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INO205

# Amazon.com’s use of AI/ML to enhance the customer experience

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"We consider customers to be loyal to us – right up until the second that someone else offers them a better service."

**Jeff Bezos**

Founder and CEO of Amazon
1998 Letter to Shareholders

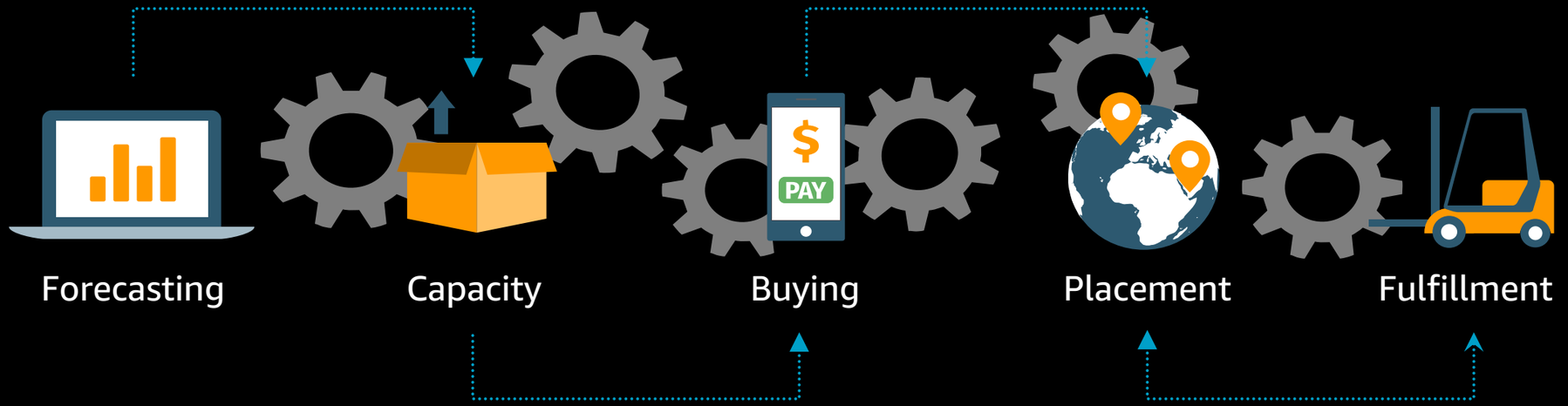


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# Customer promise: Prime One-Day | Prime Now



# Customer promise: Prime One-Day | Prime Now




400 million products forecasted every day

300+ fulfillment centers, 200,000+ robots, 19,000 trailers, and 30,000+ delivery vans

Accurate delivery promise

(1 billion+ packages shipped to Prime customers last year)

How does Amazon.com get the right items in the right place …
before the customer clicks the “Buy” button?

