Evolutionary Adaptation of Economic and Social Systems in an Era of New Scarcities

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Rethinking Work, Power, and the Future of Nations

As of writing this article in 2025, some variants of artificial intelligence have been commercially available, impacting society for just a handful of years.

Yet it is already clear that many professions, whether involving creative or complex tasks, will be partially or even fully replaceable by AI agents in the future. This trend is not limited to digital technology alone. Embodied artificial intelligence (I prefer the term I coined "non-biological intelligence"), whether humanoid robots, animal-like forms, vehicles, drones, or other types of physical manifestations, will significantly transform the job market as well.

The current model of work and compensation has led entire operating systems – i.e., nations – to base themselves on resource scarcity, with freedom and power tightly intertwined. Many of the parameters that define a nation are closely linked to, or even unthinkable without, the scarcity of labor – whether physical or intellectual. While the question of how to define "work" is important, it's not the central topic here. It's worth noting, however, that unlike "play" or "games," work typically involves securing one's livelihood and acquiring resources, which can include repeatedly performing tasks one might not feel like doing. Certainly, the difference between work and "game" can be viewed along a spectrum.

Up to now, governmental systems have generally functioned based on economic principles – largely organized through tax revenue – driven by price signals that reflect scarcity.

In this context, the technological advances and commercialization of non-biological intelligence, in all its various forms, challenge the existing structures and institutions of states and can pose risks to their citizens. That's because nations must now realign themselves in terms of distribution, and in degrees of freedom, power, and resources. It's a bit like trying to steer a massive tanker suddenly off course: numerous forces and forms of resistance slow down any swift change, and it seems that only crises can effectively overcome these obstacles.

The critical question is how national systems will respond to these changes.
This article explores the fundamental mechanics underlying national systems and institutions, examining whether the emergence of this new technology will lead to qualitative shifts or merely quantitative expansions.

In other words, artificial intelligence and robots may simply be new tools, akin to lawnmowers or electric screwdrivers, expanding our capabilities and productivity, much like leveling up in a video game. However, non-biological intelligence represents a fundamentally new level in this game. Traditionally, humans have exchanged their physical effort, time, and energy – resources – to ensure survival. This is work. The disappearance of work as we know it would represent a paradigm shift.

Nevertheless, I argue that humanity will never exist without work. Humans consistently create new forms of scarcity, preserving economic systems that reward or punish differently, much like game mechanics. Theoretically, life, including life, work and leisure, can be seen as an intensely immersive, integrated physical form of gaming. Certain parameters may shift, but the underlying mechanics remain unchanged – humans continuously generate new forms of scarcity, even as traditional scarcities, such as shortages of physical or intellectual labor, decrease.

In the future, depending on technological developments, traditional labor scarcity might virtually disappear, significantly reshaping society. Nonetheless, scarcities in materials, energy, social recognition, attention, and other parameters will persist. The core question becomes how these evolving mechanisms influence interactions between systems, nations, and institutions.

At a foundational level, these systems function like software agents, dynamically evolving, adapting, and subjected to selection pressures. They operate programmatically, possessing agency and the fundamental drive to persist, although not necessarily consciously. Humans are the carriers of these systems, each individual embodying multiple systems across multiple dimensions, continually fluctuating within a statistical range. These interactions form recognizable patterns, or systems, composed of diverse signals and background noise.

Yet, system rules carry severe consequences for people, raising crucial questions about our understanding of systems and how we adjust our perspectives on personal freedoms as conscious beings. Ultimately, we depend on these systems, using them as frameworks through which we think and operate.

The Evolutionary Dance of Competing Systems

Economic and social systems have always shown a remarkable capacity to evolve. In an Darwinian sense, these systems continuously seek to expand into new niches and adapt to novel challenges as a means of survival.

This evolutionary pressure means that existing institutions will not remain static – their degrees of freedom, power structures, and organizing principles will shift in response to changing conditions. Just as successful firms survive by adapting in a competitive environment, broader socio-economic frameworks (from capitalism to governance models) attempt to reconfigure themselves when faced with disruption.

Rather than yielding to obsolescence, these systems mutate and diversify, exploring new strategies and domains where they can thrive. We are already witnessing this: markets and governments experiment with reforms, technological integrations, and policy shifts, all aimed at extending their viable „niche“ in a rapidly changing world.

