# The Oldest Law of Power: Technology, Human Hierarchy, and the Architecture of the Emerging Global Order

**Abstract**

Technology has always been the primary driver of hierarchy within human societies. From the earliest stone tools to modern artificial intelligence systems, the capacity to create and wield technical innovations has consistently determined which groups ascend and which decline. Although contemporary discourse often frames technological disruption as a novel phenomenon, the historical record shows that human civilization has always been technologically determined. The twenty-first century magnifies this pattern: modern systems—artificial intelligence, advanced computation, semiconductor fabrication, autonomous platforms—require engineering capacities beyond the abilities of individuals or nations with limited STEM ecosystems.

This monograph examines the deep anthropological roots of technological hierarchy, analyzes the modern imbalance of engineering talent among global blocs, explores the structural implications of platform ecosystems such as TikTok, Douyin, CapCut, and Jianying, and outlines the emerging three-tier world order shaped by engineering density rather than ideology or traditional geopolitics. Technology is not merely an industry; it is the fundamental mechanism of human power. The analysis concludes by proposing a framework for understanding technological sovereignty as a function of engineering mass, educational pipelines, and institutional capacity, and suggests directions for future research into the political economy of technological systems.

## 1 Introduction

Human beings are often portrayed as symbolic animals, defined by language, ritual, myth, and institutions. From an evolutionary and materialist perspective, however, humans are distinguished most sharply by their ability to externalize cognition into tools. This capacity, which began with the shaping of stone and the control of fire, laid the foundation for every

subsequent rise in human complexity. Technology did not emerge as a cultural accessory; it defined the human niche. Once humans began altering their environment through engineered artifacts, the trajectory of the species diverged sharply from all other primates [9, 5].

In modern discourse, technology is frequently treated as a domain separate from politics, economics, or culture. This separation is artificial. Technology shapes economic productivity, military capacity, cultural forms, demographic patterns, and even psychological dispositions. Every major civilizational transformation—agricultural settlement, urbanization, writing, metallurgy, industrialization, electrification, digitization—has been technologically driven [4, 3]. Yet societies systematically underestimate this force. They attribute success to moral virtue, divine favor, political genius, or national character, while the structural role of engineering remains under-analyzed.

This monograph advances three main claims. First, technology is not a new source of disruption; it is the oldest law of human hierarchy. Second, what is new in the twenty-first century is the scale at which this principle now operates and the degree to which engineering has become the central limiting factor in national power. Third, as technological systems become more complex, nations with large, coordinated pools of STEM talent gain advantages that cannot be compensated for by ideology, wealth, or military ambition alone. The global order is thus reorganizing into three tiers, defined not by alliances or ideology but by engineering density.

To make this argument, the monograph proceeds in several steps. Section 2 examines the anthropological and evolutionary origins of technological hierarchy. Section 3 discusses why societies consistently misinterpret the true sources of their power and undercredit technology. Section 4 explores the modern crisis of complexity and the collapse of the "individual genius" model as a sufficient explanation of technological change. Section 5 analyzes the global imbalance of STEM pipelines, focusing on demographic and institutional patterns. Section 6 examines the ecosystem dynamics of ByteDance platforms as exemplars of technological sovereignty, paying particular attention to TikTok, Douyin, CapCut, and Jianying. Section 7 outlines the emerging global stratification into three technological tiers. Section 8 considers policy and research implications. The conclusion reflects on technology as the enduring substrate of human hierarchy and sketches a research agenda for the political economy of technological systems.

# 2 Technology as an Evolutionary and Anthropological Foundation

The place of technology in human evolution is well established. Homo habilis, Homo erectus, and Neanderthals each used tools, but only *Homo sapiens* turned tool-making into a scalable, transmissible cultural system. Archaeological evidence suggests that technological sophistication, rather than purely genetic superiority, played a decisive role in the demographic expansion of sapiens across Eurasia [9, 5]. The introduction of blade technologies, composite tools, and projectile weapons gave humans the ability to hunt larger prey, defend territory, and compete against rival hominin species.