Obvious



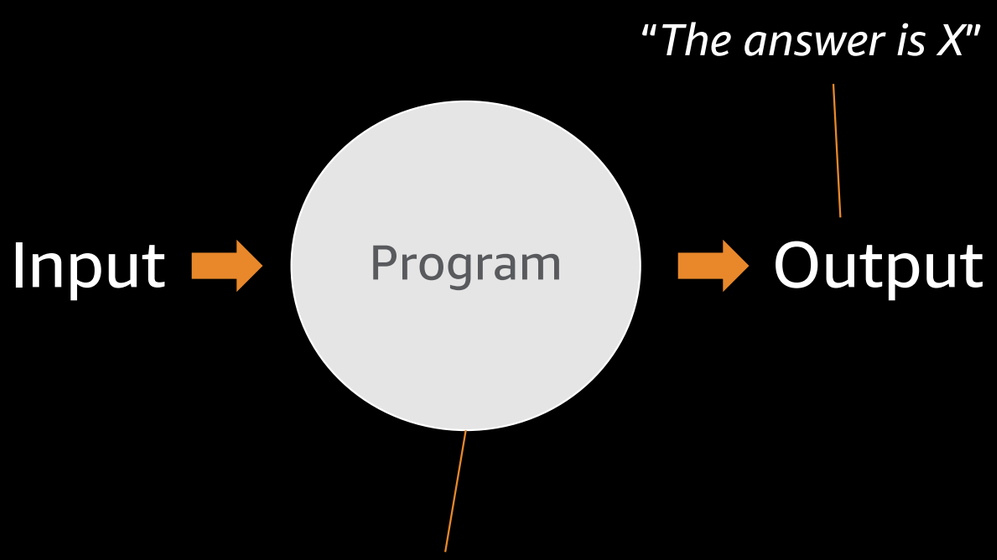

Not so obvious





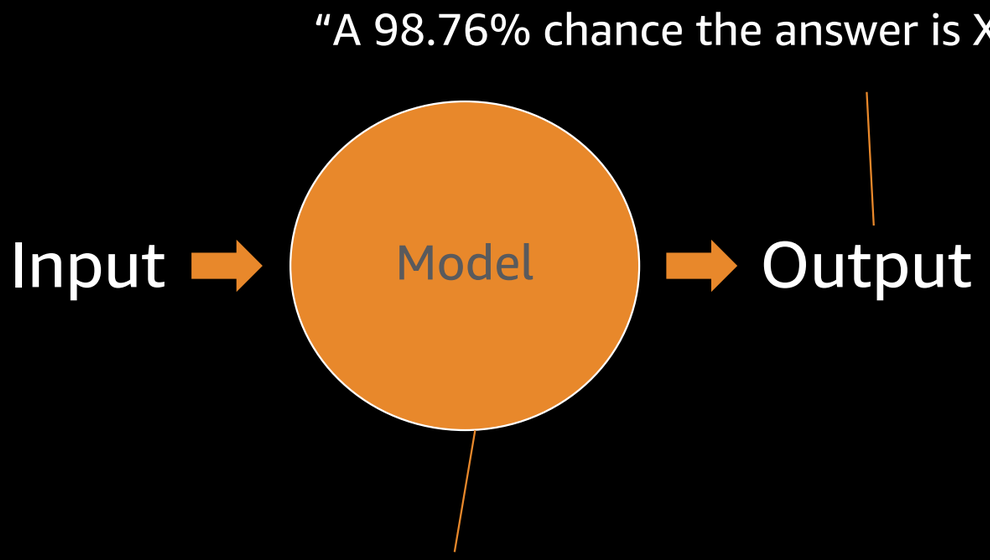
# Forecasting model that learns from data

## Traditional approach




Bunch of rules humans coded (e.g., IF… THEN… ELSE); limited by what humans can observe and program

## Machine learning

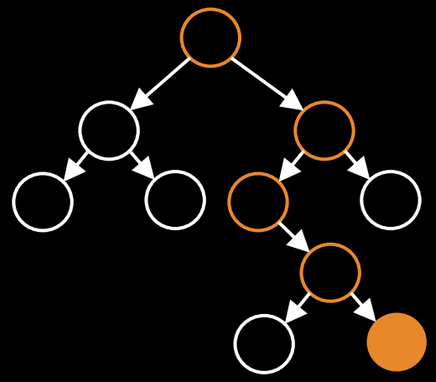



What the machine "learned" and generated by being trained by (hundreds of) millions of data points

# Predicting product demand at Amazon.com

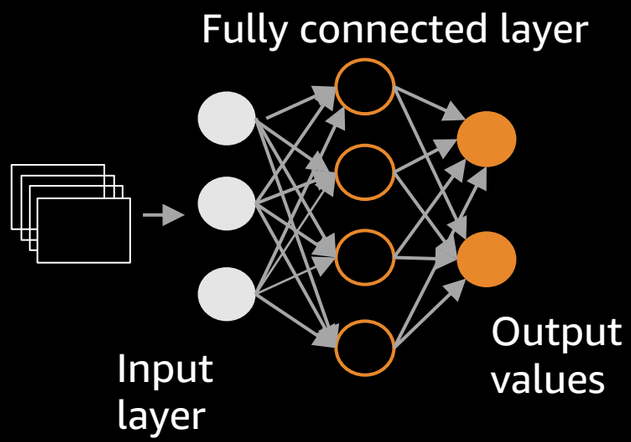
## Circa 2007

Decision tree algorithm-driven model



## Today

Convoluted neural networks




Billions of training data

Powerful nonlinear relationships

Automated feature engineering

Forecast 400M+ items every day

# A symphony of humans and robots



Randomly stowed items

\+ Robots bringing pods to humans

\+ Computer-guided picking

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= Accelerated order fulfillment

