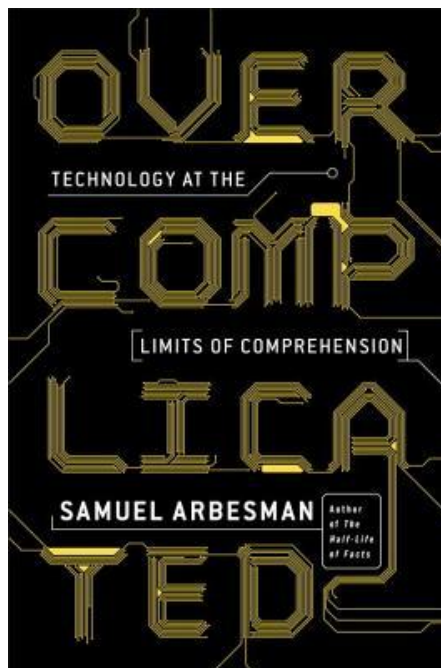




Overcomplicated: Technology at the Limits of Comprehension

Samuel Arbesman

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The acclaimed author of *The Half-Life of Facts* explains the challenges of overly complex technology.

On July 8th, 2015, something weird happened. The NYSE computers went down and trading was suspended for several hours. The culprit wasn't hackers or a rogue algorithm. It was just... a glitch. And it's just the beginning.

Technological complexity is no trivial matter. While a few hours of suspended trading may not have had lasting impact on the markets, imagine the damage that could result from a breakdown of our air traffic control systems, or earthquake warning systems. We need a new way to think about technology, and we need it fast.

In *Overcomplicated*, complexity scientist Samuel Arbesman argues that we've reached a new era: a time when our technological systems have become too complex and interconnected for us to fully understand or predict.

From our machines and software to our legal frameworks and urban infrastructure, Arbesman explores the forces that lead us to continue to make systems more complicated and more incomprehensible, despite our best efforts to make them simpler. He goes on to identify a new framework for thinking about (and planning within) complex systems.

We must abandon the idea that we will understand the rules, and instead become field biologists for technology--relying on description and observation to uncover facts about how a system might work.

Whether you work in business, finance, science, or IT, or you simply own a smart phone, *Overcomplicated* offers valuable insight on how to adapt to the complex age we are living in.

Overcomplicated: Technology at the Limits of Comprehension Details

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Atila Iamarino says

Nunca mais vamos entender completamente a tecnologia. Essa foi a mensagem principal desse livro. Uma explicação rápida e bem direta de como sistemas se tornam complexos, da nossa língua a leis, de um programa de computador ao funcionamento de um Boeing 777, e como um sistema complexo e cheio de interações como esse (daí o complicado) se torna simplesmente incompreensível. De onde surgem bugs misteriosos, problemas sem solução e todo tipo de gambiarra criativa que constrói em cima do que já existe, já que muitas vezes é a única solução.

Gostei em especial da diferença que ele faz entre uma abordagem mais física – extrair grandes princípios integradores – e uma mais biológica – observar e catalogar a diversidade – e como as duas podem ser importante para navegarmos em um mundo mais complexo. Fiquei imaginando a profissão de um zoólogo de bugs... de computador.

Tom says

Why cars, websites, and other cool technological things, go batshit crazy and what to do about it (sort of).

lee says

I thought this was a nice introduction to some concepts in complexity theory and computer science. I thought at times it was repetitive i.e. technology is creeping towards the limits of our understanding if not already surpassed. However, I also thought the author provided some great insight that should make any reader think (interoperability, entanglement, emergence, dark code, hapax legomena, etc). I also liked the correlations to linguistics and a primer on some NLP concepts and machine learning.

So how do we deal with this complexity? The author had some solutions like the return of generalists, simulations, interdisciplinary teams, humility not fear, etc. Whether or not any of them will actually work who knows, but I think it's a start and we should have more people thinking about this. How many times can we layer our knowledge upon generation and generation without any loss of context?

I also think dividing two types of thinking up into biological vs physical is true to an extent but also strips away all the details because it is such an overarching generalization. Of course any good scientist/engineer will tinker with the abstractness and messiness of reality(biological) but also look for patterns and universality using rigor and mathematics(physical). I guess it is true we need all types of people with different kinds of thinking. Also, you could argue physics forms the basis of all biological activity so there is that to ponder too.

Overall this should be entertaining for someone who wants to have a gentle introduction but if you seek a deeper dive and have good foundational knowledge look elsewhere. The author does provide a lot of further readings and notes for the reader which is helpful.

Randy Long says

Pretty good synopsis regarding the new normal of Project Management, Expert Systems, and current norms and practices in the world. Truth be told, I had an idea like this a few years' back but nothing ever came of it (go figure).

Arbesman has a good grasp of software engineering, traffic management, the grid all current sectors undergoing rapid and irreversible change. This Information Age has all the makings of a full blown man made disaster, but I'm ever the optimist.

Good read about the dangers(and opportunities) that modern industry and business have on society. Not an exaggerated read.

Melinda says

I was surprisingly underwhelmed by this book. To sum up - there is lots of systems out there, they are complicated, no, one person can know everything, all good. Press repeat, and repeat again, insert an anecdote, then tell us that there are lots of systems out there and its all very complex - but use a few different words. Kind of reminded me of a 10th grade english essay - where you are just learning to construct the argument and defend it (not well).

I thought the premise of this book was great - but there seemed to be so little substance or real evidence or information.

