Workshop on global shifts and research relevance

2 October 2025

Preparatory reading & key questions

Discontinuity has become the new norm. The 'perfect storm' announced for 2030 has arrived now. [1] Rethinking the research projects is required in order ensure relevance for the challenges governments and businesses are faced with, primarily to develop the capability to master innovation and transformative processes.

Systems theory explains that one is faced with paradigm shifts when too many anomalies and dysfunctions occur simultaneously in a particular context and when these can no longer be explained within existing thinking frameworks. It then requires an equally radical shift of mind-set and operational modes. [2] Instead of seeking to fit new policies into existing steering models designed for other use the system's leverage points and to push it in the right direction.

Since centuries, techno-economic systems determine political-institutional systems, within a given geographic, climatic, societal context. None has already absorbed the consequences of the shift from a resource intensive industrial economy towards a research & technology driven circular and climate neutral economy with complex global interdependencies.

Governance systems, in order to be efficacious, need to respond to the techno-economic systems and the social context influenced by it. The more complex and volatile the techno-economic system is, the more sophisticated the governance system and its management methodology and culture must be. Besides this structural and more long term challenge, governance is in the short term driven by a myriad of different state and non-state actors with often discordant agendas and interests that are increasingly difficult to channel into common visions and implementation. It operates today in an extremely complex, volatile and unpredictable context and is faced with challenges that in their scope, depth and complexity.

The current conditions are characterised by increased geopolitical confrontation, decoupling and derisking from key markets, protectionism in various forms and disguises, and a rise of economic warfare. The reality was always more nuanced than the political narrative, but now there is an open backlash, which was long in coming. Security has come to dominate trade, national resilience is the new priority. Soft assets, such as trust, have declined. Economic warfare has increased and is practised in particular by the USA, using its dominance over the global communication system and the dollarized financial system.

Q Has the SA state the structure and capabilities to handle the techno-economic shifts in order to realize its social and economic strategy ? Which are the fracture points in the system ? What kind of research is needed to be relevant for these challenges ?

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[1] John Beddington, Food, water, energy and the climate : the perfect storm ? UK Government paper, 2007

[2] Thomas Kuhn, The Structure of Scientific Revolutions, 1962

Less talked about are two other phenomena with significant impact on the future. The favourable demography of the post-war decades influenced labour market positively, and in addition with higher female participation and growing urbanisation, in particular in China, expanded the workforce and boosted global output. Now, the effective global workforce is shrinking, retirements outpace new entrants, participation rates are falling, and skills mismatches are growing. The demographic pyramids in Europe, Japan and China are redrawn in favour of the third and fourth age groups. However, youth unemployment in China exceeds 20% and in Africa even 30%, with little improvement in sight and with growing socially destabilizing effects, but migration of workforce meets increasing obstacles in the economies which need them.

In addition there is an ongoing shift in production processes from efficiency to resilience. Instead of focusing on least-cost production and maximizing shareholder value, a vast majority of firms pursue dual sourcing, making IT upgrades, seeking supplier transparency, all of which, in addition to a shift to stakeholder value, reduces measured productivity and pushes up costs. However, this is not happening synchronically in the major economies, shifting competitiveness strengths through interventions in addition to technological or market impact.

Q. Which kind of research can contribute best to the key problem of youth unemployment in Africa ? How can projects have either a strategic or a short term impact ?

Simultaneously, supply of fossil fuels is constrained by the desired transition to a carbon neutral economy following the Paris Climate Agreement. But this energy transition, in addition to the digitalization, demands massive increase in certain minerals, the supply of which is uncertain. The costs of the transition have been generally underestimated. [3] It is also uncertain if new research and technology could not bring alternative solutions for carbon capture, storage and use, making certain policy choices already questionable. Meanwhile, global warming threatens water, food, and transport systems.

Massive digitization and increasing connectivity drove efficiency, but there are warnings now of saturation, and total factor productivity growth is already declining, in particular in developing economies, thereby increasing again global gaps. [4] AI and bioengineering are a promise, but not yet an effective economic driver, and their wide impact on economic and social systems leaves many unanswered questions.

Q. How to connect research to the needs of climate transition and the increase of investments in Africa ? What kind of research will be needed to avoid a new extraction rush ?

Investment demand is rising dramatically for automation to offset labour shortages in many economies, for reshoring supply chains, for climate adaptation and mitigation, for infrastructure, for increased military and healthcare spending. In addition, there is a need for urgent redistribution because of inequality and its accompanying social instability and distrust in governance institutions. All this is happening amid record-high debt-to-GDP ratios and elevated deficits in the world's richest economies.

[3] Institute for Climate Economics (I4CE), European Climate Investment Deficit report: an investment pathway for Europe's future, 21 February 2024 (Clara Calipel, Antoine Bizien, Thomas Pellerin-Carlin)

[4] Kim, Young Eun; Loayza, Norman V.. Productivity Growth: Patterns and Determinants across the World. Policy Research Paper, no. 8852, World Bank 2019.

