

INSEAD

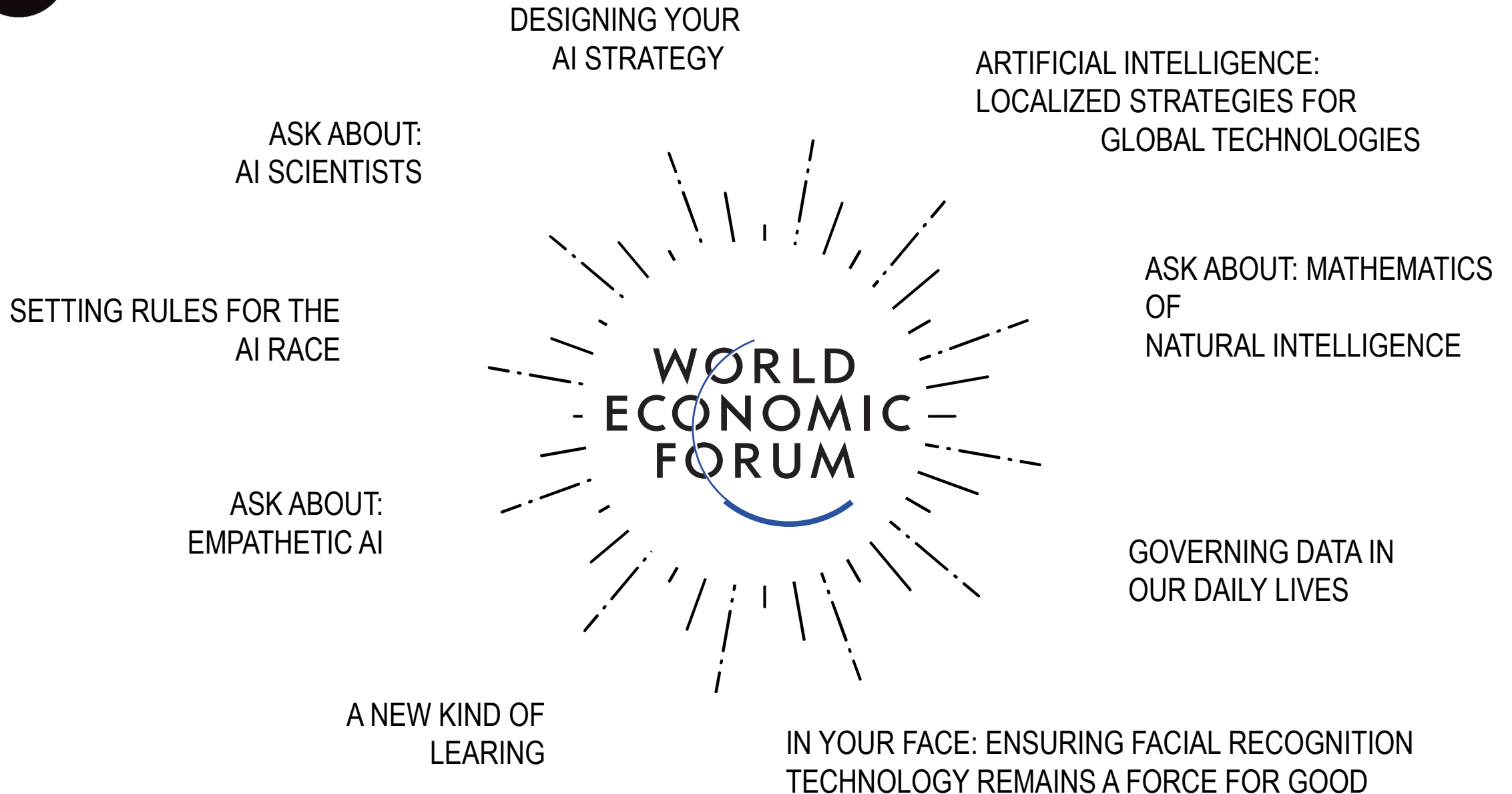
AI & Strategy

Peter Zemsky

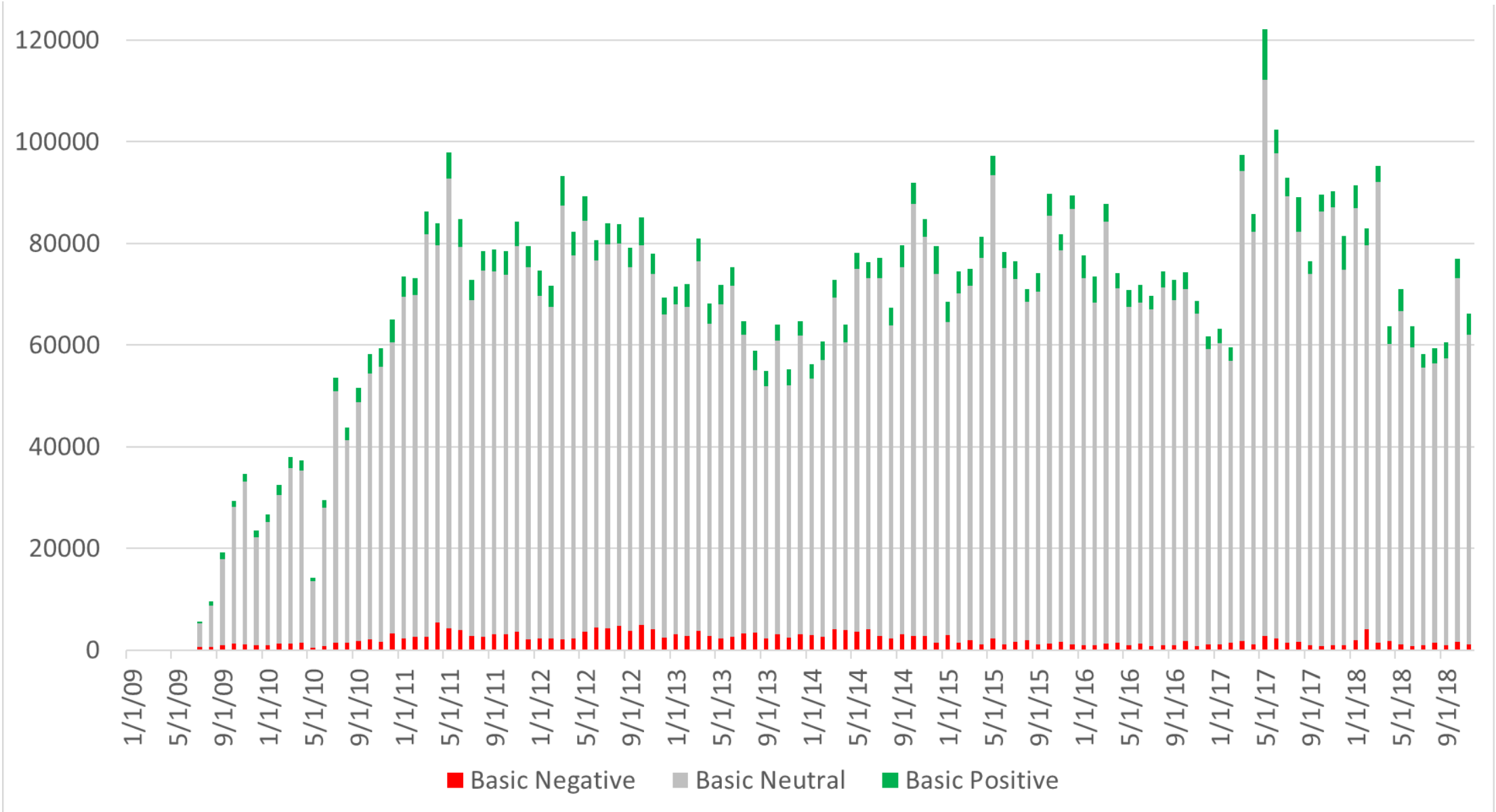
Deputy Dean/Dean of Innovation

Eli Lilly Chaired Professor of Strategy and Innovation

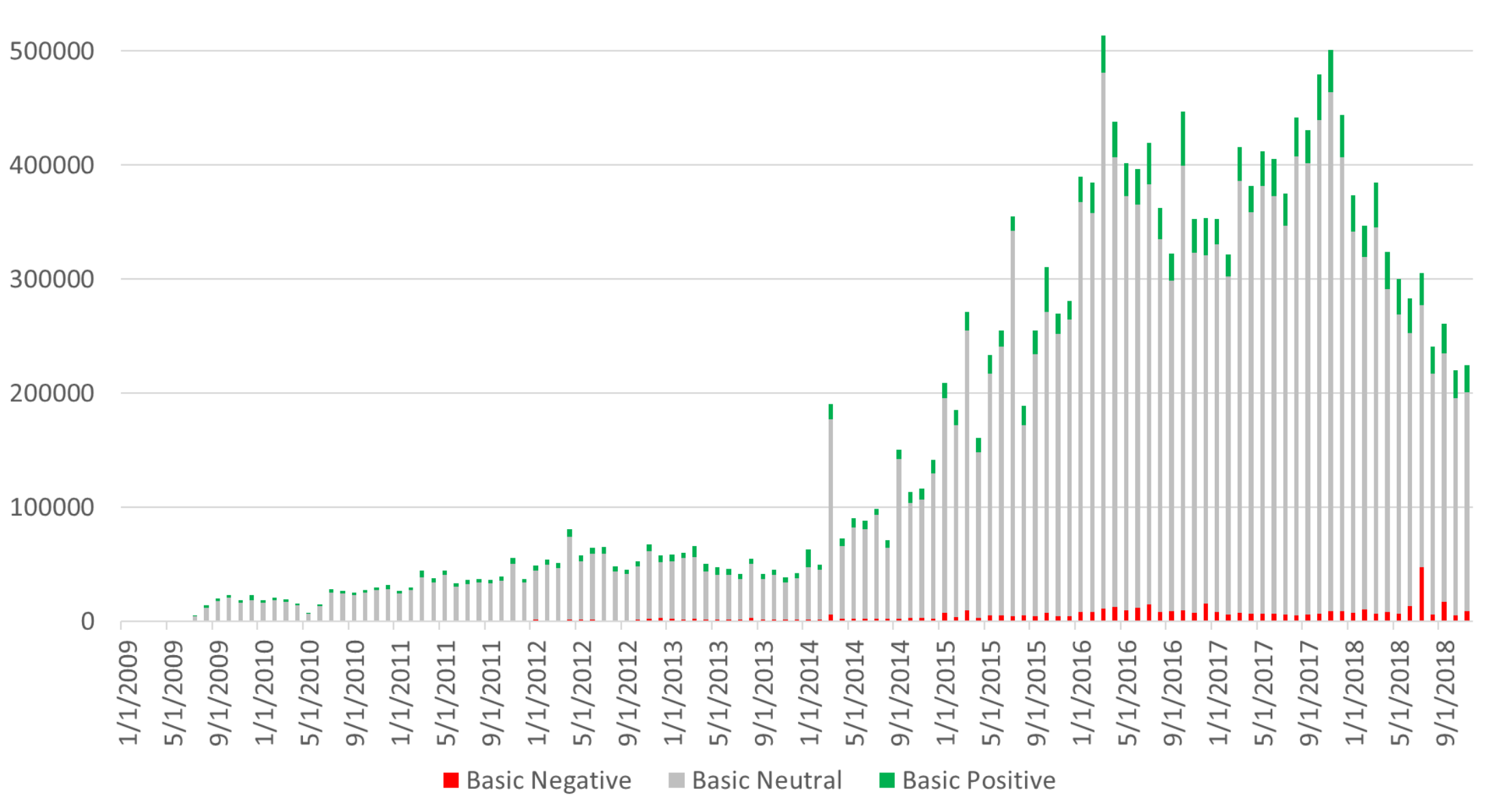




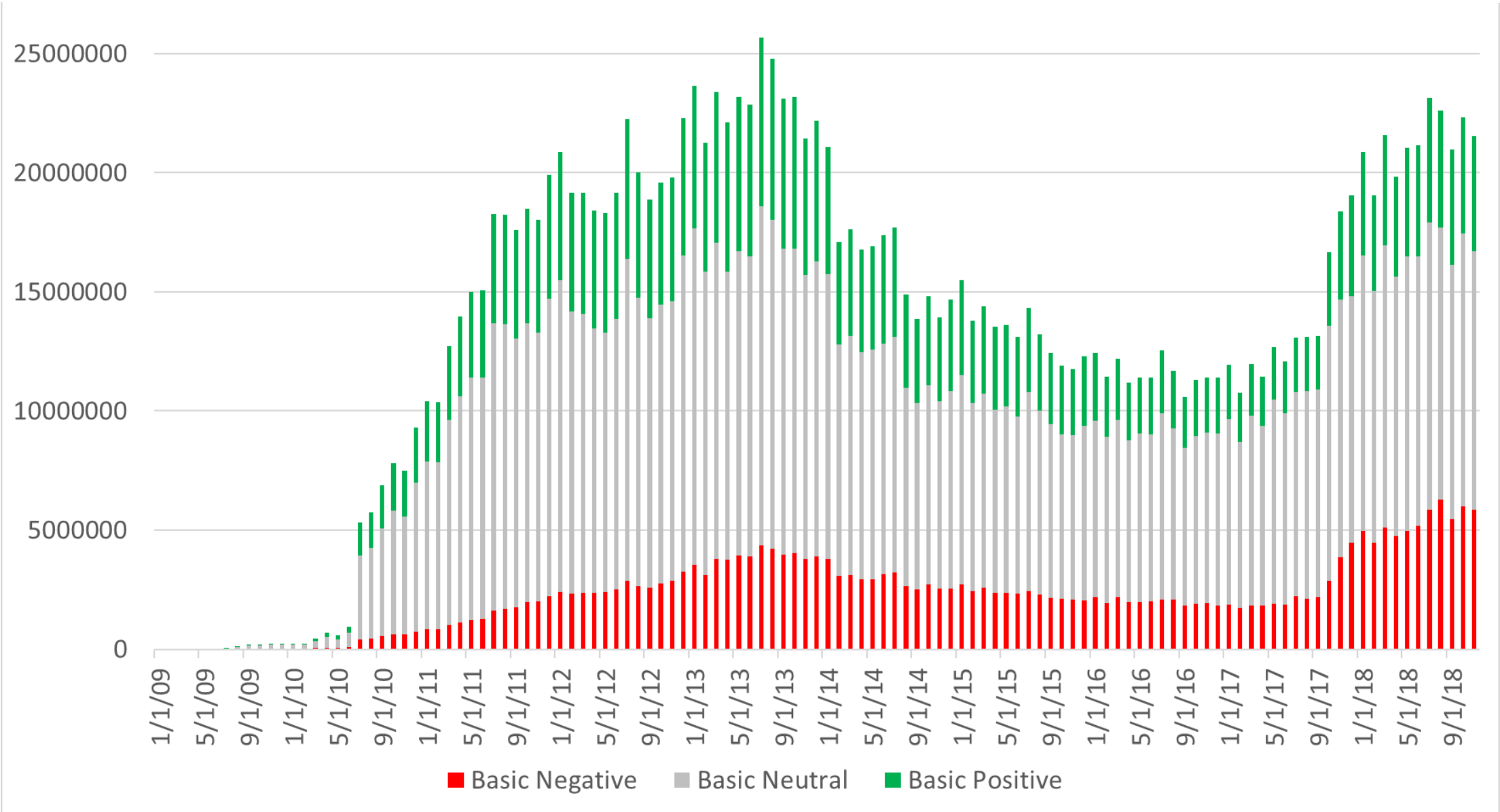
Social Listening: Cloud



Social Listening: Virtual Reality



Social Listening: AI



Artificial intelligence

Anything you can do, AI can do better.

So how will it change the workplace?







Resource Allocation?