Artur Coelho says

É algo complicado perceber qual é o propósito deste livro. Promete ser uma reflexão sobre os sistemas complexos que suportam o nosso dia a dia, desde as infraestruturas tecnológicas aos códigos legais. Tem uma linha de pensamento muito clara: da colisão da expansão do conhecimento e desenvolvimento tecnológico surgiram sistemas de elevada complexidade, dos quais dependemos para manter a funcionar a economia, instituições, e cada vez mais, com a computação pessoal e a internet, as nossas vidas pessoais. Complexidade exponencial, que leva a que poucos sejam realmente capazes de compreender todos os elementos dos sistemas, e ao surgir de paralisações ou avarias inesperadas com causas difíceis de descobrir. Analisa o papel da progressiva especialização no domínio do conhecimento, reflectindo sobre a necessidade de abordagens transdisciplinares que preservem a flexibilidade de um pensamento generalista face ao isolamento trazido pela hiper-especialização.

São argumentos interessantes e pertinentes, mas o livro lê-se essencialmente como um longo resmungo acerca das condições da modernidade contemporânea. Os sistemas tecnológicos complexos que dão o tema ao livro são abordados de forma liminar, sem nada mais profundo do que pequenas histórias de momentos em que bugs ou anomalias fizeram algo correr mal. Ao falar de alguns tipos de sistemas complexos, sente-se até que o grande problema apontado pelo autor está na diversidade de necessidades humanas, que obrigam à complexidade bizantina dos sistemas legais. As leis seriam de facto mais simples se houvessem menos direitos a respeitar. Apesar de abordar questões pertinentes, acaba por ser ler como um misto de análise

angustiada e síndrome de choque do futuro.

Hadrian says

Short, informed, playful, little book warning that technology is becoming so complicated that its component parts are now beyond the reach of human understanding. Argues that attempting to take apart these systems and starting over is too difficult to be practical, and suggests that we approach technology like in the way humans discuss ecology. Makes sense, where few other ideas do.

Ari says

This is a short book about the limits of our techniques for managing technology. I didn't care for it. The basic premise of the book is "our technology has gotten too complex for us to understand and we need new paradigms for managing it." Much of this book is true, much is thought-provoking, but alas the two subsets have limited overlap. The book also suffers from a lack of clear audience: it's a book about what technologists should do, written for non-technologists with limited grip on the problem.

The author's diagnosis of the problem is surely correct, but not very novel or deep. He points to two concerns: first, we keep tinkering with systems we half-understand, resulting in gradual increase of entropy, and second, we keep interconnecting systems, resulting in surprising couplings. I think most mid-career engineers already understand these points thoroughly. Nor are they new -- I think both points are already in The Mythical Man Month.

The author's advice about solutions is interesting but I think wrong. He says "rather than thinking like physicists who want general mathematical rules, we should be more like biologists, studying specific instances and specific interrelations." He also suggests more use of simulators. These two points, alas, contradict -- for a simulator to be useful, we need sound abstractions for the thing being simulated, which is the physics model.

Moreover, close observations of specifics and pairwise interactions has two other serious drawbacks -- it fails to scale as the systems do, and it doesn't let us extrapolate system behavior as various parameters change. Suppose you have a system and you want to know what happens as you vary some parameter -- data volume, number of nodes, whatever. The biology approach won't tell you much, and the physics approach will. The author approvingly cites Dijkstra's remark about how computer science spans orders of magnitude in ways few other fields do -- but fails to take that into account.

In all, I am afraid this book gives the illusion of insight while in fact not telling anybody anything useful.

Eva says

We build systems (software, legal frameworks, etc) and we keep adding features and exceptions to them, each addition triggering an exponential increase of interactions between individual parts. And that's when we lose the ability to understand or anticipate all possible pathways through the system. Our systems and technologies become black boxes.

Once our technological creations reach such high complexities that we don't understand them anymore, we either resort to fear or awe (the modern day sublime). Plus unexpected behaviour and/or bugs creep in and we simply can't make sense of them anymore. Arbesam makes the point that we need to find ways of keeping up with our creations, by becoming T-shaped people (specialist with generalist knowledge) and by designing more transparent, more easily-readable systems (see "explainable A.I.")

This is a pretty fascinating topic. The book could have maybe used some harsh editing and could have worked better as an elongated essay, but all in all he's collecting interesting points.

Scott Sigler says

I enjoyed this book, but put it down at some point and didn't pick it back up. I would say that's my fault more than the author's — it's getting harder and harder for me to finish a print book. Audiobooks dominate in my world.

Jerrid Kruse says

Introduces the Entanglement in which complex systems are so interconnected that they are essentially not understandable. This leads to mythical entities like "bugs" and "glitches" that seem to be somewhat random (based on our lack of knowledge). The author notes how complexity thinking in science (biology) might be more useful to gain understanding of tech than a relationship thinking (physics). Yet, a mix is likely reasonable. Finally, given the complexity, the author notes the problems with awe and fear. Instead, humbly trying to understand is a more useful outlook.

Terry says

This short book discusses the problems caused when technology becomes so complex that few people can understand all aspects of a given invention. The author discusses the ubiquity of errors in software and historical examples where this has caused problems as well as additional problems caused by inter-connectedness.

The author doesn't much posit solutions to this and merely observes what he calls thinking like a biologist and thinking like a physicist in terms of understanding elements vs a system's gestalt. He also proposes that we have more generalists to help tackle problems as narrow solutions become harder to come by.

I wasn't particularly impressed by this book. The author has a point but doesn't bring enough commentary to the table to justify this being a book. I've read other books that comment on the problems in certain hard technologies and do much better jobs both explaining what makes them hard as well as discussing how we deal with that complexity.

The book does avoid catastrophism and avoids lamenting the loss of "a simpler time" but that's not enough to stand on. Skip.
