Integrating Computational Thinking into Strategic Foresight: A Hybrid Framework for Navigating Complex Futures

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Abstract:

At a time of high uncertainty and speeding up technological dislocations, policymakers and institutions increasingly look for strategic foresight to prepare for and venture into a wide range of potential futures. As much as strategic foresight offers robust qualitative approaches in the guise of scenario planning and backcasting, these often lack formalized rigor and dynamic model capability to probe complex systems completely.

This book proposes a novel hybrid method that integrates computational thinking (CT) into strategic foresight methodology. Relying on the core CT concepts of decomposition, abstraction, algorithmic design, and iterative testing, the new methodology enhances traditional foresight methodologies by adding formal modeling and simulation-based investigations. This enables better mapping of interdependencies among systems, sensitivity analysis of main variables, and analysis of emergent behavior in future systems.

To demonstrate the applicability of this approach, we present a conceptual case study on energy transition strategies under several geopolitical and technological uncertainties. Preliminary results validate that not only does the hybrid approach strengthen the resilience of scenario planning, but it also facilitates decision-relevant insights for strategic decision-making.

By completing the loop between qualitative foresight and quantitative modeling, this hybrid approach allows decision-makers to design future-proof strategies through systemic intelligence and computational science. The article concludes with suggestions for using the framework in policy-making, corporate futures studies, and education, as well as suggestions for future empirical testing.

Keywords:

Strategic foresight, computational thinking, hybrid framework, scenario planning, complex systems, decision-making.