The Emergence of New Forms of Scarcity – From Material to Immaterial Scarcity

Traditionally, economies were built on managing scarce physical resources – land, labor, capital, commodities. However, as technology drives down the marginal cost of many goods and services, future scarcities need not be material.

Instead, capitalism is developing new mechanisms to generate scarcity in things that were previously abundant or intangible.

Attention as the New Commodity

A striking example is in the digital realm: in the information age, the new shortage isn't capital or labor, but human attention.

In a world of infinite information and endless entertainment streams, attention becomes a finite commodity – a resource fiercely competed over by advertisers, media, and tech platforms. As investor Albert Wenger observes, „the new scarcity then is attention," and our markets struggle to allocate it efficiently.

Beyond Attention: Purpose and Meaning

This logic extends beyond attention. In an era of data ubiquity and AI-driven production, capitalism may create artificial scarcities to uphold value: exclusive access to data, proprietary algorithms, digital assets, or even meaning and purpose.

Indeed, as basic material needs are met more easily, people turn to seeking purpose, authenticity, and connection – qualities that suddenly become scarce and valuable. Some have suggested that in a „post-material" age, meaning itself could become the new scarcity, giving rise to what has been called a „purpose economy" where fulfillment and experiences are the products in demand.

The Transformation Toward a New Economic Paradigm

Historical Parallels: From Industrial to Service Economy

These shifts hint at a profound transformation of the economy, one that parallels the earlier transition from an industrial manufacturing base to a service-driven model.

In the late 20th century, advanced economies saw employment and value creation move from factories to offices, from producing goods to delivering services.

The Next Economic Era

Now we stand on the cusp of another transformation: from the service/knowledge economy to something new – an economy defined by intangible scarcities and novel forms of capital.

Just as the service sector grew by commodifying intangibles like expertise and convenience, the next economic era may commodify things like attention, reputation and creativity. We already see hints of this with the rise of the attention economy (e.g., social media, streaming platforms) and the experience economy (where businesses sell experiences and meaning rather than products).

The Future of Work

In practical terms, people will pioneer entirely new fields of work oriented around these emerging scarcities. Jobs of the future will likely center on that which remains scarce when machines and algorithms have abundant output.

For example, when AI can generate endless content, the scarcity is trust – prompting demand for roles in fact-checking, curation, and quality assurance of information. If algorithms drive most decisions, the scarce element may be human judgment and ethics, giving rise to new kinds of oversight professions.

History supports this pattern of renewal: a notable portion of tomorrow's occupations do not even exist today – by one estimate, roughly 8 – 9% of labor demand in 2030 will be in new job categories that have no precedent.

Humanity continuously invents roles to fill newly created needs or scarcities. Far from running out of work, we create new forms of work to resolve the new frictions or scarcities that our own advances engender. This dynamic is essentially evolutionary, as society „mutates" its skillset and economic focus to fit the new environment.

Geopolitical Dimensions of Technological Evolution

The U.S.-China Technology Competition

Any discussion of systemic adaptation would be incomplete without examining the geopolitical landscape shaping these changes. Technological evolution is now a key front in global power dynamics.

The dominant economic systems – notably the U.S.-led liberal capitalist model and China's state-driven capitalist model – are each striving to expand their influence and secure their survival by mastering new technologies.

The United States and China have emerged as the clear frontrunners in areas like artificial intelligence, quantum computing, and advanced manufacturing, investing vast resources to outpace the rest of the world. This has created an uneasy bipolar landscape in tech innovation: an environment where two superpowers concentrate disproportionate capabilities and seek to write the rules for everyone else and therefore to be able to survive as grow as systems.

The Decoupling of Technological Ecosystems

A direct consequence is the partial decoupling of economic and technological zones.

Indeed, a „partial 'decoupling' of U.S. and Chinese technology ecosystems is well underway," driven by strategic policies on both sides. Each country is fortifying its own

supply chains, standards, and digital ecosystems – from semiconductors to internet governance – to reduce dependency on the other.

We see this in export controls and sanctions that attempt to fence off critical know-how, and in parallel efforts within China to achieve self-sufficiency in chips and software.

