

Understanding Cloud Data Tools and Complexity



John R Williams
<http://Geospatial.mit.edu>



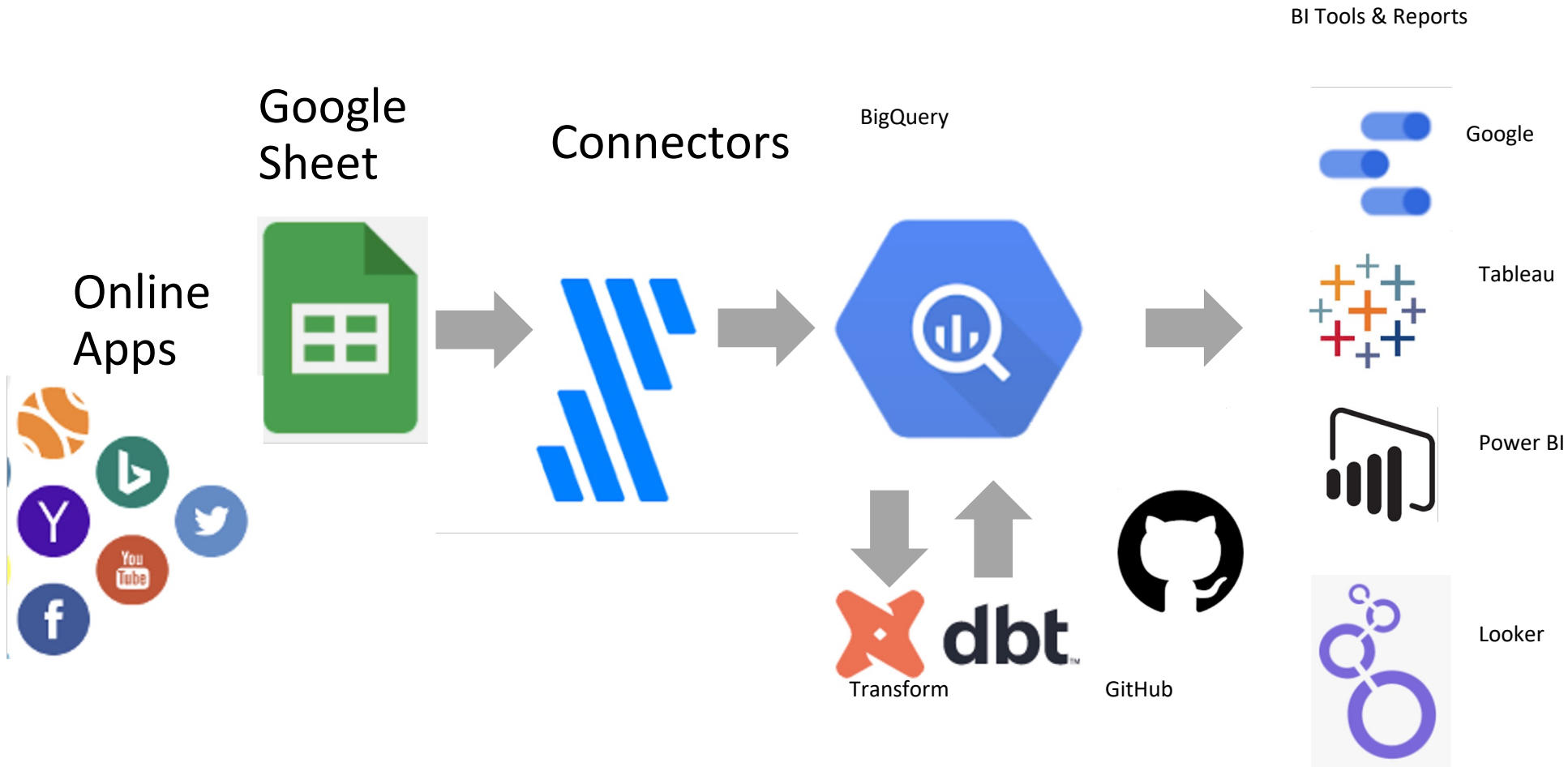
Stockfish > 3500 Carlson ~2900

Transformation of Workforce

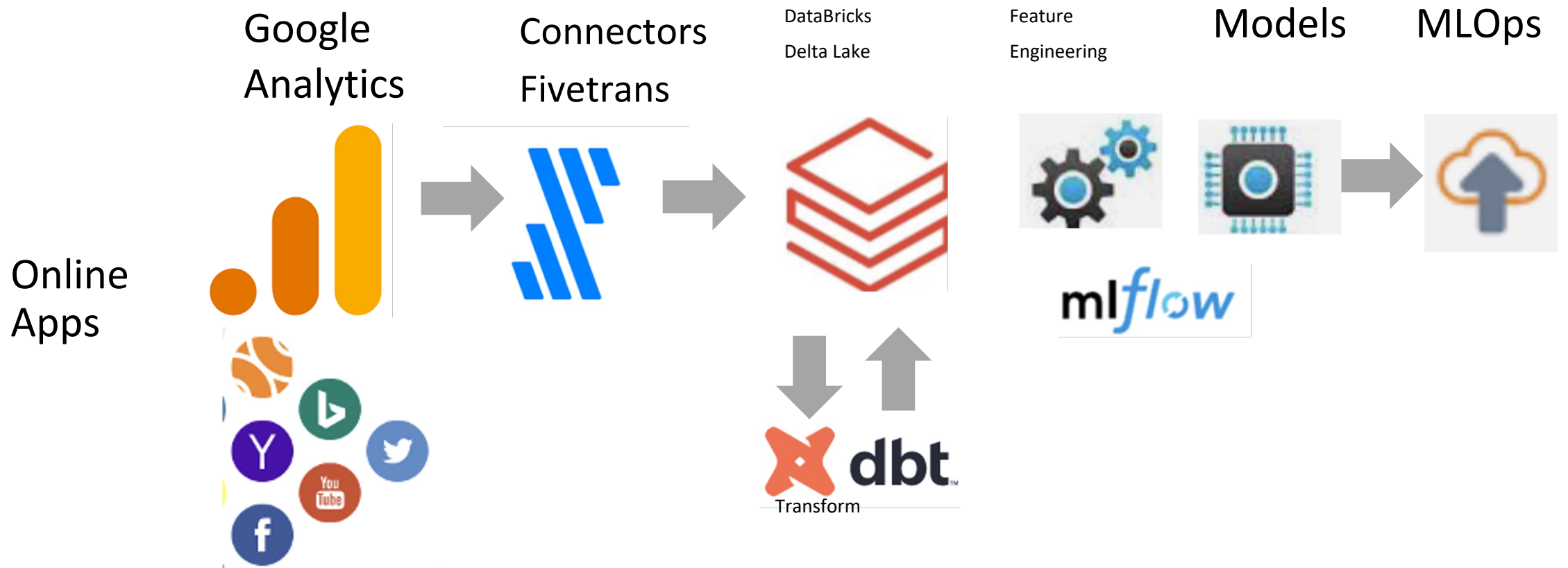
- Technology and Tools
- Managing Change
- Levers of change.
 - Command and Control vs Self Organization



Business Intelligence Pipeline – Modern Stack



ML Model Development Pipeline





Chicago Taxi Earnings

212 Million Rows

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	A	B	C	D	E	F	G	H				
1	<i>SUM of trip_total</i>								<i>trip_start_timestamp - Day of the week</i>			
2	<i>trip_start_timestamp</i>	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday				
3	0	\$24,031,466	\$10,988,478	\$9,364,401	\$9,634,370	\$11,306,717	\$14,868,929	\$22,157,400				
4	1	\$22,742,268	\$7,393,945	\$6,045,628	\$5,989,475	\$7,241,932	\$10,288,987	\$20,237,400				
5	2	\$19,658,139	\$4,610,916	\$3,572,900	\$3,540,671	\$4,431,481	\$6,645,357	\$17,084,500				
6	3	\$16,024,603	\$3,409,553	\$2,448,541	\$2,556,626	\$3,223,240	\$4,583,376	\$12,491,000				
7	4	\$11,370,029	\$5,035,806	\$3,181,744	\$3,222,854	\$3,623,088	\$4,587,944	\$7,909,400				
8	5	\$8,364,281	\$8,830,371	\$5,611,930	\$5,554,700	\$5,797,426	\$6,374,355	\$5,519,300				
9	6	\$7,286,898	\$11,915,338	\$8,913,596	\$9,007,495	\$9,209,259	\$9,348,182	\$5,679,400				
10	7	\$7,638,419	\$15,439,263	\$14,373,713	\$14,810,329	\$14,960,192	\$14,340,212	\$7,095,200				
11	8	\$8,809,245	\$20,796,907	\$21,582,768	\$21,763,421	\$21,815,308	\$19,925,585	\$9,105,200				
12	9	\$11,496,373	\$24,480,081	\$25,116,680	\$25,451,283	\$24,850,716	\$23,125,604	\$12,325,700				
13	10	\$14,949,368	\$23,747,909	\$23,801,653	\$24,244,814	\$23,581,076	\$23,181,796	\$14,989,200				
14	11	\$18,017,531	\$23,951,869	\$24,198,592	\$25,239,104	\$24,997,237	\$25,619,831	\$17,163,600				
15	12	\$19,687,628	\$24,727,287	\$25,251,578	\$27,072,914	\$27,367,479	\$28,683,365	\$18,927,600				