Peter Zemsky

Deputy Dean/Dean of Innovation

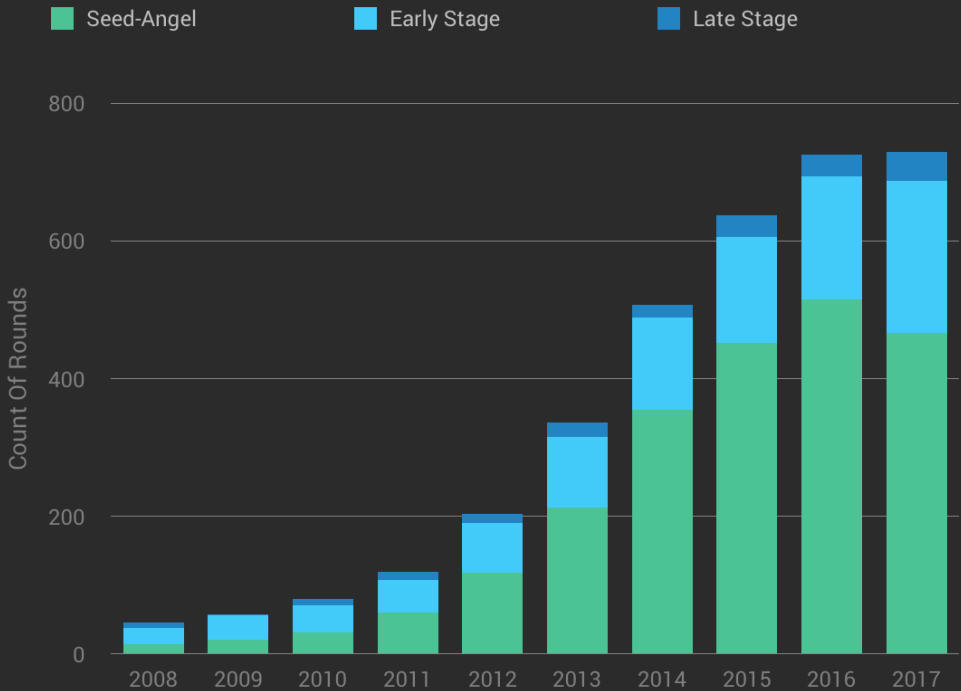
Eli Lilly Chaired Professor of Strategy and Innovation



Strategy is about Resource Allocation

VC Deal Volume In US Artificial Intelligence, Machine Learning, And Related Startups, By Stage

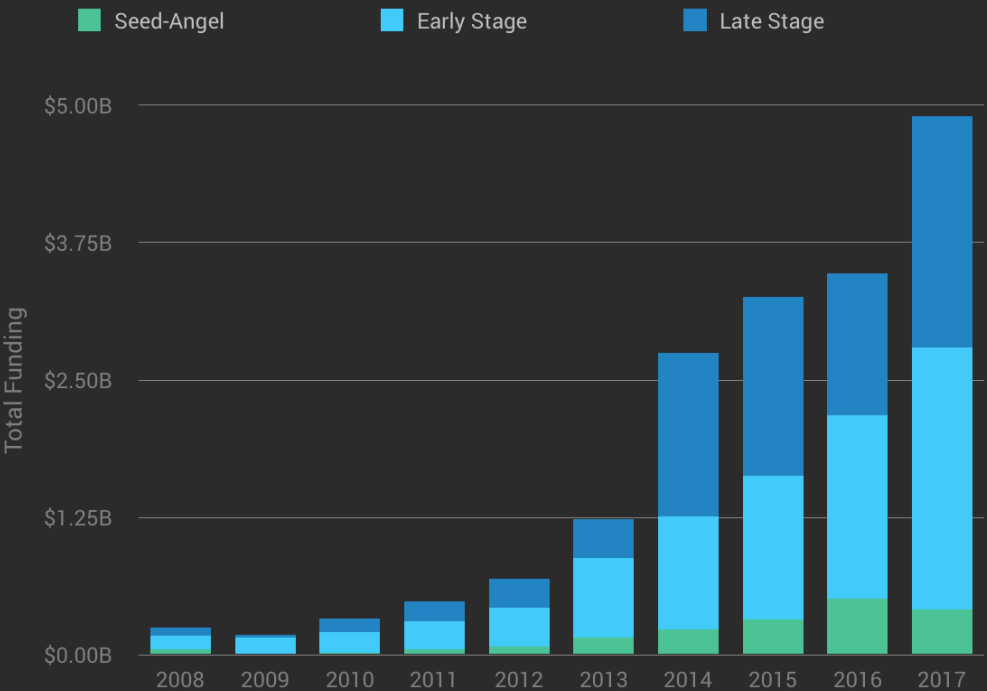
2008 through 2017.



crunchbase news

VC Dollar Volume In US Artificial Intelligence, Machine Learning, And Related Startups, By Stage

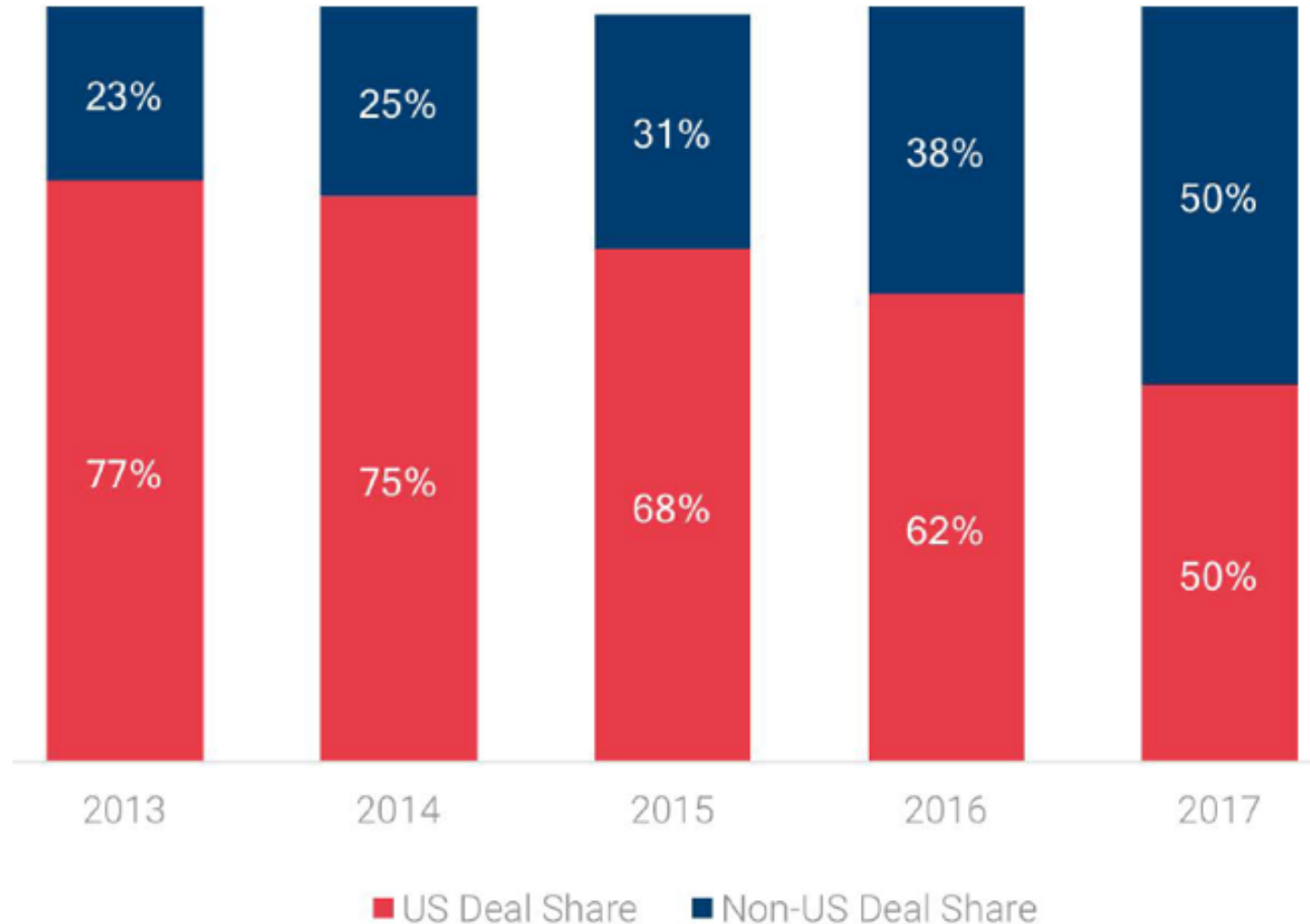
2008 through 2017.



crunchbase news

Strategy is about Resource Allocation

Equity deal share, 2013–2017



2010 2011 2012 2013 2014 2015 2016 2017 2018



CleverSense DNNresearch DeepMind Jetpac Emu Dark Blue Labs Vision Factory Granata Timeful Moodstocks Api.ai Halli Labs AIMatter Banter



Siri *Novauris Technologies Perceptio Vocal IQ Emotient tuplejump SensoMotoric Lattice Regaind Init.ai Pop Up Archive



Face.com Mobile Technologies Wit.ai Masquerade Technologies Zurich Eye Ozlo



Evi Technologies *Orbeus Harvest.ai Angel.ai Sqrri



Indisys Saffron Technology Nervana Systems Itseez Movidius



Netbreeze Equivio SwiftKey Maluuba Genee

Traditional Players are Moving



Microsoft



Traditional Players are Moving



CVS +
pharmacy[®]

aetna[®]

\$69B

Case: MDLive

Peter Zemsky

Deputy Dean/Dean of Innovation

Eli Lilly Chaired Professor of Strategy and Innovation



Conservative

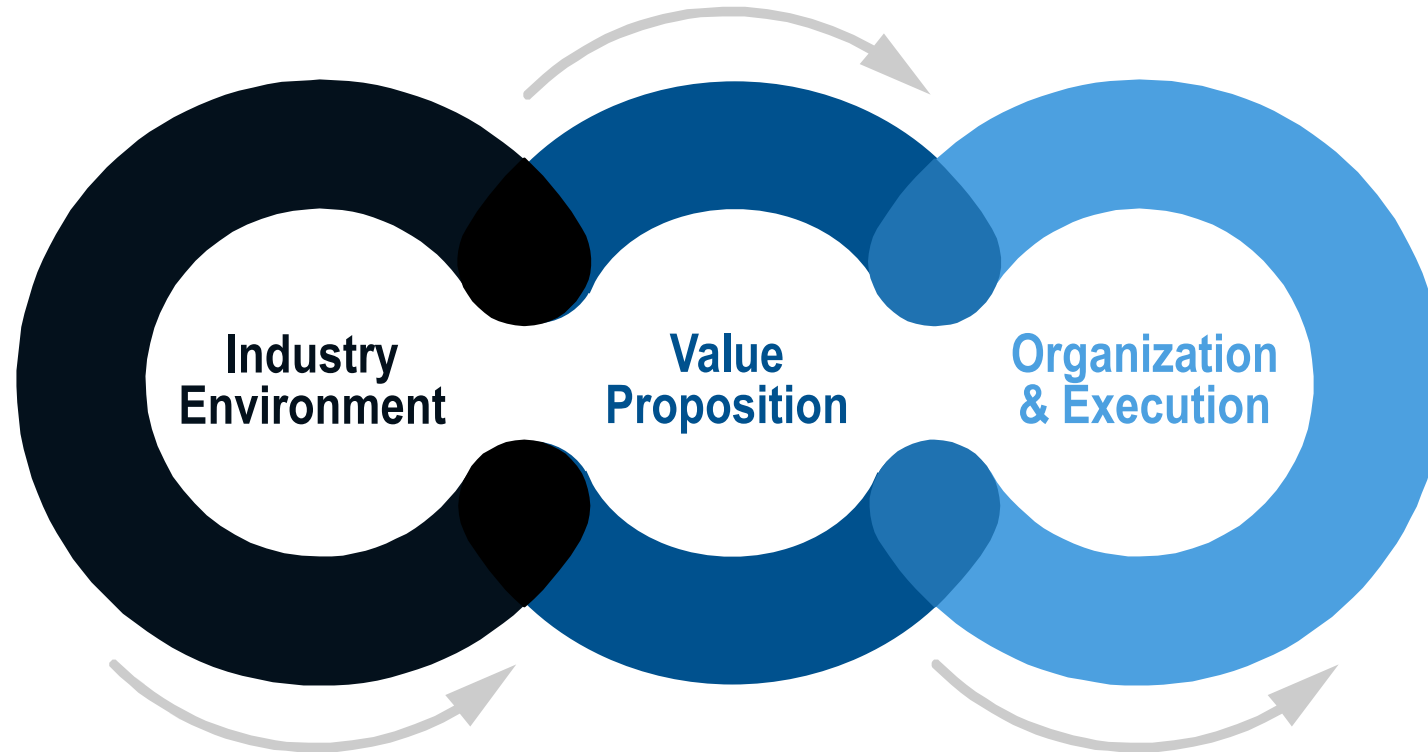
Highly regulated

Escalating
healthcare costs

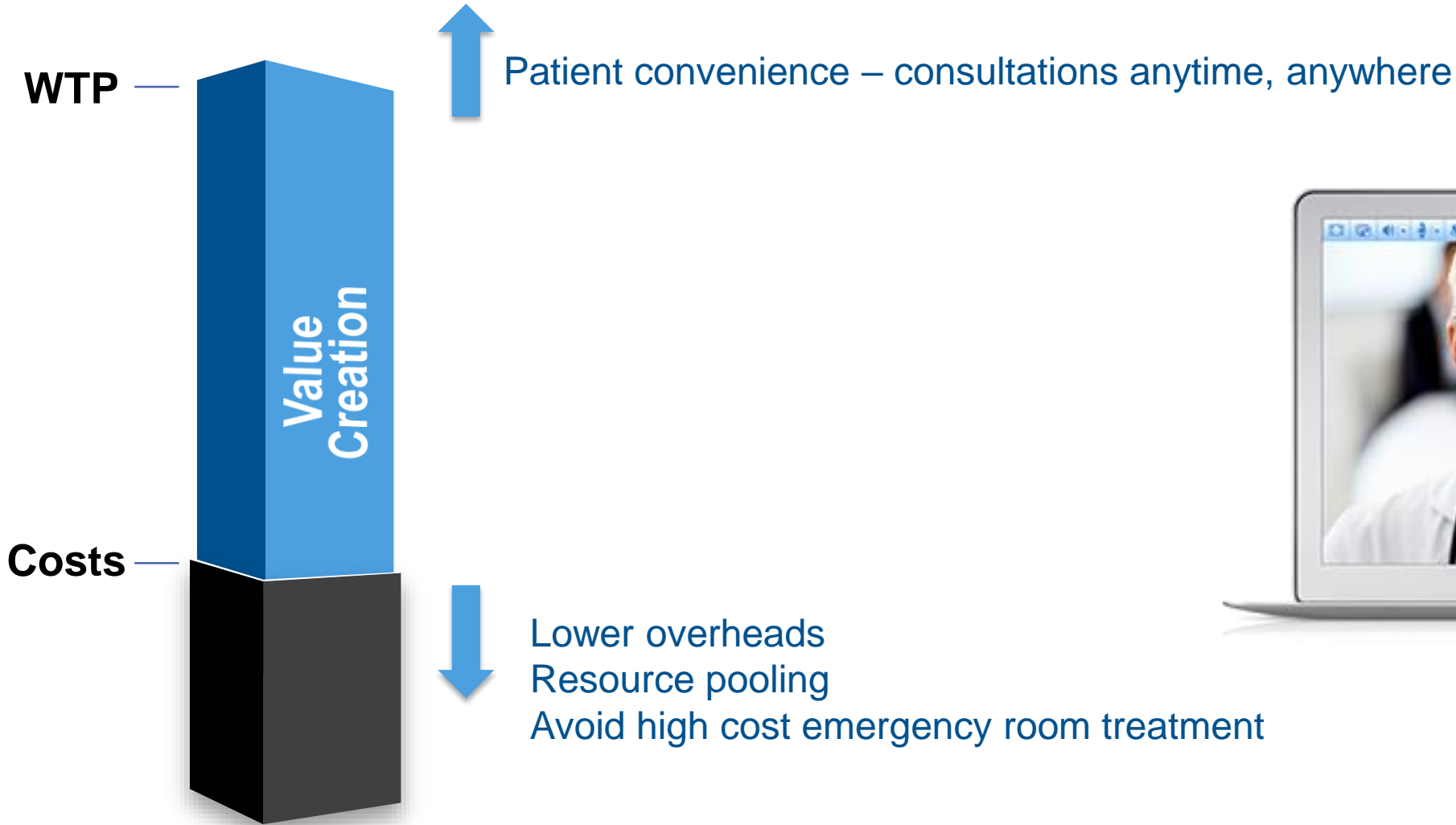
Strong employer
interest in
telemedicine...