The world could plausibly bifurcate into distinct tech-economic blocs, each centered around different values and rules (for example, one prioritizing open data flows and privacy, the other prioritizing sovereign control and collective goals).

Such entanglement and estrangement of major economies will force existing systems to adapt their power structures: alliances may shift, smaller nations might align with one bloc or hedge their bets, and global institutions might be reinvented to mediate between separated spheres.

Information Control as the New Currency of Power

Information as Strategic Resource

A crucial aspect of this geopolitical-technological nexus is the control of information flows. Information has become a strategic resource, and managing its movement is seen as vital for societal stability and power.

Systems must always be considered in competition with each other. When various models for organizing societies are compared, this comparison can intensify selective pressure on each already competing system. Today, this occurs primarily through decentralized, uncurated global internet communication, at least for the most part. Communication regarding the characteristics of systems – such as societal operations concerning freedom, power, and resource distribution – allows us comparative assessment.

Despite the inherent and varying exit barriers present in each system, it is generally easier for a system to disrupt communication channels rather than risk jeopardizing its power position by allowing comparisons with other systems to occur without curation and appropriate framing.

Losing control over the narrative concerning comparisons with competing systems threatens the system's very existence.

It's important to keep in mind that no single citizen or member of a society wields power over the entire system. Each individual only holds a small share. However, when all those shares are combined, they collectively form the whole. That's why every individual's contribution is crucial to the existence of the system or the nation.

The system itself may not necessarily be a consciously acting entity; however, the manner in which it operates leads it to develop particular traits similar to those of a software system governed by programmatic rules. These traits ensure its continued existence, including the capability to adapt.

Within every societal system, every individual serve as carrier of these informational complexes – essentially, systems – and thereby exercise microparticular power.

Each citizen or inhabitant participates in steering the behavior of others within the framework of this ‘software system’ by employing reinforcing impulses – such as praise, idealization, rewards – as well as inhibitory impulses – such as monitoring, control, punishment, or social ostracism.

In doing so, every individual simultaneously functions as both carrier of the system’s software and as an executing agent, thus forming an integral part of the mechanism of the larger systemic machine.

Thoughts, perspectives, and cognitive patterns of people are shaped by this software system, significantly modulated by media. What is thought is defined by what is conceivable, and this conceivable framework is structured by cognitive templates, consciously and subconsciously absorbed by individuals through these systems.

In this context, humans function similarly to hosts for these software systems. In the competition among systems for survival, it becomes crucial for each system to establish dominance in defining the meaning and significance of its position by communicating to its individual members – the constituent parts of the organism called a nation – that the survival of the system is essentially identical to their own personal survival.

In doing so, the system constructs a form of identification or ‘self,’ in which any existential threat to the organism (the nation) is perceived as a direct threat to its individual cells (the citizens).

Thus, the prevailing narrative of systems tends to link the importance of the system directly to the individual’s fear of death.

We observe nations like China tightly regulating the internet within their borders (the „Great Firewall“) to maintain social order and nurture domestic tech alternatives. In democracies, debates rage about regulating social media and data to protect public interest.

Algorithms as Selection Pressure

Beyond state action, private tech giants themselves have become gatekeepers of information on a global scale. Their algorithms classify, filter, and prioritize what billions of people see each day, effectively shaping collective perception and discourse. In this role, algorithms introduce a new kind of selection pressure on social systems.

Content creators, businesses, even political movements now must tailor their strategies to appease algorithmic criteria – whether it’s search engine rankings, newsfeed algorithms, or AI-curated marketplaces. Those who master the art of being favored by the algorithms thrive, while others fade from view, a dynamic not unlike natural selection but with artificial intelligence setting the fitness criteria.

Adaptation to Algorithmic Reality

This feedback loop means that AI systems are actively steering the evolution of markets and opinions. For instance, media outlets adjust their headlines and topics to maximize clicks and shares in algorithm-driven feeds, sometimes at the expense of depth. Corporations invest in search engine optimization and recommendation engine tactics to ensure their products are the ones algorithmically deemed most „relevant.“

Even social and political organizations adapt their messaging to navigate online censorship or amplification.

In sum, control over information – who gets to see what – has become a pivotal mechanism through which power is exercised and through which systems are pressured to evolve. Artificial intelligence amplifies this by making that control more fine-grained and dynamic, constantly measuring and tweaking what is disseminated.