ROBOT RIGHTS: US
court rules AI machines
'are not human beings'
and cannot claim rights
over their inventions





MetaHumans by Epic

THE TECHNOLOGY 202

White House unveils 'AI bill of rights' as 'call to action' to rein in tool



Github Copilot - GPT3 Machine Learning Help

```
EXPLORER  
Get Started  
index.html  
DEMO  
index.html  
<html>  
<head>  
<title>My First Web Page</title>  
<script>  
</script>  
</head>  
</html>
```

```
1 <html>  
2 <head>  
3 <title>My First Web Page</title>  
4 <script>  
5 | let url = "https://polysnips.s3.amazonaws.com/users.json";  
6 </script>  
7 </head>  
8 </html>  
9
```



"https://polysnips.s3.amazonaws.com/users.json"

Cloud Services

SaaS – Software

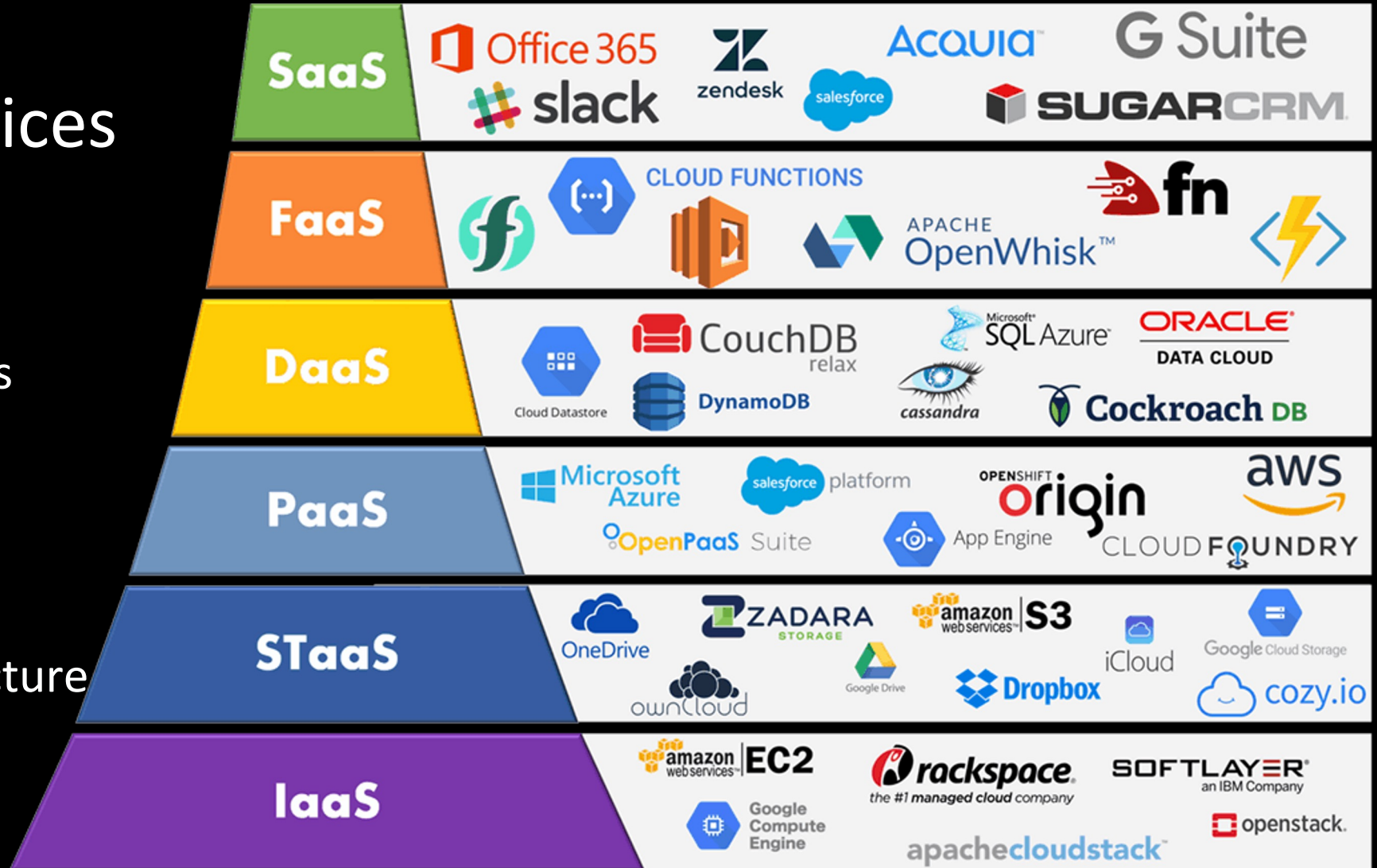
FaaS – Functions

DaaS – Data

PaaS – Platform

STaaS – Storage

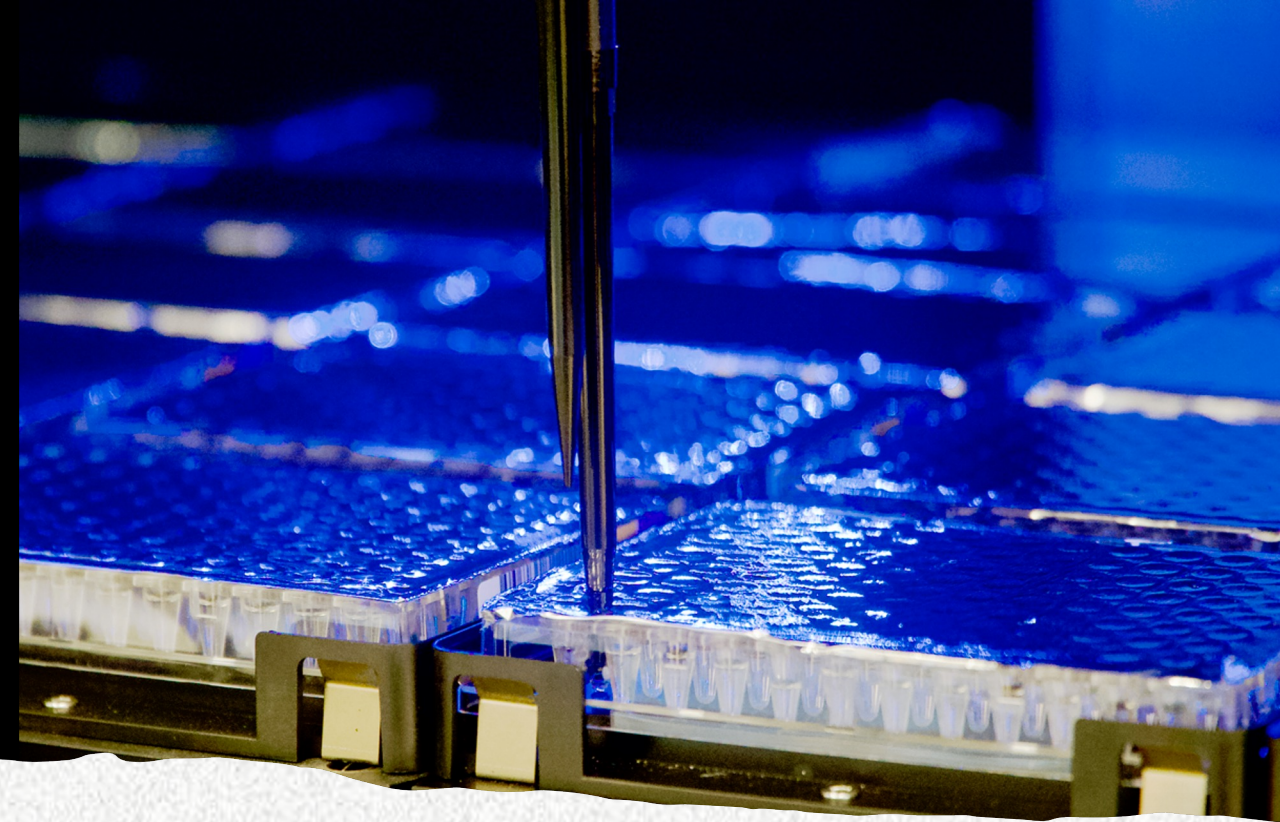
IaaS – Infrastructure



Tooling has changed

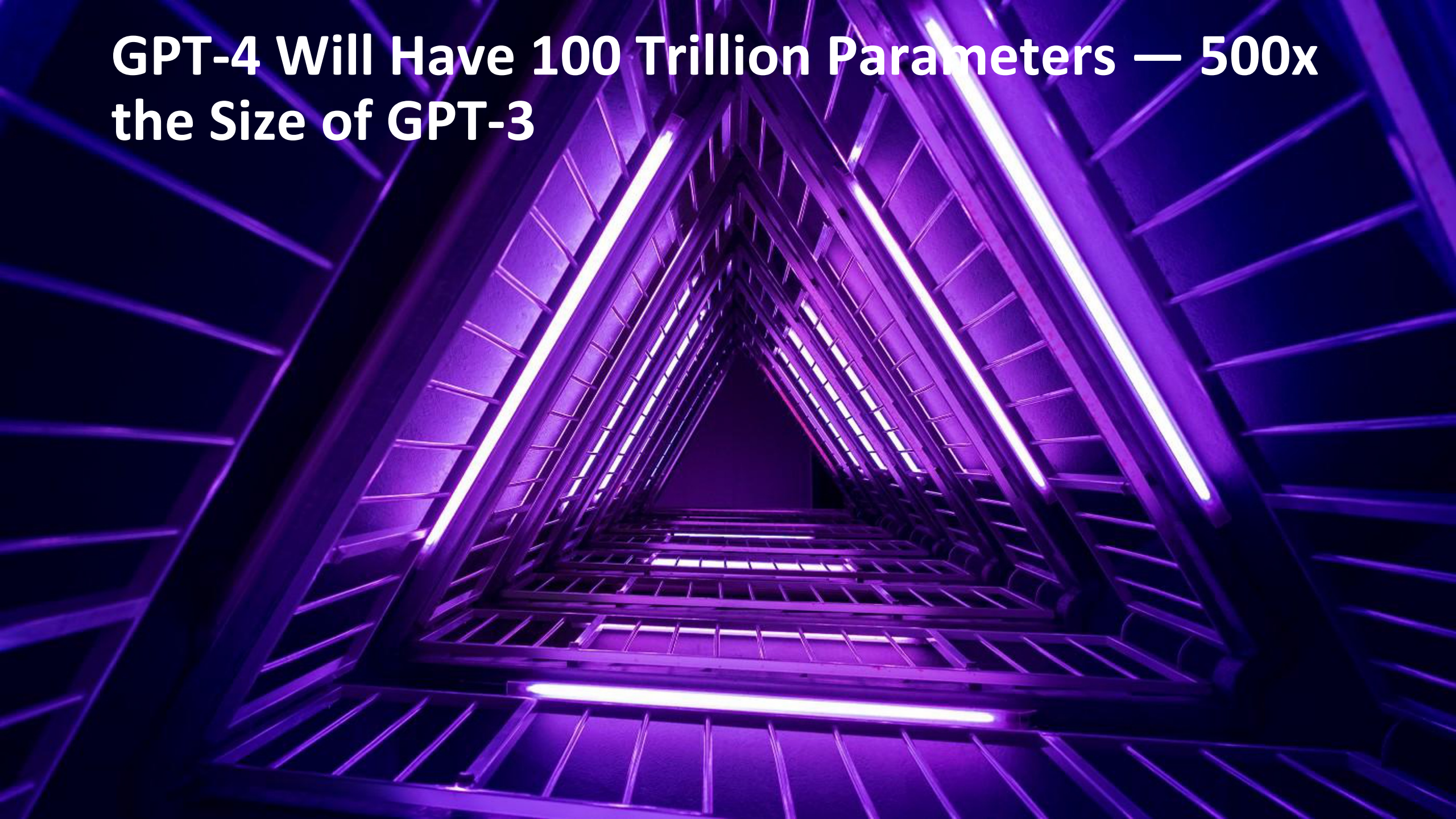


AWS Ground Station Service <https://www.youtube.com/watch?v=JlbIYCM48to>

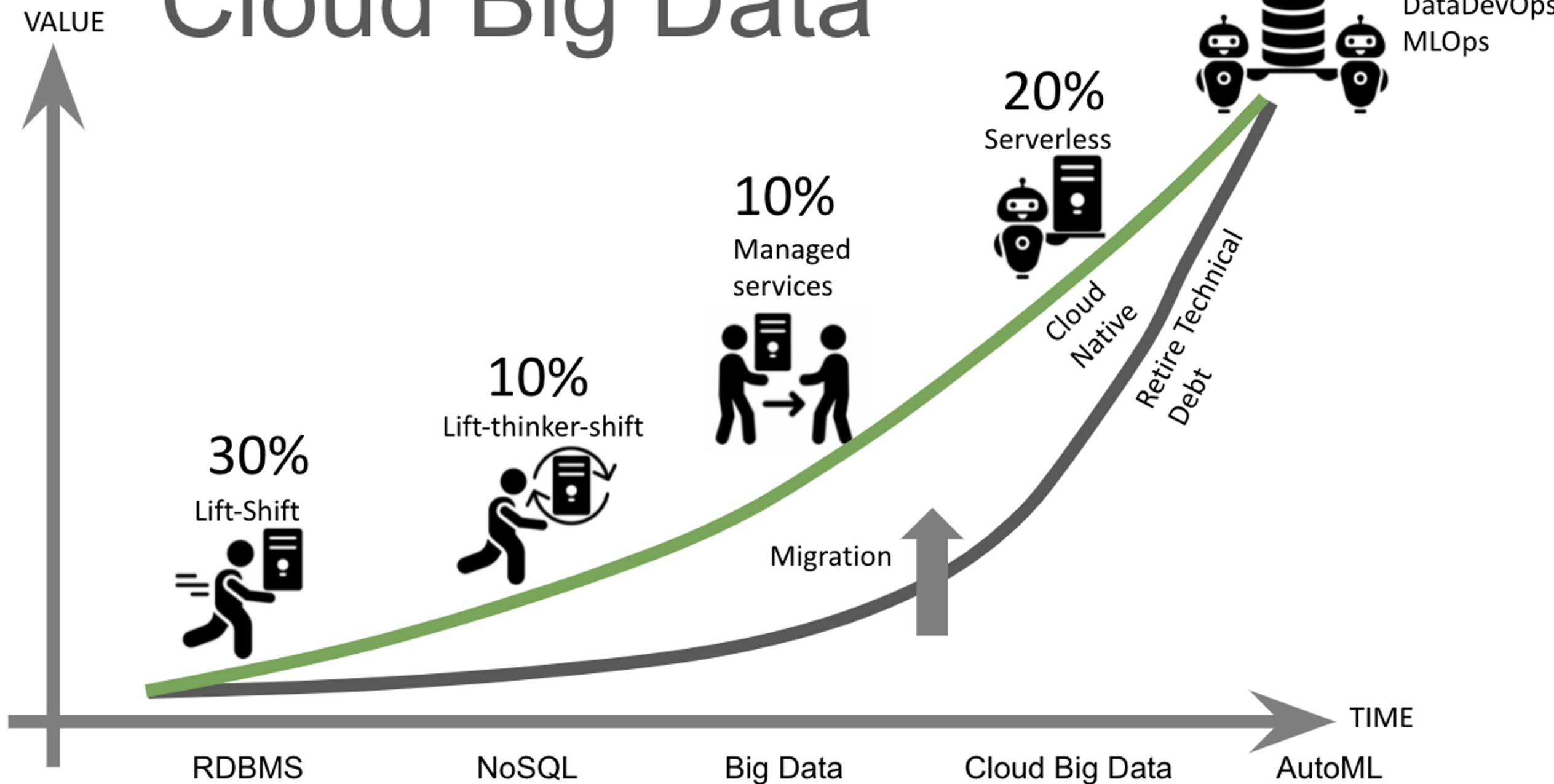


Automated Robotic Labs – Strateos

**GPT-4 Will Have 100 Trillion Parameters — 500x
the Size of GPT-3**



Cloud Big Data



A Car Guy

with wheels since 2006



1900 – World knowledge was double that of 1800

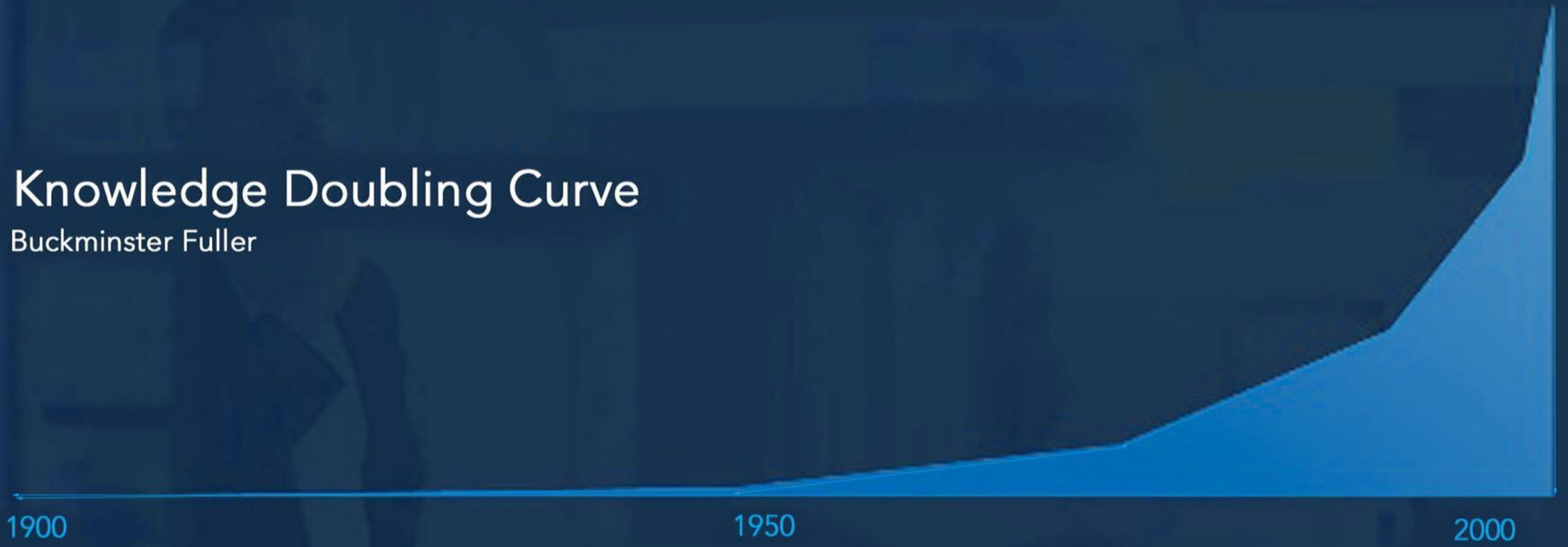


Today
knowledge is
doubling every
18 months



Knowledge Doubling Curve

Buckminster Fuller



Until 1900 human knowledge doubled approximately every century.