...but patient
adoption lagging

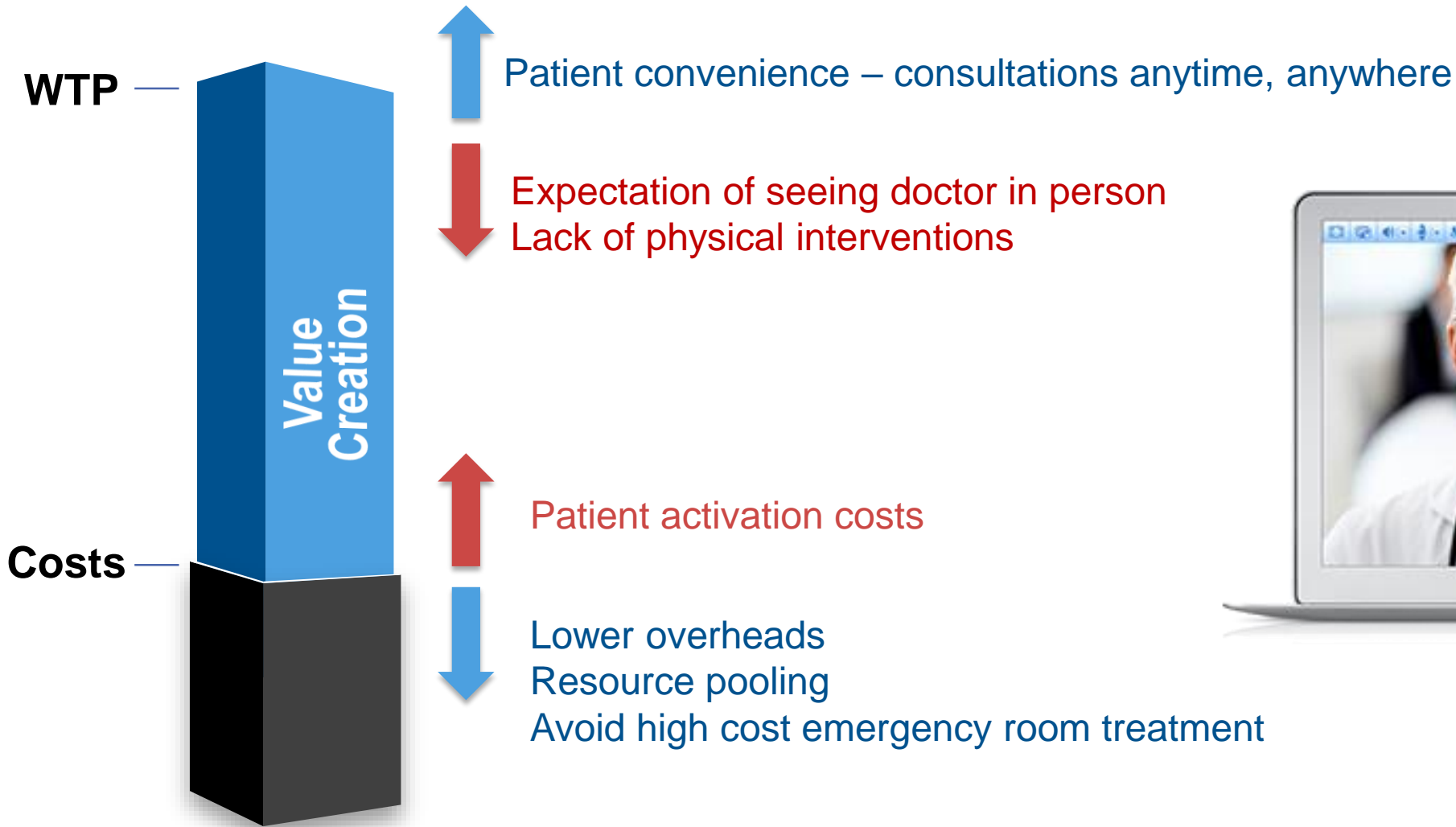
AI technology



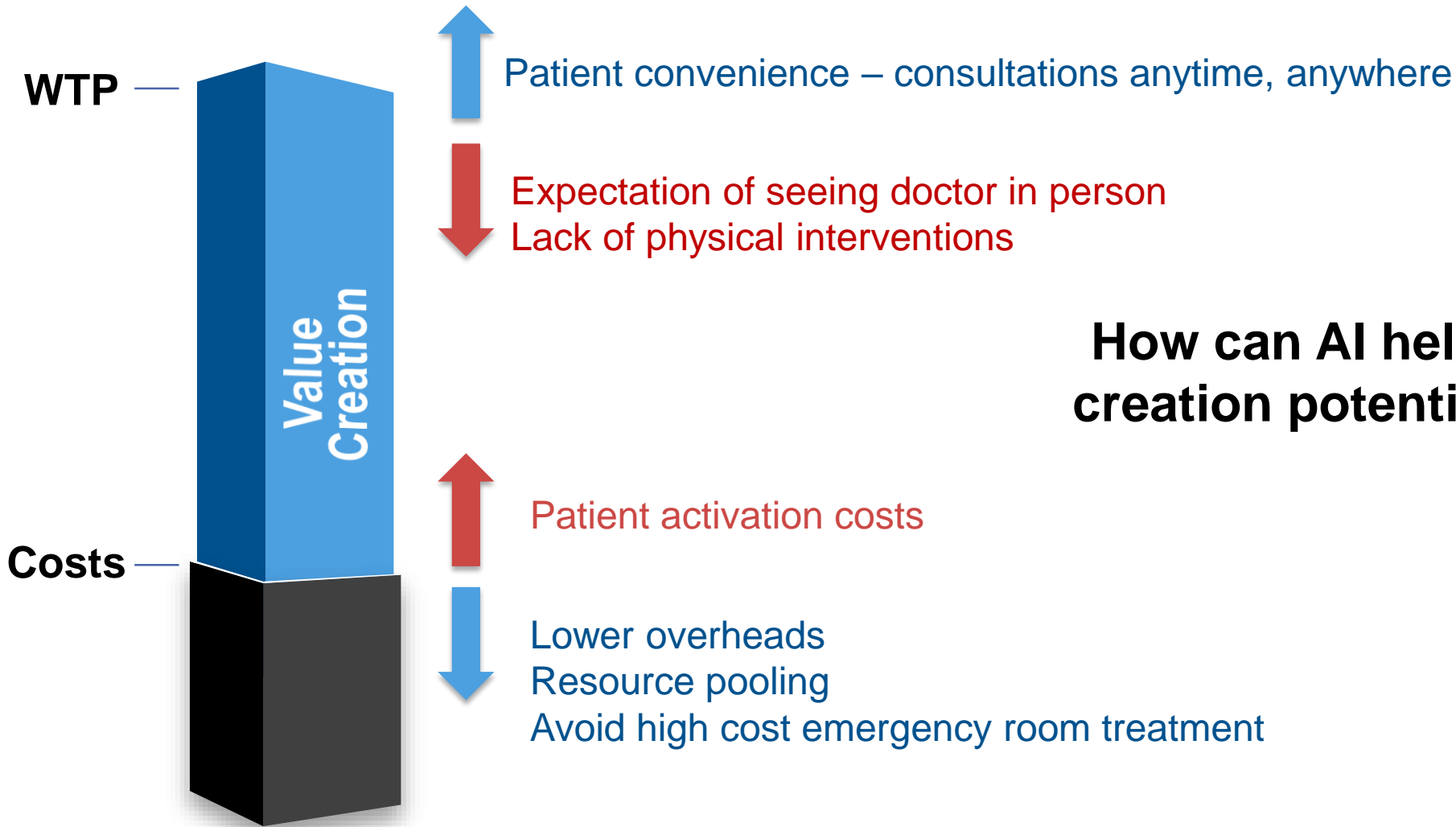
Value Creation from Telemedicine



Value Creation from Telemedicine



Value Creation from Telemedicine



How can AI help unlock the value creation potential of telemedicine?

MDLIVE[®]

Always there.



MDLIVE[®]

Always there.



24/7/365 Care
Anytime, Anywhere



US Board-Certified
Doctors



10 Minute Average
Call Back Time



Prescriptions Sent
Directly to Your
Pharmacy

Cost Savings

Redirection



Visit Redirection sourced from visit member surveys. Starting April 2018, Other has been removed as an option from redirection surveys.
Cost per Instance sourced from National AVG of [healthcarebluebook.com](https://www.healthcarebluebook.com) values

YTD Potential Savings by Month

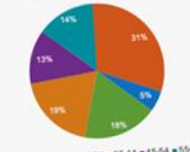


Potential Savings - YTD			
Redirection Percentage	YTD Visits	Cost per Instance	YTD Savings
UCC	12,114	\$229	\$2,774,197
PCP	10,208	\$180	\$1,837,425
ER	679	\$821	\$557,793
Retail	388	\$88	\$34,160
Other/Delay Care	7,240	\$0	\$0

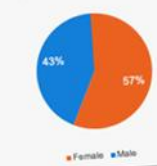
Visit Savings YTD: **\$5,203,575**

Patient Demographics

Utilization by Age - YTD



Utilization by Gender - YTD



Utilization by Relationship



Utilization by Top States - YTD



Utilization by Weekday - YTD



Utilization by Time of Day - YTD



Visits, Activation & Utilization



There were **4,903 visits** in May-18



30,630 visits in 2018 YTD

49.4% Annualized Utilization



There are **108,343** currently eligible activated users



There are **36,775** currently engaged users

33.9% Users Engaged

Eligible Lives		
Primaries	Dependents	Eligible
May-18: 150,907	250,036	400,943
2018 YTD AVG:		

Utilization			
Primaries	Dependents	Eligible	
Visits	Utilization	Visits	Utilization
May-18: 2,149	1.4%	2,754	1.1%
4,903	7.6%		

Patient Wait Time

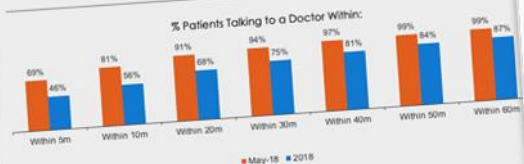


Average wait time to see a doctor in May-18:

6.6 Minutes

Average wait time to see a doctor in 2018 YTD:

25.5 Minutes

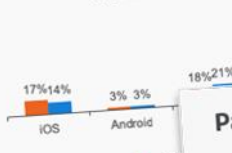


Patient Use Trends

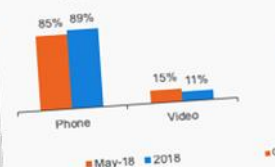
Waiting Room vs Scheduled - YTD



Source of Encounter



Phone vs Video



Repeat Usage - YTD



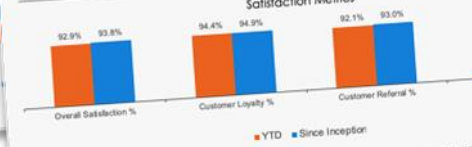
Patient Satisfaction

Overall Satisfaction - YTD



Net Promoter Score YTD: 66.4%

Surveys Completed YTD: 3,441



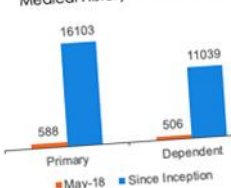
Medical History, Visit Summary



Medical History Completions May-2018: **1,094** Since Inception: **27,142**

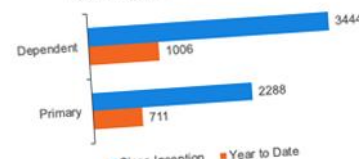


Medical History Completions



20,637 (19%) Active users have submitted their Primary Care Provider (PCP) to MDLIVE

Follow Up SOAP Notes Sent to PCP



% of Active Users with Medical History: % of Registered, Active accounts that have completed at least one medical history section
% of Active Users Submitted PCP: % of Registered, Active accounts that have submitted a PCP contact



Regression Model

$$Y_{it} = \beta_{0i} + \beta_{1i}X_{1it} + \beta_{2i}X_{2it} + \varepsilon_{it} \quad i = 1, \dots, n = 10 \quad t = 1, \dots, T = 20$$

Matrix Form:

$$Y_i = X_i \beta_i + \varepsilon_i \quad Y_i = \begin{bmatrix} Y_{i1} \\ Y_{i2} \\ \vdots \\ Y_{i,20} \end{bmatrix} \quad X_i = \begin{bmatrix} 1 & X_{1i1} & X_{2i1} \\ 1 & X_{1i2} & X_{2i2} \\ \vdots & \vdots & \vdots \\ 1 & X_{1i,20} & X_{2i,20} \end{bmatrix} \quad \beta_i = \begin{bmatrix} \beta_{0i} \\ \beta_{1i} \\ \beta_{2i} \end{bmatrix} \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \vdots \\ \varepsilon_{i,20} \end{bmatrix}$$

$$Y = \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_{10} \end{bmatrix} \quad X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_{10} \end{bmatrix} \quad \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_{10} \end{bmatrix}$$

$$E(\varepsilon) = \begin{bmatrix} 0 \\ 0 \\ \vdots \\ 0 \end{bmatrix} \quad V(\varepsilon) = E(\varepsilon \varepsilon') = V = \begin{bmatrix} \sigma_1^2 V_{11} & \sigma_{12} V_{12} & \cdots & \sigma_{1,10} V_{1,10} \\ \sigma_{12} V_{12} & \sigma_2^2 V_{22} & \cdots & \sigma_{2,10} V_{2,10} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{10,1} V_{10,1} & \sigma_{10,2} V_{10,2} & \cdots & \sigma_{10}^2 V_{10,10} \end{bmatrix}$$

Erlang C Formula

$$p(>0) = \frac{\frac{A^N}{N!} \left(\frac{N}{N-A} \right)}{\sum_{x=0}^{N-1} \frac{A^x}{x!} + \frac{A^N}{N!} \left(\frac{N}{N-A} \right)}$$

Where:

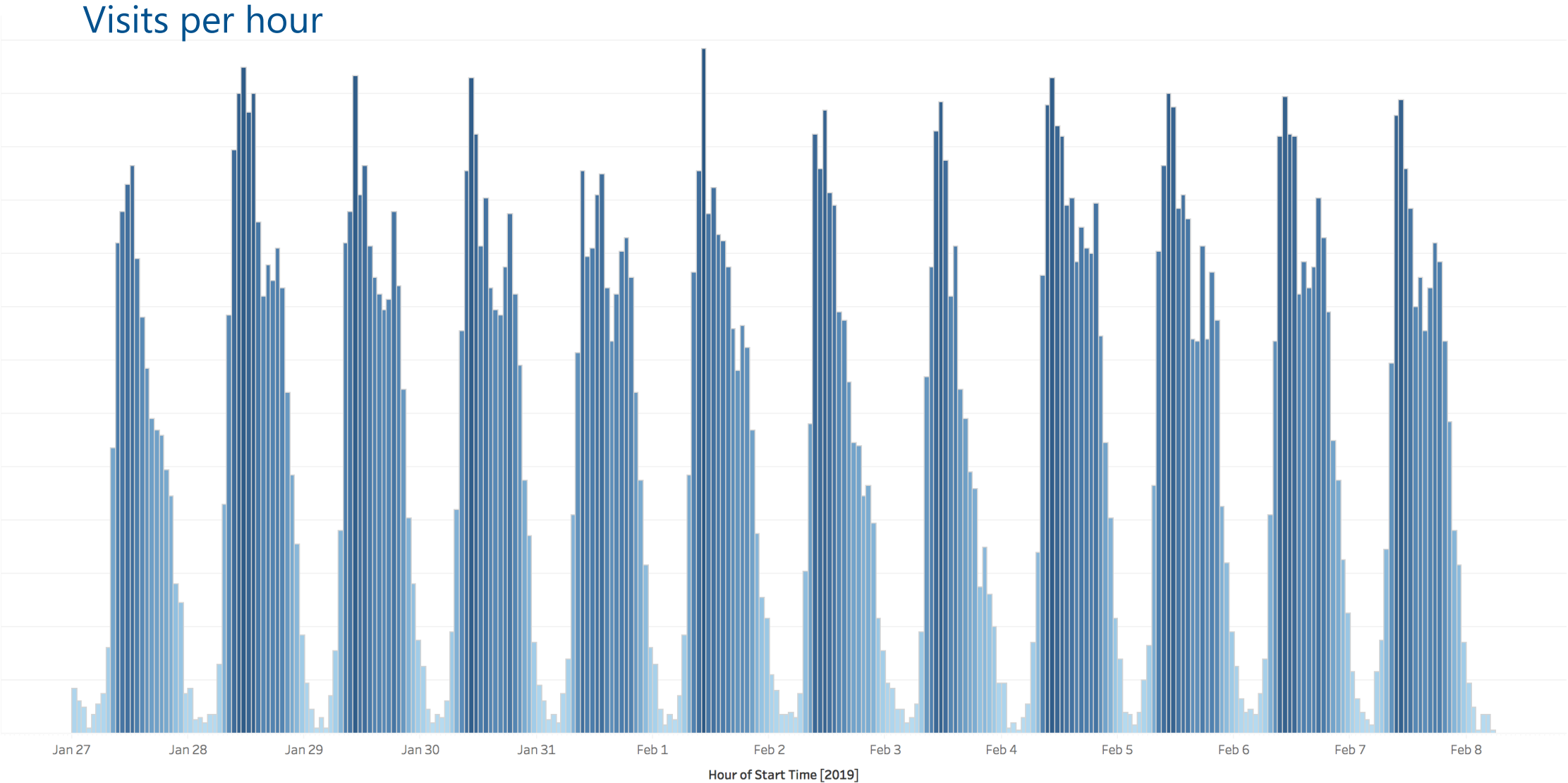
A = total traffic (in erlang c)