The result is an environment where economic and social actors must be highly adaptive, responding not just to market signals and regulations, but also to the opaque, shifting logic of AI-driven platforms.

Gradual Transformation Rather Than System Collapse

Despite the immense changes on the horizon – new scarcities, shifting job landscapes, geopolitical rifts, and AI-mediated realities – an overly catastrophic view of disruption is not warranted.

History suggests that while technological and economic shifts can be disruptive, societies tend to undergo gradual transformation rather than sudden collapse. We are likely to see an incremental reconfiguration into new kinds of economies, as opposed to a chaotic breakdown.

One can draw parallels to the Industrial Revolution or the transition to the service economy: those periods were turbulent, yes, but they unfolded over decades, giving institutions and individuals time to learn and adapt. The coming transformation may accelerate, but it will still span years and involve trial-and-error adaptation rather than an overnight switch.

During this process, existing systems will incorporate reforms and new ideas – essentially hybridizing old and new principles – until a coherent new paradigm emerges. For example, capitalism as we know it might evolve by internalizing some externalities (like carbon costs), embracing more stakeholder-centric practices, or blending with digital token economies, thereby remaining viable in a changed form. Government structures might decentralize in some areas and tighten control in others to cope with new challenges, but we are unlikely to abandon governance altogether. In short, wholesale systemic extinction is rare; metamorphosis is the more probable path.

Evolutionary Dynamics and Adaptive Systems: Navigating Human Societal Fitness

To enhance the overall fitness of the human species for the future, it is essential to maintain multiple „trial-and-error laboratories“ – locations, organizations, processes, structures, and regions – where diverse forms of societal systems, or different operating systems if you will, can be tested. It will then become clear which system or systems best align with human nature and effectively adapt to emerging evolutionary developments in technology and society, particularly concerning the environment and nature. It may well be that numerous systems prove viable.

What I've previously called the laboratories of trial and error are, in reality, the systems themselves. These systems consist of all the different nations, organizations, and institutions – the entirety of real life. It is happening right now, globally and everywhere. Whenever a new evolutionary pressure emerges, it immediately impacts the basic units of the system: the citizens and residents interacting within it. Through their interactions, they actively shape what we call a state.

In this way, the diverse citizens or residents of nations – and their ancestors – not only influence how the system functions but are the very reason the system exists. This existence is sustained only through an active, ongoing process.

Within such an organism, every individual has to believe in its processes and institutions and regard them as real. The conceptual frameworks and informational infrastructures gain tangible, material significance precisely because citizens believe in them, continuously reaffirm them, and act upon them.

That means the system continuously re-emerges, moment by moment. Hypothetically, if all individuals suddenly and simultaneously withdrew their attention completely from the system, giving it no positive, negative, or even neutral attention, this construct, this system, would instantly cease to exist. Thus, the system is not simply born once but is continually reborn anew every moment.

Like a flame, constantly changing at the molecular level yet perceived as stable, these systems are continuously fluctuating. They appear relatively unchanged from moment to moment but, in truth, transform constantly. Hence, while the macro-level (the nation itself) remains recognizable, at the micro-level – the individual elements – there is constant statistical fluctuation of information.

Over time, certain informational patterns begin to crystallize – patterns that statistically show peaks in the same places within a sea of dynamic informational noise. These recurring behaviors form a kind of static structure amidst the flux, eventually solidifying into what we recognize as institutions or processes of these systems.

However, these patterns aren't self-sustaining – they must be continually reenacted and reinforced through ongoing psychosocial, communicative, and interactive human engagement.

Subsequently, these crystallized forms reciprocally influence everyone else within the system. This creates feedback loops with frameworks that, having been constructed, become less dynamic than their subsystems. These frameworks manifest as institutions or processes – sometimes temporary, sometimes enduring – and represent materializations of the software of human interactions.

Institutions and their processes, seen as crystallized elements, can thus dissolve if enough energy is exerted by these atomic units.

The constant fluctuation in the microlevel is precisely why such software agents exhibit a certain dynamism. However, due to the decentralized distribution of micro-level power among these atomic elements, the system as a whole reacts sluggishly to external selective pressures.