Several principles follow from this early technological edge. First, technology amplifies energy conversion. Fire made food more digestible and safer, freeing metabolic resources for brain expansion and enabling new social time at night [16]. Second, technology extends sensory and motor capacities: spears extended reach; clothing extended habitable zones; containers extended storage and mobility of resources. Third, technology reorganizes social structures. Tools required teaching, imitation, and coordinated labor, which fostered more complex social organization and cultural transmission. Finally, technology accumulates. Unlike genetic traits, tools and techniques compound across generations, a process described as cumulative cultural evolution.

**Figure 1. Technology as Human Niche Construction.**
A conceptual diagram would show concentric layers: at the core, energy capture and tools (fire, stone, metallurgy); around it, social organization (kinship, labor division, political hierarchy); outside that, symbolic systems and narratives (religion, ideology, law). The figure emphasizes that tools and techniques form the innermost layer upon which institutions and stories are built.

Figure 1: Conceptual structure of technology as the innermost layer of human adaptation.

Figure 1 summarizes this relationship schematically. Technology is the innermost layer of human adaptation. Social institutions, legal frameworks, and cultural narratives arise on top of that layer. When tools change, everything outward must eventually adjust.

From the perspective of human competition, the implication is clear: groups with superior tools consistently outperform groups with inferior ones. This is not merely a theory of greed or aggression. It is a structural observation borne out across hundreds of thousands of years of archaeological and anthropological evidence.

### 2.1 From Tools to Techniques to Institutions

As tool repertoires expanded, they became increasingly embedded in institutional forms. Agricultural technologies—plows, irrigation systems, storage facilities—required collective management. Metallurgical expertise demanded training, secrecy, and specialized craft guilds. Over time, technological proficiency became inseparable from institutional complexity [11].

Anthropologists and historians of technology have repeatedly shown that technical innovation is both constrained and enabled by institutional structures. Yet the causal arrow also runs in the opposite direction: once a society adopts a new technological regime, its institutions must adapt or be replaced. This mutual shaping of technology and institutions is central to understanding why some societies achieve prolonged periods of dominance while others stagnate or collapse [3].

### 2.2 Technology and the Elimination of Ecological Constraints

Technology can be understood as a process of systematically removing or softening ecological constraints. Hunting technologies reduce dependence on proximity to prey. Agricultural tools reduce dependence on seasonal abundance. Energy technologies reduce dependence on geographic sources of fuel. Information technologies reduce dependence on physical co-presence and slow communication.

Each wave of technological innovation thus offers a new way of decoupling human life from the immediate environment, but only for those groups able to deploy the relevant tools. This decoupling is uneven, which is why technology consistently generates hierarchy and not merely general uplift.

## 3 Why Technology Rarely Receives Historical Credit

Despite its decisive role, technology consistently fades from public narratives of power. Ancient societies attributed success to the gods; medieval societies credited kings and prophets; modern political narratives emphasize ideology, constitution, or culture. Technological determinism is often dismissed as reductionist. Yet historical patterns show a close correlation between technical capacity and civilizational ascendancy [4, 12, 1].

Table 1 offers a stylized summary of major technological transitions and associated civilizational shifts.

Several reasons explain why technology rarely receives the central credit it deserves.

First, human self-image prefers moral explanations. Societies favor stories that elevate virtue, courage, or destiny over mechanical advantage. Rome preferred myths of Roman

Table 1: Selected technological transitions and associated civilizational patterns.

