

# ASHRAE – Manitoba Chapter

## Using Artificial Intelligence to Make You Irreplaceable



HVAC Unleashed: AI's Bold Leap to Workforce Transformation and Skyrocketing Productivity

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# Learning objectives

- Describe skills and strategies for working with generative AI tools
- Analyze how AI will reshape job roles, drive upskilling needs, and redefine workforce competencies in the HVAC industry
- Identify how generative AI and large language models are currently being used in building design and building automation
- Explain challenges that individuals and organizations may face integrating AI and how they can address these challenges

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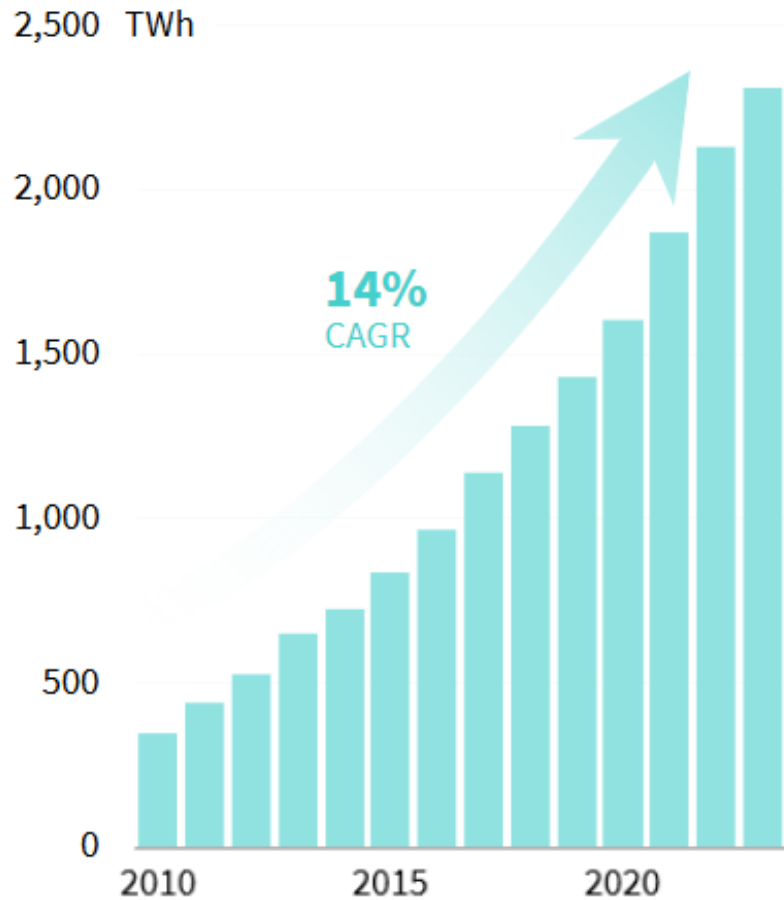
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# THE ACCELERATION WE DIDN'T SEE COMING