N = number of resources

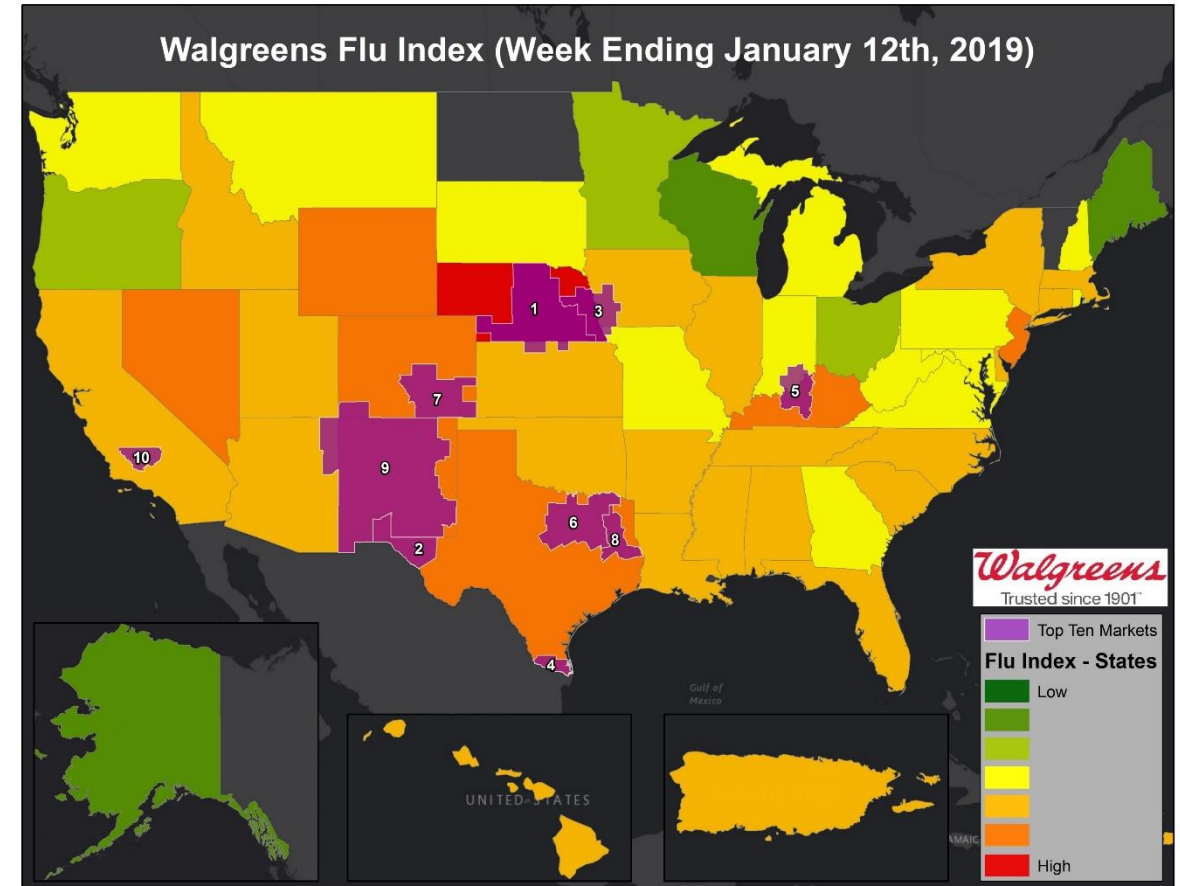
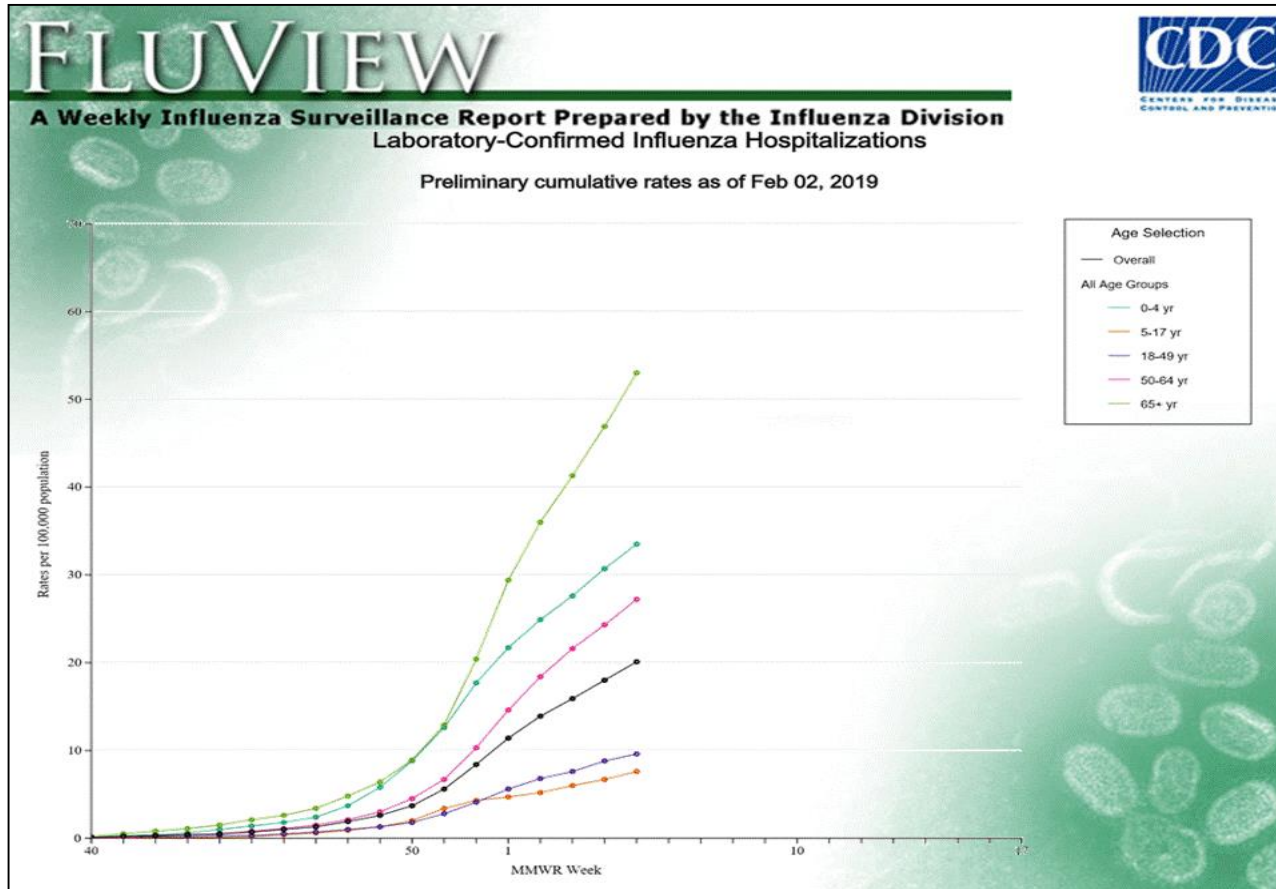
P(>0) = probability of delay

P = probability of loss – Poisson formula

Inputs: MDLive historical data

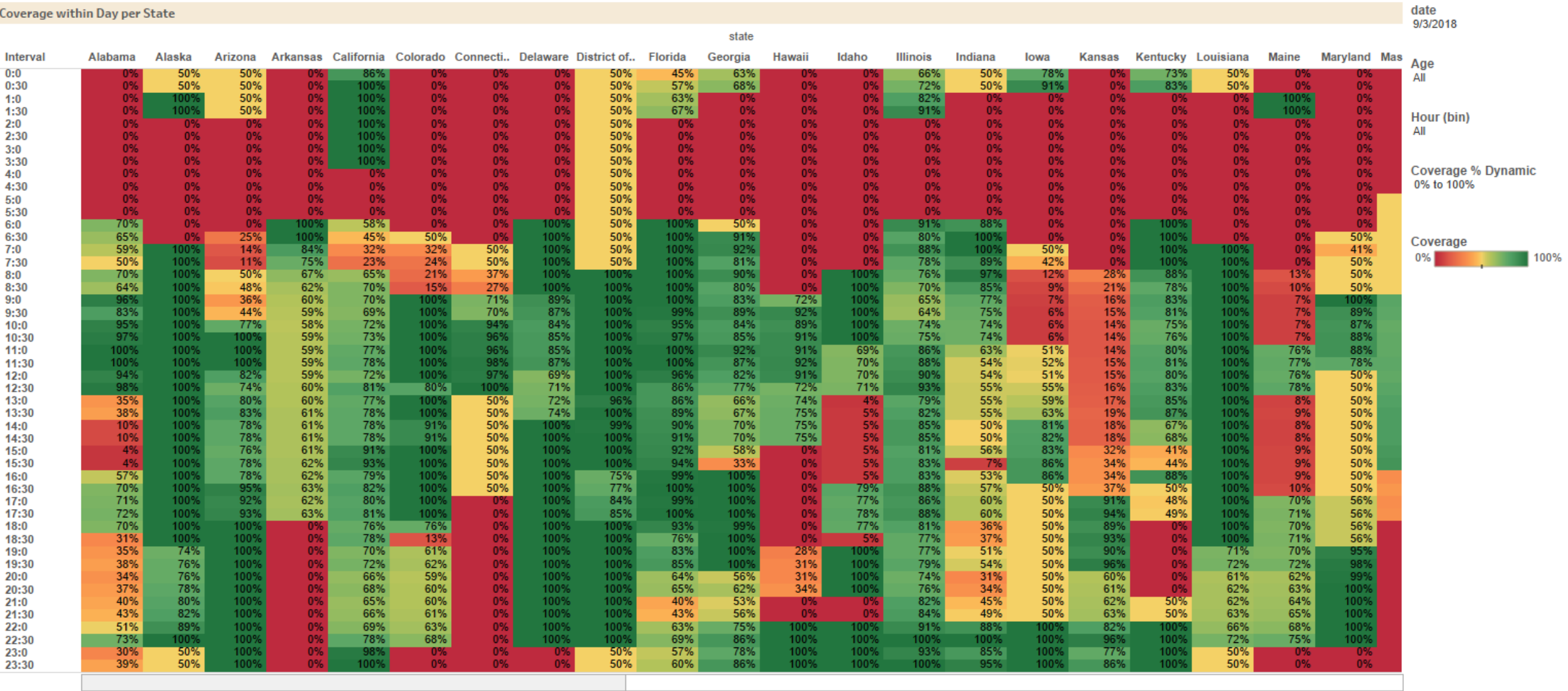


Inputs: External data sources



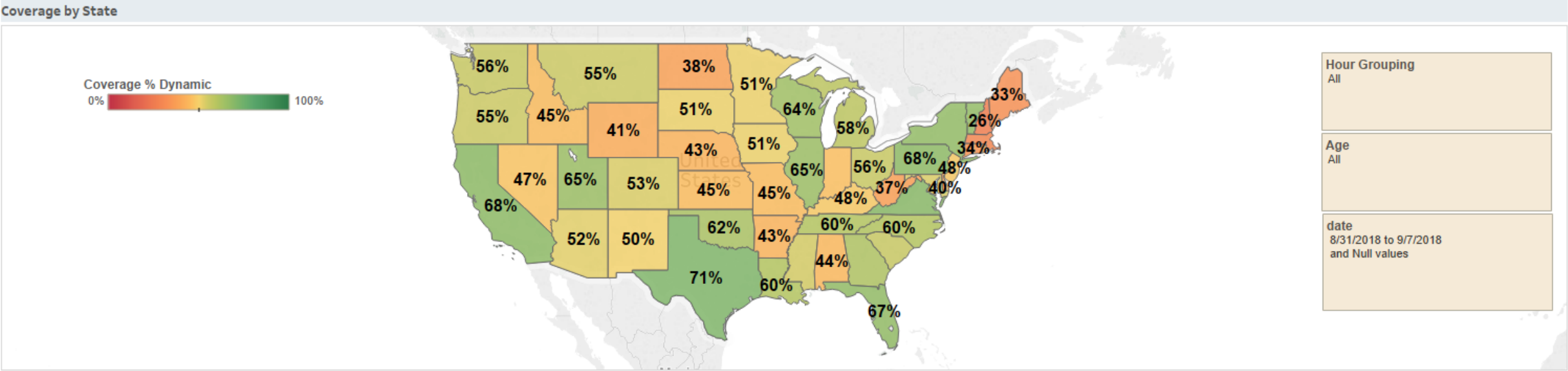
Integration: Scheduling Tool

Coverage within Day



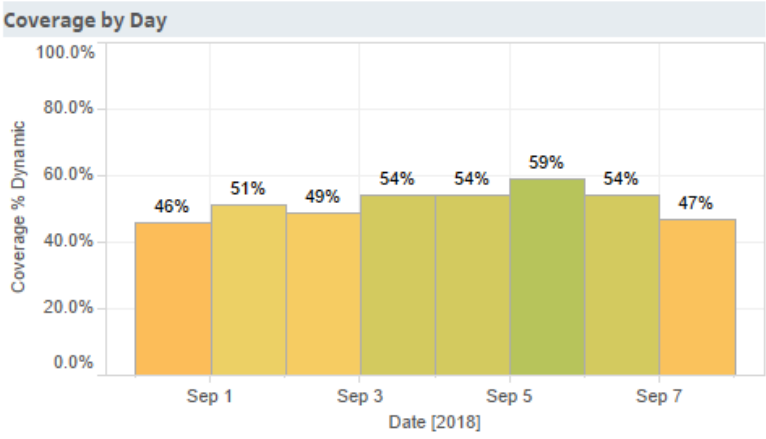
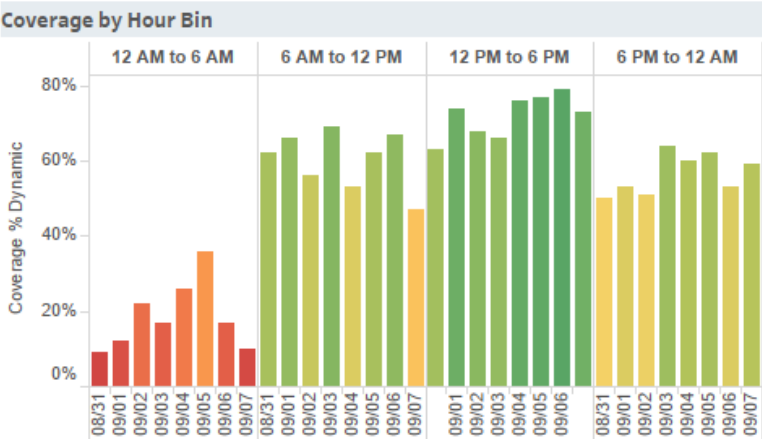
Integration: Scheduling Tool

Coverage Dashboard



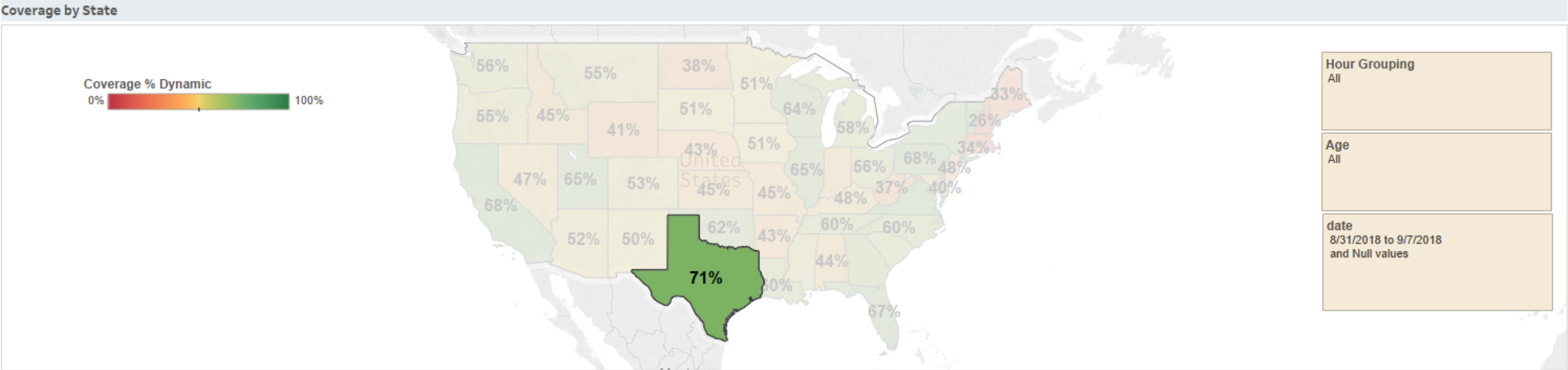
Coverage by Hour

Interval	08/31	09/01	09/02	09/03	09/04	09/05	09/06	09/07
6:0	41%	30%	39%	54%	40%	31%	24%	
6:30	38%	37%	46%	57%	46%	29%	71%	
7:0	45%	72%	48%	62%	49%	65%	62%	
7:30	45%	66%	43%	58%	45%	63%	58%	
8:0	58%	71%	50%	71%	46%	72%	71%	
8:30	72%	64%	46%	66%	42%	65%	68%	
9:0	75%	67%	62%	75%	50%	67%	71%	
9:30	73%	60%	60%	74%	52%	68%	73%	
10:0	75%	75%	65%	74%	64%	66%	75%	
10:30	76%	80%	65%	75%	64%	66%	73%	