# Other customer experiences transformed through ML (at scale)



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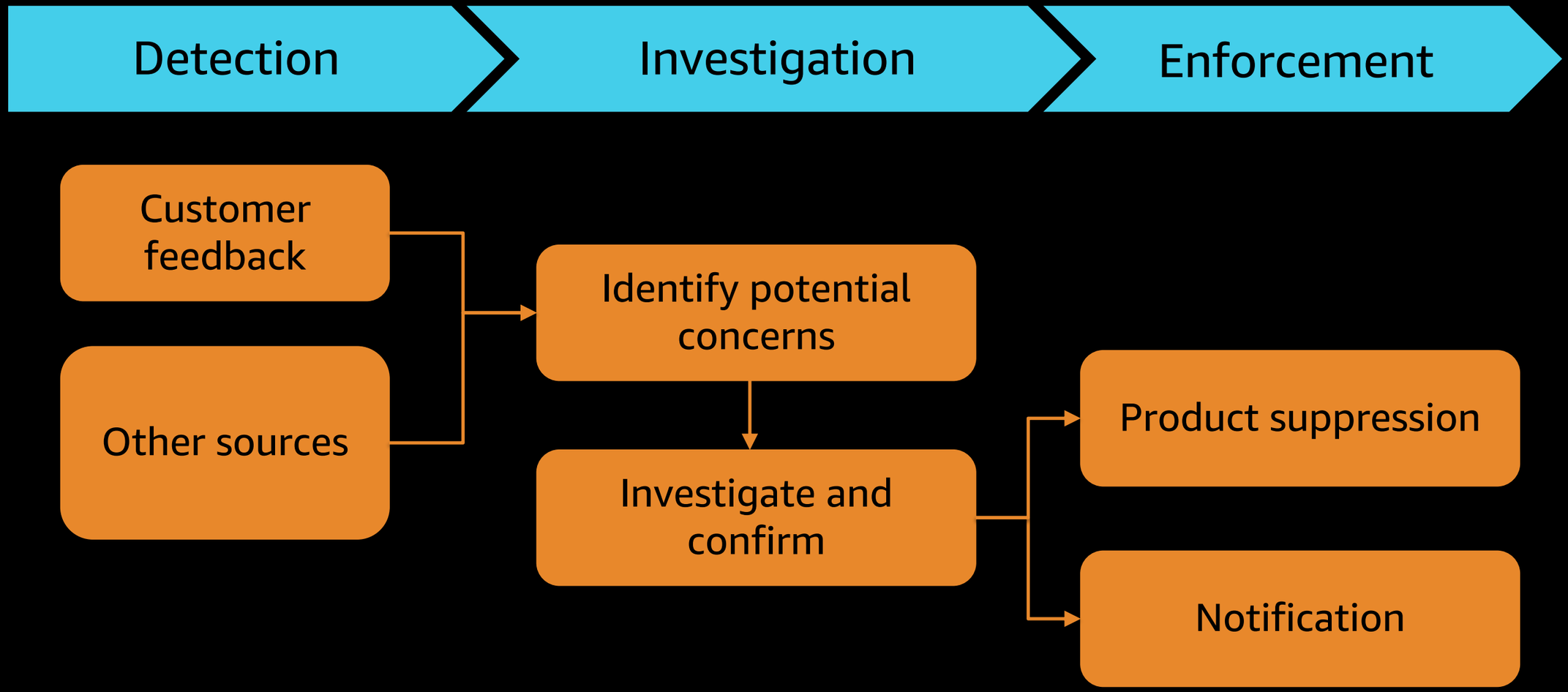
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# A delicious treat or a ticking time bomb?





