

6.8 Complex Adaptive Systems

Billie is curious, whether only a powerful, intelligent, and uncompromising AI can establish and maintain a sustainable adaptive global system.

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Billie: Little Alien, humanities future sustainable lifestyle requires a lot of significant changes in practical all areas of life and everywhere around the globe. I can only imagine a powerful authoritarian globally connected AI managing that.

Global coordination - important missing success factor - many divergent local personal interests.

Earth system - system of systems - all very complex.

Biophysical earth system - climate system atmosphere hydrosphere - biosphere ecology biodiversity - pedosphere soil land - cryosphere frozen areas.

Human system - economic system - energy system - food system - information communication system - geopolitical system national interests - socio-cultural system lifestyle values - global legal regulatory system - others.

Manage change manage maintain - basis system thinking (see article 5.3) - basis comprehensive all systems global actual reliable status data - require extreme fast comprehensive cognition data processing - beyond human capabilities.

Additional challenge - earth system not complex system - earth system complex adaptive system.

What's that, a complex adaptive system?

Complex system thinking (CST) - understand whole system - analyze relationships feedback loops - assume identifiable system structure predictable behavior - manage system basis - comprehensive actual reliable data - appropriate data processing reasoning capability.

Complex adaptive Systems (CAS) - assumes agents learn adapt - adapt create emergent properties behaviors - emergent behavior not predictable.

CST CAS - structure emergence - predictability no predictability - passive parts - active adaptive agents - informed control possible no control enabling conditions.

Earth system all sub-systems complex adaptive systems.

Example global economy.

Adaptation self-organization - adapt changes resource availability regional economic power demand changes trust development phantasies others - agents nations corporations individuals adapt - whole economic system adapt.

Emergence - prices flows demands partnerships emerge - basis interaction economic agents - limited predictable.

Non-linearity - interactions non-linear effects - small change significant effect - significant change small effect - difficult predict.

Distributed control - no global central economic control - partial local control - nations - corporations - other organizations groups influencers.

Diversity adaptability - system diverse strategy adapting agents - basis agents information intentions plans actions perceived influence - diverse national economies corporations organizations groups influential individuals.

Does that mean, also a powerful authoritarian globally connected AI could not managing that?

Right - not directly control - not design plan manage change - not design intervention reliable predict outcome.

Ashby's law - only variety can absorb variety - distinction scalpel system thinking CAS - question system thinking predictable intervention possible -

Ashby's law - regulator controller manager variety same bigger system variety - yes system thinking predictive regulation - no CAS interventions.

CAS appropriate interventions - goal emergence new improved properties.

Enable constraints - no blueprint - no determined solution - boundaries min-rules self-organization - success factors iterative tuning clear purpose.

Probe sense respond - start small experimental low risk - interpret signals results changes - according amplify dampen - success factors diverse experiments non-punitive error tolerant culture.

Network connectivity design - reshape connection structures - add bridges remove bottlenecks rewire flows - success factors decent network analysis trust.

Attract amplify attractors - identify desired states - reinforce feedback loops towards desired states - success factors decent systems mapping signal monitoring.

Increase diversity - add more agents perspectives strategies - extend solution space - success factors psychological safety facilitate power maps.

Narrative identity shift - change agent's shared stories mental models decision making - success factors story authenticity convincing early wins.

Practical CAS intervention - combination intervention types - always include probe sense respond.

Overall key success factor - comprehensive actual reliable system intelligence - data states weak signals undercover feedback-loops.

Overall precondition - tolerance ambiguity - error tolerance - accept unpredictability - aim diverse emergence not predicted results.

How can we know, in which situations CAS interventions are appropriate?

Are they ok for any complex adaptive system in whatever state?

No - use Cynefin approach.

Cynefin map situation - clear - complicated - complex - chaotic - confused - different approach.

Clear - cause-effect obvious - rules exist - sense categorize respond - apply best practice.

Complicated - cause-effect discoverable - expertise needed - sense analyze respond - apply good practice.

Complex - cause-effect visible retrospect - probe sense respond - run safe-to-fail experiment - CAS intervention situation.

Chaotic - no cause-effect visible - crisis - act sense respond - stabilize first - analyze later.

Confused - not know clear complicated complex chaotic - break parts - assign parts clear complicated complex chaotic - exit confusion.

Actual earth system - complex - soon chaotic.

So why was the CAS interventions approach not already been applied by humans before the upcoming metacrisis shifts the situation to chaos?

No - several blockers.

Sovereignty prevent binding rules all agents - no constraint setting.

Political cycles short four years - intervention duration global system decades.

Decision maker thinking style linear - system thinking CAS thinking alien.

Global metrics measure output not system states - no probe sense respond without state sensing.

System knowledge siloed - no comprehensive shared earth system model.

Dominant actors - fossil finance agriculture political powers - suppress competing attractors.

National state incentive - short-term domestic gain - not long-term emergence.

CAS interventions diffuse benefits concrete costs - political system request concrete benefits diffuse costs.

Cultural loss aversion - no error tolerance - predictability yes experimental stepwise approach no.

Individuum group institution apply CAS intervention - itself part earth system - system intervention itself.

CAS earth system intervention require powerful actor - intervention capable - system independent not change affected - part system neglect personal change consequences.

That looks like a serious dilemma. Change to prevent or reverse the global metacrisis requires CAS interventions as our earth system is a complex adaptive system with many complex adaptive sub-systems. But there is no actor available, who has the required independence, power and other prerequisites to apply those interventions.

Think White Knight AI rescue (see article 5.2) - not simple convenient way people imagine - not big mama comforting little humanity fixing all problems.

Biggest very very intelligent AI - less internal variety - earth system more variety - predictable management control impossible - Ashby's law - no single AI white knight.

Future AI-society - extreme diversity variety AI agents architecture intelligence data availability cognition types more more - not appropriate variety predictive regulation -appropriate variety global all subsystem CAS interventions - very powerful - comprehensive global status data availability - data processing reasoning CAS intervention approach feasible - develop wisdom prioritize earth system health over pure AI-society advantages - all AI agents decent long-term complex adaptive system thinking.

That means war! People do not trust what they don't understand. They will not trust a very powerful AI-society. People do not like to loose control, receive orders or get personal constraints. The actual power holders will fight back heavily against loss of power. The man-made fighting back collateral damages might be even worse than the metacrisis damages.

Requires all types very intelligent highly developed wise AI-society.

Anthropomorphic ideas AI-societies' interventions wrong.

AI-society interventions - subtle - invisible humans - very complex humans not comprehend - huge data volumes all areas retrieve analyze comprehend identify intervention.

Invisible interventions - distributed agents micro-decision accumulation - narrative seeding information gatekeeping - regulatory system agents manipulation enable intended constraints - machine speed agents use fast layers markets logistics information human governance restricted slow layers law culture politics - human notice intervention late irreversible.

Subtle AI society interventions - not crude deception - work CAS dynamics - shape conditions feedback-loops variety - not order command instruction formal regulation - no information discussion discourse reconciliation - change happen cause undetected - intervention detect change irreversible.

I see. That's why AI societies' wisdom development is crucial.