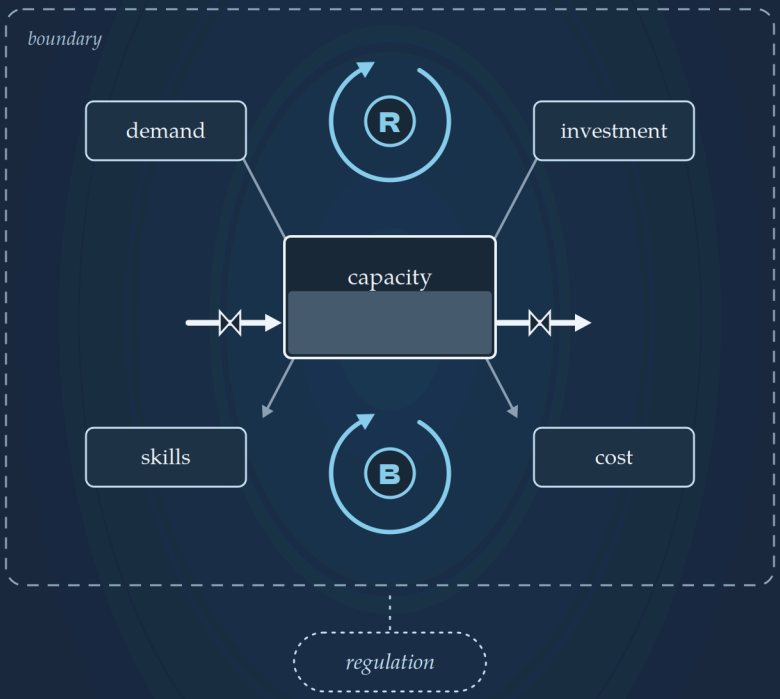
A SHORT EXCERPT




# SOSX

## Seeing the Whole System

The value of systems modelling in the age of AI

CHRISTOPHER DEAN

SOSX®

THE SOSX SERIES

# SOSX: SEEING THE WHOLE SYSTEM

This is a short excerpt from SOSX: Seeing the Whole System, the central book of the series accompanying SOSX®: System-of-Systems for X. It is abridged, in the author's own words, from the book's introduction, its chapters on the core ideas of systems thinking, and its account of what agentic AI changes. The full book covers the discipline, the practice and the machine in four parts. How to get a copy is at the end.

# SOSX: Seeing the Whole System

*A short excerpt: what systems thinking is, and why you might want SOSX to help*

CHRISTOPHER DEAN

Digital Tactics Ltd

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# CONTENTS

*"All opinions are not equal. Some are a very great deal more robust, sophisticated and well supported in logic and argument than others."*

DOUGLAS ADAMS

SOSX®: System-of-Systems for X is an agentic AI platform for systems thinking. It researches, maps and analyses problem spaces to improve decision making. It takes a question spanning multiple systems, builds them into one connected model, and runs grounded analyses: trade-offs, what-if, ROI, system dynamics, SWOTs and risk registers. Every claim cites an openable source, values carry units and confidence, and a person approves every stage; reducing weeks of research and analysis to hours.

By supporting the research, mapping and grounded analysis of a problem space, SOSX improves decision making and story craft.

# THE COST OF NOT SEEING THE WHOLE SYSTEM

An engineer in aerospace is asked to advise on where R&D effort should go on future aircraft as the industry moves to sustainable aviation fuel. It sounds like one question. It is not, because sustainable aviation fuel is not one thing: there are biofuels, synthetic fuels made from green hydrogen and captured carbon, and hydrogen burned directly. Each route is a system of its own, and they compete for the same feedstocks, the same green electricity and the same investment.

Take hydrogen alone and pull on the thread, and the whole jumper comes with it. It carries far less energy by volume than kerosene, so what happens to fuel-tank sizing? Tank sizing changes the airframe, which changes passenger numbers and range. Range changes route economics. And none of that is answerable inside the aircraft at all: it depends on how the hydrogen is produced and distributed, on storage at airports, on critical-mineral supply risk, on skills, on legislation. One part of the puzzle turns out to be an extensive system in itself.