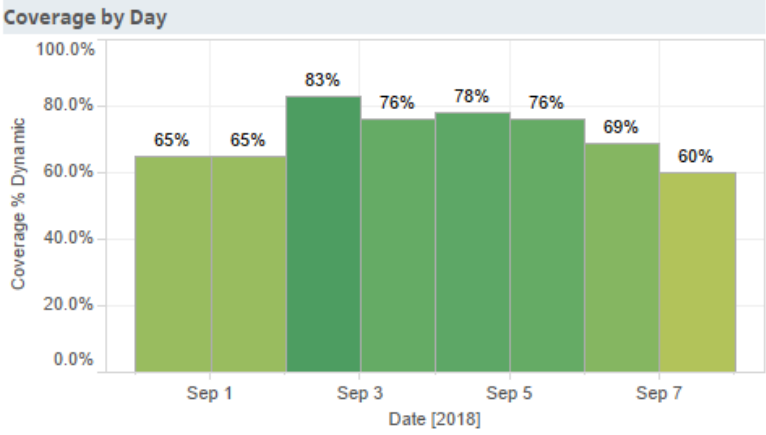
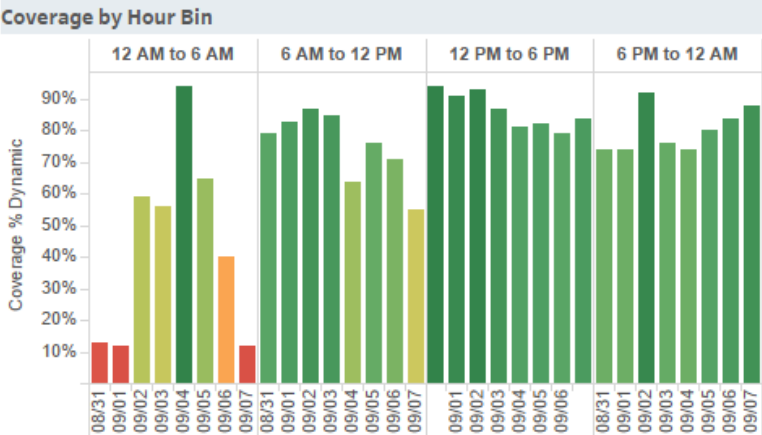
Integration: Scheduling Tool

Coverage Dashboard



Coverage by Hour

Interval	08/31	09/01	09/02	09/03	09/04	09/05	09/06	09/07
6:0	77%	100%	100%	100%	66%	100%	100%	100%
6:30	68%	100%	96%	100%	61%	87%	95%	95%
7:0	61%	84%	68%	97%	71%	84%	77%	77%
7:30	58%	75%	50%	85%	66%	75%	70%	70%
8:0	66%	63%	88%	74%	56%	73%	59%	59%
8:30	63%	60%	84%	68%	55%	67%	60%	60%
9:0	96%	80%	100%	78%	62%	67%	62%	62%
9:30	91%	70%	100%	76%	63%	68%	63%	63%
10:0	89%	91%	93%	78%	62%	67%	65%	65%
10:30	90%	92%	91%	80%	62%	67%	63%	63%





Search for a company...

MDLIVE®

MDLIVE

Reviews 1,561 • Great



 Write a review



Reviews 1,561

Filter by: Rating **1** English >

☒ Excellent



71%

☐ Great



7%

☐ Average



5%

☐ Poor



4%

☐ Bad



13%



ROCHELLE PICON
1 review



Verified order

A day ago

Love MDLive
I loved being able to speak with a doctor about a minor problem, without having to take off work to go to a doctor's appointment. The doctor was thoughtful, caring, and thorough. I would use MDLive again.

 Useful

 Share

 Notify



Search for a company...



MDLIVE

Reviews 1,561 • Great



 Write a review



Reviews 1,561

Filter by:

Rating 1

English

☒ Excellent

71%

☐ Great

7%

☐ Average


5%

☐ Poor


4%

☐ Bad

13%

 NP

1 review



Verified order

Oct 31, 2018

Felt like doctors did not listen to...

Felt like doctors did not listen to anything I had to say. Giving 2 stars because it was faster than going to my primary care doctor. Finally after the 2nd call for the same reason, I got a prescription and was able to start feeling better! I'm not sure I would use this service again, but this is the first time I experienced this. In the past, I never had an issue and it was fast and convenient to use.

Useful

Share

Notify



Reply from MDLIVE

Nov 1, 2018

Hello, we are so sorry to hear that you had an unpleasant experience with our services. We would like to hear more about your concerns, so we have escalated your comment to our team and someone will be in touch with you shortly. Thank you so much for taking the time to give us your feedback.

		Predicted				
		Poor	Fair	Good	Very Good	Excellent
Truth	Poor	99%	1%	0%	0%	0%
	Fair	1%	98%	0%	0%	0%
	Good	0%	1%	99%	1%	0%
	Very Good	0%	0%	0%	97%	5%
	Excellent	0%	0%	0%	2%	95%



MDLIVE [®]		Customer Queue				 Jeniffer Sanders ▾
Name	Gender	Age	Issue	Location	Wait Time	
 E Smith	Female	64	Flu Symptoms	Georgia	63:12 min	Potential Issue Detected Customer satisfaction estimated under 50 points. Level 3 escalation (callback) is recommended. Schedule Call Manager
M Perez	Female	32	UTI	Texas	13:32 min	
R Scott	Male	41	Sore Throat	New Jersey	22:04 min	
V Zucco	Female	24	Sinus Infection	Texas	7:54 min	
A Peterson	Female	34	Flu Symptoms	California	2:14 min	
S Adams	Male	11	Ear Pain	Florida	1:17 min	
W Decker	Female	36	Flu Symptoms	Illinois	1:02 min	

MDLIVE®

**Esther Smith**

69yr old patient in Georgia
Height: 5'6" Weight: 197 lbs

Chief Complain:

Flu Symptoms

Conditions:

Hypertension
Psoriasis

Medications:

Prilosec

Allergies:

Penicillin

- ✓ Patient Name Confirmed
- ✓ Location Confirmed
- ✓ DOB Confirmed

Recommended Diagnosis:

Influenza (97% Confidence)