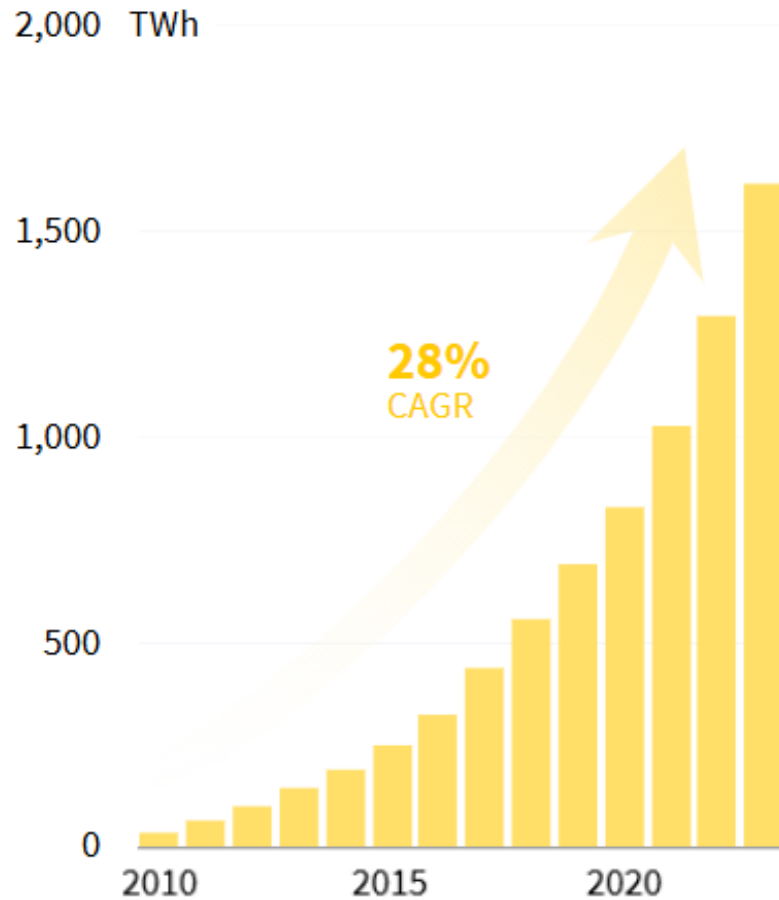


# The global energy transition is here.

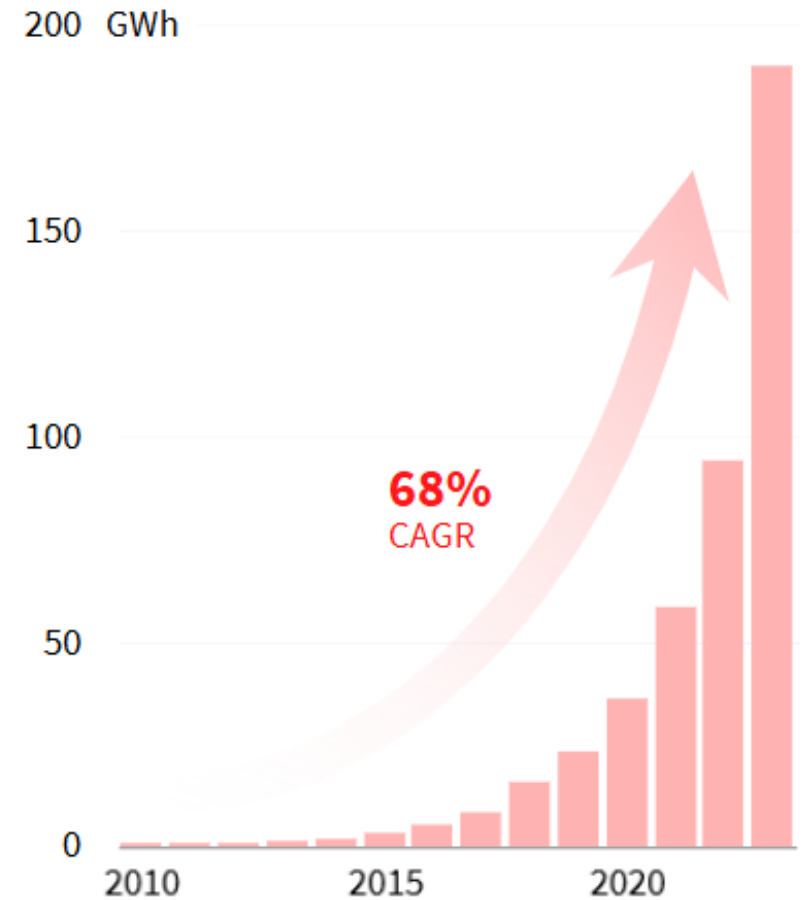
## Wind generation



## Solar generation



## Battery storage



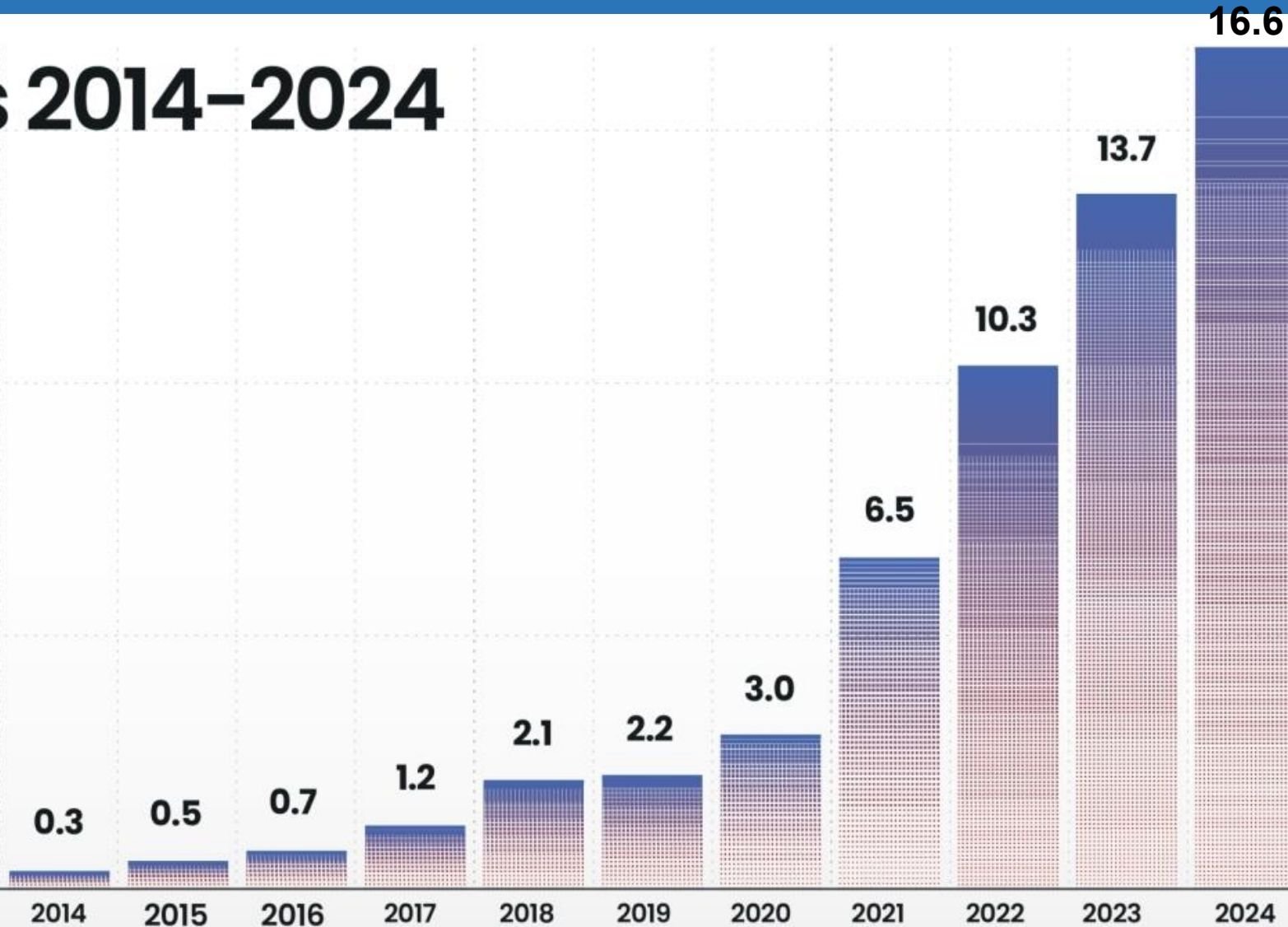
Source: IEA, BNEF; Note: CAGR is the compound annual growth rate between 2013 and 2023.

# Global Electric Vehicles

## Sales 2014–2024

(in millions)