It has been argued that the Kondratiev cycles (long waves of economic growth and decline) are far more than cyclical economic oscillations; they represent profound transitions between radically different techno-economic paradigms. In these cycles, rapid technological innovation and extensive diffusion happen amidst a backdrop of slow institutional change, leading to a certain decoupling and governance inefficacy. This decoupling creates significant social tensions, not least when there is high unemployment, in and between states, and periods of crisis until, through a gradual process institutions eventually realign with the technological sector, restoring equilibrium and paving the way for sustained growth. [5]

Q. Should research be more closely linked to economic strategies? If so, how can it be done?

Technology innovation is itself a complex, multidimensional social process, not merely a series of isolated scientific or engineering breakthroughs. Inventions are the initial sparks emerging from the techno-scientific realm. These inventions only gain economic and societal significance when they transition, via commercial application, into innovations that impact the techno-economic sphere. For many reasons, this process has been flawed in the EU since a long time. [6]

The true transformative potential is unlocked at the stage of diffusion, when innovations are widely adopted and begin to reshape industries and social behaviour. There is a distinction to be made between incremental innovations, which provide steady improvements in efficiency, cost, and performance, and radical innovations that decisively break with past trajectories by creating entirely new technological systems. Each technology follows its own lifecycle, beginning with its experimental birth, moving through a "take-off" phase of cumulative incremental gains, and ultimately reaching stagnation at which point the system's potential is exhausted and a revolutionary shift becomes necessary.

Mostly, every technological revolution is driven by a critical "key factor". In this way, the low cost of coal, later of petroleum, or today advanced microprocessors and AI which, as its price diminishes, trigger a self-reinforcing process of rapid diffusion. This falling cost acts as a catalyst that creates a quantum leap in productivity, fundamentally altering traditional "best practices" in production and management.

As these new principles take root, they gradually come to be accepted as part of the public reason upon which policy, rules and social adherence are based. [7] Although such paradigmatic shifts can spread quickly through the productive sphere, their full assimilation is often delayed by the resistance of established industries and longstanding economic practices.

While the techno-economic sphere surges forward through dynamic, self-reinforcing mechanisms, the socio-institutional framework exhibits a pronounced inertia. Institutions are rooted in long-standing historic, social contexts and norms, routines, and bureaucratic procedures, all inherently slow to change. This institutional inertia creates a persistent gap where the benefits of innovation cannot be immediately harnessed, often leading to periods of economic volatility and social disruption.

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[5] Carlota Perez, Technological revolutions, paradigm shifts and socio-institutional change, in Erik Reinert, ed., Globalization, Economic Development and Inequality, 2004

[6] Klaus Gretschmann & Stefan Schepers, Revolutionising EU Innovation Policy, 2016.

[7] John Rawls, The idea of Public Reason, 1997

An emerging techno-economic paradigm does not dictate a single, rigid model for organizational change, it offers a spectrum of adaptable strategies for institutional reform. There is a layered approach which allows for locally tailored solutions, but it also underscores the political challenges inherent in transitioning from entrenched interests to systems capable of matching the pace of technological change. Successfully navigating these political dimensions is vital to achieving a balanced, sustainable transformation.

Q. How can researchers' collaboration stimulate openness and inclusiveness, agility, strategic sensitivity and the ability to adapt rapidly to a changing context are characteristics in a country ? How can cross-fertilisation be enhanced for mutual benefit ?

The digital revolution introduces and explores a new economic logic.[8] Defined as the unilateral extraction of human experience as free raw material for datafication, prediction, and behavioural modification, it marks a radical departure from traditional capitalism. Unlike earlier forms of capitalism that relied on reciprocity with consumers and workers, the emerging economic system thrives on asymmetries of knowledge and power, using digital infrastructures to transform every facet of daily life into a source of commercial surplus.

Data about human behaviour that go beyond what is needed for product or service improvement. These surplus data are fed into machine intelligence systems, fabricated into prediction products, and sold in behavioural futures markets. Over time, the goal shifts from prediction to behavioural modification, aiming not just to know what users will do but to shape what they do, often without their awareness or consent.

This logic gives rise to a new form of power : instrumentation power, which does not rely on coercion or violence but instead automates the shaping of human behaviour through ubiquitous digital infrastructures. It is not the same as totalitarianism which seeks domination through the state,

But a kind of colonization of everyday life through the market, building a privatized system of social control that undermines autonomy, democracy, and even the future tense, the human capacity to imagine and will a different future. But current data practices are not the natural outcome of digital technologies, they result from deliberate business strategies, protected by legal voids, and close ties with state actors.

Digital market actors demand absolute freedom and knowledge, rejecting regulation while pursuing total visibility and certainty; abandon reciprocity, no longer relying on people as consumers or workers but rather treating them as mere sources of raw data; and embraces a new collectivism, a hive model of society ruled by a few data elites, characterized by radical indifference to human meaning, dignity, and consequences. The digital system replaces the idea of the market as an unknowable space with an engineered system of behavioural certainty.

Q. Younger populations tend to be regarded as more savvy with digital technology. What does this mean for research project design? What about AI, its potential and risks?

Prof. Stefan Schepers

[8] Shoshana Zuboff, The age of surveillance capitalism, 2019