| **Transition** | **Key Technologies** | **Representative Civilizational Effects** |
|---|---|---|
| Early agrarian | Domestication of plants and animals; basic irrigation; storage | Emergence of settled communities; surplus production; stratification; city-states in Mesopotamia and the Nile Valley |
| Classical empires | Ironworking; road-building; siege engines; coinage | Large-scale empires (e.g., Rome, Han China); standardized administration; long-distance trade; standing armies |
| Early modern | Oceanic navigation; gunpowder weapons; printing; scientific mathematics | European global expansion; colonial empires; Reformation; scientific revolution |
| Industrial | Steam engine; mechanized textiles; railways; electricity | Urbanization; mass production; new social classes; imperial competition; global trade integration |
| Digital | Semiconductors; networking; software; AI; platforms | Global information networks; financialization; platform capitalism; data-driven governance; algorithmic media |

discipline and civic virtue over analyses of Roman metallurgy and logistics. Confucian bureaucrats in imperial China emphasized moral order over the role of technologies like paper, printing, and gunpowder.

Second, technological systems are invisible in daily life. Aqueducts, roads, steam engines, fiber-optic cables, and recommendation algorithms recede into the background as infrastructure. Their importance becomes clear primarily when they fail. The everyday experience of citizens is mediated by institutions and narratives, not by direct engagement with technical systems.

Third, political elites benefit from the illusion of agency. Attributing success to leaders or foundational texts reinforces political legitimacy. Acknowledging engineering as the true backbone would shift prestige from rulers toward technologists and anonymous laborers. This would undermine narrative control, and so it is rarely encouraged.

Finally, technological evolution is cumulative and collective. It is difficult to attach heroic narratives to systems created by thousands of unnamed workers and incremental improvements. Even when individual inventors are celebrated, they often represent the visible tip of a much larger collaborative iceberg [6].

For these reasons, societies consistently distort the drivers of their own success. Yet

when viewed through a materialist and evolutionary lens, the pattern becomes unmistakable: technology is the substrate of civilization, and all higher cultural forms sit upon it [3, 14].

# 4 Complexity in the Modern Era: The End of the Lone Genius

A major difference between ancient and modern technological regimes is the scale of complexity. In earlier eras, individual inventors—Archimedes, Gutenberg, Faraday, Tesla, Turing—could reshape technological landscapes via discrete breakthroughs. Today, no single individual can comprehend, let alone construct, a modern AI model, semiconductor fabrication facility, or national cloud infrastructure.

These systems require:

- distributed teams of thousands of engineers and technicians,
- multi-layered version control and software tooling,
- globalized supply chains for rare materials and components,
- iterative deployment pipelines with continuous integration and delivery,
- algorithmic tuning at scale based on real-time data,
- massive data management and storage,
- and unprecedented levels of operational coordination.

The myth of the lone genius collapses under these conditions. Even the most brilliant modern engineer cannot single-handedly build an autonomous vehicle stack or a state-of-the-art language model. Instead, power now belongs to institutions and nations with sufficient engineering depth to sustain these systems over time [13, 15].


Figure 2: Conceptual chain from population to geopolitical power via engineering capacity.

Figure 2 illustrates the causal chain linking population, education, engineering mass, system-building capacity, and geopolitical power. The bottleneck of the twenty-first century is not ingenuity but human resources. The value of STEM labor has risen far faster than

the supply. Firms at the frontier of AI, semiconductor design, and platform infrastructure compete for engineers capable of managing large-scale distributed systems, machine learning pipelines, and algorithmic architectures. Salaries reaching into the hundreds of thousands of dollars for senior engineers signal an economy where engineering scarcity now dictates strategic possibility [2].

## 4.1 Division of Cognitive Labor in High-Complexity Systems

The internal structure of technological organizations has evolved to reflect this complexity. Modern AI and platform companies exhibit a fine-grained division of cognitive labor. Table 2 offers an illustrative breakdown.

