: — Task completion quality affects reputational weight — Reputation affects voting weight in Code DAO and Commerce DAO — Continuous verification: participant who stops activity loses right to rewards

AI task quality verification (from A8): — Automatic quality assessment of completed tasks before human confirmation: $Q(\text{task}) = \text{AI_Review}(\text{deliverable, spec, context})$ $Q \in [0, 1]$, where $Q < \theta_{\text{min}} \rightarrow$ return for revision, $Q \geq \theta_{\text{min}} \rightarrow$ forward for review to participant with higher status — AI does not replace human confirmation but serves as first filter: reduces reviewer load and ensures basic control (spec compliance, completeness, formatting) — Threshold θ_{min} determined by Code DAO voting

Sybil detection and farming protection (from A8): — Graph Neural Network analyzes wallet interaction graph, detecting clusters of coordinated/fake accounts: $\text{Sybil}(\text{wallet_cluster}) = \text{GNN}(\text{G_interactions})$ — Anomaly detection identifies atypical patterns: task wash trading, mass creation of identical tasks, suspicious confirmation chains — Proof of Personhood (ZK-cryptography): proof of "one person — one account" without revealing personal data (A3) — Sybil analysis results are advisory: final blocking decision made by Social DAO

6.5 LQD, SAPP, PowerSwapMeta, Contact – Auxiliary Ecosystem Projects

Beyond the main platform components, the GyberExperiment ecosystem includes several applied

****LQD (Liquidity Deployer):****

- Automated deployment of liquidity pools for project tokens
- Integration with major DEXs (PancakeSwap, Uniswap)
- Customizable parameters: initial price, liquidity depth, LP-lock strategy
- LP Burn mechanism for initiating Accumulation phase (burning 0.1% of budget in Gbr)

****SAPP (Social Application Protocol Platform):****

- Protocol for creating decentralized social applications on top of GSP
- Developer SDK: API, widgets, templates
- Application marketplace managed by Commerce DAO
- Monetization through internal application tokens

****PowerSwapMeta:****

- DEX aggregator optimizing ecosystem token swaps
- Meta-transactions: users don't pay gas directly
- Integration with multiple blockchains (BSC, Ethereum, Polygon)
- Automatic routing through pools with best liquidity

****Contact:****

- Decentralized contact and identity management system
- Integration with DID (Decentralized Identifiers)
- Portable identity: one profile for all ecosystem projects
- Privacy: zero-knowledge proofs for verification without data disclosure

6.6 Portfolio Validation and Ecosystem Integration

All applied ecosystem components are connected by a unified economic circuit:

Ecosystem economic circuit:

```

Participant | ┤► G-Plan: completes tasks → activity verified | | | ┤► UnitManager: receives Gbr rewards | | | ┤► Gbr token: used for | | | ┤► Voting in DAO | ┤► Staking (passive income) | ┤► Project investments (Commerce DAO) | ┤► Service access (GyberComputer, AiC) | ┤► GSP: participates in social life | | | ┤► Reputation: grows with activity → increases | voting weight in DAO | ┤► IPI projects: invests / works | ┤► Project tokens → LP with Gbr → DEX | ┤► Revenue → distribution via smart contracts
  
```

This integration ensures implementation of all eight axioms:

Axiom	Implementation in ecosystem
--- ---	
A1 (Decentralization)	P2P GSP architecture, distributed GyberComputer, multisig management
A2 (Transparency)	On-chain transactions in GyberNet, open code (AGPL-3.0)
A3 (Data sovereignty)	DID identification, IPFS storage, E2E encryption
A4 (Expandability)	Modular architecture, SAPP protocol, open APIs
A5 (Meritocratic fairness)	UnitManager, G-Plan verification, reputation system
A6 (Inclusivity)	PMIP (minimal participation threshold), multilingual, cross-chain
A7 (Self-governance)	Four-class DAO taxonomy, Governor contracts
A8 (Cognitive augmentation)	AiC (three circuits), federated learning, AI audit, AI summarization

End of Sections 5 & 6 Translation

Translation of CyberSocium Foundation document

Original version: Russian, 2025

Translation: English, 2026

CyberSocium Foundation: Sections 7-12 (English Translation)

7. Comparative Analysis and Related Works

Cyber-social economics and GyberExperiment do not exist in a vacuum. A number of projects are