# What are the limitations of this approach?



# Predicting safety risk before products ship



Billions of product and sales data updates

Hundreds of thousands of concerns a year

Predictive and highly accurate models

# Why does shipping packaging matter?

Less of this



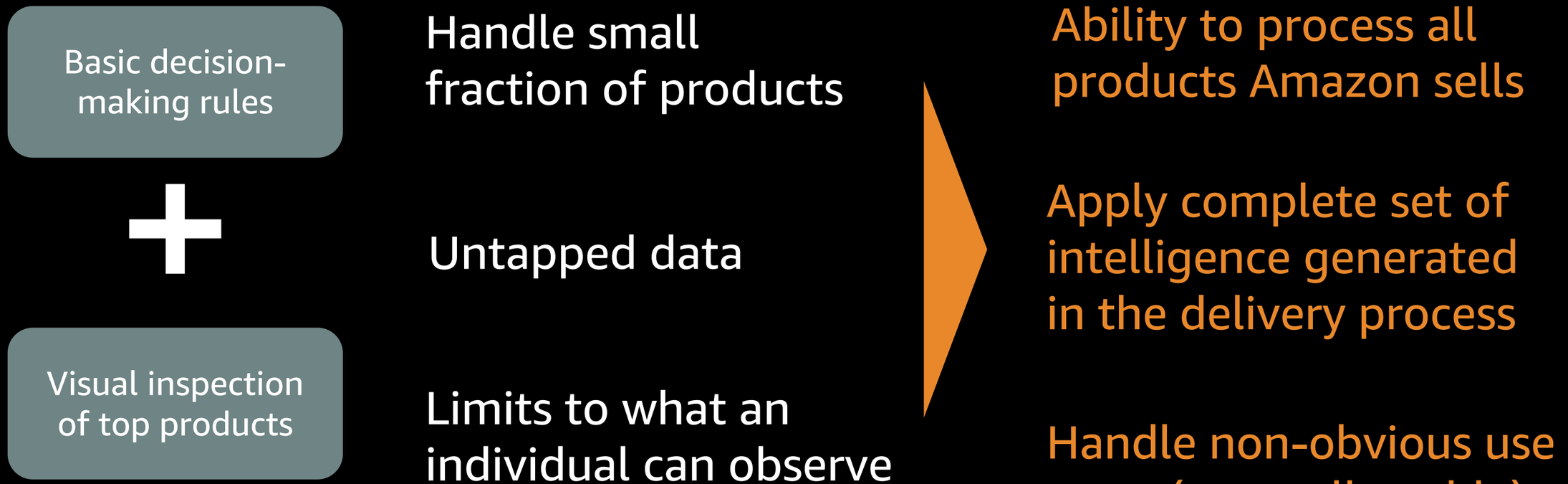
A lot more of this



**75% lighter**
than similarly sized boxes

take up
**40% less space**
during shipping

# Replacing guesses with data-driven logic



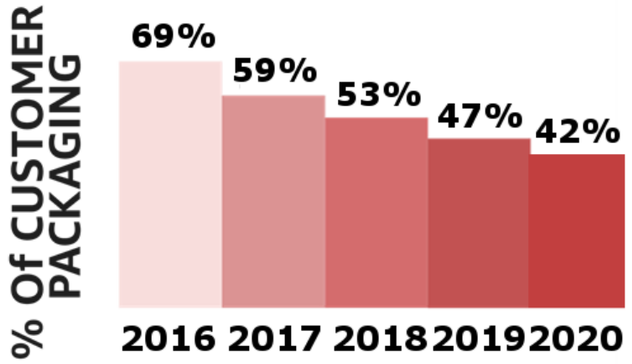
# Optimizing packaging saves ~~money~~ Earth

Higher Waste → Lower Waste

## Corrugated

### Boxes

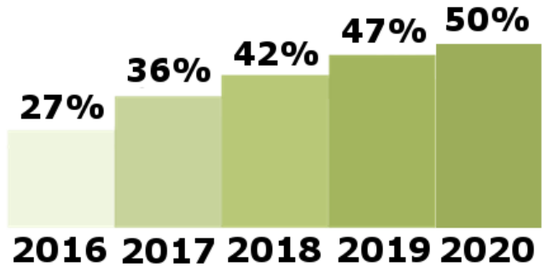



## Mailers

### Padded & Unpadded Mailers

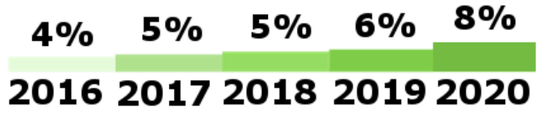


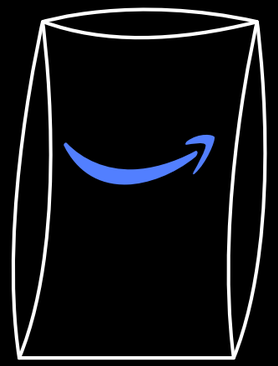

## Zero Amazon Packaging

### Frustration Free Packaging



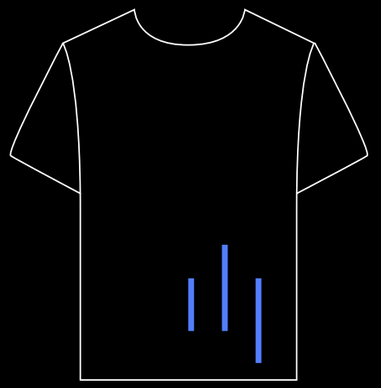
# New ideas in production



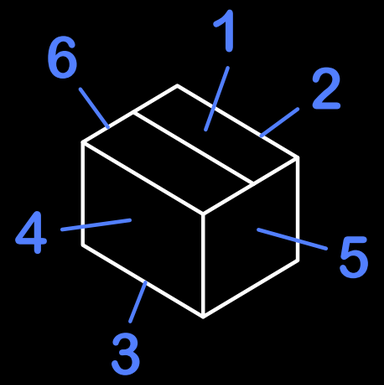
Suitable for paper bag?