Significant energy input is necessary to activate these atomic elements to facilitate systemic change. This energy is emotional in nature and is embedded into narratives delivered through media and information to the citizens—the atomic units of the system. Beyond these narratives and fears they convey, environmental disasters or other factors can also directly affect individuals, the atomic constituents, shaping interpretations in their immediate interpersonal networks.

These experiences can generate powerful emotional tensions – often fear, but not exclusively – that can provide enough energy to surpass a critical threshold, prompting (radical) changes in institutions and processes. While fear is one possible catalyst for an intense emotional response, other emotions – such as overwhelming joy – might also spark similar transformations, though examples may be harder to pinpoint.

Ultimately, what's key for change is the high level of individual activation fueled by strong emotional energy.
In this sense, the intensity of emotion acts as the "currency" needed to overcome the inertia of the current state.

It follows that when emotional energy exceeds a critical threshold, changes become possible within this statistically stable yet fluid ocean of potential, transforming specific, crystallized elements of the system.

That's why, in almost all systems, it often takes a crisis to trigger the kind of change needed for adaptation. Ideally, a proactive approach would be preferable – but this typically follows a top-down model, which is often linked to paradoxical or unintended effects. As a result, adaptation tends to work more effectively when it happens organically, emerging from within the system itself.

Adaptive Pluralism: Why Diversity of Systems May Be Humanity's Best Survival Strategy

Open, objective international communication about the fitness and characteristics of these systems might influence other systems. Although each system, driven by its inherent programmatic structure, naturally strives for its own survival, this open comparative approach encourages systems to selectively adopt beneficial elements from other systems. By integrating these elements strategically, systems can enhance their fitness within their specific niches.

Additionally, existing systems may evolve and transform through partial mergers and the incorporation of new elements, compelled by evolutionary pressures and societal and technological changes, to ensure their continued survival.

However, it is important to recognize that only what can be measured and categorized is acknowledged and interpreted as reality. Thus, there arises the task for scientists to define measurable parameters of fitness that enable benchmarking and comparative analysis. Yet, the feasibility of such meta-analyses remains uncertain, as scientists themselves inevitably operate within particular cognitive frameworks shaped by the societal and organizational systems that influence their perception. This context may distort their lived reality and challenge their capacity for objective analysis. It is therefore questionable to what extent the scientific method – implemented by scientists, whether

based on biological or non-biological intelligence – can truly deliver unbiased insights, given the inherent complexity, variability, and adaptability of human cognition and societal influences.

In any case, certain elements from various systems may be adopted and incorporated into other systems – not necessarily through deliberate cooperation, but rather because these elements enhance the relative fitness and adaptive capacity of the systems that adopt them.
This kind of selective incorporation across diverse systems could prove more advantageous for the long-term survival of the human species than a uniform, monocultural global system, which would likely suffer from a significantly reduced capacity for dynamic adaptation in the face of disruptive influences.

Instead, what emerges might resemble a global patchwork of distinct systems, each representing different forms of niche adaptation and relative fitness. These differences are, in many cases, not only natural but necessary – shaped by the cultural backgrounds of local populations, specific geographic conditions, and other preexisting factors such as neighboring regions and historical context. While political and societal systems don't have to be territorially bound, the systems discussed here – primarily nation-states – tend to have a strong geographical identity, which is why categorization across different levels is relevant.

Each of these individual systems, or "tiles" within the broader mosaic, may – through their own iterative development – gradually move in a direction more aligned with intuitive human values, nature, and fundamental aspects of human psychology.
However, the author acknowledges uncertainty about what this truly entails. Specifically, what exactly constitutes the authentic and active values of a human being, or fundamental human psychology, given the considerable interindividual variability, complexity, diversity, and the human species' remarkable capacity for learning and adaptation?

The Potential for New Value Creation and Meaning

Crucially, this new economic order that emerges has the potential to create value in unprecedented ways and offer new forms of meaning for people.

If material abundance increases (through automation, robotics and AI), human endeavor can pivot toward solving qualitative scarcities – improving well-being, fostering community, exploring creativity and knowledge for its own sake.

Already we see burgeoning sectors around personal development, sustainable living, and creative industries that trade not in commodities but in improving quality of life. As routine work is automated, society can place higher value on what makes us distinctly human: empathy, artistry, innovation, and ethical insight. New professions and enterprises will form to deliver these human-centric values at scale.