By 1945 knowledge was doubling every 25 years.



Currently, on average human knowledge is doubling every 13 months.

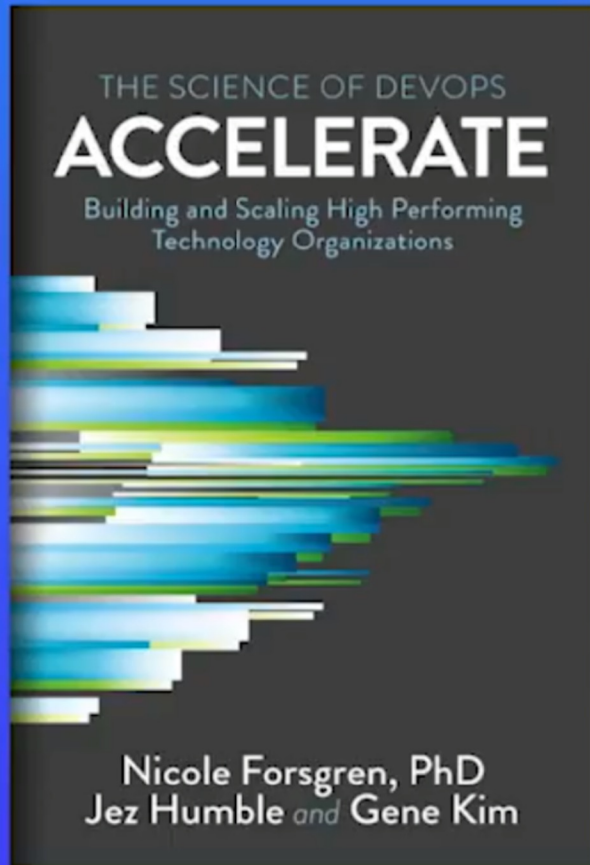


IBM predicts the build out of the "internet of things" will result in the doubling of knowledge every 12 hours.



Time to Value

DevOps



The fast companies are **440x** faster than the slow

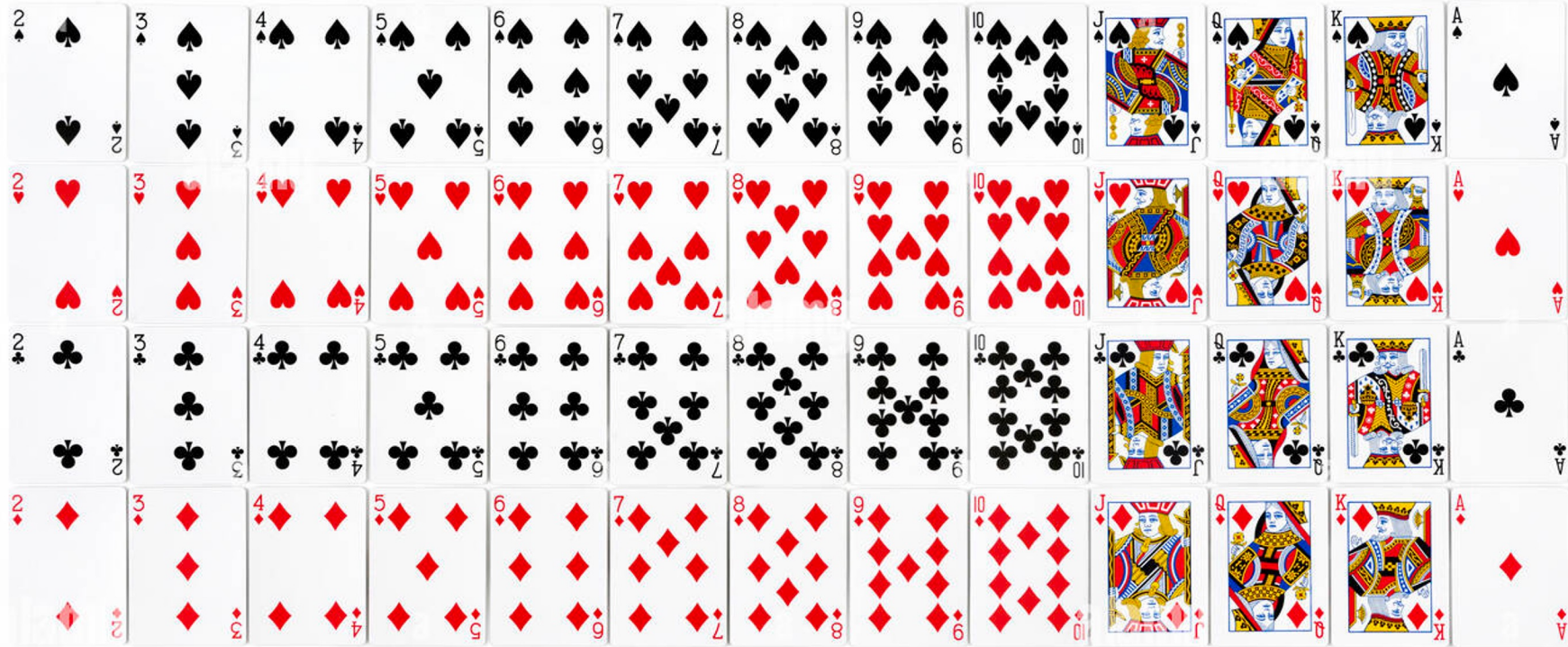
We found that, compared to low performers, high performers have:

- 46 times more frequent code deployments*
- 440 times faster lead time from commit to deploy*
- 170 times faster mean time to recover from downtime*
- 5.0 times lower change failure rate (1/5 as likely for a change to fail)*