NUMBER OF  
EVS SOLD



Source: The International Energy Agency

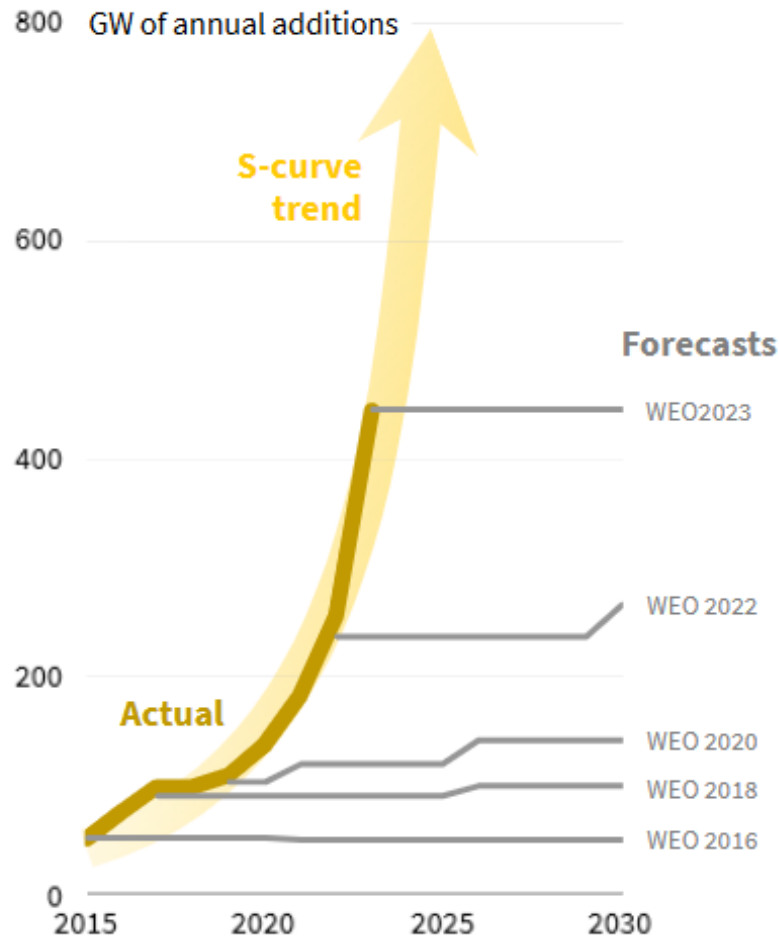
# BYD Seagull is just the beginning

*Starting price , \$10,000*

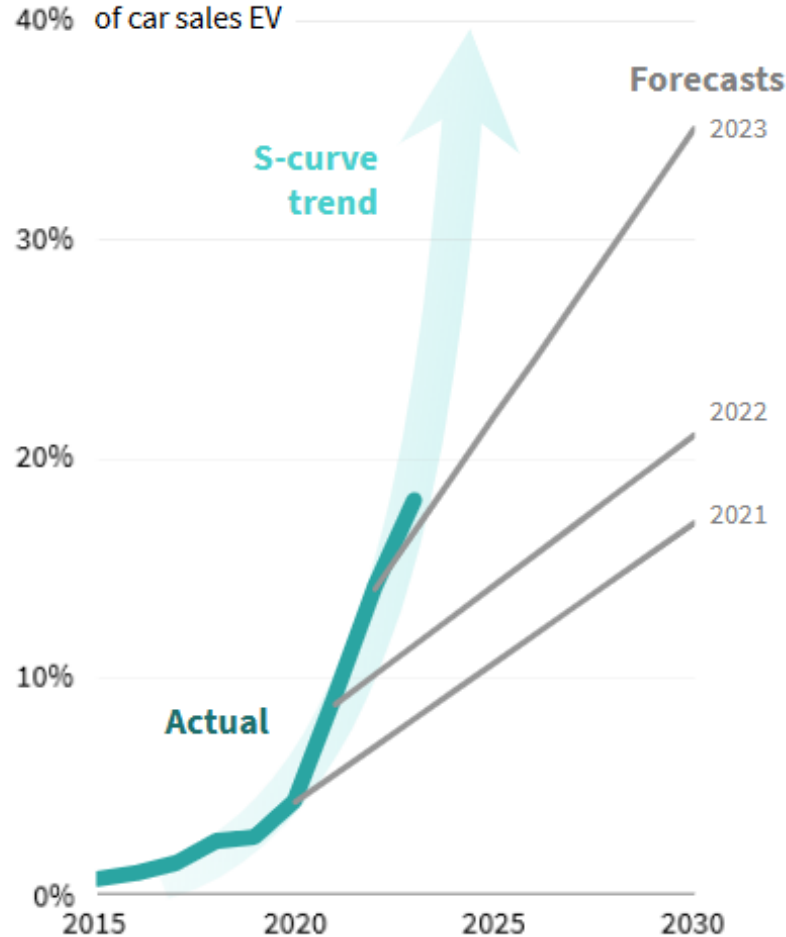


# And we have underestimated the speed of change

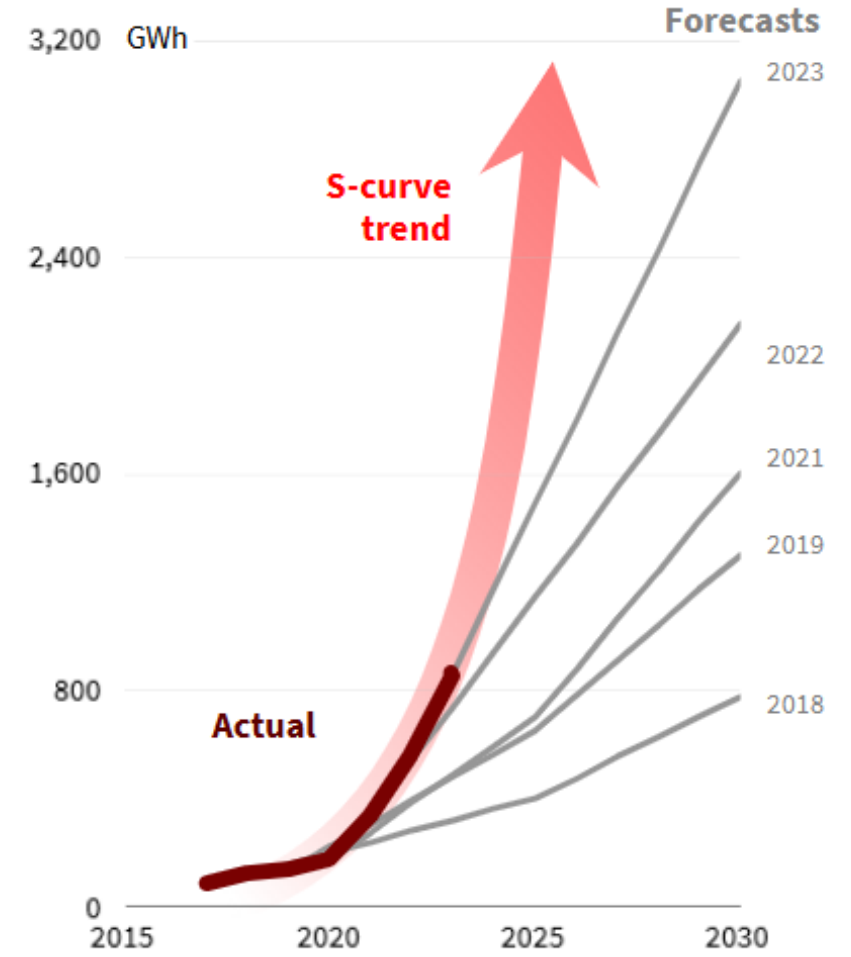
## New solar additions



## EV share of sales



## Battery sales

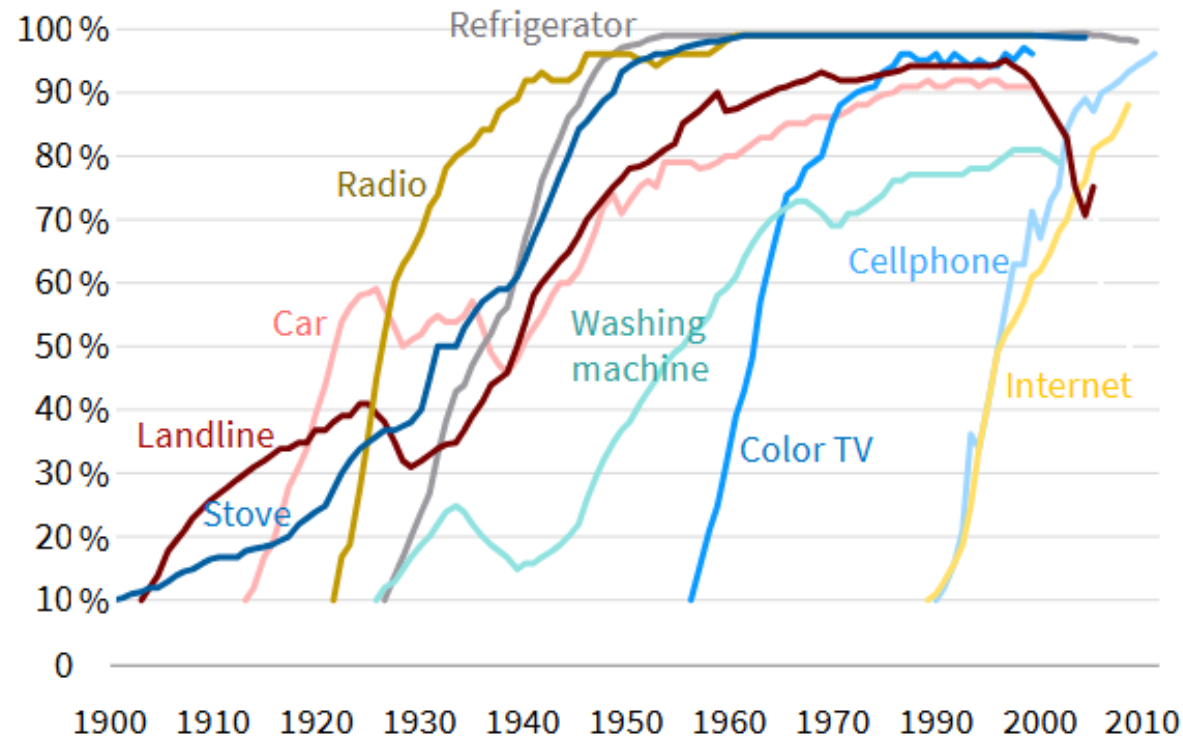


Source: BNEF (solar and battery actuals), IEA STEPS for WEO forecasts, RMI annotation.