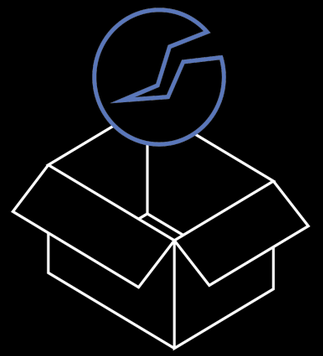
Might leak?



Foldable?




No Amazon package needed?



Prone to damage?

# AI/ML + Amazon = better customer service



## Automation



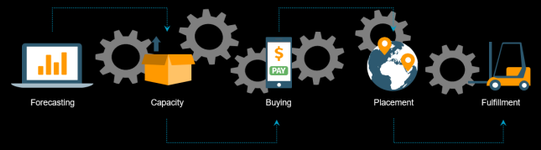
## Augmentation



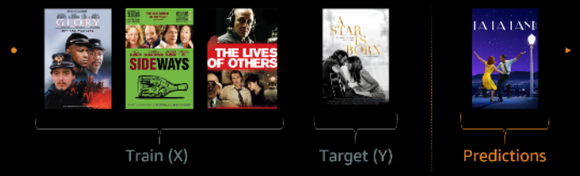
## Enrichment



## Invention



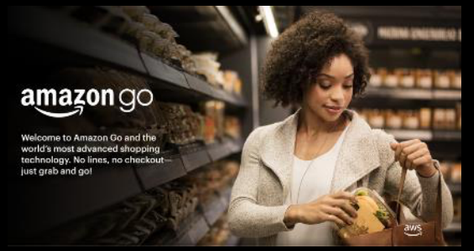

Supply chain automation




Personalized Amazon Prime Video recommendations



StyleSnap – match the style in the picture




No checkout lines – ever

# What lessons did we learn that were most important to get right?





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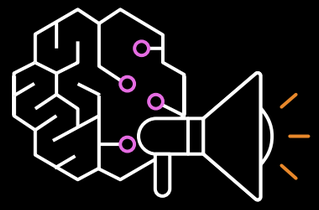
# It’s (always) the basics

? What are the most common challenges with AI/ML adoption?

| Challenge | % of Respondents |
|---|---|
| Skills of staff | 56% |
| Understanding AI benefits and uses | 42% |
| Data scope and quality | 34% |
| Finding use cases | 26% |
| Integration complexity | 26% |
| Defining the strategy | 25% |
| Security or privacy concerns | 20% |
| Measuring the value | 17% |
| Governance issues or concerns | 13% |
| Finding funding | 12% |

Source: Gartner Research Circle members survey, July 2019

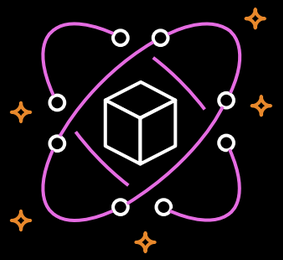
# Solve for a system of enablers



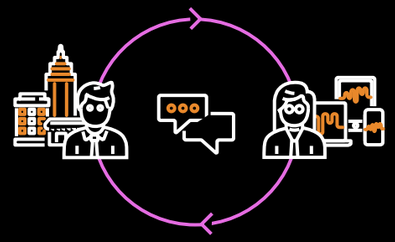
ML-first mindset and culture



Enabling teams for the mission



Powerful data platform

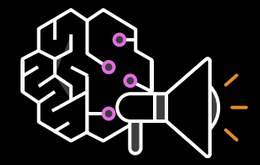


Choosing the right first project



Scaling

# Start with a simple question



ML-first mindset
and culture

How will you use machine learning?