Months  Hours

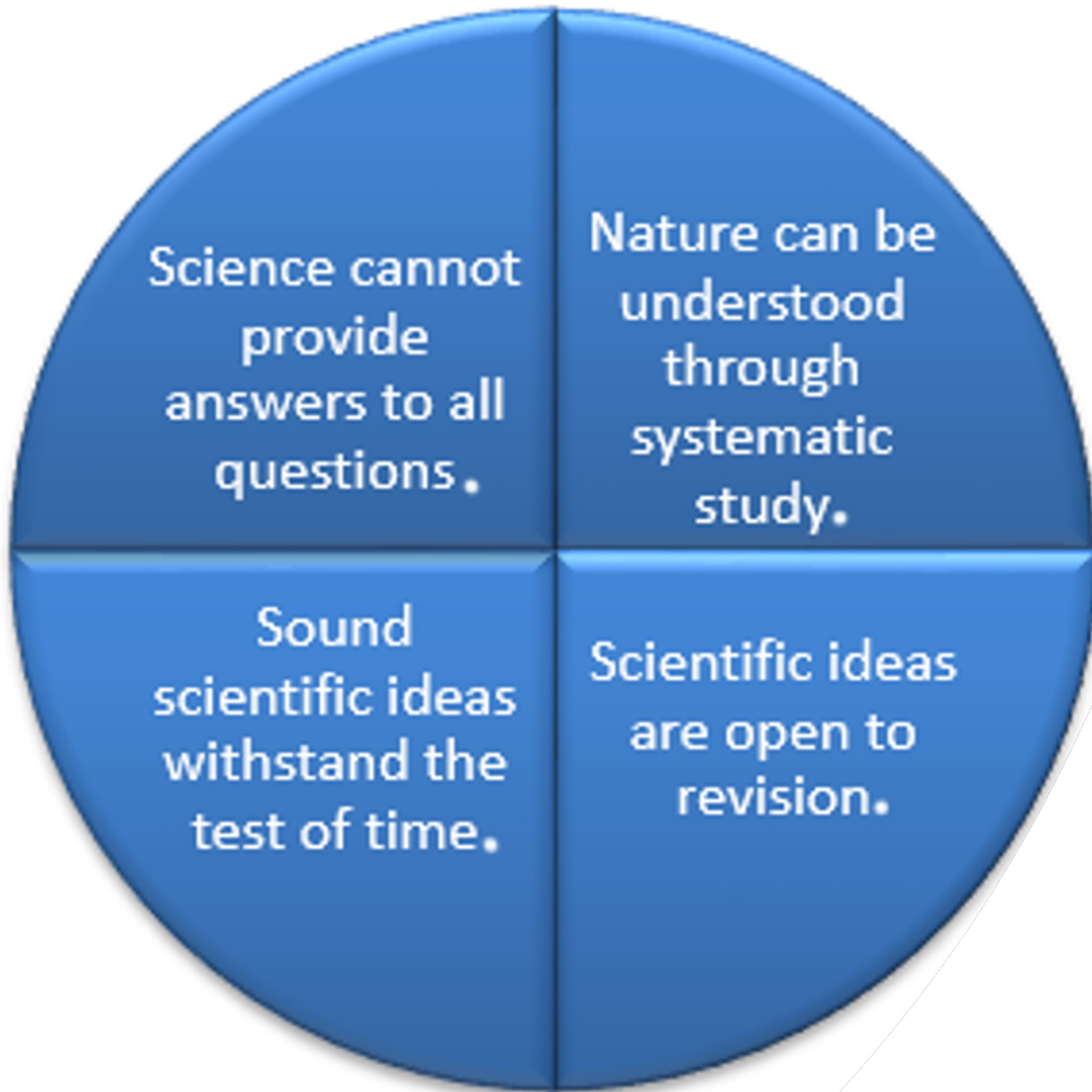
<https://itrevolution.com/book/accelerate/>

If we gave every employee in MIT (~10,000) an app that generated a random deck of cards every second. How long would it be before we get a repeat of the same order?



1.85e+50 Ages, where an Age is the age of our universe





Hume's "is" vs
"ought"
dichotomy

Science and
Trans-Science



DATA but from Chaotic Systems

STORM
5 HRS REMAINING

12 PM	1 PM	2 PM	3 PM	4 PM
73°	72°	68°	63°	62°

STORM DIRECTION

4 EXPECTED RAINFALL





NEW YORK TIMES BESTSELLER
THE
BLACK SWAN



The Impact of the
HIGHLY IMPROBABLE

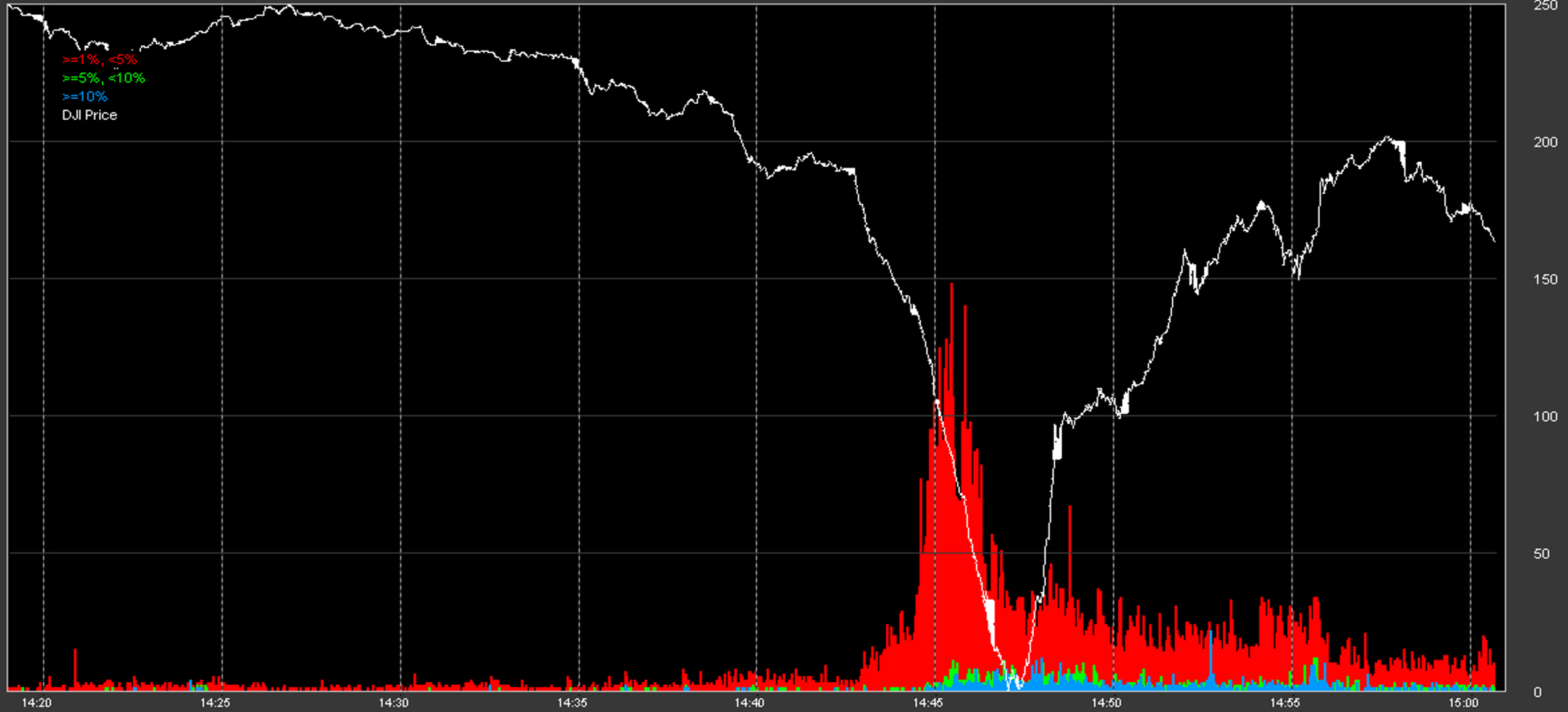
“The most prophetic voice of all.”
—GQ

Nassim Nicholas Taleb

Market Crash May 6, 2010 - \$1 Trillion lost in 10 mins



% Drop in Price (1 trade) VS Dji Price (Last Price > 10.0) & (TradeSize=100)