# We know how technology revolutions work

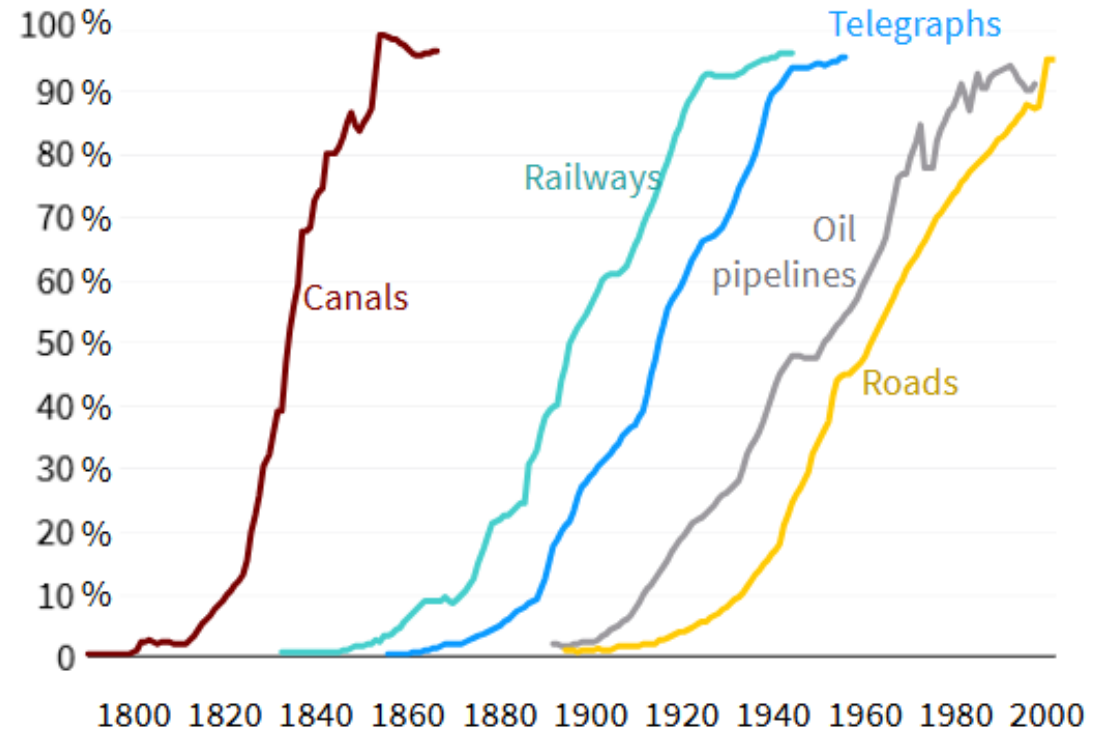
## Individual products

Technological adoption by household in the United States



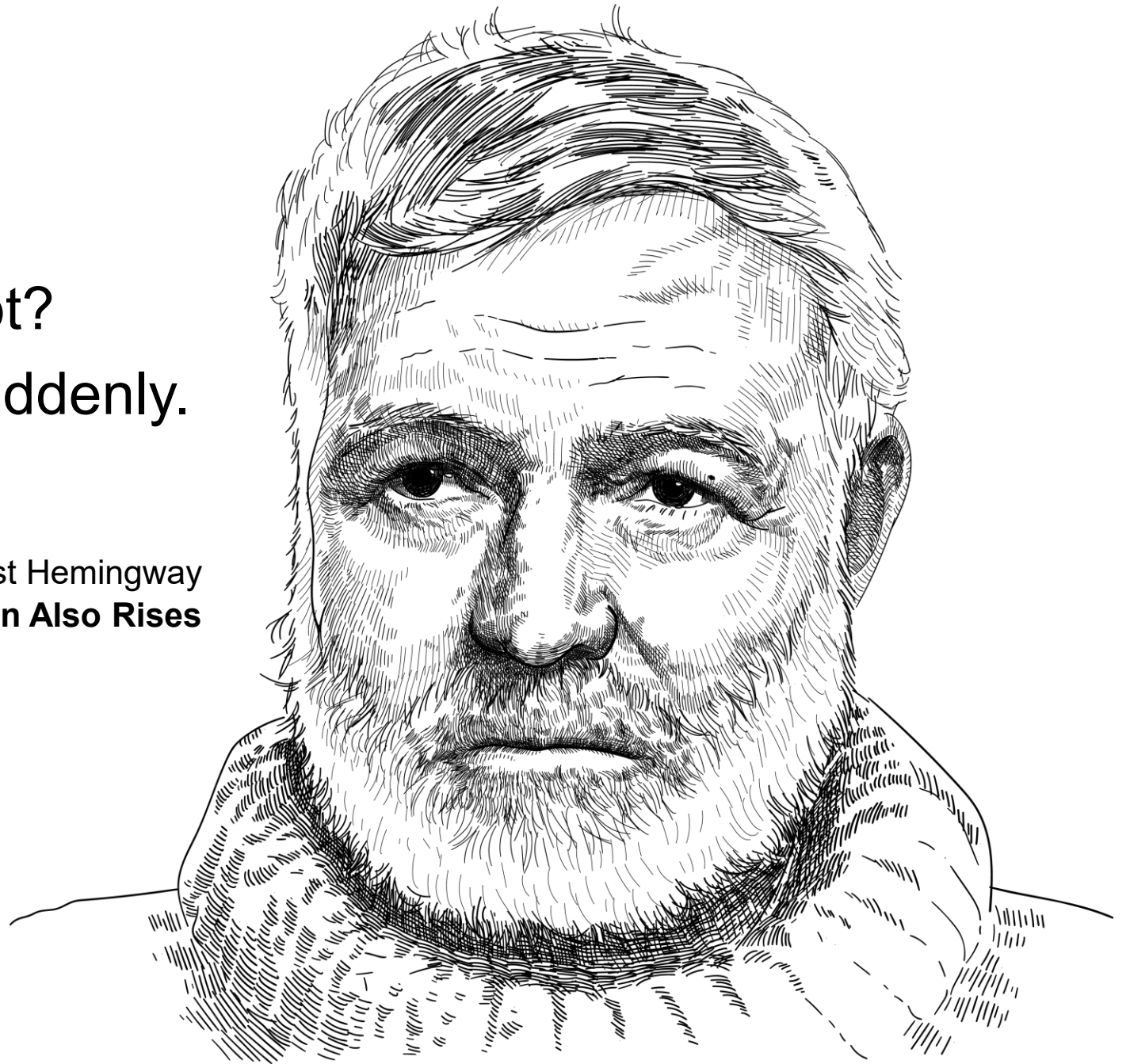
## Infrastructure systems

Share of maximum size in the United States



How did you go bankrupt?  
Two ways. Gradually, then suddenly.

-Ernest Hemingway  
**The Sun Also Rises**



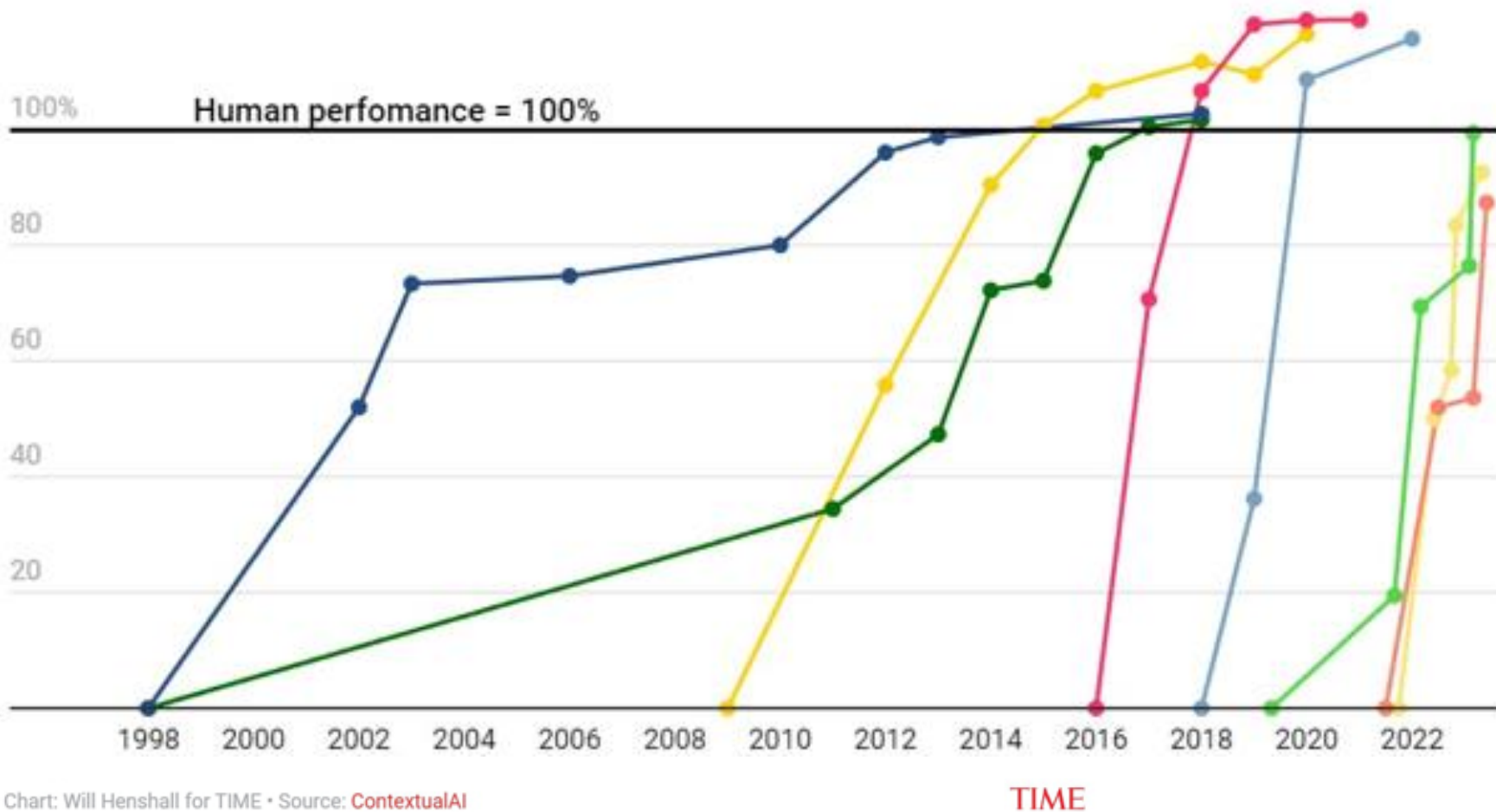
# AI EVOLUTION & THE MULTI DATA SOURCES MERGING OPPORTUNITY



# AI has surpassed humans at a number of tasks and the rate at which humans are being surpassed at new tasks is increasing