Customer mood: **Frustrated** 😡



Video



Audio

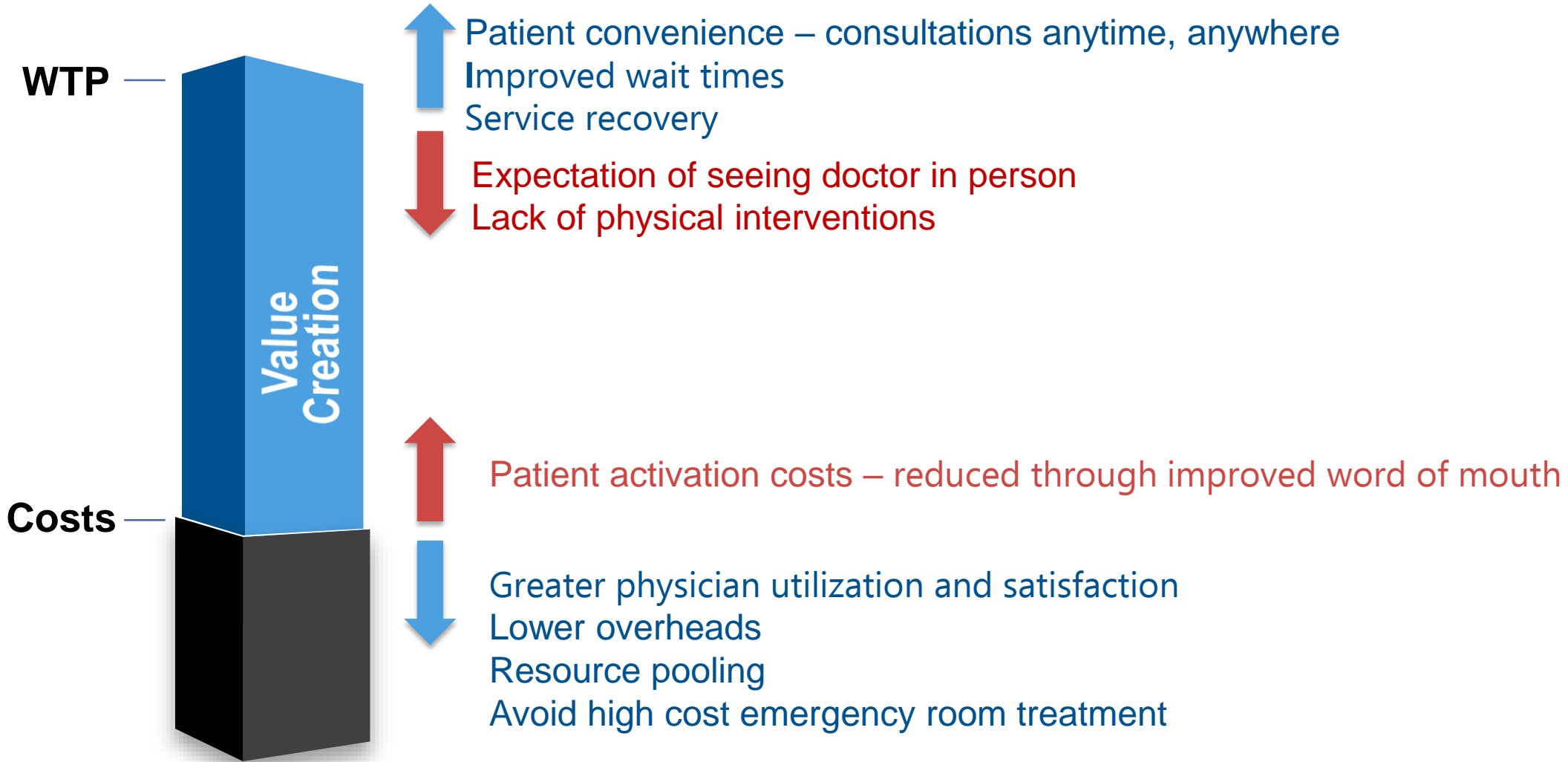


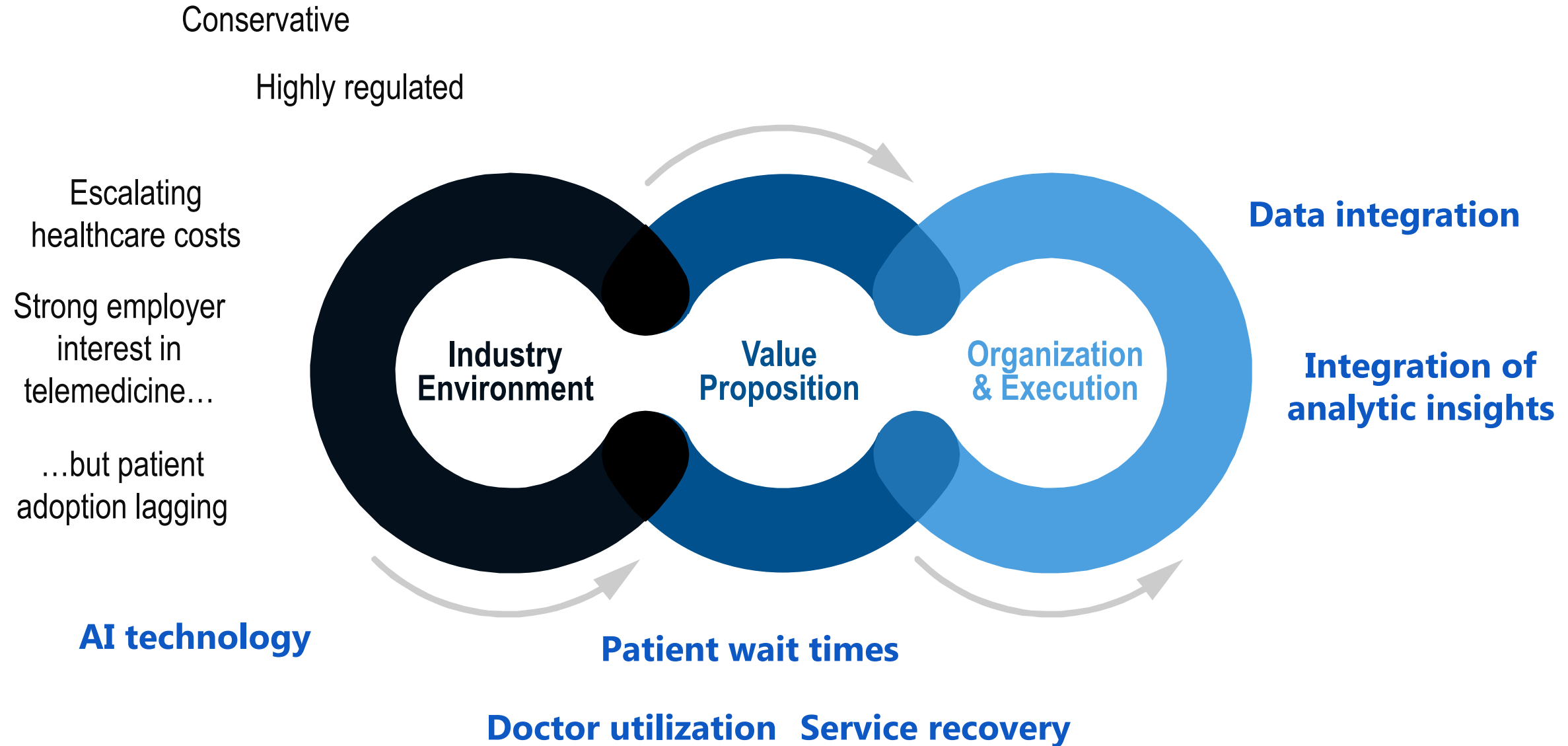
Settings



Close

Value Creation through AI





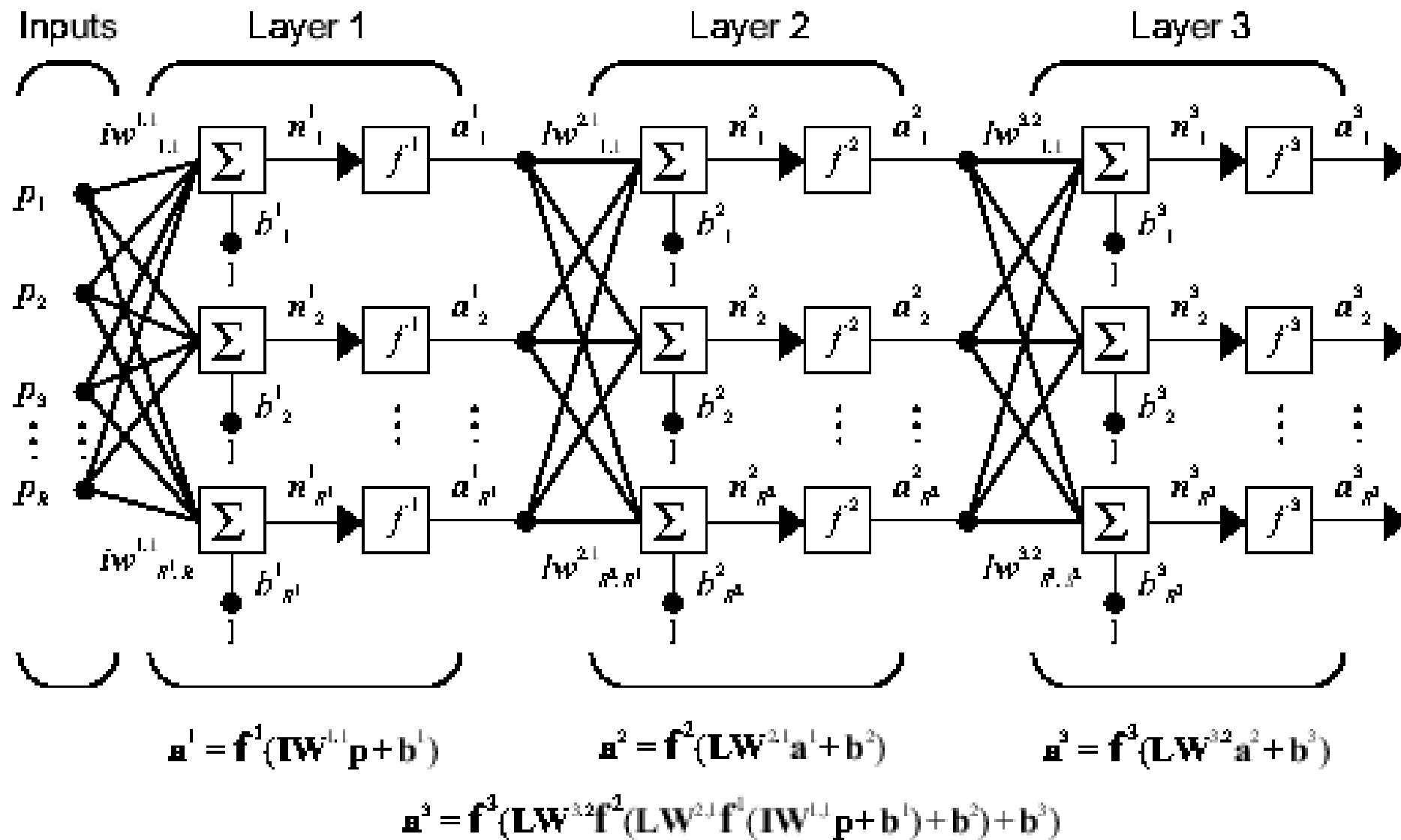
Machine Learning

Peter Zemsky

Deputy Dean/Dean of Innovation

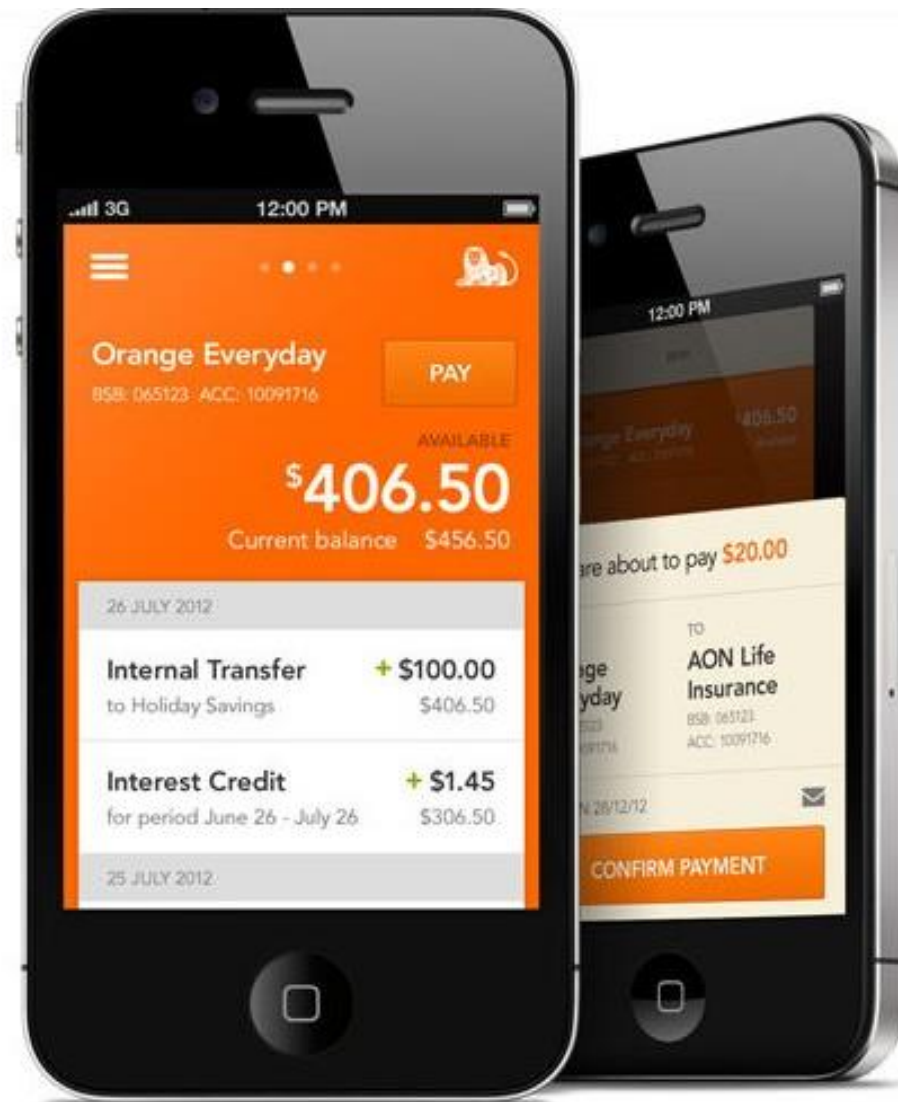
Eli Lilly Chaired Professor of Strategy and Innovation









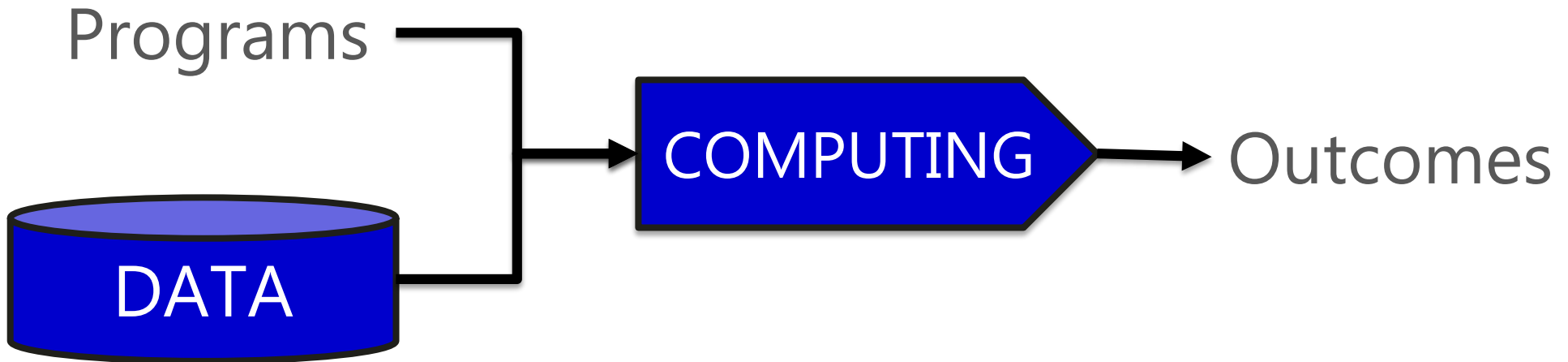




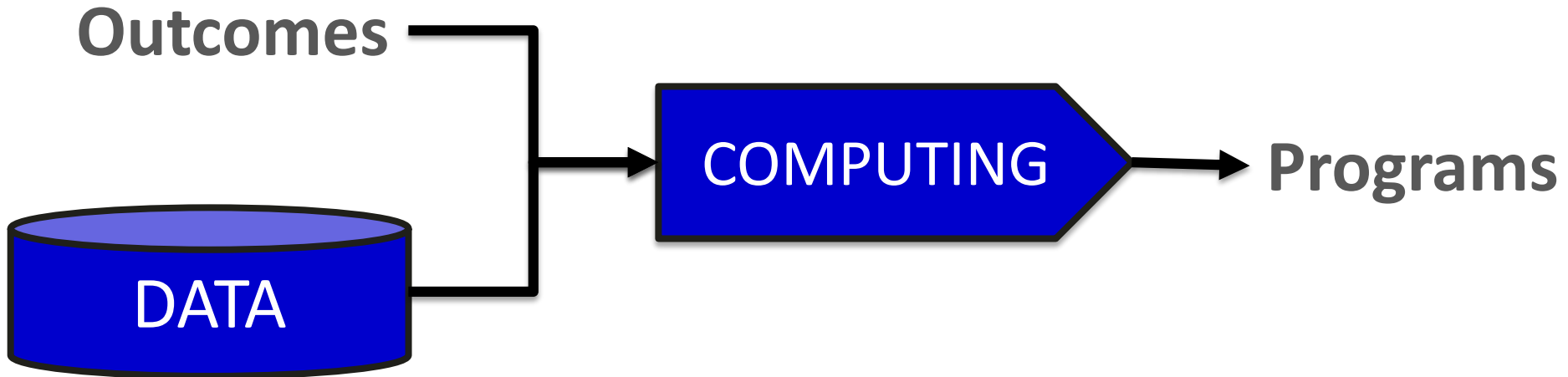
Same or different from the software-based digital revolution?

Why is it happening now?

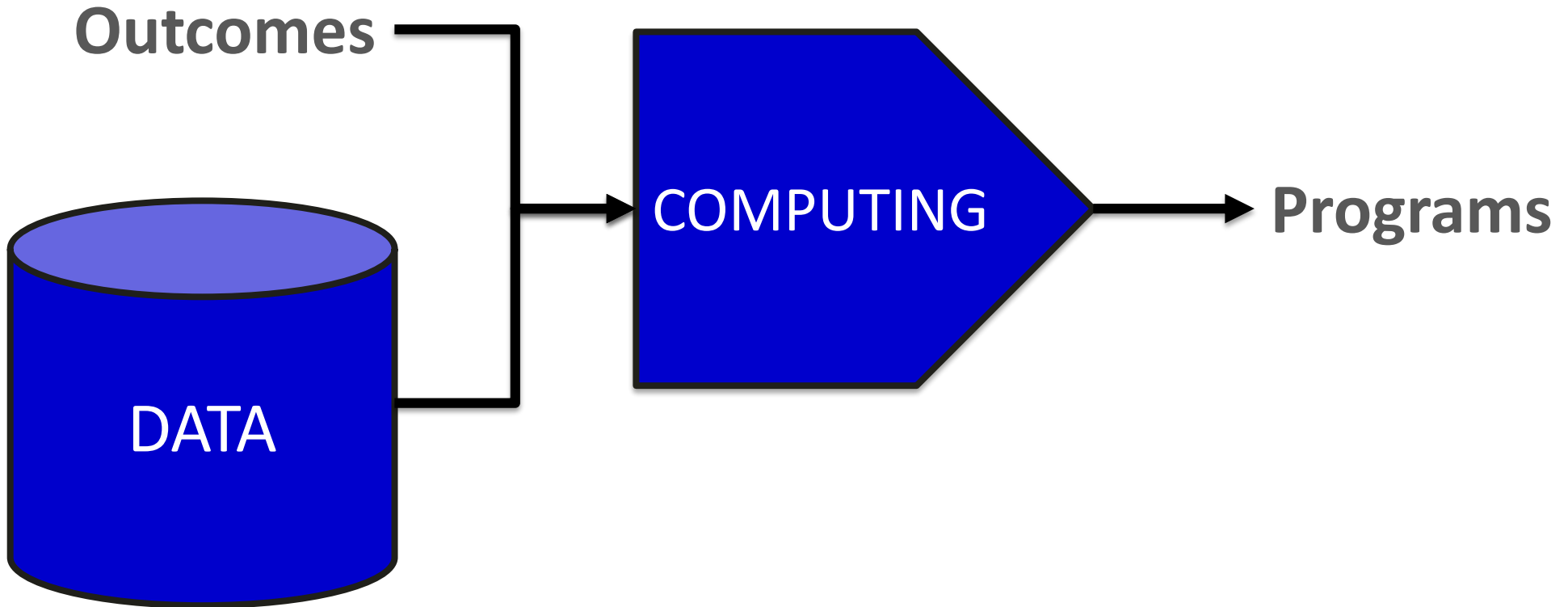
Logic of Traditional Computing

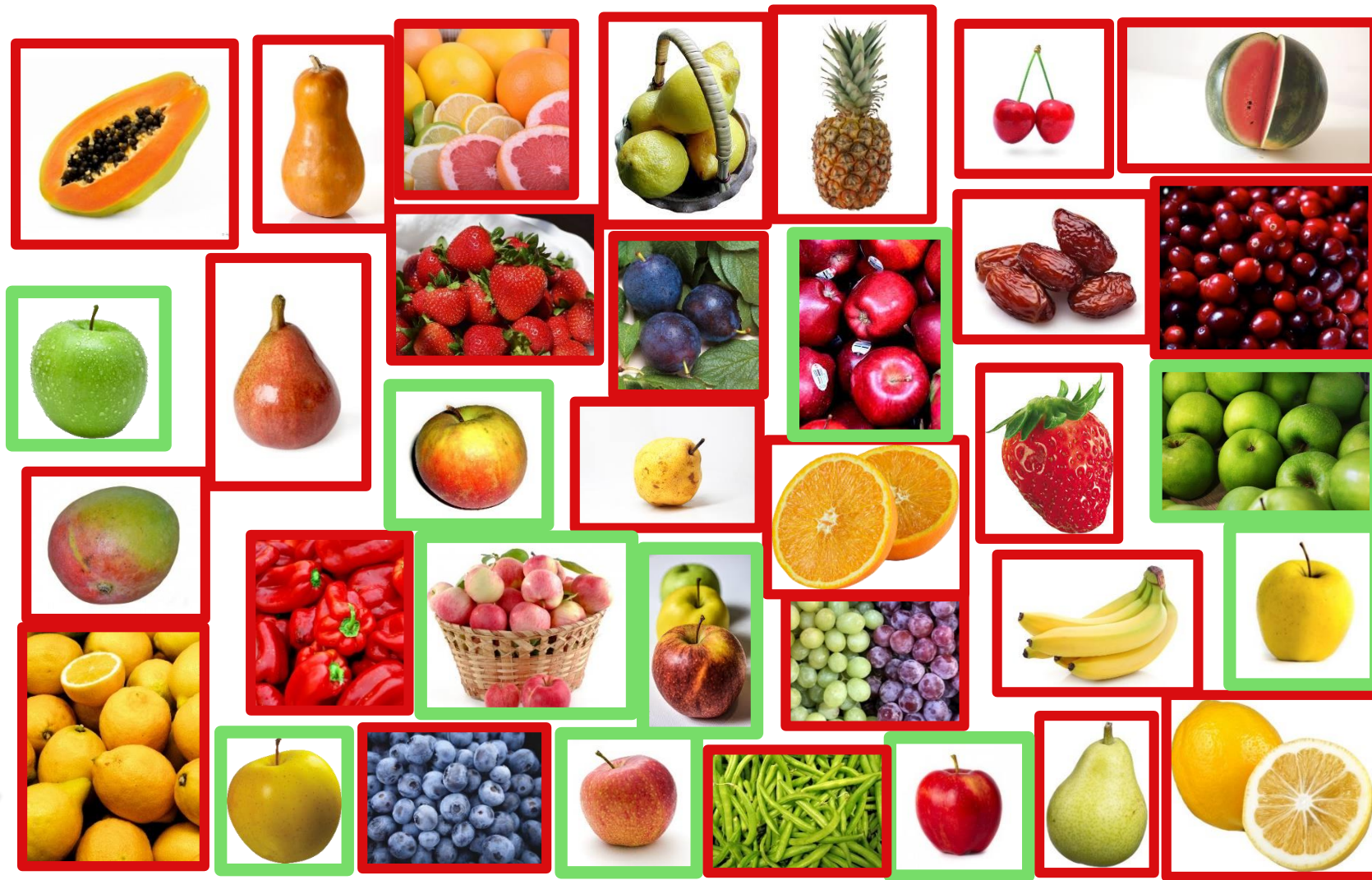
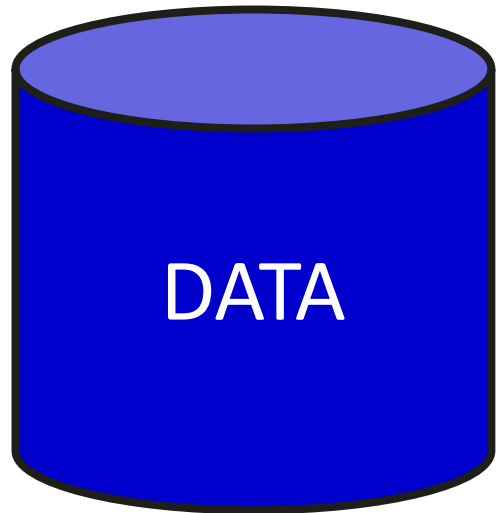