7.1 Theoretical Frameworks

Framework	Connection to CyberSocium	Difference
--- --- ---		
Commons-based peer production (Benkler, 2006)	Shared model of non-hierarchical production	
Institutional economics (Ostrom, 1990)	Principles of self-governance of common resources	
Platform cooperativism (Scholz, 2016)	Democratic ownership of platforms CyberSocium goes beyond	
Cryptoeconomics (Buterin, 2014)	Economic incentives in blockchain systems CyberSocium integrates	
Token engineering (Voshmgir, 2020)	Design of token ecosystems CyberSocium integrates	

7.2 Practical Projects

Project	Similarity	Difference from GyberExperiment
--- --- ---		
MakerDAO	DAO governance, economic mechanisms	Focus on a single financial product (DAI)
Aragon	Infrastructure for creating DAOs	Provides tools but does not define a socio-economic model

Gitcoin Funding public goods Limited to grants, does not implement full project life cycle
Colony Decentralized organization management Focus on organizational structure without economic incentives
DAOstack Framework for scalable governance Technical infrastructure without economic incentives

7.3 Unique Contribution of GyberExperiment

GyberExperiment differs from the listed projects on several key parameters:

1. **Completeness:** Not a tool or protocol, but a holistic socio-economic system with theoretical foundations.
2. **Formalization:** Introduction of PMIP, SES, FRP, IPI-model as formalized mechanisms, not just concepts.
3. **Four-class DAO taxonomy:** None of the existing projects offers a structured classification of DAOs.
4. **Legal integration:** Use of DUNA (Wyoming) as a legal wrapper providing legal legitimacy and protection.
5. **AI integration:** AiC as an institutional model for democratic governance of AI development.

8. Discussion: Implications, Limitations, and Open Questions

8.1 Theoretical Implications

The model of cyber-social economics presented in this document has several important theoretical implications:

For economic theory: CyberSocium proposes a model of economic organization in which value creation is decentralized and distributed.

For organization theory: The four-class DAO taxonomy proposes a new approach to structuring organizations based on their primary function and governance principles.

For game theory: The SES (socio-economic selection) model proposes an evolutionary mechanism for the emergence and evolution of social norms and behaviors.

8.2 Practical Implications

For blockchain industry: GyberExperiment demonstrates that DAOs can go beyond governance and become the primary mode of organization for decentralized systems.

For policy and regulation: Use of DUNA as a legal wrapper offers a model for regulatory compliance that is more flexible and less centralized than traditional corporate structures.

For AI industry: AiC proposes an alternative model for organizing AI development, based on democratic governance and AI mitigation.

8.3 Limitations and Challenges

We acknowledge the following limitations and challenges. For each limitation, the degree of severity is indicated by the level of the challenge:

1. **Governance scaling problem:** As the community grows, the number of proposals and votes increases exponentially.
 - > **AI mitigation (substantial).** AI Analyst (5.6) generates personalized summaries of proposals to reduce the volume of information.
2. **Bootstrap problem:** The PMIP model is most effective with large |SIC|, but initial problems arise with small |SIC|.
 - > **AI mitigation (moderate).** AI agents compensate for small |SIC| in early stages by prioritizing high-priority proposals.

3. **Regulatory uncertainty:** Despite DUNA as a legal wrapper, the regulatory landscape for AI remains uncertain.
4. **Technical risks:** Dependence on smart contracts introduces risks of software errors which can be mitigated through AI mitigation (substantial). AI Code Reviewer (5.6.2) provides multi-level automation for code review.
5. **Plutocracy problem:** Despite mechanisms for activity verification and reputation weighting, there is a risk of AI agents becoming dominant.
6. **AI dependency risks (new limitation):** Deep AI integration (Axiom A8) introduces its own set of dependencies and potential points of failure.
7. **AI decision verification problem (new limitation):** When an AI agent acts in the "AI on behalf of user" mode, it's challenging to verify the correctness of the AI's decisions.
8. **Key-person risk (bootstrap phase limitation):** The current phase of the experiment is heavily dependent on the actions of a few key individuals.

8.4 Threat Model and Security Analysis

Systematic analysis of attack vectors and their mitigation mechanisms is a necessary condition for the long-term stability of the system.