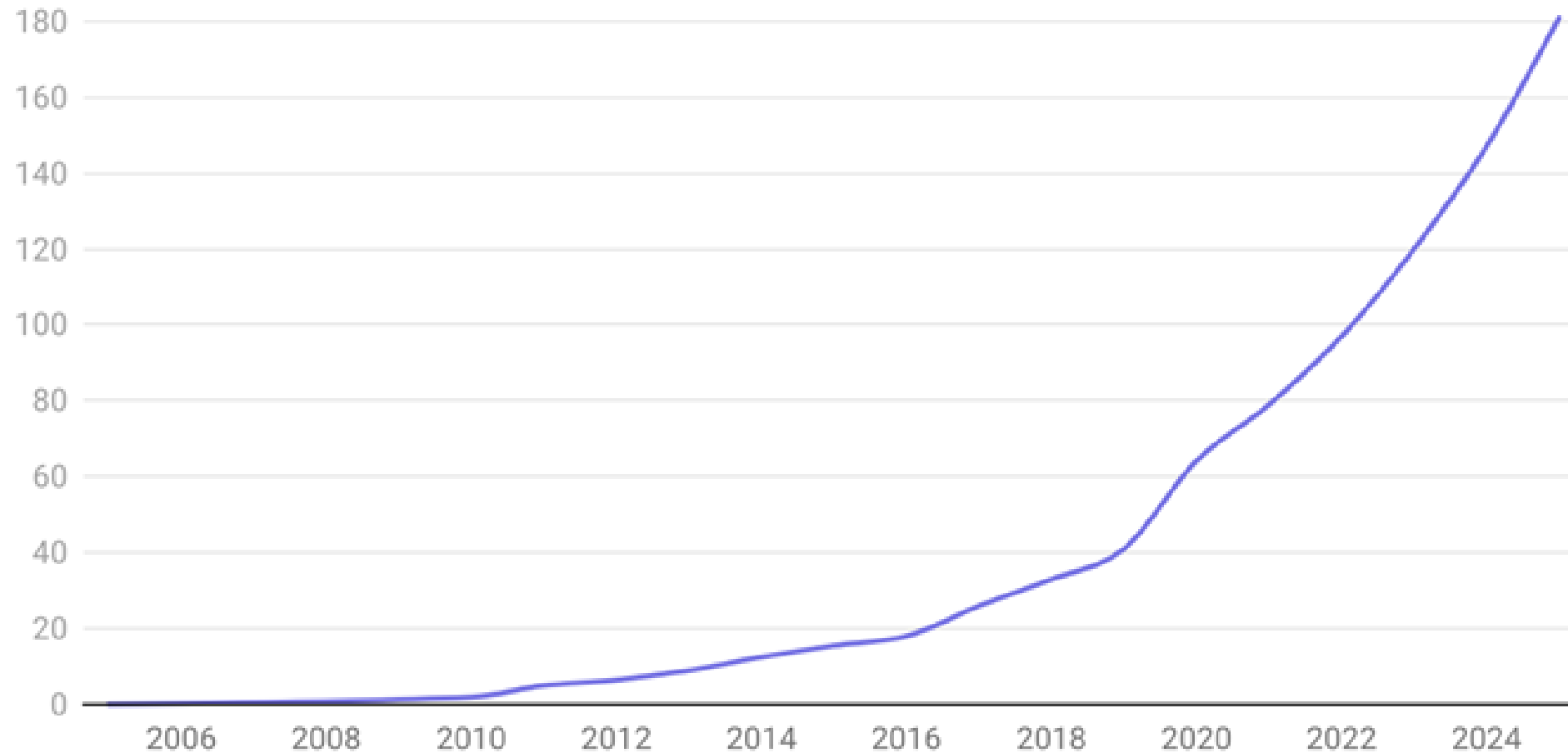
State-of-the-art AI performance on benchmarks, relative to human performance

- Handwriting recognition
- Speech recognition
- Image recognition
- Reading comprehension
- Language understanding
- Common sense completion
- Grade school math
- Code generation



# The volume of data in the world is increasing exponentially

Volume of data/information created, captured, copied, and consumed worldwide from 2010 to 2020, with forecasts from 2021 to 2025 (zettabytes)

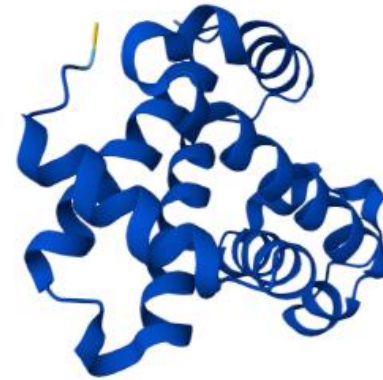
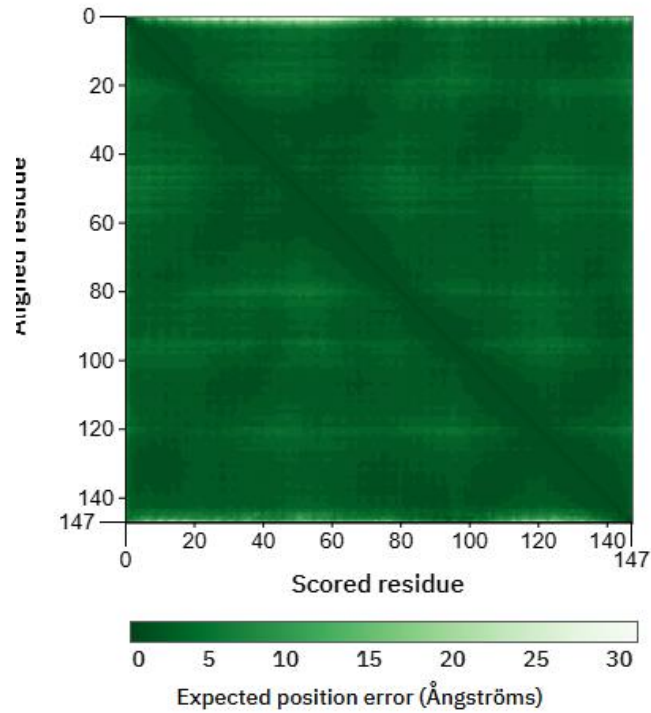


# Hemoglobin (HBA1/HBB)

Carries oxygen from lungs to tissues.

A | 1: Hemoglobin subunit epsilon

1 MVHFTAEEKAAVTSLSWSKMNVEEAGGEALGRLLVVYPWTQRFFDSFGNLSSPSAILGNPKVKAHGKKVLTSPFGDAIKNMDNLKPAFAKLSLHCDKLHVDPENFKLLGNVMVLIILATHFGKEFTPEVQAAWQKLVSAVAIALAHKYH 147



## Model Confidence

- Very high (pLDDT > 90)
- High (90 > pLDDT > 70)
- Low (70 > pLDDT > 50)
- Very low (pLDDT < 50)

pLDDT is a per-residue measure of local confidence.  
[Learn more...](#)

Domains (1)

Annotations

# AI is a different form of intelligence

How do you take a massive quantity of streaming data, perform the analysis of it in order to extract what is important and derive the optimal decision base on that data stream in real time?

Only AI could do this.