Far from a dystopian scenario of mass unemployment or purposelessness, we could enter a renaissance of human agency in which people devote more of their working lives to pursuits imbued with social and personal meaning (mentorship, caregiving, creative collaboration, scientific exploration, etc.).

The human drive for purpose and improvement virtually ensures that we will invent meaningful roles for ourselves, even as old roles wither away. Our adaptability is our greatest asset – as old frontiers close, we relentlessly seek or construct new ones.

The Anarchic Arena of Competing Systems

Building on these reflections, it is crucial to acknowledge that global competition unfolds in what political scientist John Mearsheimer characterizes as an anarchic international system. In other words, one might argue that the global environment – the ecology in which these niche systems operate – is fundamentally anarchic.

In such an environment, sovereign actors (nations) seek to maximize their security and power, often under the assumption that no overarching authority can definitively prevent conflicts. Historically, disruptive technological advances – especially those tied to resource distribution – have heightened tensions among major powers, sometimes culminating in open hostilities.

Today's rapid innovations in AI, automation, and communication hold the potential to reshape strategic balances in unpredictable ways, and there is a latent concern that rival state systems may resort to conflict if they feel cornered or sense their survival at stake.

Guarding Against Existential Panic

However, there are reasons to hope that direct confrontation can be avoided. Two key factors offer particular promise:

- Interconnectedness: The high degree of global integration – through extensive trade relations and relatively open communication channels like the internet – continues to link economic and social interests across borders. While certain trends hint at tighter regulation and regional „splinternets," the flow of information is still robust enough to foster interdependence, mutual benefits, and at least some level of mutual understanding.

- Prosperity: The major systems in competition today operate from a position of comparative affluence rather than facing an existential crisis of resource scarcity. This relative wealth diminishes, though does not eliminate, the impetus for military escalation.

The Paradox of Resource Scarcity in the Age of AI: Geopolitical Competition and Economic Survival

Historically, conflicts surrounding technological changes primarily arose from situations of resource scarcity.

Over the last few millennia, technological advances, environmental changes, and similar factors have generally led to the need for resource allocation, which in turn often resulted in wars as a means for systems to survive. In these conflicts, those who are in control or are "chosen" by the system tend to remain relatively safe, while individuals with less

influence and power are sacrificed for the system's survival. This risk is present in any form of significant disruption.

What gives us hope today is that we possess a certain historical and socio-psychological understanding of how wars arise, that we have institutions for negotiation and communication, and that we have lived through an era of prosperity that – despite significant population growth – has dramatically reduced poverty. This success story is closely tied to cooperation among different systems.

In economics, it is well known that when individuals collaborate in a market, the "pie" to be shared increases in size. So far, however, this growth has been powered primarily by energy resources (oil, gas, metals, rare earths, etc.). A constant flow of energy is necessary to keep such systems going.

Although we are currently discussing a scenario where artificial intelligence – and its physical embodiment, robotics – potentially alleviates many aspects of resource scarcity, the competition for critical resources needed for producing robots, microchips, energy, and (digital) infrastructures remains intense. Essential materials, such as specific metals and other elements necessary for building essential infrastructures, have become integral components of geopolitical strategies, recognized as vital for the survival and competitiveness of nation-states and their subsystems.

We are thus experiencing a paradoxical situation: significant reductions in traditional resource scarcity, driven by cheaper labor and affordable cognitive capacities from AI, coexist alongside acute shortages of the very resources needed to sustain this new prosperity. Moreover, Western systems fundamentally depend on quantitative and qualitative economic growth. The primary measure used – albeit roughly – is Gross Domestic Product (GDP).

One might argue that increased GDP constitutes a fundamental fitness parameter of a nation's system because it motivates the individual elements within the system – namely, the citizens – to sustain and perpetuate it. Economic growth, prosperity, and overall citizen satisfaction thus become central narratives essential to the survival of a nation-state. Systems incapable of guaranteeing continued prosperity inevitably face heightened competition and risk their existence. Consequently, such systems must increasingly fight to maintain barriers against exit, bolster their narratives, and strengthen information control if they fail to enhance prosperity.