Table 2: Illustrative division of cognitive labor in a large-scale AI/platform organization.

| **Role Type** | **Primary Responsibilities** |
|---|---|
| Research scientists | Develop new architectures, algorithms, and theoretical insights; publish cutting-edge work; prototype models |
| ML engineers | Implement, train, and fine-tune models; manage data pipelines; optimize training procedures and hyperparameters |
| Data engineers | Design and maintain data storage, processing, and access systems; ensure data quality, labeling, and governance |
| Infrastructure engineers | Build and maintain underlying compute, networking, and storage systems; ensure reliability and scalability |
| Product engineers | Integrate models into user-facing products; design APIs; balance performance, usability, and security |
| Trust and safety teams | Design and implement content moderation rules; develop detection models; evaluate social and political impacts |
| Operations and SRE | Monitor system performance; handle incidents; ensure uptime and adherence to service-level objectives |

This division of labor underscores that modern technology is the emergent outcome of coordinated activity by many specialists. No single person embodies all necessary skills. Nations lacking large numbers of such specialists are structurally constrained in their ability to build and maintain advanced systems.

# 5 The Global STEM Imbalance: Demographic and Educational Realities

The distribution of STEM talent across countries is highly asymmetric. China produces more STEM graduates each year than the United States, Europe, Japan, and South Korea combined [10]. India produces the second-largest cohort, with increasing quality in AI, cloud operations, and computer science. The United States produces world-class researchers but insufficient numbers to sustain its infrastructure without immigration. Europe lags in both scale and urgency.

## 5.1 China: Engineering as National Strategy

China's leadership has explicitly framed science and technology as central to national rejuvenation. State documents highlight the importance of "indigenous innovation" and "self-reliance" in core technologies. Investments in universities, research institutes, and industrial parks reflect a deliberate attempt to build an engineering-intensive society. The result is a massive and expanding STEM workforce with capabilities in hardware manufacturing, telecommunications, AI, and platform ecosystems.

## 5.2 India: Rising Talent in a Constrained Infrastructure

India's demographic profile and educational sector have produced large numbers of engineers, particularly in software and IT services. Indian engineers play critical roles in global technology firms. However, domestic infrastructure constraints and institutional fragmentation have limited India's ability to build indigenous platforms at the scale of China's ecosystems. Nonetheless, as connectivity, capital, and policy environments evolve, India possesses the raw human capital necessary to become a system-building power.

## 5.3 The United States: High Talent Density, Low Talent Volume

The United States remains a global leader in research, with institutions like MIT, Stanford, and Berkeley driving foundational advances. It also hosts the headquarters of major platform companies (Google, Meta, Amazon, Microsoft). However, the domestic pipeline of STEM graduates is insufficient for the scale of ambition, particularly in AI, semiconductor design, and national infrastructure. This shortfall is partially offset by immigration, as highly skilled engineers from China, India, and other countries staff American firms. Policies that restrict

immigration therefore have direct and negative impacts on U.S. technological competitiveness [8].

## 5.4 Europe and the Rest of the World

European countries maintain strong engineering traditions in specific domains (e.g., German manufacturing, Nordic telecommunications), but lack the demographic scale and risk-tolerant capital ecosystem that characterize the U.S. and China. Many other countries are primarily technology importers, relying on external platforms, hardware, and expertise. Their ability to shape technological standards is limited.

Table 3 presents a stylized comparison of STEM capacity.

Table 3: Stylized comparison of STEM capacity in selected regions.

| **Region** | **STEM Graduate Volume (Qualitative)** | **System-Building Capacity** | **Trajectory** |
|---|---|---|---|
| China | Very high; sustained national priority | High; large-scale platforms, infrastructure, manufacturing | Strengthening; state-backed initiatives in AI and chips |
| India | High; uneven but growing | Moderate; strong in software/services; emerging in platforms | Rising; demographic expansion and startup ecosystem |
| United States | Moderate; high quality, low volume | High in research and platforms, but reliant on immigration | Vulnerable; talent constraints and policy uncertainty |
| European Union | Low to moderate; fragmented and aging | Moderate; strong in specific industries, weaker in platforms | Stagnant; demographic aging and regulatory focus |
| Rest of World | Variable, generally low | Limited; mostly technology importers | Mixed; dependent on external systems and standards |

Figure 3 schematically represents this hierarchy as a pyramid.