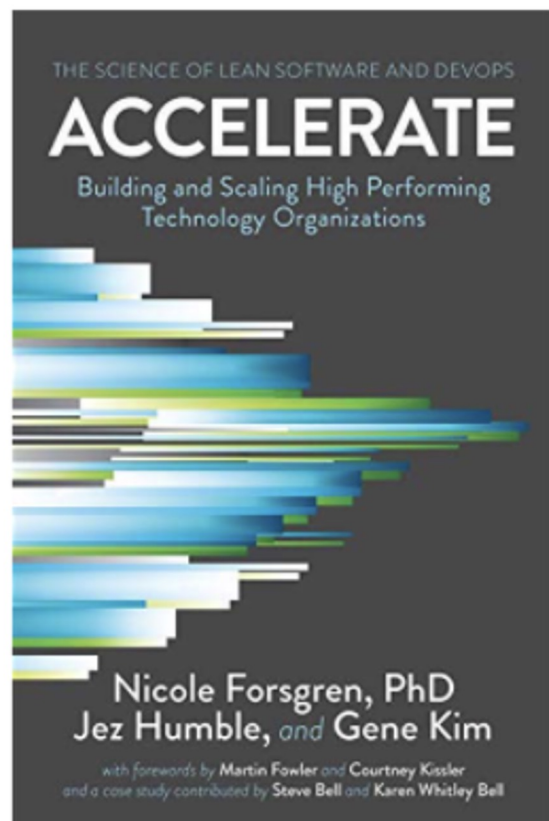




Speed of Learning



Time to value (2018 DORA Report)



The elite companies are **2555x** faster than the slow

Compared to low performers, high performers:

46 times more frequent code deployments

2555 times faster lead time from commit to deploy

2604 times faster mean time to recover from downtime

7 times lower change failure rate (1/7 as likely for a change to fail)

The elite are widening the gap

RotiMatic Bread Maker - Designing MVP to Learn Fast

<https://www.youtube.com/watch?v=fKhrIO0KGVl>



Learn what your customers want – let them build it online



Edit Location 01742

Switch Model

View Saved

Chat

① CONFIGURATION

② TRIMS

③ COLORS

④ PACKAGES

⑤ EXTERIOR

⑥ INTERIOR

⑦ ACCESSORIES

⑧ SUMMARY

NEXT

2020 CORVETTE STINGRAY RWD Coupe 2LT

\$73,300 Net Price ▼



Configuration (2)

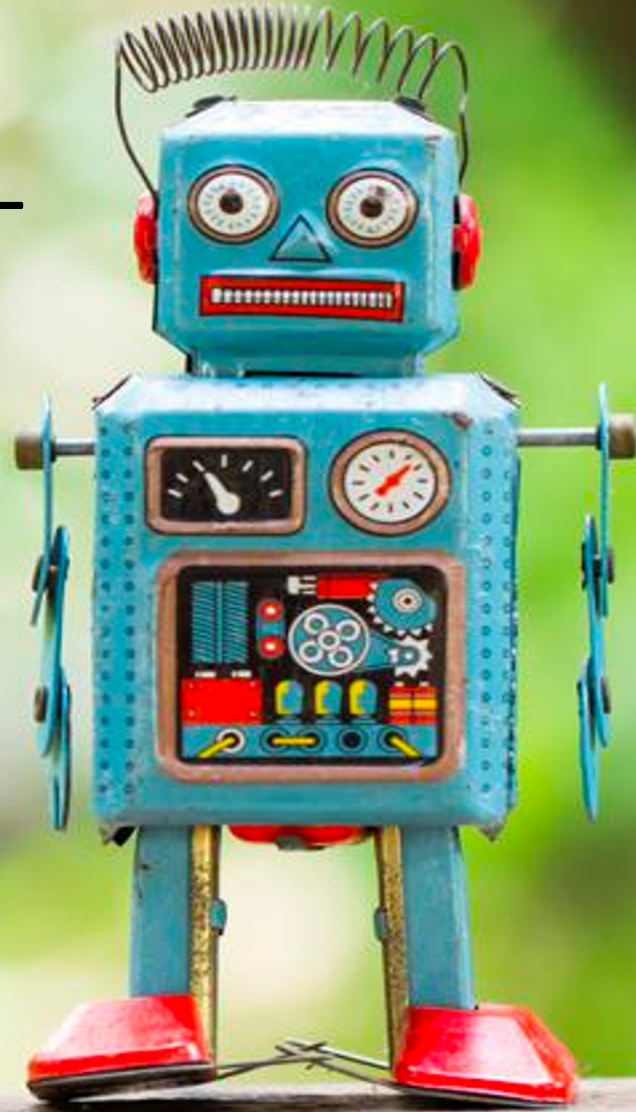
COUPE
MSRP from \$59,995[±]

VERTIBLE
MSRP from \$67,495[±]

Next Step: Trims

Organization Design Challenge - Human + Machine

Command & Control (Top-down) or
Self Organizing (Bottom-up)



“I’m an Architect, not a Captain.”

McKinsey Quarterly

Shattering the status quo: A conversation with Haier’s Zhang Ruimin

July 27, 2021 | Interview

Imitation





A photograph of a colony of ants on a white, textured surface. The ants are arranged in a long, winding line that starts from the top left and moves towards the bottom right. The ants are small, with dark bodies and reddish-brown heads. The surface has a fine, woven texture. The text "Stigmergy – leaving signals for others to follow" is overlaid in the upper right quadrant.