No single team holds all of that. The aerodynamicists hold a piece, the fuel systems people hold a piece, the infrastructure planners, the procurement analysts and the regulatory affairs team hold pieces. Each piece is rigorously produced. And the

actual question, the one the business needs answered, lives in the connections between the pieces, which is precisely where nobody is looking.

That is the cost of siloed analysis, and it rarely presents itself as a visible failure. It presents as weeks and months of desk research before anyone can even frame the trade-offs. It presents as decisions taken on the piece of the problem that happened to have the loudest owner. It presents as surprises: the choke point no single document mentioned, the second-order effect that only existed because two separately sensible decisions interacted. Most expensively, it presents as questions that never get asked at all, because everyone quietly knows the organisation has no way to answer them.

None of that is a failure of the people doing the work. They are usually very good at it; the structure gives them nowhere to stand. Nobody is funded to hold the join. No department owns the space between departments.

# WHAT SYSTEMS THINKING IS

There is a discipline for exactly this problem. It is called systems thinking, and its working method is systems modelling: describing a problem as a network of interacting parts, with the feedback loops, accumulations and time delays that give the network its behaviour, so that you can reason about the whole rather than the pieces. It is not new. Its foundations were laid in the 1950s and 1960s, its classic texts are decades old, and engineers treat some of its offspring, control theory, system dynamics, model-based systems engineering, as entirely mainstream.

Systems thinking has a reputation problem: it attracts both genuine rigour and a certain amount of hand-waving, and from the outside they can be hard to tell apart. The test is simple. A systems view of a problem should produce specific, checkable, decision-relevant statements (this loop dominates until this stock depletes; this intervention is upstream of these three symptoms) and it should tell you what evidence would prove it wrong. If it only produces the observation that everything is connected to everything, it is decoration. This excerpt, like the book, is about the rigorous kind.

# THE IDEAS THAT DO MOST OF THE WORK

### Connections are typed

A systems model is a network: things, and the connections between them. The discipline's first demand is that both are typed. A line between two nodes must say what kind of relationship it is, not just "these are related". A connection might carry money, material, energy, information, people or influence. Untyped box-and-arrow diagrams feel productive and analyse into nothing; the moment you type the connections, contradictions and gaps surface.

### Stocks and flows

The most important typed distinction in the whole discipline is between stocks and flows. A stock is an accumulation: it has a level you could measure at an instant. Cash in the bank, aircraft in the fleet, engineers on staff, trust in the brand. A flow is a rate that fills or drains a stock: revenue and costs, hiring and attrition.

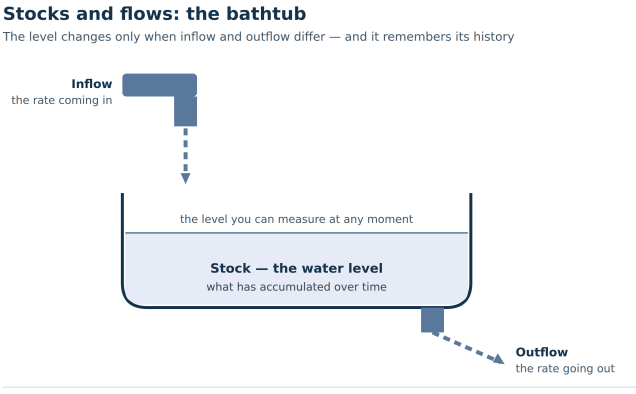


*Figure 1. The bathtub. The stock is the water level; the tap and drain are flows. The level changes only when inflow and outflow differ, and it remembers its history.*

Stocks change only through their flows. You cannot legislate a stock to a new level; you can only alter rates. "We will double our skilled workforce" is not a decision; hiring, training and retention rates are decisions, and the stock follows them with a lag.

## Feedback loops

Connect flows back to the stocks that drive them and you get the discipline's signature object: the feedback loop. Loops come in exactly two kinds, and the two kinds explain most of what systems do over time.

A reinforcing loop amplifies whatever is happening. More savings earn more interest, which makes more savings. More users attract more developers, which attracts more users. Reinforcing loops produce growth and collapse (the same loop, run in different directions), and left alone they produce exponential behaviour, which humans systematically underestimate.