# THE AGENTIC WORLD



# AI

▲ A few buzz words

## Deep Learning

## Agentic AI

## Agentic

## Large Language Models (LLM)

## GPTs

## AI Agent

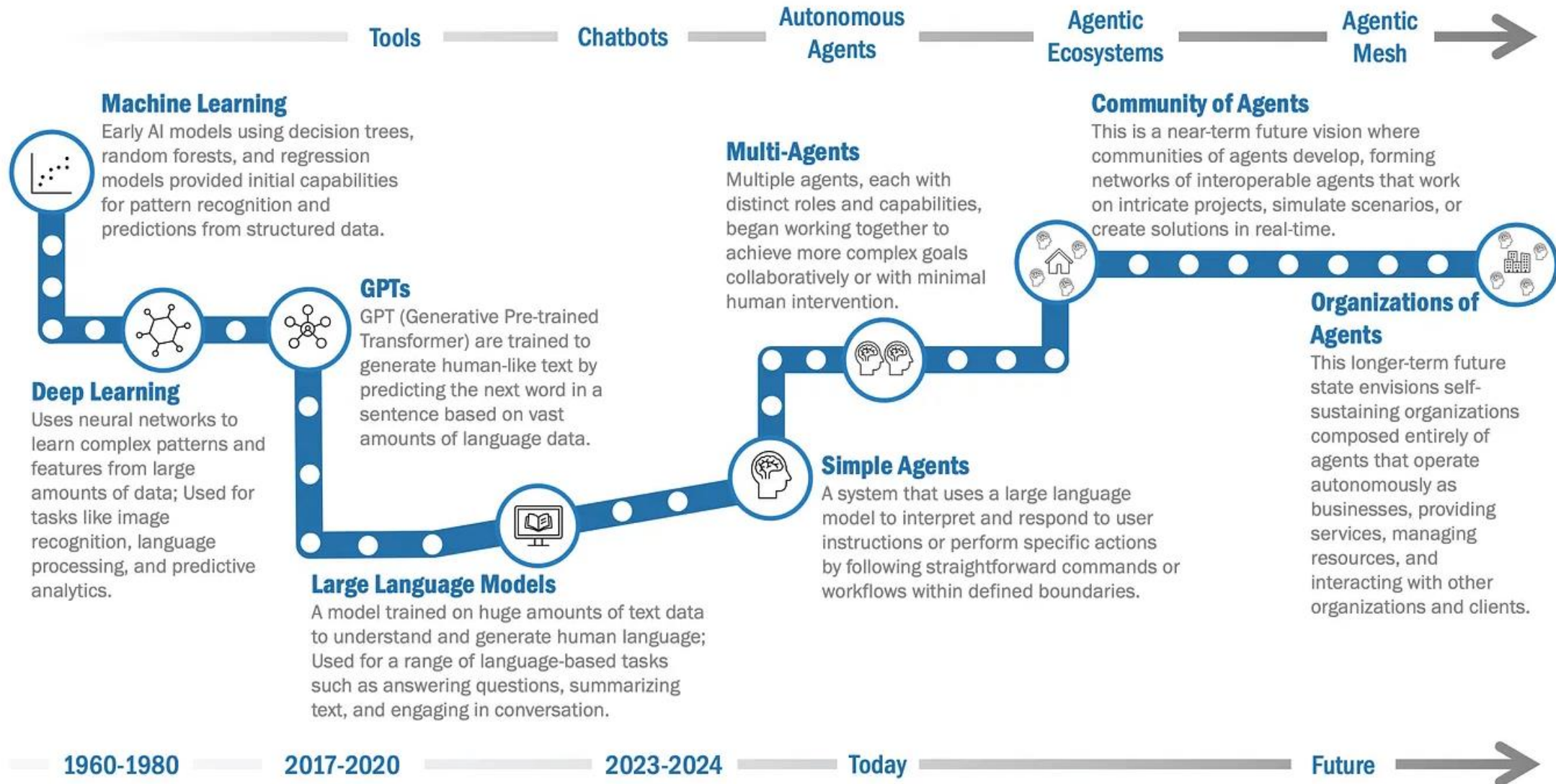
## Autonomous Agents

### Multi-Agent

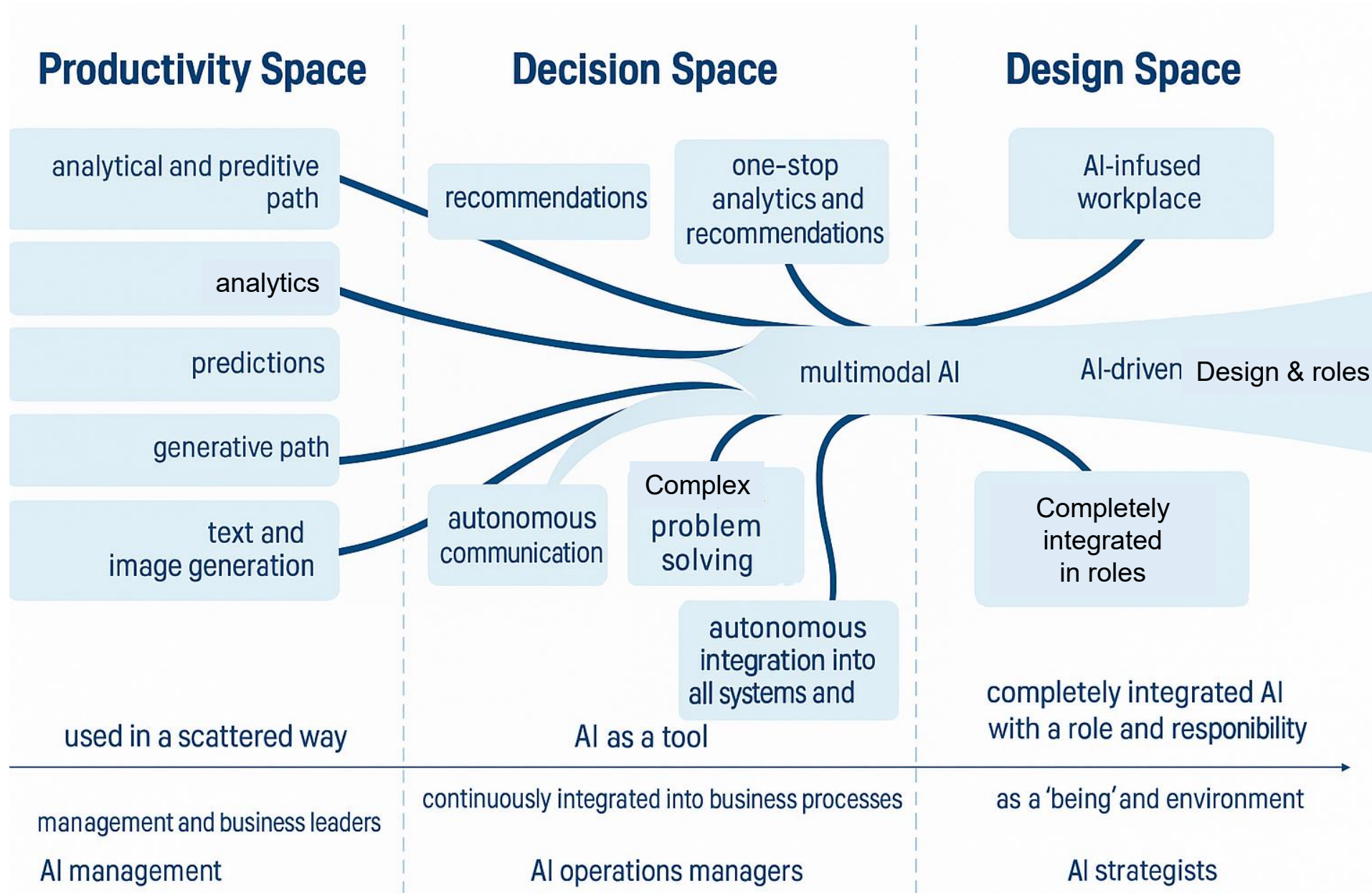
## Agentic Mesh

### Machine Learning

# Agentic Evolution

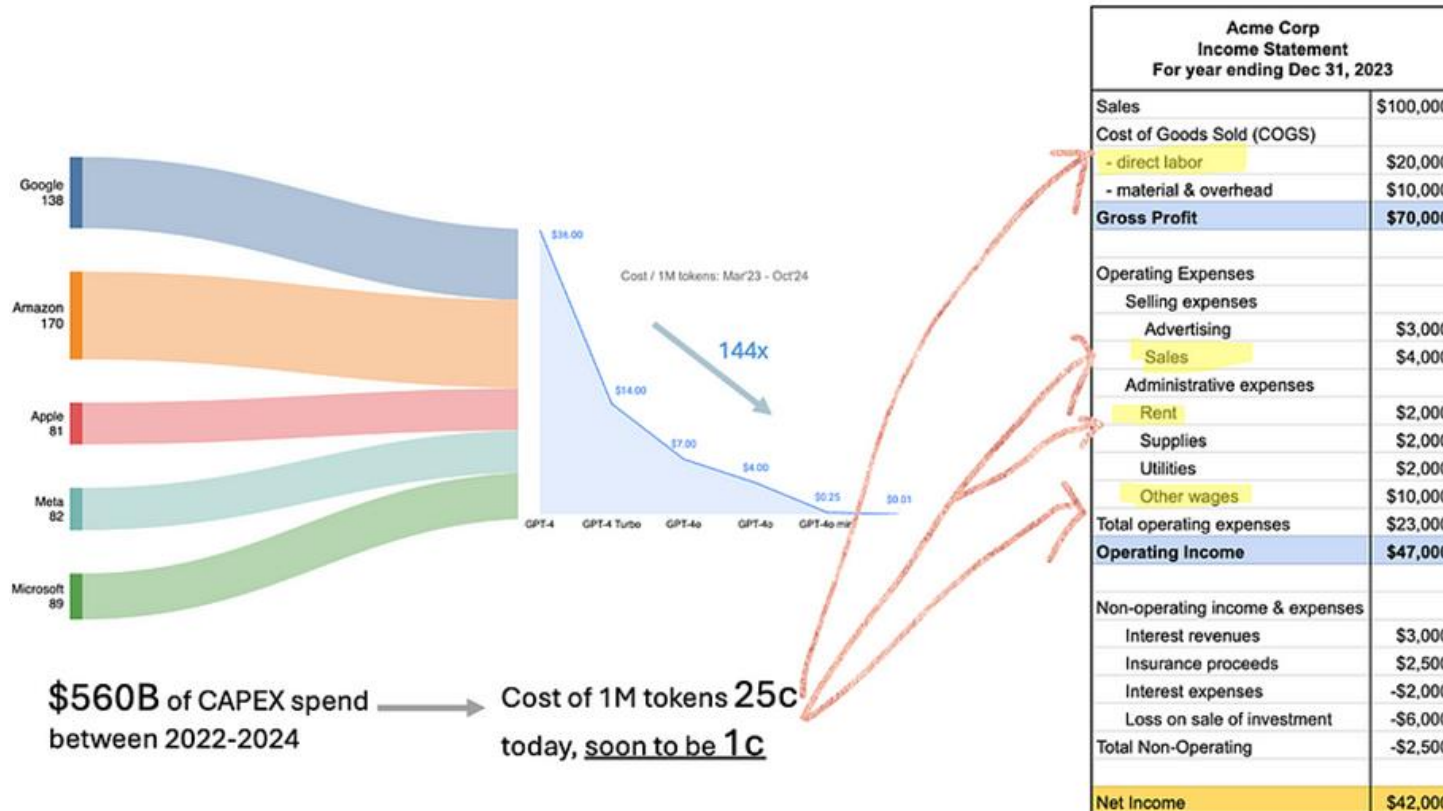


# AI: The Strategy Game-Changer Everybody is Underestimating – Prepare for impact



# AI – The productivity story

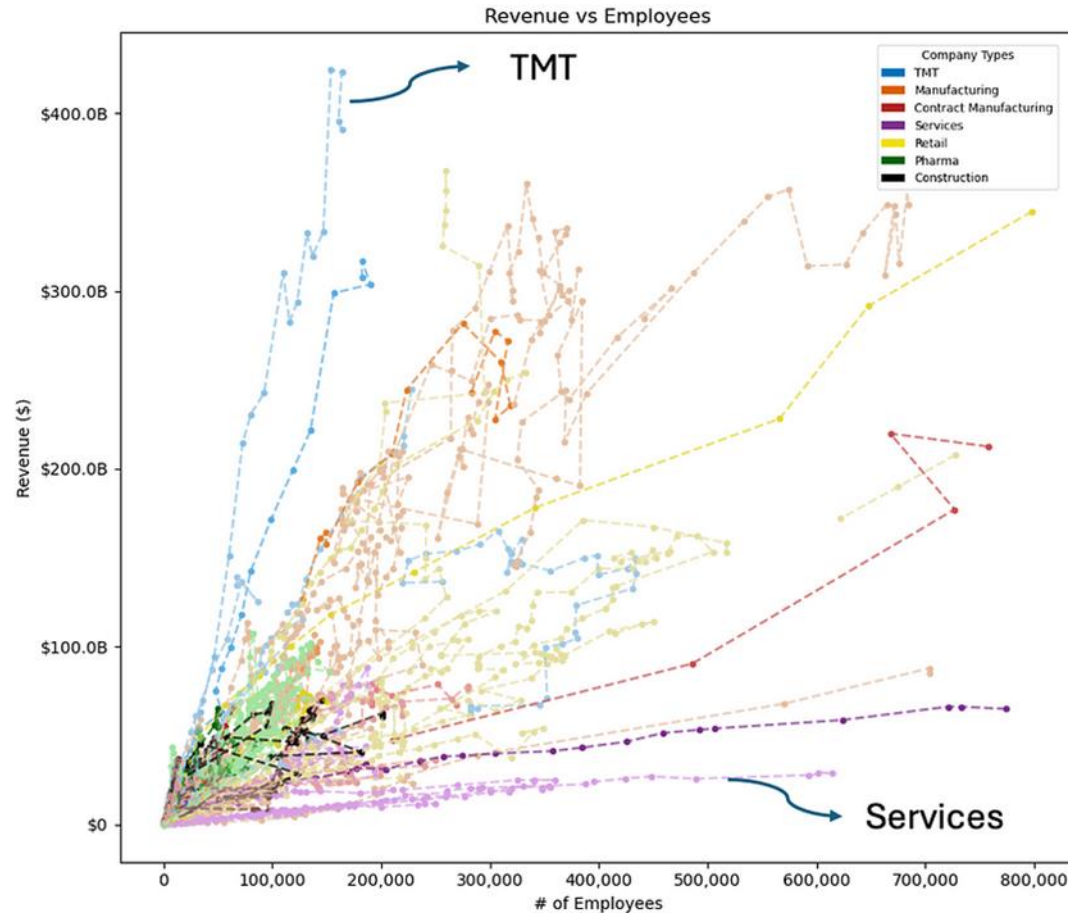