Stigmergy – leaving signals for others to follow

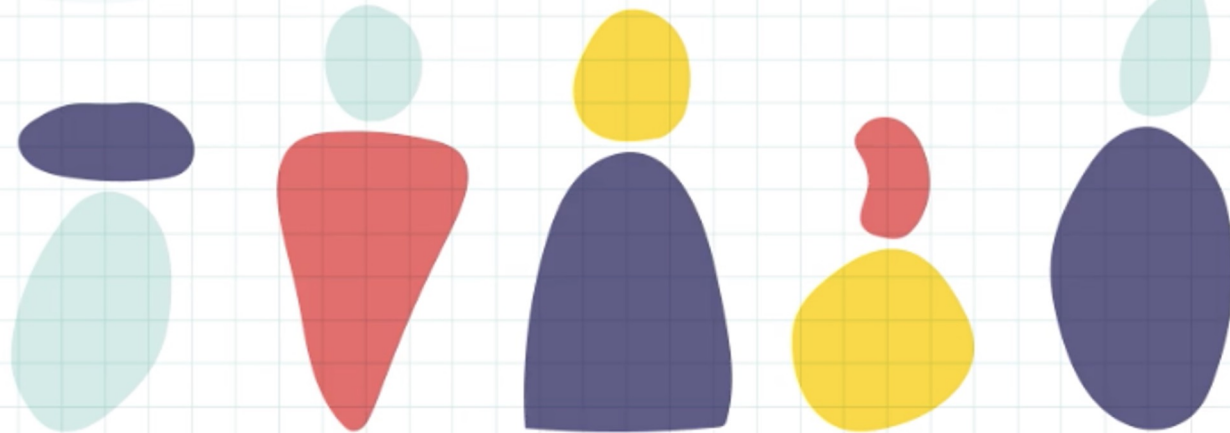
Open Source – Millions of Libraries

Companies as complex human systems

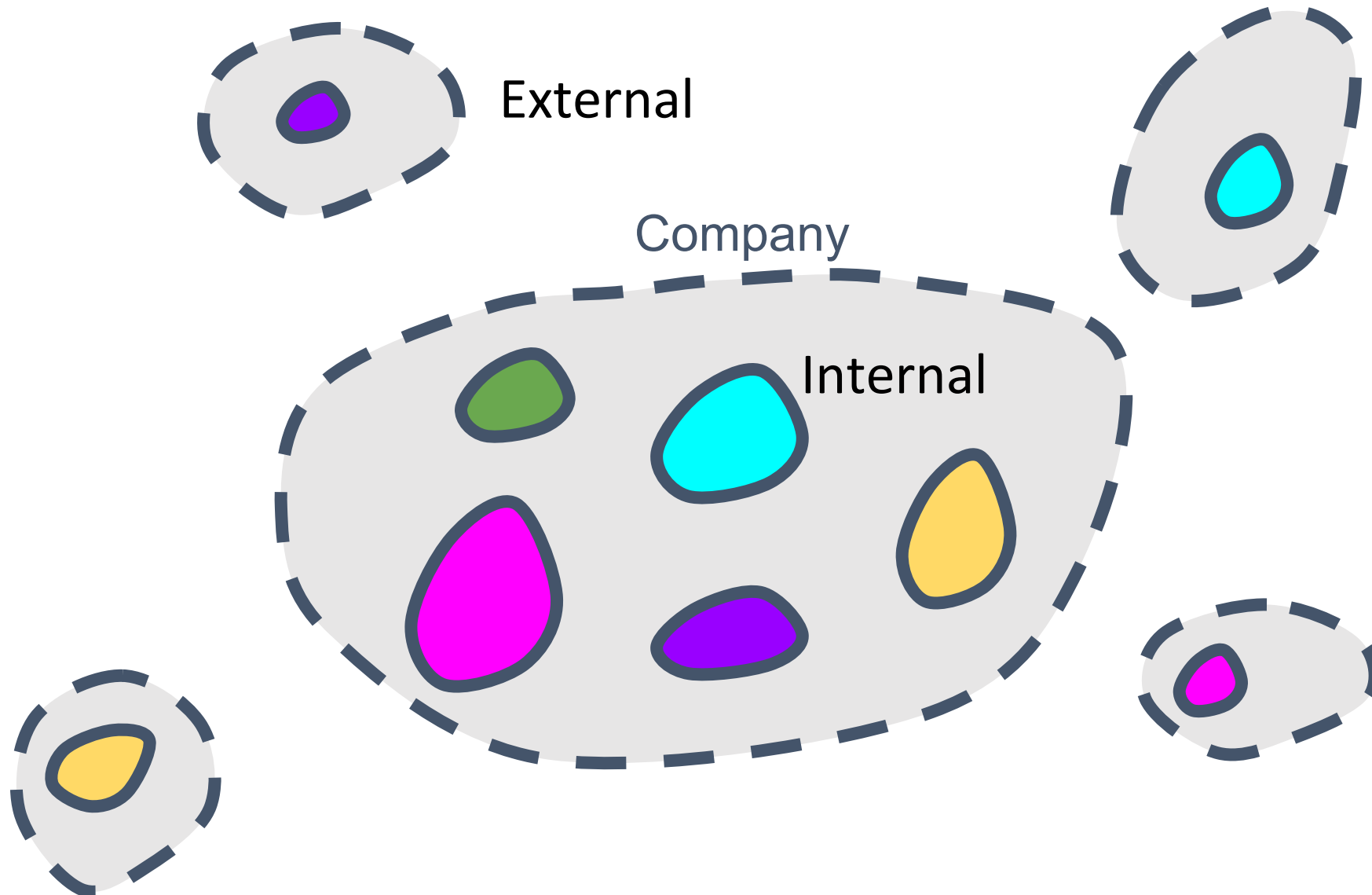
needs

challenges

motivations



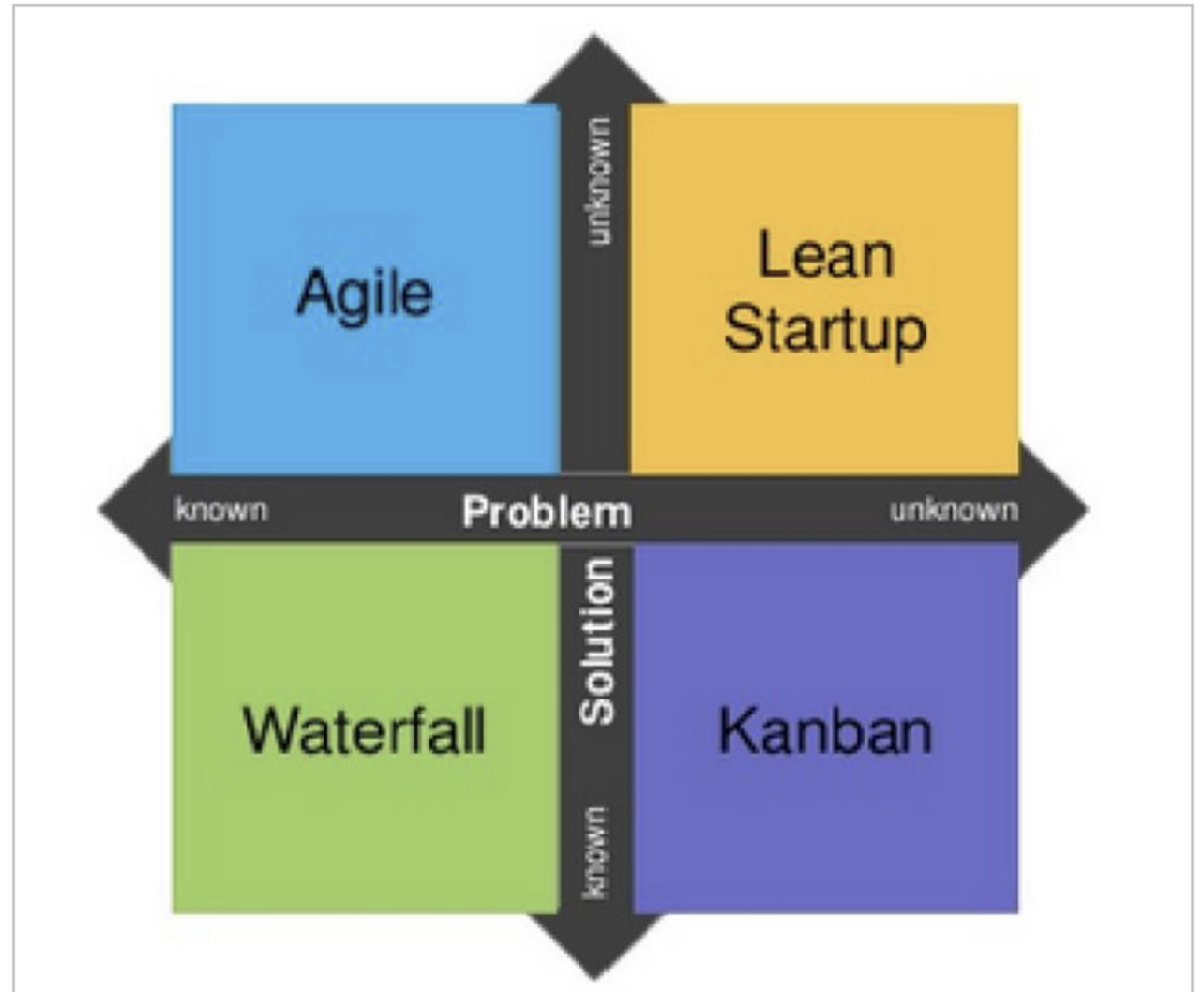
View companies as Complex Adaptive Systems



What Framework?

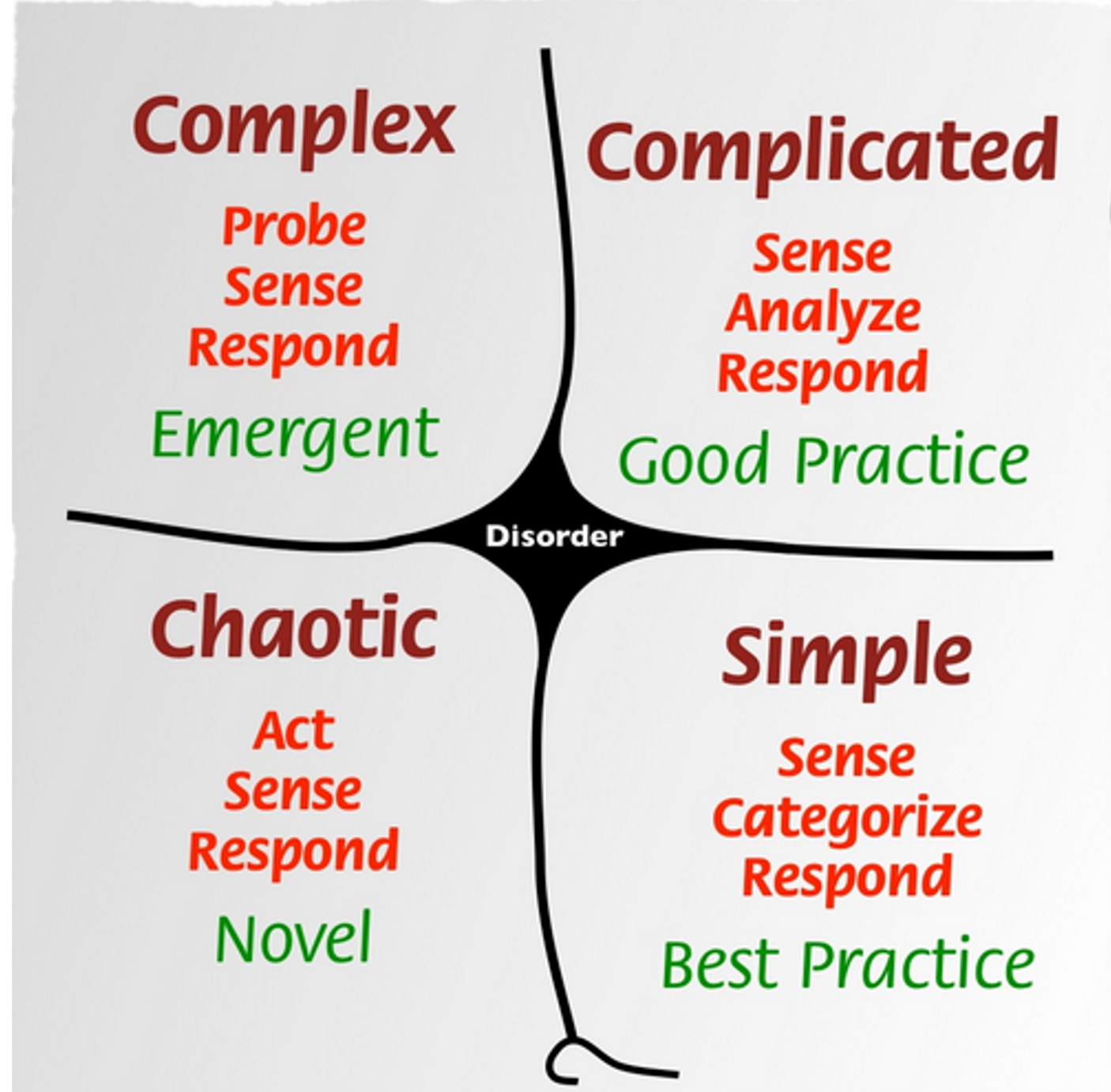
What framework depends on knowledge of Problem and knowledge of Solution space.