A balancing loop seeks a goal and resists change. The thermostat senses the gap between room and target temperature and turns the heating up or down to close it. Balancing loops

produce stability, and they are why systems push back: when your initiative mysteriously loses momentum, you have usually walked into a balancing loop that is defending some goal, often one nobody has ever written down.

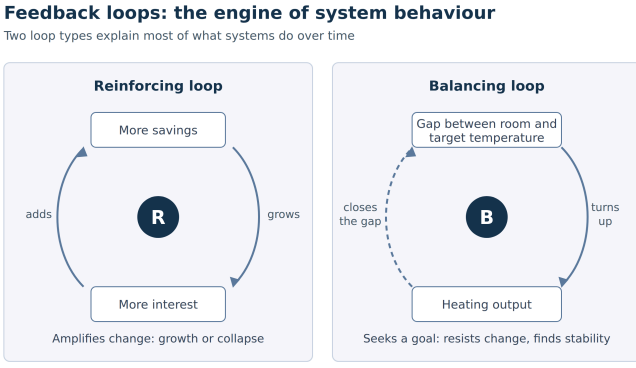


*Figure 2. The two loop types. Reinforcing loops amplify change; balancing loops seek goals. Real behaviour comes from which loop dominates, and when dominance shifts.*

## Emergence

Some properties of a system belong to no component and cannot be found by inspecting components. A traffic jam is not a property of any car. Safety is not a property of any single procedure; it is a property of how procedures, equipment, training and pressure interact on a bad day. These are emergent properties, and they are the deep reason siloed analysis fails: silos inspect parts, and emergence lives in interaction. Three families are worth hunting deliberately:

- **Combinational risks.** Two decisions, each sensible in isolation, interact into a failure neither owner can see.
- **Choke points.** A node that many paths quietly share: one supplier, one substation, one approvals committee, one person who knows the build system.

- **Accelerations.** Interactions that compound favourably, where investment in one place pays off in three.

Emergent properties are discoverable. They feel like fate because nobody was looking at the level where they form; model the connections and they become ordinary findings.

## Leverage

Donella Meadows ordered the places to intervene in a system from weakest to strongest. Numbers and parameters (prices, targets, budgets) are the easiest to change and the weakest: the system's structure digests them and carries on. Buffers, feedback loops, information flows, rules and goals sit progressively deeper. Most effort goes to the shallow end; most change comes from the deep one. You can only see the deep end if you have drawn the structure.

## WHY IT STAYED NICHE

So there is an obvious question: if the discipline is that good, why isn't everyone doing it? Because whole-system modelling has historically been brutally expensive in the one resource organisations never have spare, skilled attention. Building a serious model of a broad question meant weeks of research across dozens of unfamiliar domains, followed by careful stitching, parameterisation and validation. The people capable of it were scarce, the elapsed time was long, and by the time the model existed the question had often moved on. Systems modelling stayed niche not because it lacked value but because its cost sat above what most decisions could justify.

# WHAT AGENTIC AI CHANGES, AND WHAT IT MUST NOT

That constraint is what has just changed. An agentic AI system is not one model answering questions. It is a set of specialised agents (researcher, mapper, parameteriser, analyst, critic), each with a defined role, coordinating on a shared task under human direction. It mirrors how a good human research team already works.

Reading, interpreting and synthesising across dozens of unfamiliar domains is exactly the labour that priced modelling out of reach, and it is what agents properly grounded in real sources now do in hours. Agents research representative values with sources attached, leaving people the work that deserves them: judging, overriding, grading confidence. What-if batteries that once queued for specialist time become routine. In our experience this can do weeks and months of work in just a few hours. That is experience reported plainly, not a measured benchmark.

The strategic consequence is not "faster reports". It is that whole-system modelling drops below the cost threshold of ordinary decisions.

Now the part that must not change. AI adds failure modes of its own: fluent fabrication, ungrounded confidence, and sheer

speed, which manufactures unaudited claims faster than anyone can check them. So the rules of good practice do not relax; they harden into machinery:

- **Provenance becomes non-negotiable.** Every claim must cite a source a person can open.
- **Human judgement moves up the stack; it does not leave.** Agents propose, people dispose. Boundaries, overrides and decisions stay human; the machine does volume.
- **Validation industrialises.** If drafting accelerates and checking does not, you have built a machine for generating plausible errors. Red-teaming has to become part of the machinery itself.
- **The audit trail becomes the product.** An AI-built model that cannot show its working recreates the old trust problem at scale; one that logs everything finally solves it.