Engineering density thus becomes a central determinant of sovereignty. Without the ability to build, maintain, and adapt technological systems, political independence becomes nominal rather than substantive.

**Top Tier:** System-Builders (China, potentially India, United States with sufficient talent)

**Middle Tier:** System-Consumers (most of Europe; advanced Asia outside China)

**Bottom Tier:** System-Dependents (countries unable to build or robustly adopt advanced systems)

Figure 3: Schematic pyramid of technological tiers based on engineering capacity.

# 6 Platforms as Ecosystems: The ByteDance Model

Technology companies are no longer mere firms; they are infrastructural organisms that blend media, commerce, payments, logistics, and data into integrated ecosystems. ByteDance exemplifies this transformation. Its platforms—TikTok globally and Douyin within China—function as micro-economies with their own recommendation systems, creator tools, commercial marketplaces, payment channels, editing suites, and algorithmic governance.

## 6.1 Douyin: An Integrated Digital Economy

Douyin, the domestic Chinese counterpart of TikTok, is not simply a social app. It is a comprehensive economic interface: users discover products, order food, book services, attend live commerce events, participate in micro-education, and interact with local businesses, all inside a single environment. The system integrates content, commerce, logistics, and payments with advanced recommendation algorithms. Such integration is only possible with sustained engineering effort at significant scale.

Douyin is also deeply integrated with China's broader "platform ecosystem" that includes services from Tencent, Alibaba, and other major players. The interoperability of payments, logistics, and identity systems enables seamless flows between entertainment, retail, and financial activities.

## 6.2 TikTok Under U.S.-Aligned Ownership

Outside China, TikTok has faced intense political scrutiny, particularly in the United States. Regulatory pressure has driven a restructuring in which a consortium led by Larry Ellison, his son, and U.S.-approved investors assumes majority control over the U.S. arm of TikTok. This satisfies national security concerns about data governance and formal ownership. However, the engineering challenge remains: maintaining and evolving a platform of TikTok's scale still requires large, highly skilled teams coordinating across jurisdictions.

The restructuring illustrates a broader point: legal control and engineering control are not identical. A change in equity ownership does not automatically produce an equivalent change in engineering capacity. Nations may "nationalize" platforms in a legal sense but still depend on global talent flows and transnational technical arrangements to keep them functioning.

## 6.3 Editing Pipelines: CapCut and Jianying

CapCut (global) and Jianying (Chinese domestic) are ByteDance's video editing platforms. They form the productive edge of the ecosystem. Users do not simply consume content; they create and edit it using these tools, feeding new material back into TikTok and Douyin. The pipeline flows from creative tools (CapCut/Jianying) into distribution platforms (TikTok/Douyin), and then into commerce and advertising.

Table 4 summarizes key differences between Douyin and TikTok as they relate to technological sovereignty.

Table 4: Stylized comparison of Douyin (China) and TikTok (global focus).

| **Dimension** | **Douyin (China)** | **TikTok (U.S. and global)** |
|---|---|---|
| Core ecosystem | Fully integrated content, commerce, payments, and local services | Primarily content and advertising; commerce features growing but more fragmented |
| Regulatory context | Aligned with Chinese state data and platform policy | Subject to Western security, privacy, and antitrust scrutiny |
| Engineering base | Domestic engineering mass; high iteration speed | Mixed; reliant on international talent and policy-stressed restructuring |
| Toolchain | Deep integration with Jianying and domestic service networks | Integration with CapCut and selective partnerships |
| Economic role | Central infrastructure for digital consumption and retail | Major entertainment and discovery platform; evolving commerce hub |

Figure 4 captures the layered architecture of such platforms. The visible interface is only the tip of a much deeper technical and human infrastructure. Sovereignty at the surface (e.g., control over content policies) depends on sovereignty at the base (e.g., capacity to field sufficient engineers).