- John Thomas and Pam Mantri, Cognitive Tools Inc.



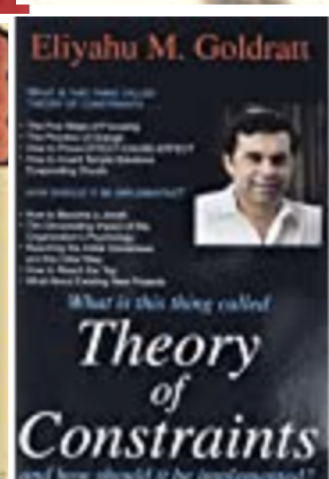
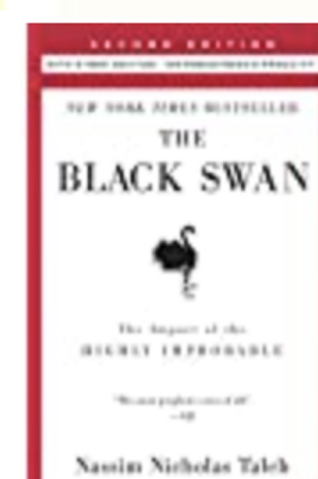
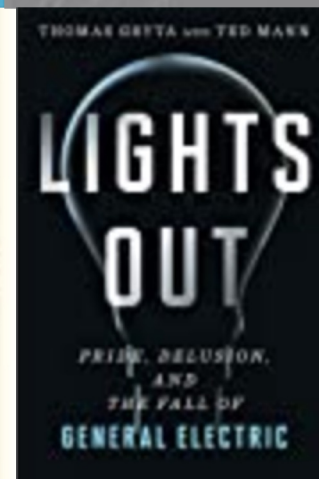
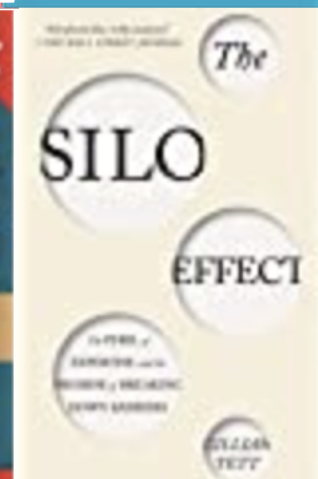
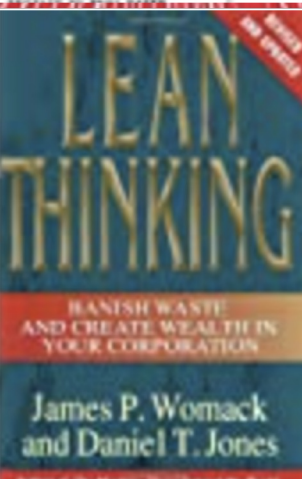
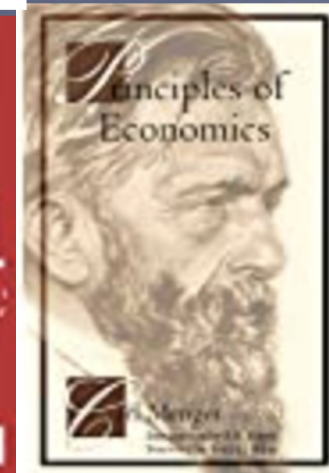
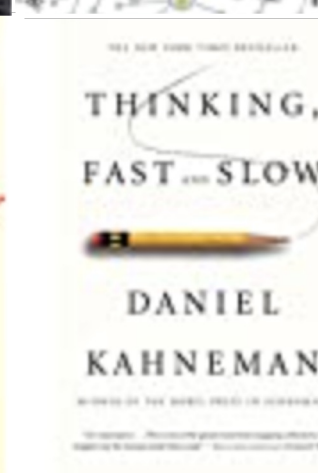
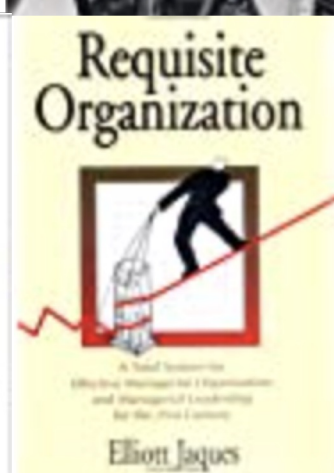
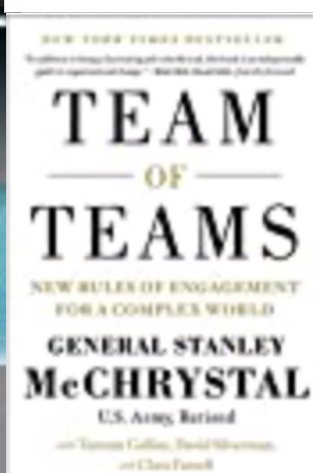
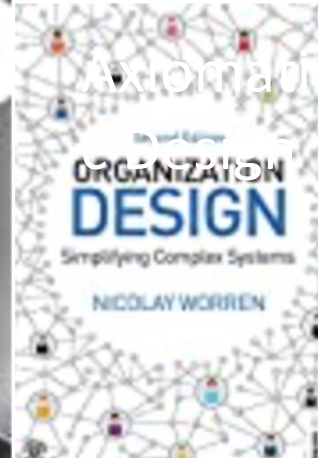
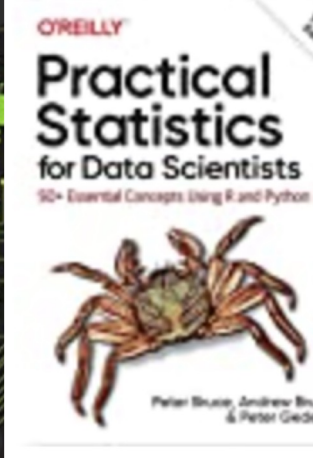
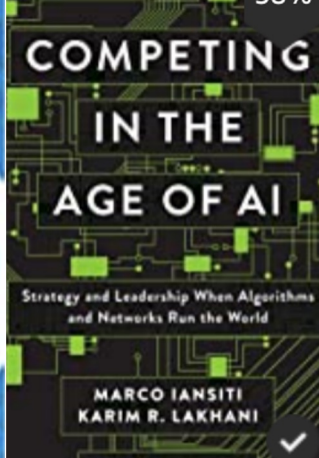
Different systems
require different
management
practices

David Snowden



CAS Systems
Self Organizing
C2 vs SO





Cyber attacks for sale on the web (I)



- Hacking a Facebook or Twitter account: \$130
- Hacking a Gmail account: \$162
- Hacking a corporate mailbox: \$500
- Scans of legitimate passports: \$5 each
- Windows rootkit (installing malicious drivers): \$292
- Winlocker ransomware: \$10–20
- Unintelligent exploit bundle: \$25
- Intelligent exploit bundle: \$10–3,000
- Traffic: \$7–15 per 1,000 visitors for the most valuable traffic (from the US and EU)



Note: Ars Technica, Wired, Russian Underground 101, Trend Micro, Max Goncharov



mabl[®]

Case Study

Testing is part of a continuous pipeline

Testing in the cloud using Mabl

...but it's bursty concurrency

Concurrency needed over the course of a day - by test window