We are currently in the “loading” phase of AI, the entire landscape is wide open and there is a land-grab going on



There are over \$20T of expenses that are finally becoming available to software as AI reaches near-human capabilities in software and in robotics

# AI – The productivity story

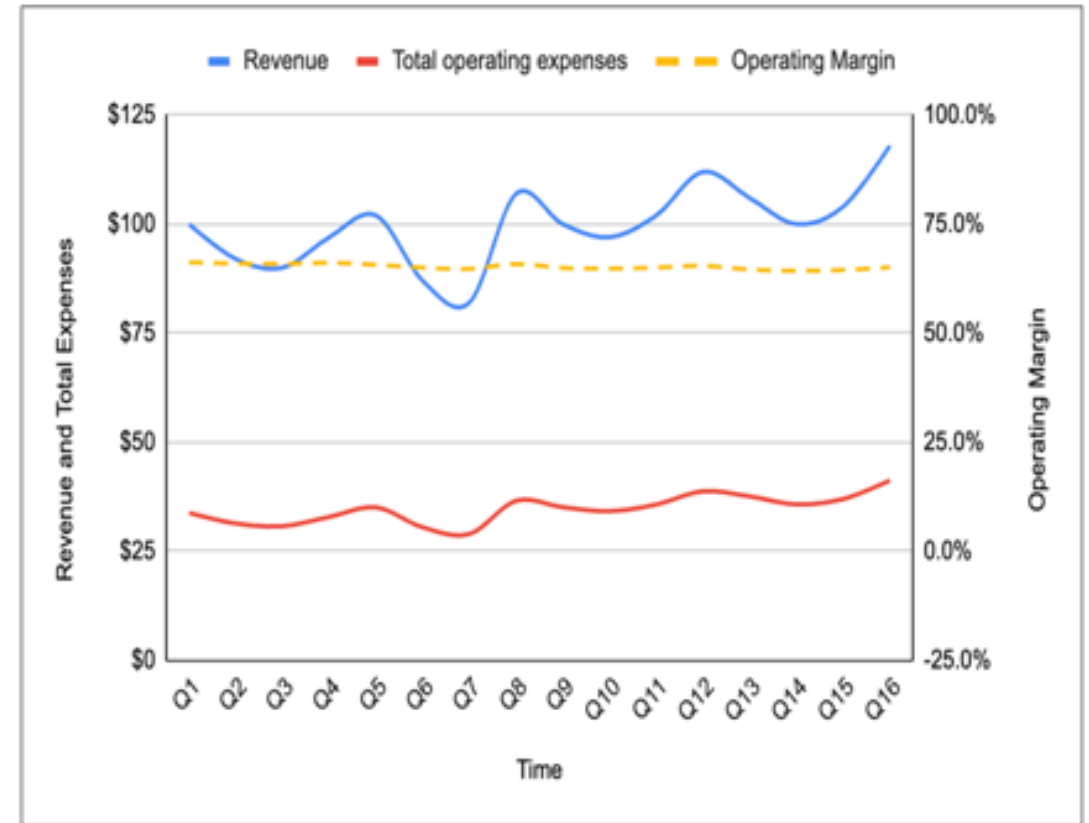
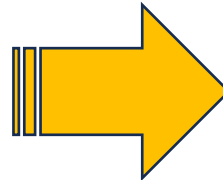
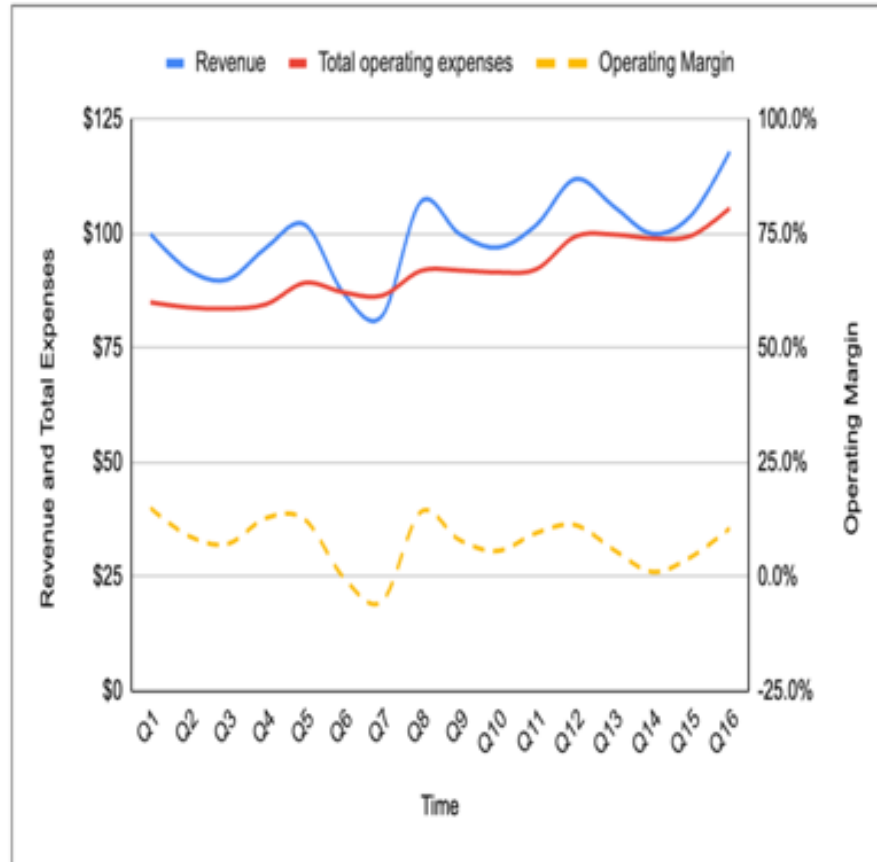
- Tracking the revenue and number of employees matrix



The more automation an organization has, the steeper their productivity curves – they squeeze more from the same capita.