(“We won’t” is not an acceptable answer)

# Break down the silos



**Enabling teams for the mission**



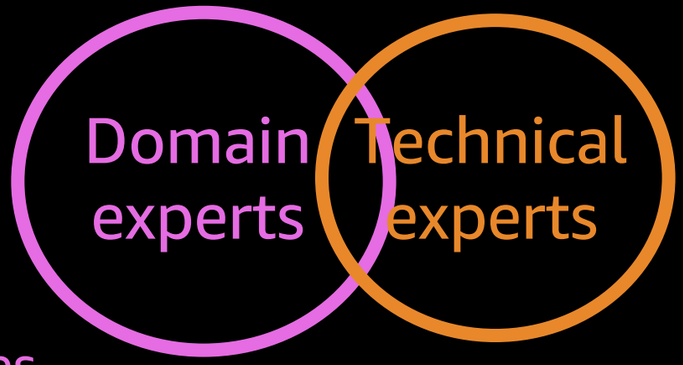
## Product manager

- Requirements / validations



## Data scientist

- Model development and testing






## Data engineer

- ML data foundation and performance



## Research scientist

- Cutting-edge theories and applications



## ML platform engineer

- Model production and optimization

# Teams will evolve in different ways



**Enabling teams for the mission**

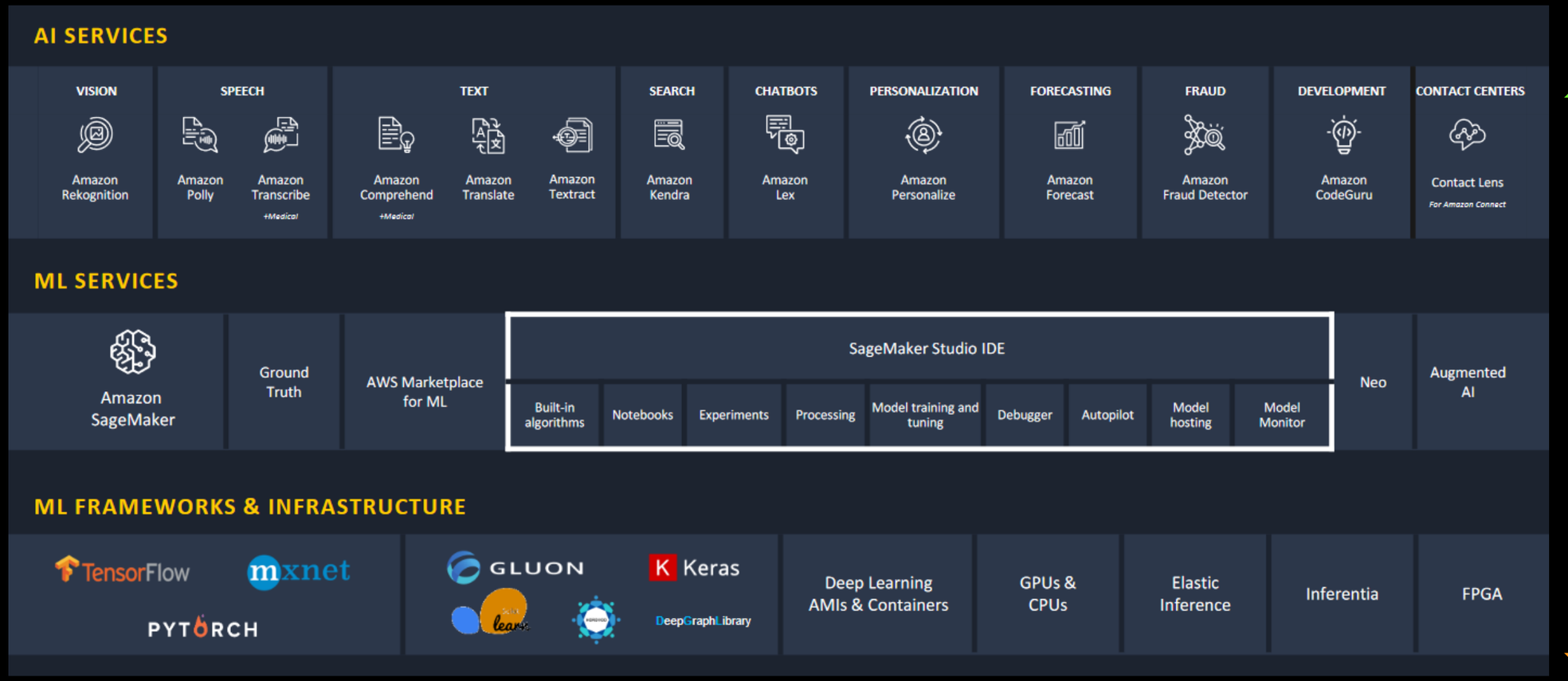
| | How teams might start | Scaling within teams | Scaling across teams |
|---|---|---|---|
| Team level | Product manager | Product manager, Data scientist | Product manager, Data scientist |
| Function / LoB level | Data engineer | Data engineer | Research scientist, Platform engineer, Data engineers |
| Enterprise level / consultants | Data scientist | Platform engineers | Other specialist |