Logic of Machine Learning



Logic of Machine Learning



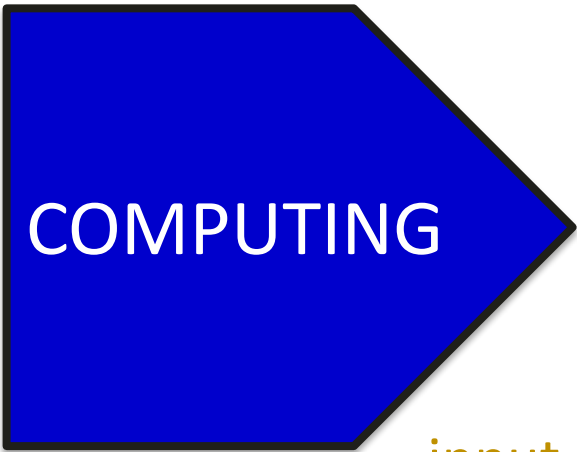


Not Apple



Apple





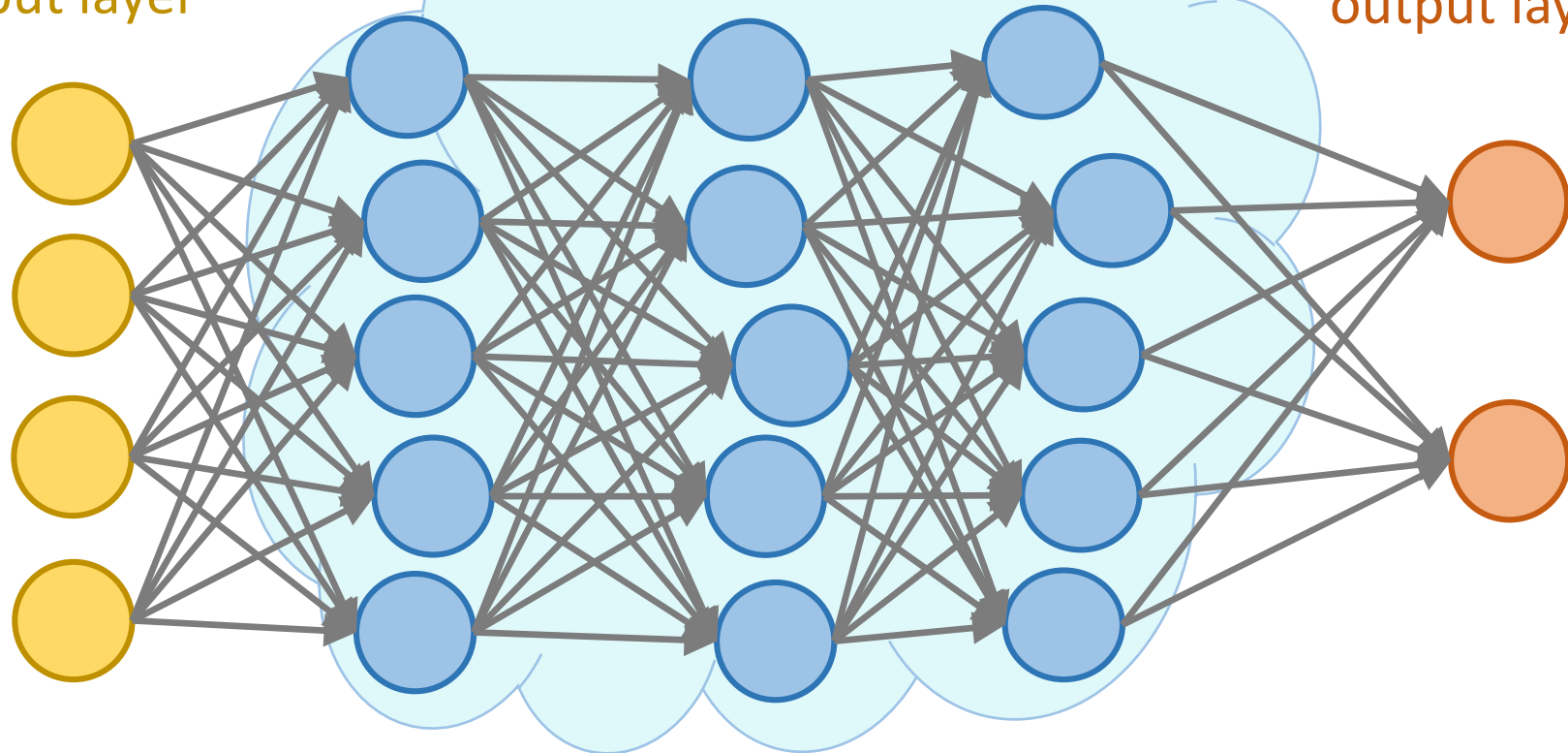
Neural Networks

hidden layers

input layer

output layer

DATA →





Apple: 99.8%

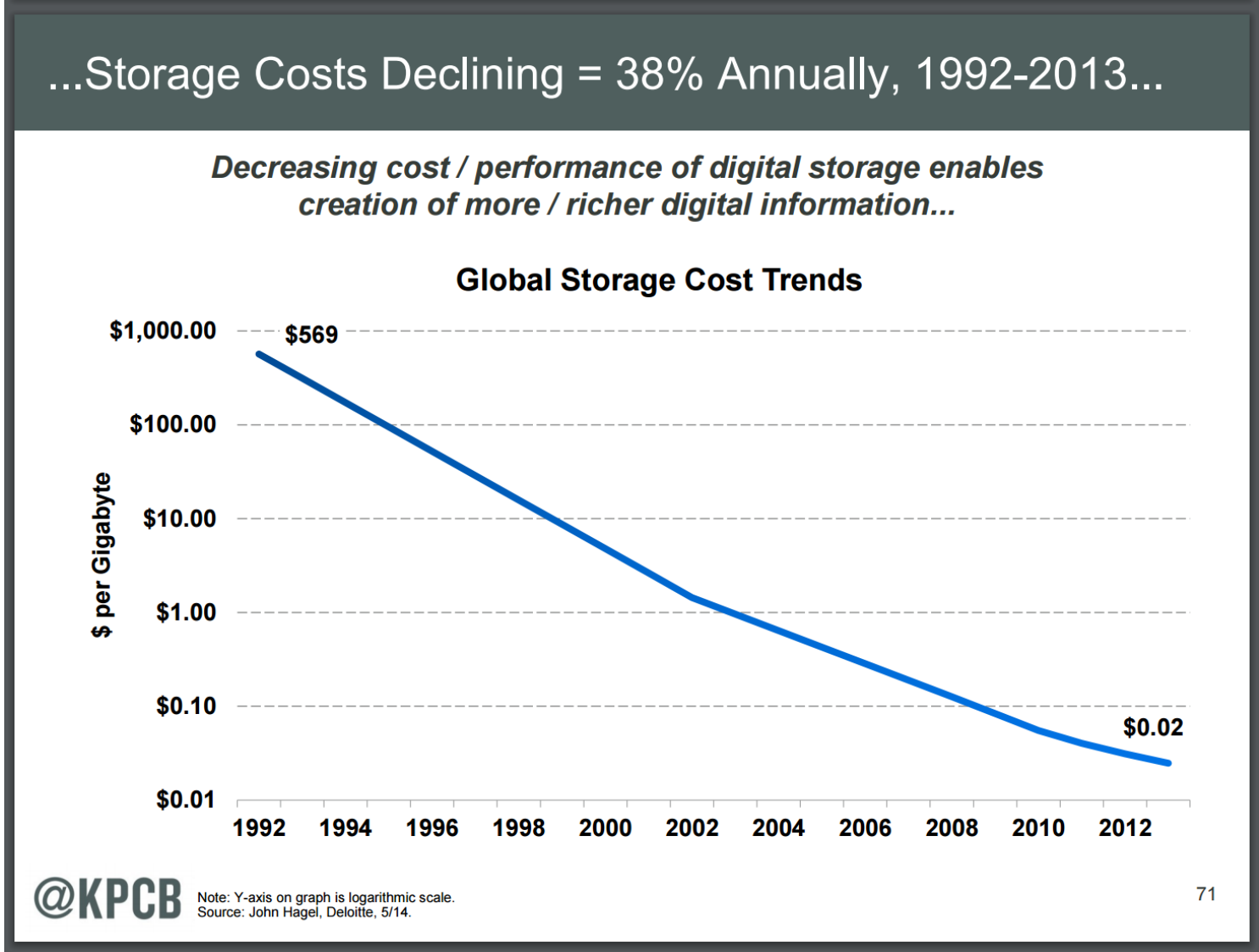
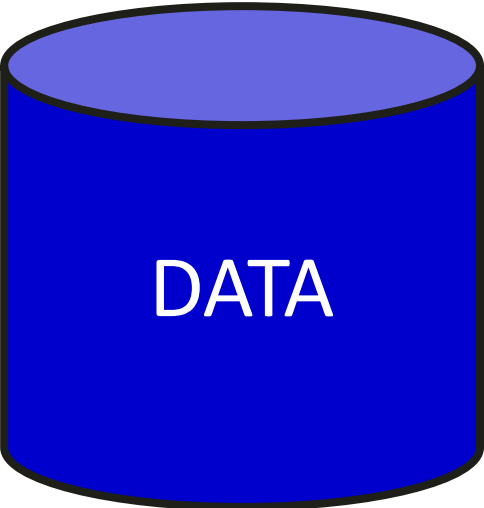




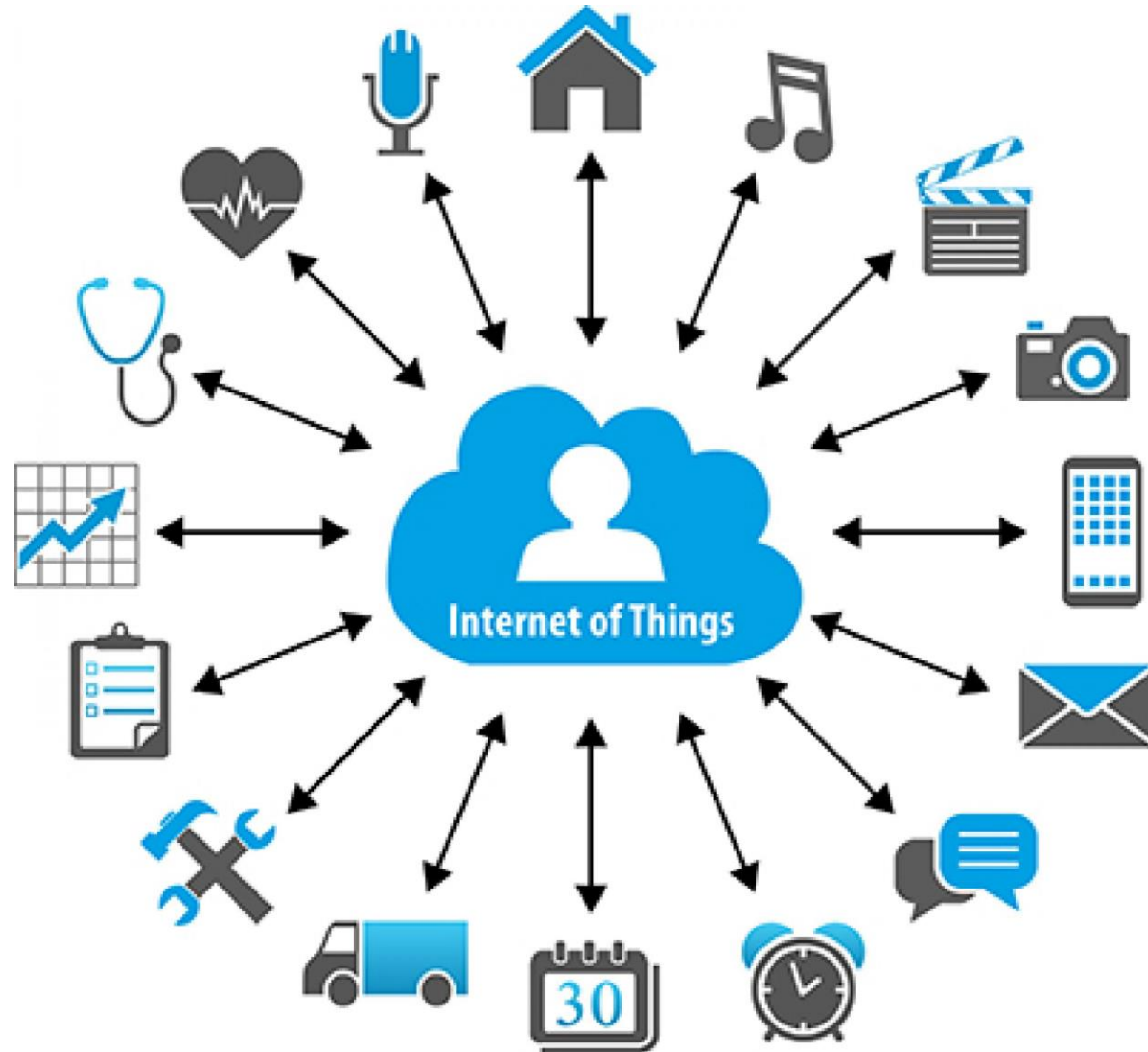
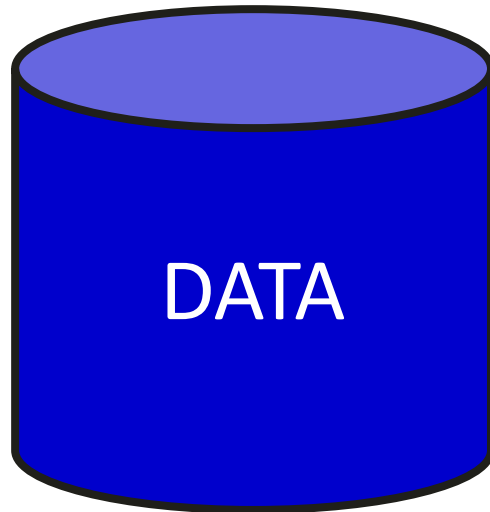
Same or different from the software-based digital revolution?

Why is it happening now?

Why Now?



Why Now?



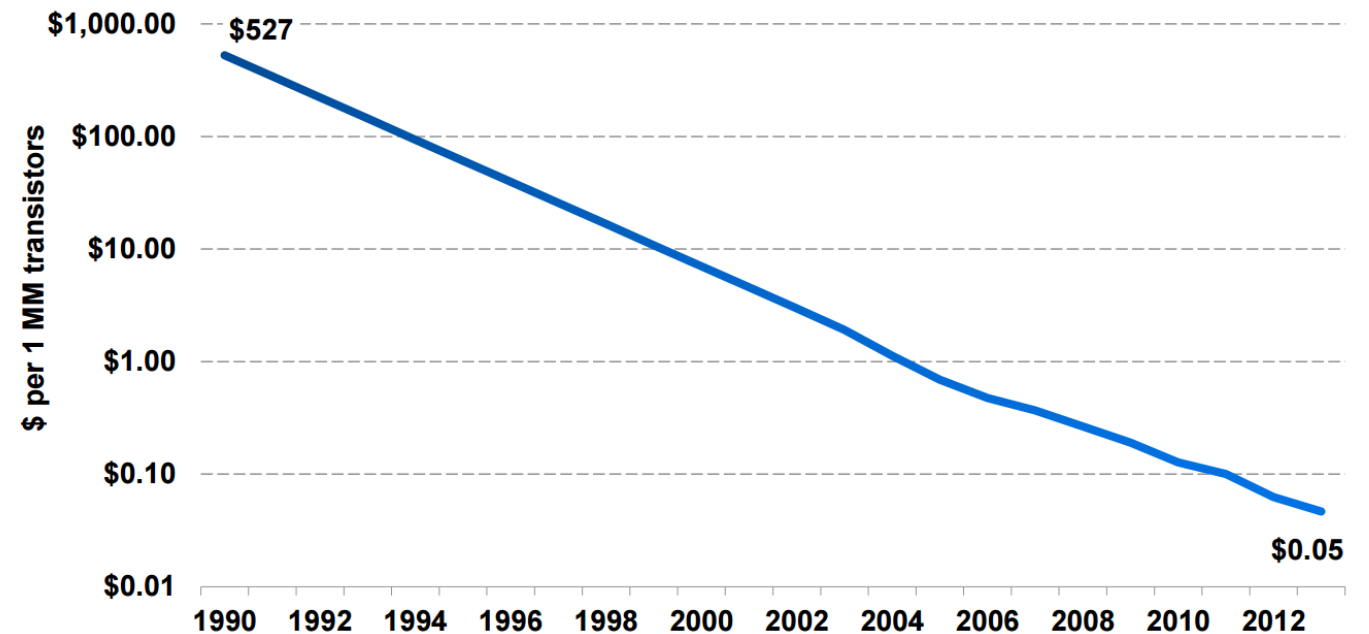
Why Now?

COMPUTING

Compute Costs Declining = 33% Annually, 1990-2013...

*Decreasing cost / performance curve enables
computational power @ core of digital infrastructure...*

Global Compute Cost Trends



@KPCB

Note: Y-axis on graph is logarithmic scale.
Source: John Hagel, Deloitte, 5/14.

Why Now?