**Figure 4. Layers of a Modern Platform Ecosystem.**

**Layer 4 (Surface):** User experience, feeds, creators, brands, cultural content.
**Layer 3:** Recommendation algorithms, ranking, personalization, trust and safety.
**Layer 2:** Infrastructure—datacenters, storage, networking, payments, logistics APIs.
**Layer 1 (Base):** Engineering mass—developers, data scientists, operators.

The figure emphasizes that the visible interface (Layer 4) depends entirely on the invisible base (Layer 1).

Figure 4: Conceptual layers of a modern platform ecosystem.

# 7 The Coming Three-Tier World Order

The preceding analysis suggests that the world is quietly reorganizing into a three-tier system defined by technological capacity and engineering mass.

The top tier consists of system-building nations. These are countries capable of designing, producing, and maintaining complex technological infrastructures: AI stacks, platforms, cloud services, semiconductor ecosystems, and integrated logistics. China already occupies this tier; India has the demographic and educational trajectory to join; the United States remains a member only if it retains access to global engineering talent through immigration and maintains robust STEM pipelines.

The middle tier consists of system-consuming nations. They can adopt advanced technology, regulate it, and integrate it into their economies, but they cannot independently reproduce the underlying systems. Much of Western Europe, advanced Asian economies outside China, and parts of North America increasingly fall into this category. Their sovereignty is constrained by the origin of the technologies they depend upon.

The bottom tier consists of system-dependent nations. These states lack the capacity to build or robustly adopt advanced technologies. Their digital infrastructures are imported, their platforms are foreign-owned, and their data sovereignty is limited. In practice, they exist as peripheral nodes in systems designed elsewhere.

Table 5 summarizes these tiers.

This stratification is not ideological. It is structural, demographic, and educational. Ideologies may differ, but the decisive factor is whether a nation can field and coordinate enough engineers to participate in system-building.

Figure 5 emphasizes that sovereignty in the modern world is increasingly contingent on engineering mass. Nations without sufficient inner-circle capacity cannot sustain outer-circle influence.

Table 5: Stylized three-tier technological world order.

| Tier | Description | Examples (Indicative) |
|---|---|---|
| Tier 1: System-Builders | Design and maintain complex systems; export platforms and standards | China; potentially India; United States (conditional on talent and policy) |
| Tier 2: System-Consumers | Adopt and regulate advanced systems; limited ability to reproduce them | European Union states; Japan; South Korea; Canada; Australia |
| Tier 3: System-Dependents | Rely heavily on external systems for digital infrastructure and platforms | Many states in Africa, Latin America, and parts of South and Southeast Asia |

**Figure 5. Technology and Sovereignty.**

A conceptual diagram would depict three concentric circles. The innermost circle represents engineering mass (STEM density). The middle circle represents system-building capacity (platforms, infrastructure, AI). The outer circle represents geopolitical influence and sovereignty. The diagram highlights that outer-circle outcomes depend on inner-circle capacities.

Figure 5: Schematic relationship between engineering mass and geopolitical sovereignty.

# 8 Policy and Research Implications

If technology is the oldest law of power and engineering mass is the primary constraint on technological sovereignty, several policy and research implications follow.

## 8.1 Education Policy and the Design of STEM Pipelines

First, education policy becomes a central matter of national security. Nations that underinvest in STEM education, particularly in the foundational disciplines of mathematics, physics, computer science, and engineering, will gradually lose system-building capacity. The lag may not be immediately visible, but over time infrastructure will age faster than it can be replaced or upgraded.

Research on educational design suggests that producing high-quality STEM graduates requires more than increasing enrollment. It demands coherent curricula, strong teacher training, incentives for advanced study, and institutional linkages between universities and industry [10]. Comparative studies between China, India, the United States, and European systems could illuminate how different educational architectures affect the composition and capabilities of engineering cohorts.