# Apply the right tool for the job



**Enabling teams for the mission**

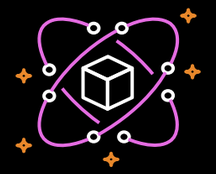
Example – AWS AI/ML service stacks




Simple, powerful and ready to use

Control and flexibility at the most granular levels

# Data fuels ML-driven innovations



Powerful data platform

Amazon.com’s big data marketplace

Innovation happens at the edge

Bring your own clusters / queries

Self-service discovery and subscription

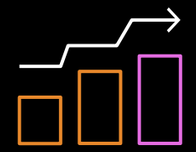
# Speed and substance are critical



Choosing the right first project

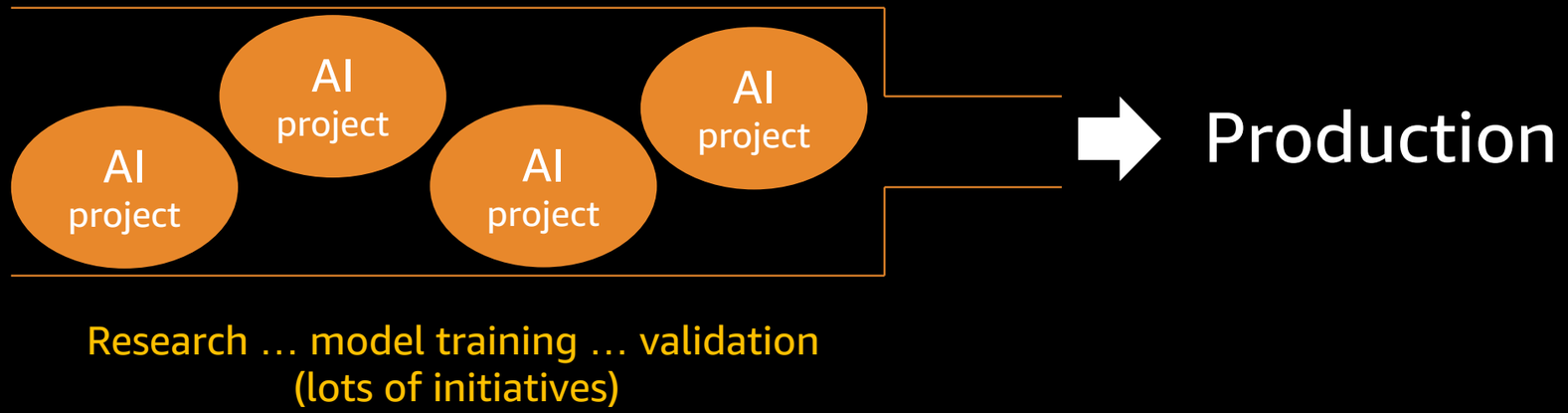
1. Real and significant problems?
2. New and differentiated solution?
3. Already have a lot of untapped data?
4. Success in the first 6–10 months?
5. Sustained attention and support?

# Remove that bottleneck

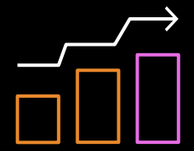


Scaling

| # of AI projects next year | % of solutions in production |
| --- | --- |
| x2 | 40% |



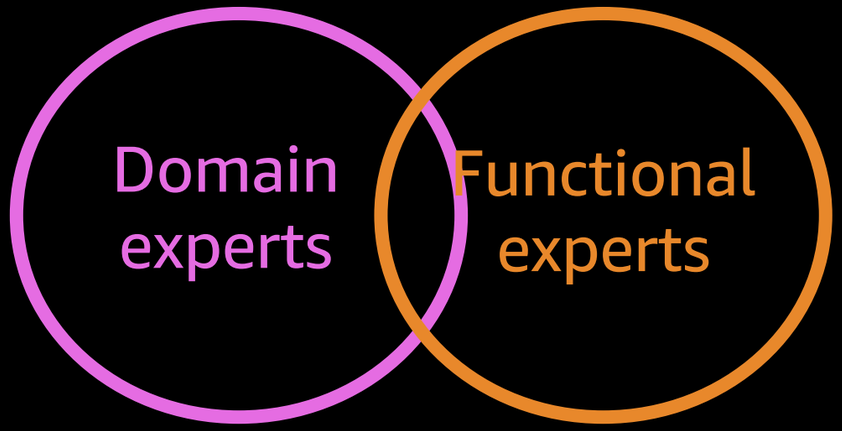
# Eliminate blockers to path to production