Attack Vector	Description	Mitigation	Status
--- --- --- ---			
Flash loan attack on governance	Attacker takes flash loan, acquires Gbr, votes for malicious proposals.	Implement strict governance rules and limit the amount of Gbr available for flash loans.	Mitigated
Governance capture	Purchase of significant Gbr volume on open market to gain voting control.	Monitor Gbr market and implement rules to prevent large-scale purchases.	Mitigated
Sybil attacks on G-Plan	Creation of multiple fake accounts to receive UnitManager rewards.	Implement account linking and monitoring.	Mitigated
Smart contract vulnerabilities	Exploitation of smart contract vulnerabilities (reentrancy, logic bugs).	Regularly audit smart contracts and use secure coding practices.	Mitigated
Social engineering on Gnosis Safe signers	Compromise of signer keys through phishing, bribery.	Implement two-factor authentication and monitor for suspicious activity.	Mitigated
Death spiral (Gbr)	Gbr price drop reduces reward value, causing participant exodus, potentially leading to governance capture.	Monitor Gbr price and reward values.	Monitoring

8.5 Open Research Questions

1. **Formal verification of macroeconomic properties:** Is it possible to formally prove the stability and efficiency of the system under various economic scenarios?
2. **Optimal DAO parameters:** What should be the optimal parameters for quorum, voting period, and proposal threshold?
3. **Cross-system interaction:** How can cyber-social corporations interact with each other and external systems?
4. **Long-term evolution:** How will the system evolve over decades? What emergent properties can we expect?
5. **AI and governance:** How does integration of AI systems into governance processes (AI on behalf of user) affect the system's stability and accountability?

9. Roadmap: From Experiment to Ecosystem

9.1 Phase I: Foundation (2024-2025)

Priorities: — DUNA registration (Wyoming) — Governor + Timelock + Gnosis Safe deployment — GSP launch (MVP): profiles, project spaces, basic communication — UnitManager v1: reward accrual for first participants — G-Plan v1: basic task management — Community core formation: Core, ArchDev, LeadDev participants — Publication of this document as foundational white paper — Gbr token launch on BSC

Success Metrics: — ≥50 active participants — ≥5 projects in Discussion/Formation stage — DUNA registered and operational — GSP functioning and used by community

9.2 Phase II: Growth (2025–2026)

Priorities: — GSP v2: full-featured platform with IPFS storage and E2E encryption — GyberNet testnet: test network with basic consensus — First Commerce DAO projects: LQD, SAPP, PowerSwapMeta — AiC: formation of research groups, infrastructure work begins (Circuit 1) — Reputation system v1: integration G-Plan + UnitManager + DAO voting — First public token sale — International community expansion

Success Metrics: — ≥500 active participants — ≥20 projects at various stages — ≥3 projects generating revenue — GyberNet testnet functioning stably

9.3 Phase III: Scaling (2026–2028)

Priorities: — GyberNet mainnet: full network with cross-chain bridges — GyberComputer v1: distributed computing network — AiC: first trained models, AI services launch (Circuit 3) — Cross-chain integration: BSC, Ethereum, TON, Solana — Liquid democracy: vote delegation in four-class DAO structure — Formalization of inter-community protocols: interaction with other DAO ecosystems — Storage decentralization: full transition to IPFS/Filecoin

Success Metrics: — ≥5,000 active participants — ≥100 projects at various stages — GyberComputer: ≥100 nodes — AiC: ≥3 AI models in production

9.4 Phase IV: Maturity (2028+)

Priorities: — Full autonomy: all critical functions managed by smart contracts and DAO voting — Inter-community economy: protocols for interaction between cyber-social corporations — AI governance: full implementation of A8 — AI agents for all four DAO classes, AI orchestration of GyberComputer, AI predictor SR for SES, AI coordinator for PMIP — Full implementation of eight axioms (A1–A8) at global ecosystem scale — Influence on regulatory frameworks: promotion of DUNA-like laws in other jurisdictions — Academic recognition: publication of results in peer-reviewed journals

Vision: MacroeconomicDAO demonstrates that a decentralized, self-governed, transparent economic community is capable not only of competing with traditional economic institutions, but of surpassing them in efficiency, fairness, and sustainability.

10. Conclusion

This document has presented the theoretical foundations and architecture of cyber-social ec...