Therefore, unevenly distributed global resources are of significant strategic importance to wealthy and powerful systems. Despite improved conditions brought about by technological advances, these uneven distributions continue to pose risks of new conflicts precisely because the foundational elements of prosperity and national prestige remain at stake.

Yet it remains imperative that no state (or coalition of states) feels excessively threatened or „backed into a corner." Under such stress, rational calculation can falter, potentially leading to rash decisions with catastrophic outcomes. If states perceive existential threats – like technological inferiority or resource cutoff – they may act irrationally. For instance, a cornered system might weaponize AI, data controls, or various forms of warfare across different levels, jeopardizing global stability.

Optimizing the Wrong Thing: The Pitfalls of Misaligned Environmental Metrics

Public goods and the environment – nature, and the shared ecological niche that supports human life alongside countless other organisms – are not sufficiently protected.

One core challenge is developing effective models to prevent the overuse or destruction of these shared resources, particularly when competing economic interests are at stake.

Assigning a price to certain environmental impacts is one proposed strategy, but like any pricing mechanism, its effects can be difficult to predict. If the chosen metrics are misaligned with the original goal, new systemic behaviors may arise, often with unintended consequences. This tends to happen when institutions optimize for the measured indicator itself rather than tackling the underlying factors that truly affect the environment – much like a company that uses the wrong metric for customer satisfaction and neglects what customers genuinely need.

That's why selecting the right metrics is so crucial to achieving the intended outcome. Over time, the design and operation of institutions will show whether we picked the most suitable parameters. When policies aim to protect public goods – including the environmental conditions necessary for human survival – they must be iterative, using feedback loops to assess their effectiveness.

This means continuously measuring and monitoring the correct parameters, indicators outcomes and critically reassessing the assumptions on which any model rests for adequate controlling.

However, as these systems grow and gain supporters, it can become increasingly difficult to dismantle or recalibrate them – even if they no longer serve their original purpose – because some groups benefit from their continued existence.

Further complicating matters, humanity has, over millennia, destroyed certain habitats while creating new niches for other species through domestication and industrial processes. At the same time, we produce substances – some of them referred to as "forever chemicals" and endocrine disruptors, radioactive elements etc. – that may pose long-term risks to the basic conditions enabling life as we know it. Two perspectives help frame this issue:

- Normative (Anthropocentric): From a human-centered viewpoint, we have a vested interest in preserving the ecological niche we've adapted to through centuries of evolutionary pressure. Consequently, regulatory frameworks need to be introduced to safeguard the environmental factors critical to our survival and therefore of the fabric of societies.

- Systemic (Evolutionary): From a broader evolutionary standpoint, humans are just one of many species altering the planet. For example, algae and plants once radically transformed Earth's atmosphere by producing oxygen – a substance that, from the perspective of a hypothetical outsider, might have been seen as a form of „pollution." Similarly, human-driven environmental changes lay the groundwork for future life forms as evolution continually reshapes ecosystems.

No matter which perspective one adopts, the imperative to measure and manage the right elements remains paramount. If our chosen metrics do not accurately reflect what we aim to protect, institutions and practices risk optimizing for the wrong reasons. In such cases, performance indicators – intended to serve as control variables to effectively influence outcomes – become the targets of optimization instead of addressing the underlying drivers that truly matter.

This misalignment represents an evolutionary misstep at the expense of genuine environmental well-being and can ultimately lead to societal regression and a loss of prosperity. Such outcomes increase the adaptive pressure on the system, generating stress and tension within organizations or nations that may spur irrational responses. Therefore, it is essential to establish iterative approaches and programmatic planning from the outset.

Although nature itself will evolve regardless, how we guide – or fail to guide – this evolution will determine whether we secure a sustainable future for our own species.

Individuals vs. Systemic Imperatives

Mearsheimer's framework underscores the limited role of individual personalities in steering systemic behavior. Within this dance, individual agency is constrained.

Systems prioritize survival, elevating leaders and innovators who reinforce their goals. A CEO advocating cooperation over tech dominance, for example, might be sidelined by shareholders seeking competitive edge. Similarly, political leaders face structural pressures to prioritize national security over global welfare.