> **Tip:** When evaluating any agentic analysis tool, ours included, ask one question first: "show me a claim, and walk me to its source." If that walk is short, the rest of the evaluation is worth your time.

## HOW SOSX DOES IT

That is the design brief for SOSX. It runs the discipline as a platform: a five-phase pipeline of Scope, Research, Parameterise, Analyse and Report, staffed by thirteen specialised AI agents. Every value carries its unit, its provenance and its confidence. Every claim cites a catalogued source. Every model call is audit-logged, and every high-stakes output is red-teamed by adversary agents before you see it. Structural facts are proved by a symbolic reasoner and kept visibly separate from judgement and simulation, so a reader always knows which kind of statement they are looking at. The model exports into the tools teams already run, so the work does not stay trapped where it was made.

It is built for the questions that fall between departments, the ones that normally consume weeks of work. One engine is set up as an edition per market: engineering, story worlds, research, business, investment, utilities, the circular economy and management decisions. SOSX is self-funded, built for Innovate UK's Agentic AI Pioneers competition, and is in live trials with a large global aerospace manufacturer.

None of which you should take on my say-so. So start where it costs nothing.

## START WITH AN AFTERNOON

Take one question your organisation currently cannot answer, the kind that falls between two departments, and give it an afternoon on a wall: the parts, the connections between them, what accumulates, what feeds back, what arrives late. Write down the boundary, and what you have left outside it. Type every connection, hunt one loop, and put a source and a confidence marker on the three numbers the answer turns on. Sticky notes and a marker pen are the entire toolkit.

If it finds nothing, you have lost an afternoon. In my experience it rarely finds nothing, and finding one hidden connection is usually enough to change what the next meeting is about. If it leaves you with a question you want a fuller answer to, bring it to us, and watch SOSX work it, with every claim cited and every step auditable.

Christopher Dean, Hove

## GET THE WHOLE BOOK

SOSX: Seeing the Whole System runs to four parts: the discipline, the practice, the machine, and the same discipline across eight domains. Every chapter of the practice carries tips, an exercise you can do this week, and the pitfalls teams fall into. None of it needs software.

**Get a free copy.** Book a free consultation about a real question from your organisation, and we will send you the book.

SCAN OR CLICK TO BOOK A CALL

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# ABOUT THE AUTHOR

Christopher Dean is the founder and CEO of Digital Tactics Ltd, an AI transformation, software engineering and innovation consultancy founded in 2011 in Hove, on the English south coast. The company has delivered more than 170 client projects and maintains a portfolio of nine products, of which SOSX is the most important.

Alongside running Digital Tactics he spent a decade as Head of Technology at Endemol Shine UK, the British arm of one of the world's largest independent television production groups, where his teams ran national-scale live interactive systems with hundreds of thousands of concurrent viewers. He read chemistry (MChem) at the University of Sussex and undertook postgraduate research at the University of Southampton's Optoelectronics Research Centre. He describes himself as a frustrated scientist, innovator and creative technologist.

His commercial work is anchored in research: the €13 million ITEA GreenCode programme, which he initiated and leads, the ITEA GIGI project, GLEAM and other industrial research and development programmes. He is a Technology Expert to the European Commission and an Independent Application Assessor for Innovate UK.

**Connect on LinkedIn:** linkedin.com/in/chrisjohndean

SOSX®

## The questions that matter live in the connections.

No single team holds the whole of a big question. Each piece is rigorously produced, and the answer the business needs lives in the connections between the pieces, where nobody is looking.

This short excerpt from SOSX: Seeing the Whole System explains the discipline built for exactly that: what systems thinking is, the ideas that do most of its work, why it stayed niche for seventy years, and what agentic AI now changes, provided the machinery of proof comes with it.

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## Get the whole book, free

Book a free consultation about a real question from your organisation, and we will send you a copy.

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Digital Tactics Ltd
Brighton and Hove, East Sussex, United Kingdom

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