We have shown that:

1. **The problem exists and is systemic:** Concentration of economic power, data appropriation, and surveillance.
2. **A decentralized alternative is formalizable:** Through concepts of cyber-social corporations and DAOs.
3. **Governance can be both decentralized and efficient:** The four-class DAO taxonomy (Social, Economic, Technical, Governance).
4. **Practical implementation is possible:** GyberExperiment, its applied ecosystem (GSP, Governance System Platform).
5. **AI is a condition for realizing the full potential of CyberSocium:** Axiom A8 (Cognitive AI).
6. **The mathematical consequence of PMIP – "Millions are Billions"** – is not a utopian slogan but a fundamental principle of the system.

CyberSocium is not a ready solution. It is an experimental platform, research program, and v...

> *"The exclusive purpose and possibility of society is the most effective unification of i...

This principle is not an ideal to be achieved in the future. It is an engineering specification...

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12. Appendices

Appendix A. Glossary

Term	Definition
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CyberSocium A new interdisciplinary field studying the patterns of transition of society to a post-industrial era	
Cyber-Social Corporation (CSC) A decentralized, autonomous, self-governed economic organization	
MacroeconomicDAO Meta-governance level coordinating four DAO classes and executing social projects	
PMIP Principle of Minimum Individual Participation – mechanism for distributing project rewards	
SES Socio-Economic Selection – evolutionary mechanism for project selection through competition	
IPI Idea-Project-Realization model – formalized project lifecycle in a cyber-social ecosystem	
FRP Conflict Resolution Protocol – formalized mechanism for resolving disagreements between participants	
SIC Social Investment Circle – set of participants interested in realizing a specific project	
AG Active Group – subset of SIC directly participating in project realization	
Gbr GyberCommunityToken – main economic instrument of the ecosystem (BEP-20, BSC)	
UnitManager Smart contract on BSC managing reward distribution by status levels	
G-Plan Task management and participant activity verification system	
GSP GyberSocial Platform – decentralized social platform of the ecosystem	
GyberNet Dedicated blockchain infrastructure of the ecosystem	
GyberComputer Distributed computing network provided by participants	
AiC Artificial Intelligence Community – AI department within Gybernaty	
DUNA Decentralized Unincorporated Nonprofit Association – legal wrapper in Wyoming	
DSP Decentralized project space (Digital Social Product)	
LP Burn Liquidity pool burning mechanism to initiate Accumulation phase	

Appendix B. Smart Contract Addresses

Network: Binance Smart Chain (BSC)

Gbr Token (BEP-20): 0xa970cae9fa1d7cca913b7c19df45bf33d55384a9

UnitManager: [address will be published after v2 deployment]

Governor: [address will be published after deployment]

Timelock: [address will be published after deployment]

Gnosis Safe (Treasury): [address will be published after deployment]

Status: Contracts are in active development. All addresses will be verified and published on BSCScan with open source code.

Appendix C. Eight Axioms of CyberSocium – Summary

A1 — DECENTRALIZATION No single node, agent, or group can exercise control over the system as a whole. Implementation: P2P architecture, multisig, distributed storage.

A2 — TRANSPARENCY All economic transactions and governance decisions are recorded on blockchain and available for verification by any participant. Implementation: on-chain governance, AGPL-3.0.

A3 — DATA SOVEREIGNTY The user is the sole owner of all rights to generated content, metadata, and any other types of data. Implementation: DID, IPFS, E2E encryption, zero-knowledge proofs.

A4 — EXTENSIBILITY The system is designed for expansion without central authority permission. Implementation: modular architecture, SAPP, open APIs, permissionless participation.

A5 — MERITOCRATIC FAIRNESS Reward is proportional to verified contribution, not capital, status, or connections. Implementation: UnitManager, G-Plan, reputation system, verification of activity.

A6 — INCLUSIVITY Entry threshold is minimized to ensure maximum broad participation. Implementation: PMIP, multilingualism, cross-chain compatibility, free basic access.

A7 — SELF-GOVERNANCE All system rules are established and modified by participants themselves through formalized voting mechanisms. Implementation: four-class DAO taxonomy, Governor contracts, Timelock.

A8 — COGNITIVE AUGMENTATION The system uses artificial intelligence as a tool for amplifying participants' collective cognitive capabilities, while preserving human control over strategic decisions. Implementation: AiC (three circuits), federated learning, AI audit, AI summarization, human-in-the-loop for all critical decisions. ^``

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