# AI – The productivity story

## ▲ The transformation of the P&L



# AI HVAC Optimization Results



# Key inputs to service Process in the HVAC world

- Technicians are constantly jumping from one file/ system to another



**Telemetry &  
Fault Data**

What's  
the temp  
in this  
zone?



**Equipment  
Manuals**

How do I  
replace  
this  
sensor on  
this unit?



**Workorder &  
Asset Data**

What's the  
make/model?  
  
When was  
this unit last  
serviced?

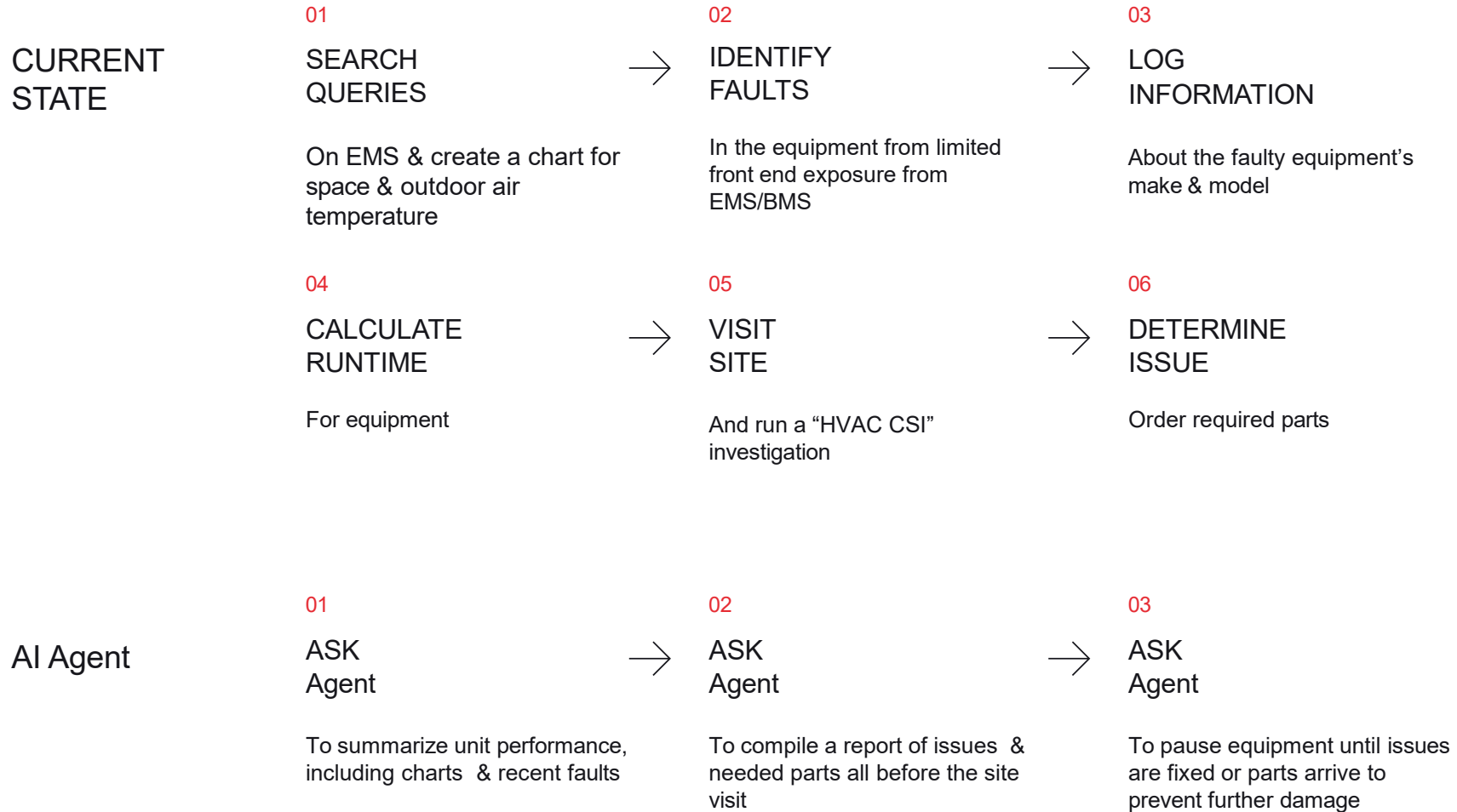


**Parts Data**

What part  
do I  
need?

# Slashing issue resolution time

## Scenario: Hot call received from retail store manager



**CURRENT STATE**

- \$570\*
- 2 hour discovery
- Site visit(s)
- Lack of insights

**Agent**

- \$12\*\*
- 10 minute discovery
- No initial site visit
- Clear procedure & part list

\* Includes 2 hours discovery work (\$150) and initial visit (\$420 from 2 hours of work (\$230) + travel (\$115) + truck charge (\$75))  
 \*\* Includes 10 minutes of discovery work (\$12) and initial site visit eliminated

# What does a virtual engineer look like?

## Case of the comfort complaint

 You • April 8, 17:54

I'm getting a comfort complaint from the store in Bolingbrook, can you investigate?

**VE** • April 8, 17:54

Certainly. I've investigated the comfort complaint for the store in Bolingbrook, Illinois

The data shows significant temperature variations across different zones, which could be the source of comfort issues.

Key findings:

### 1. Temperature Range

- Lowest temperature: 18.4°C (65.12°F) in zone 100-VAV\_115B
- Highest temperature: 24.556°C (76.2°F) in zone 100-VAV\_120
- Overall range: 6.156°C (11.08°F)

### 2. Potential Problem Areas

- Coldest zones:

- 100-VAV\_115B: 18.4°C (65.12°F)
- 100-VAV\_105: 18.567°C (65.42°F)
- 100-VAV\_135A: 18.972°C (66.15°F)

- Warmest zones:

- 100-VAV\_120: 24.556°C (76.2°F)
- 100-VAV\_123: 24.5°C (76.1°F)
- 100-VAV\_141: 22.65°C (72.77°F)

### 3. System Performance

- RTU (Rooftop Unit) temperatures:

- RTU\_01: 18.402°C (65.12°F)
- RTU\_02: 19.164°C (66.5°F)

### 4. Comfort Zone Analysis

- Ideal comfort range: 20-22°C (68-72°F)
- 9 out of 22 measured zones fall within this range
- 7 zones are below 20°C
- 6 zones are above 22°C

Recommendations:

#### 1. Investigate and adjust the following VAV (Variable Air Volume) units:

- VAV\_115B, VAV\_105, and VAV\_135A for insufficient heating
- VAV\_120, VAV\_123, and VAV\_141 for potential overheating

#### 2. Check RTU\_01 for proper operation, as it's supplying air at a lower temperature than RTU\_02.

#### 3. Conduct a system-wide balance check to ensure proper airflow distribution.

#### 4. Review zone-specific setpoints and adjust as necessary to achieve more consistent temperatures across the store.

#### 5. Inspect building insulation and check for air leaks, particularly in the coldest zones.

#### 6. Consider occupancy patterns and adjust the HVAC schedule accordingly to optimize comfort during peak hours.

# What does a virtual engineer look like?

## Case of the blower motor

You • November 19, 16:12

The blower motor is running continuously, even when the thermostat isn't calling for heating or cooling. How do I fix this?

**VE**

• November 19, 16:12

Thank you for bringing this issue to our attention. A continuously running blower motor can indeed be problematic and may lead to increased energy consumption and unnecessary wear on the system. Based on the information provided, there are several potential causes and solutions for this issue. Here are some steps to troubleshoot and potentially fix the problem:

1. Check thermostat settings: Ensure that the fan setting on the thermostat is set to "Auto" and not "On". If it's set to "On", the blower will run continuously regardless of heating or cooling demands.
2. Inspect the fan relay: The fan relay in the control board may be stuck in the closed position, causing the blower to run constantly. This component should be tested and replaced if found faulty.

3. Examine the control board: If the fan relay on the control board has failed in the closed position, it might be necessary to replace the entire control board.

4. Check for wiring issues: Verify that there isn't a short in the G (fan) wire between the thermostat and control board. A short in this wire can cause the fan to run continuously.

5. Test the blower motor run capacitor: A failed run capacitor can cause the motor to run continuously. This component should be tested and replaced if needed.

6. Verify wiring connections: Ensure all wiring connections are correct between the thermostat, control board, and blower motor.

7. Software check: For units with the Prodigy controller, investigate any software issues or parameter settings that may be keeping the fan on.

# AI is becoming a colleague in our daily work



**Are you ready?**

# Thank you

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