## 8.2 Immigration Policy and the Global Market for Engineers

Second, immigration policy must be understood as a lever in the global market for engineers. Countries that restrict the inflow of highly skilled STEM workers effectively constrain their own technological capacity. The United States, whose frontier firms rely heavily on foreign-born engineers, faces a particularly stark trade-off between political impulses to restrict immigration and practical needs to sustain innovation [7, 8].

Empirical research is needed to quantify the impact of immigration restrictions on specific sectors, such as AI, semiconductors, and cloud infrastructure. Such research could inform broader debates about growth, inequality, and national security.

## 8.3 Industrial Policy and Technological Sovereignty

Third, industrial policy aimed at achieving technological sovereignty must account for engineering constraints. Initiatives to build domestic semiconductor fabs, AI centers, or cloud infrastructure will fail if they do not address the underlying need for human capital. Subsidies, tax incentives, and public–private partnerships must therefore be coupled with measures to attract, train, and retain engineers.

The literature on the "entrepreneurial state" has emphasized the role of public investment in shaping innovation trajectories [8]. Extending this work to focus on the specific conditions under which such investments translate into sustainable engineering ecosystems is an important task.

## 8.4 Platform Governance and Cross-Border Dependence

Fourth, platform governance must grapple with the reality of cross-border dependence. Nations may seek to regulate or localize platforms (as in the case of TikTok in the United States), but the underlying technical capacity to replicate or replace such platforms cannot be assumed. Regulatory frameworks must therefore be designed with an explicit understanding of engineering dependencies.

Comparative research on platform governance regimes—for example, contrasting China's state-aligned model with the European Union's regulatory model and the United States' market-centric approach—could clarify how different strategies intersect with technological capacity and dependence.

## 8.5 Research Agenda: The Political Economy of Technological Systems

Finally, this monograph suggests a broader research agenda on the political economy of technological systems. Traditional political economy has focused on capital, labor, and institutions. In a world where technological infrastructures dominate production, communication, and governance, a more fine-grained understanding of engineering labor, code, and platforms is necessary.

Future work could address questions such as:

- How do different arrangements of engineering labor (e.g., national vs. transnational teams) affect the resilience and sovereignty of technological systems?
- Under what conditions does a nation transition from being a system-consumer to a system-builder?
- How do demographic trends and aging populations interact with the need for sustained STEM output?
- What are the distributional consequences, within and between countries, of differential access to technological systems and engineering capacity?

Answering these questions will require interdisciplinary cooperation among economists, political scientists, sociologists, historians of technology, and computer scientists.

# 9 Conclusion

Technology has always determined human hierarchy. The first sharpened stone created the first advantage; the first spear created the first expansion; the first domesticated fire created the first metabolic surplus. The twenty-first century is the same dynamic operating through vastly more complex systems. The logic of tools deciding winners has not changed; only the scale and opacity of the tools have.

This monograph has argued that the modern world is being reorganized around engineering mass as the key constraint on technological sovereignty. Nations that can produce and coordinate deep pools of engineering talent will shape the future. Those that cannot will rely on imported systems. Those that can neither produce nor adopt at scale will become peripheral to the digital order.

Platforms such as Douyin and TikTok, with their integrated ecosystems of content, commerce, payments, and logistics, exemplify the transition from technology as a tool to

technology as an institutional environment. Their existence depends on layers of hidden engineering labor that only a few nations can supply. The restructuring of ownership in TikTok's U.S. operations illustrates both the political desire for sovereignty and the structural dependence on engineering capacity that crosses borders.

In a sense, the global order is returning to an old principle. From the earliest hominin who picked up a more effective weapon to the modern state that deploys more capable AI, technology has always chosen the winners. The modern world reveals this truth with greater clarity and higher stakes than ever before. Recognizing this is not a call for technological determinism in a crude sense, but an invitation to take seriously the material and institutional conditions that underpin human agency and political choice.

Understanding the oldest law of power—that technology, grounded in engineering mass, structures the possibilities available to societies—is a necessary step toward any serious attempt to govern, distribute, or resist the technological forces now reshaping the planet.

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