Scaling

1. Lack of common mentality / priorities
2. Teams in silos, not cross-functional

3. Undefined and unmeasured business outcome




6. Lack of an integrated end-to-end data pipeline and production platform

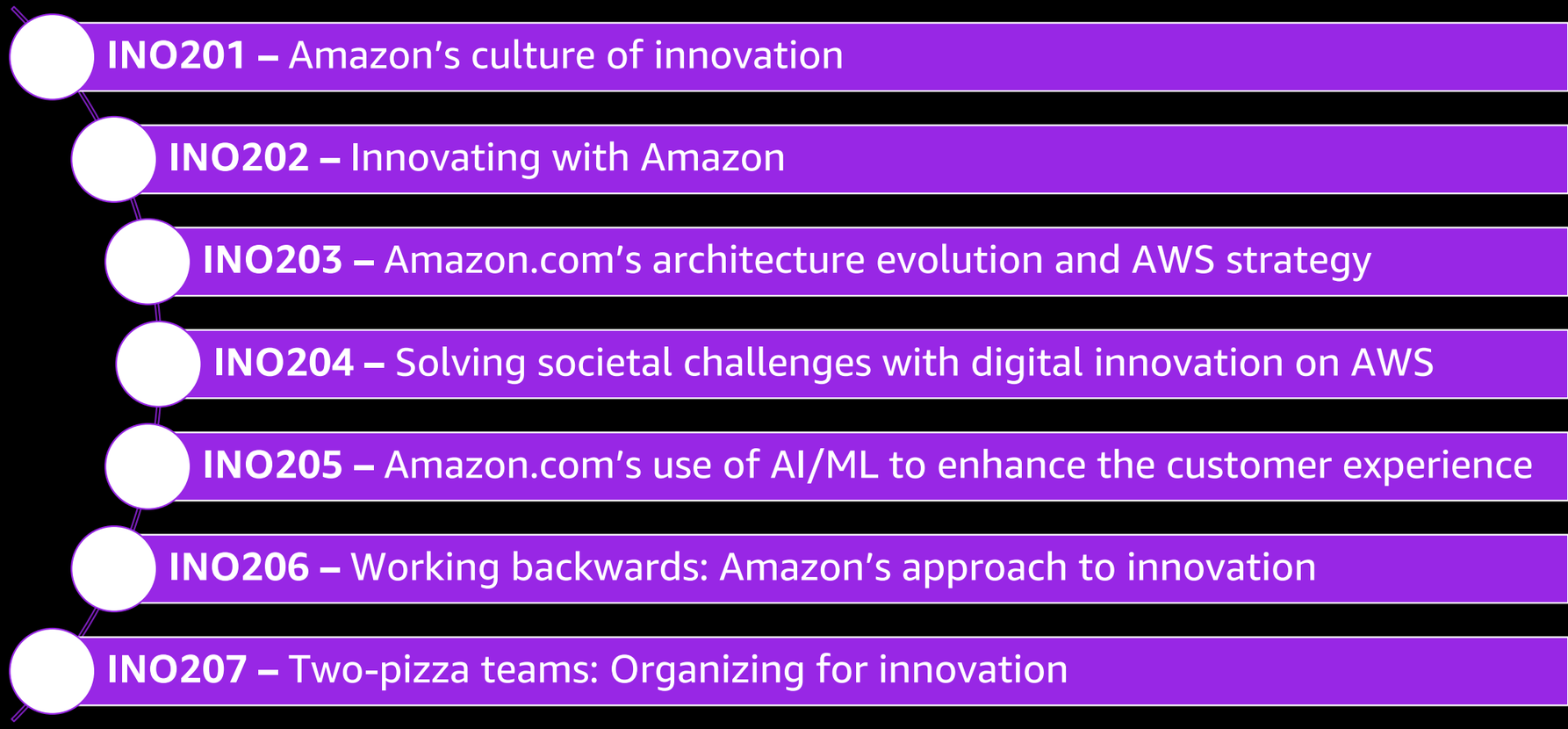
4. Unique aspects of ML delivery methods
5. Governance, compliance, and security

# Summary

1. AI/ML + Amazon = better customer service
2. Amazon leverages ML across all operational areas
3. Building an ML-driven innovation engine requires a "system of enablers"
4. Automating the end-to-end process accelerates the path to production

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