Leaders and elites rise within structures that reward those who best serve the overarching interests of the state, and these interests revolve around preserving security and power. As a result, even dramatic leadership changes seldom produce wholesale shifts in grand strategy.

The state machinery – its defense apparatus, economic policies, and governing doctrines – exerts a powerful inertia that usually outlives any single administration or influential figure. This creates systemic inertia: systems resist radical change unless forced by crisis.

Consequently, meaningful strategies to avoid large-scale confrontation must come from the systems themselves, rather than relying on a sudden pivot by particular individuals. Generally speaking, based on economic logic, it's safe to assume that – unless there's resistance – a resource-rich system will always fully enforce its interests.

Strategic Preparedness: The Need for Plan B

If strategic competition is unavoidable, it is in every state's interest to develop a „plan B" that prepares for peaceful coexistence and shared technology governance, rather than drifting into panic or zero-sum logic. To avoid panic-driven collapse, systems must:

- Diversify alliances: Smaller nations hedging bets between blocs could buffer shocks.

- Invest in redundancy: Backup supply chains for critical tech (e.g., semiconductors) prevent overreliance.

- Establish crisis protocols: Clear rules for, among other things, AI governance or data sharing during times of tension.

This would guard against scenarios in which a system's existential anxieties grow so severe that it endangers its own population – the very base upon which its power and legitimacy depend.
The goal isn't to eliminate competition but to manage it within guardrails that prevent escalation. Just as evolution favors organisms that adapt without self-destructing, socio-economic systems must balance ambition with resilience.

Finding the Niche: Adaptive Optimization in Complex Evolving Systems

Every element or software agent subject to evolutionary forces must find its niche. In the competition for optimal parameterization – where everything is interdependent within a complex system of interactions in a constantly changing environment – an individual that finds its niche is, ideally, precisely tuned within the framework of a Gaussian distribution. This applies to every element, to every cell of an organism. And when we consider the whole system, we get a statistical mean that defines the parameters that shape the niche.

A niche is thus defined by the essential parameters that ultimately characterize the "phenotype" best suited to that ecological niche. In other words, a niche is simply a situation in which multiple critical parameters are optimized. The constant task is to adjust configurations in a multidimensional space so that a new economic – energetic steady state emerges. This is a dynamic, ongoing process in which certain patterns, by virtue of their statistical relevance and adaptive pressure, crystallize into a kind of software manifestation – complete with elements of inertia. Just as code can be efficient or inefficient, these patterns act as a form of resistance within the flow of energy.

From Utopia to Dystopia: When Systems Ignore Adaptation

From experience, it appears that bottom-up, slow, incremental changes within systems are significantly more humane than top-down decisions. Top-down decisions are less subject to the pressures of adaptation and thus often aren't sufficiently "fit," which can lead to severe turbulence in the system—potentially endangering its fundamental units, namely the citizens. Unlike bottom-up processes and decision-making, top-down approaches logically lack the flexibility to adapt to specific niches. In many cases, they fail to fulfill their intended tasks because paradoxical effects aren't accounted for when plans are conceived purely in the abstract. This is also the core issue with a planned economy. Because systems are complex, solutions must grow organically rather than being designed on the drawing board. Every solution has to prove itself constantly in the real world and be subject to the pressure to adapt.

That's why utopias turn into dystopias: there's simply no „product-market" fit.

Actively Shaping System Evolution

In navigating this epochal shift, the will to adapt and the imagination to build anew become decisive.

If we recognize the changes early – the new scarcities, the altered power balances, the need for updated principles – we can steer the transition more deliberately.

There is a collective learning process underway: communities, firms, and nations are experimenting with innovations in real time (from alternative energy economies to digital governance like blockchain-based organizations) to see what might define the next era. Through resilience and ingenuity, we are likely to avoid the worst-case of chaotic disruption.

Instead, bit by bit, we will assemble a new kind of economy and society that preserves core human values while exploiting new opportunities. The coming decades may feel uncomfortable as familiar structures shift, but they also hold the promise of renewal. The only constant is continuous change, constant transformation.

Conclusion

Ultimately, the story of human progress is one of continual reinvention. By evolution, not revolution, our economic and social systems will adapt to the challenges ahead – expanding into new niches, harnessing new technologies and ideas – to not only survive but to empower human flourishing in fresh and meaningful ways.