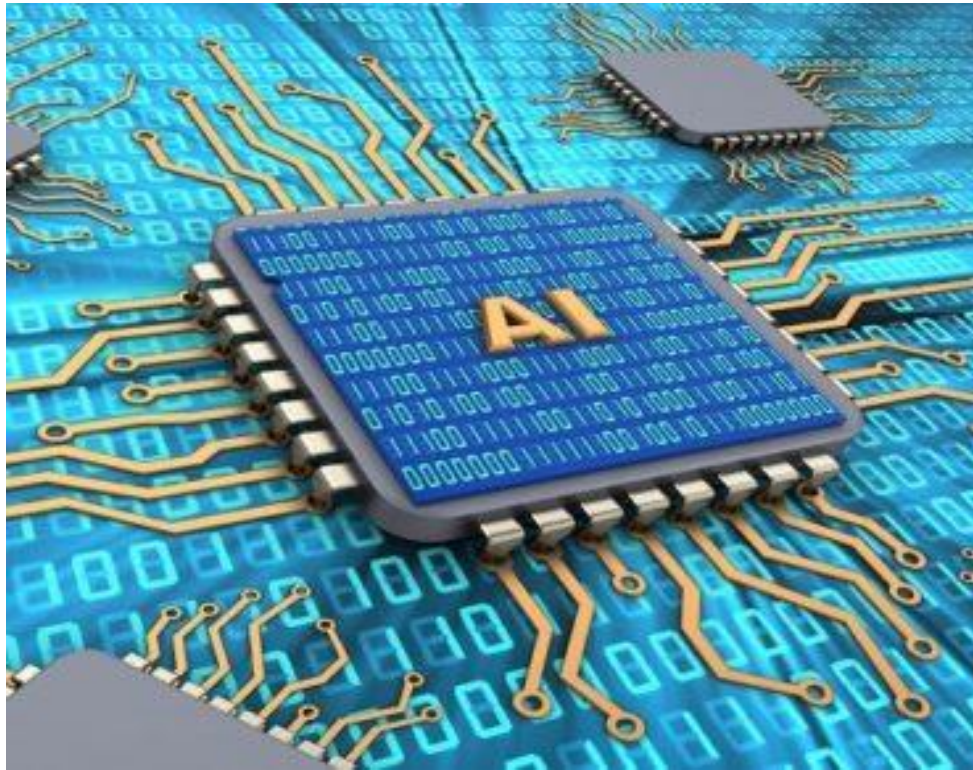
COMPUTING



NVIDIA
VRREADY



COMPUTING



GRAPHCORE



Amazon AI

Intelligent Services Powered By Deep Learning

Value Creation

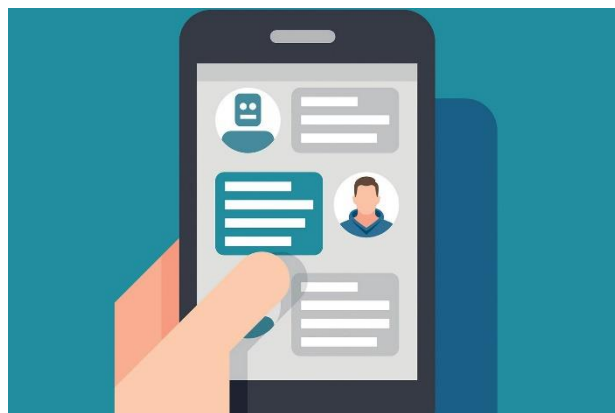
Peter Zemsky

Deputy Dean/Dean of Innovation

Eli Lilly Chaired Professor of Strategy and Innovation



Value Creation from AI



WTP

Costs

Value
Creation

Novel and improved predictions

Faster predictions

Mass personalization

Breakthroughs in image processing

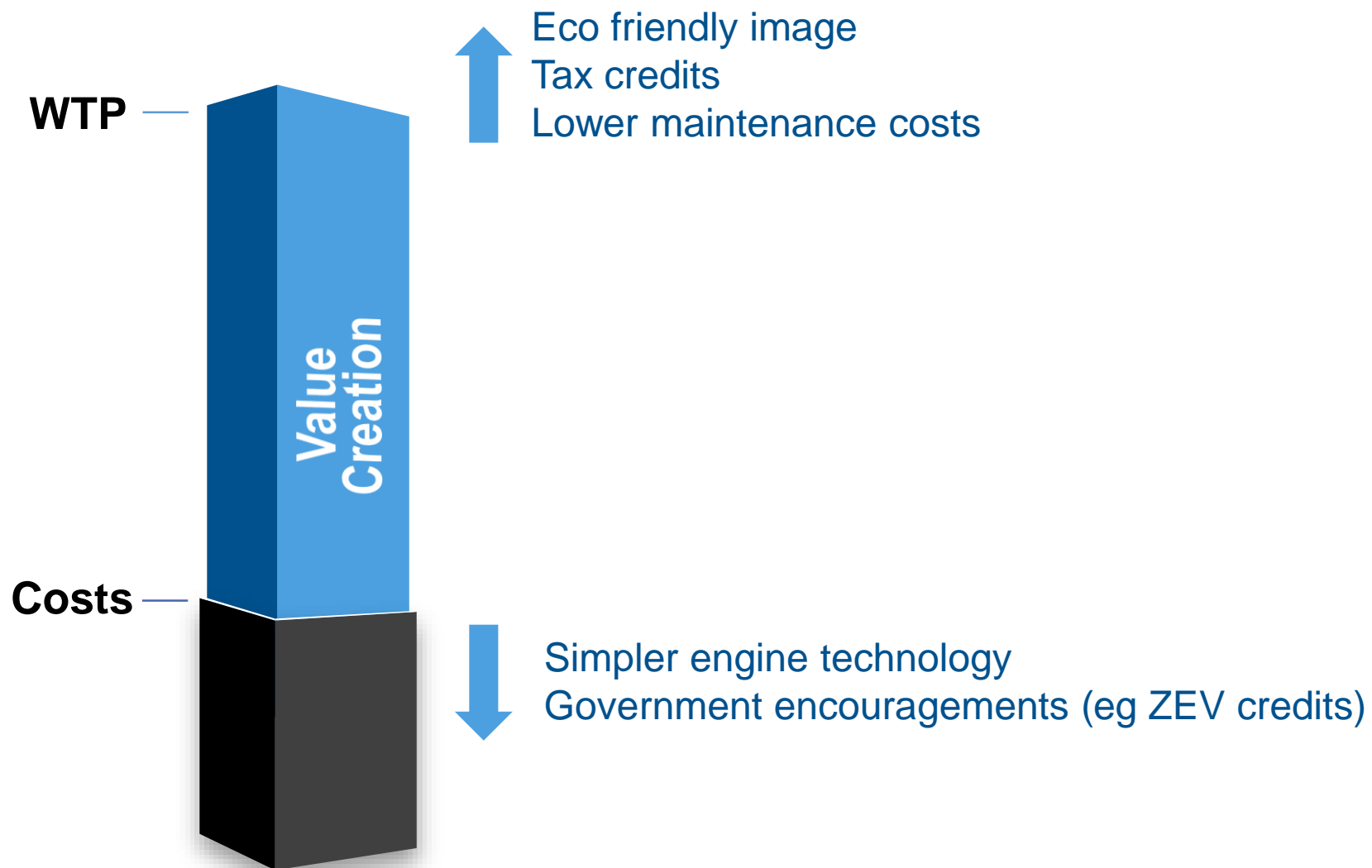
Breakthroughs in natural language processing (NLP)

Falling costs of (specialized) processing

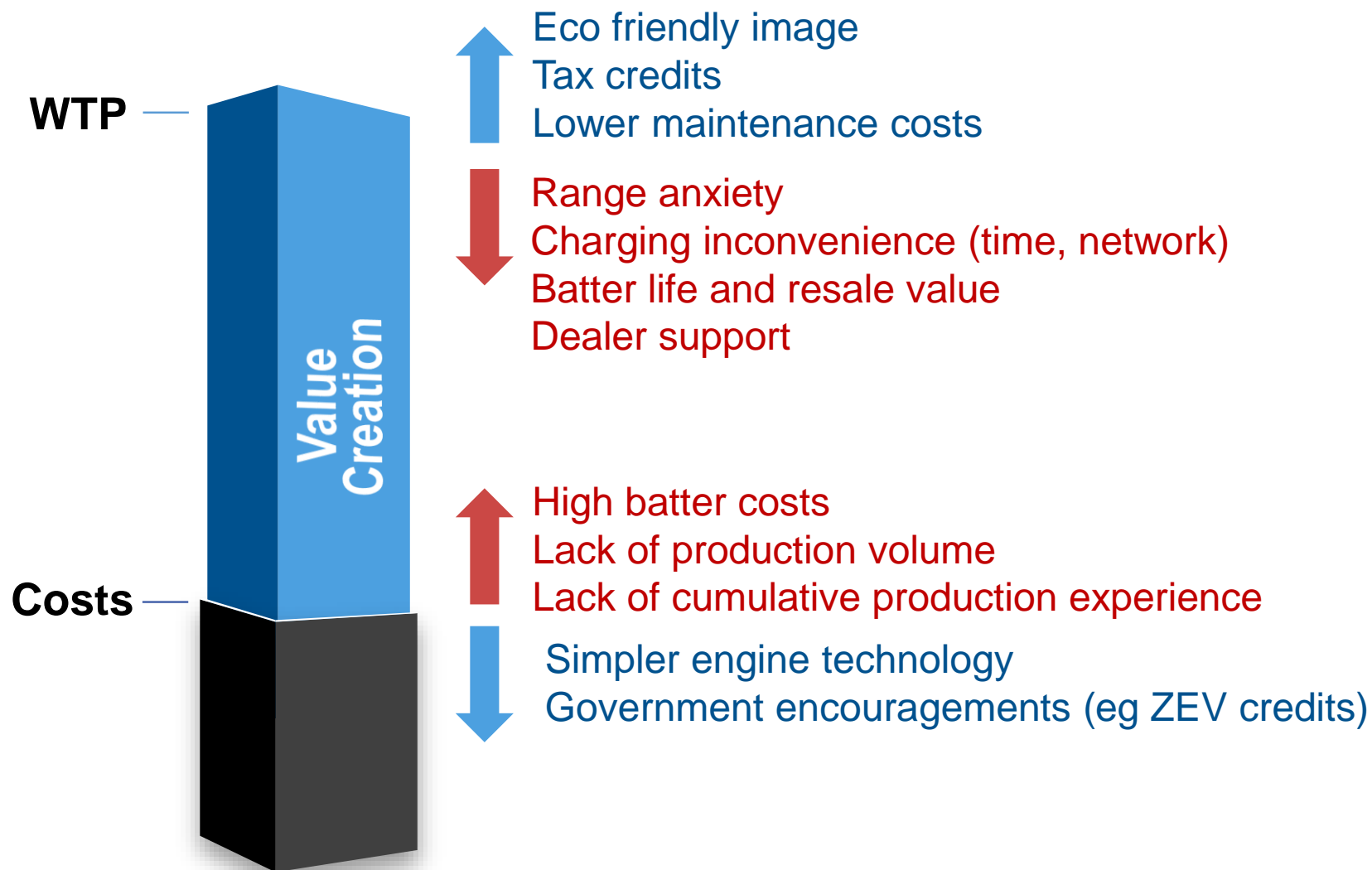
Explosion of data with digitalization

Strong open source tradition for ML code

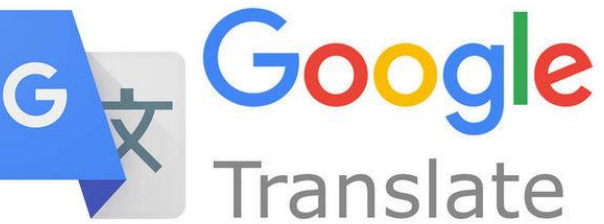
Value Creation from EVs






Value Creation from EVs









English ▾






Turkish ▾





She's a mother Edit

O bir anne

Turkish ▾






English ▾





O bir anne Edit

She's a mother

English ▾






Turkish ▾





She's a doctor Edit

O bir doktor

Turkish ▾



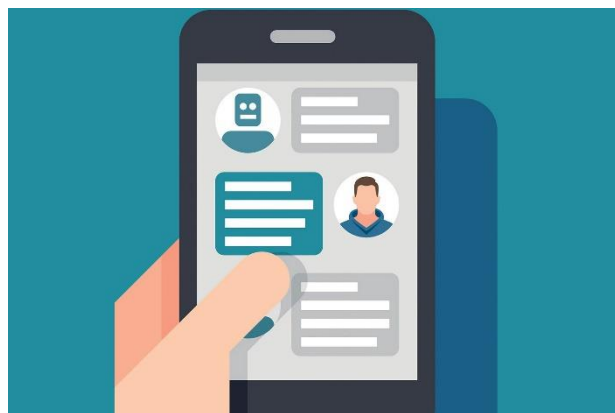
English ▾



O bir doktor Edit

He is a doctor

Value Creation from AI



WTP

Costs

Value
Creation

Novel and improved predictions
Faster predictions
Mass personalization
Breakthroughs in image processing
Breakthroughs in natural language processing (NLP)

Data privacy concerns
Black box and lack of transparency
Risk of bias
Reputational risks

High fixed costs of acquiring and preparing data
Scarcity of specialized talent
Legal and regulatory risks

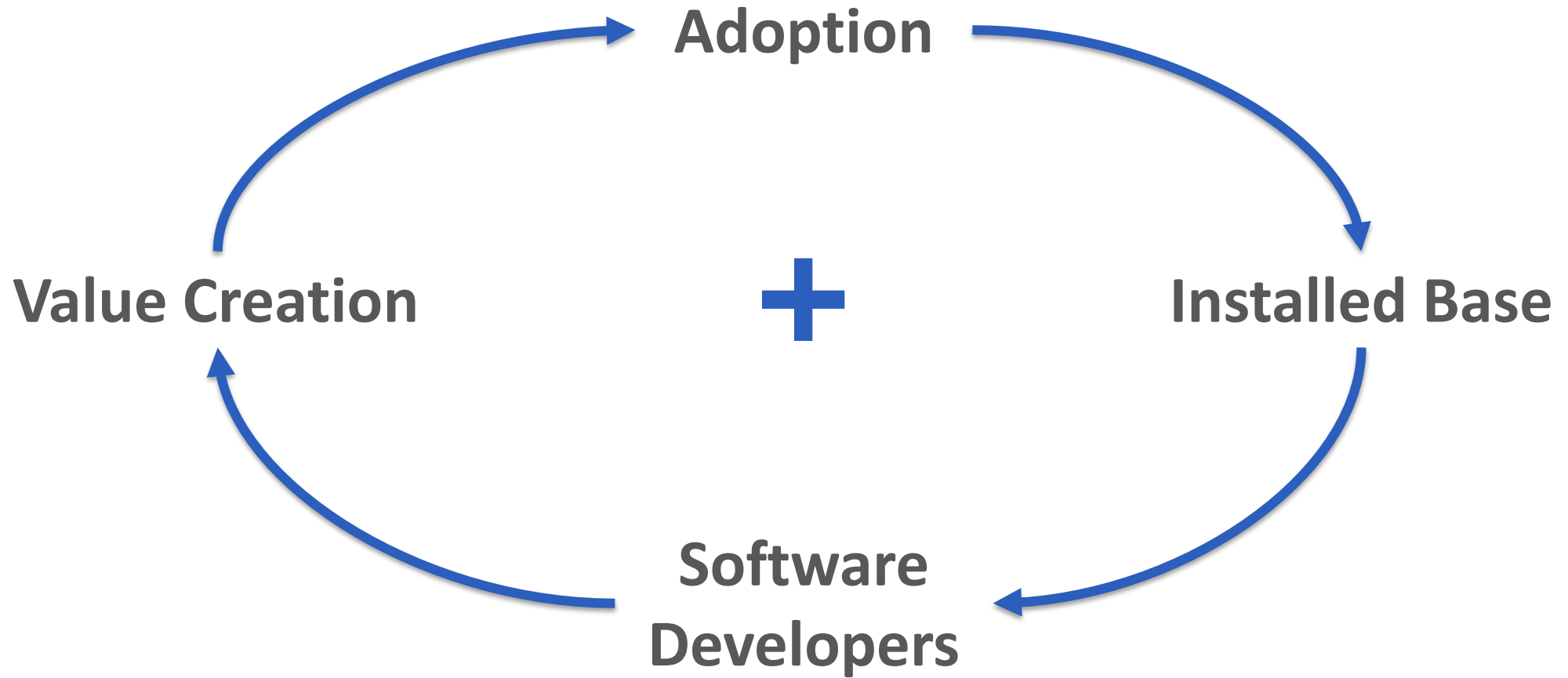
Falling costs of (specialized) processing
Explosion of data with digitalization
Strong open source tradition for ML code



Choose wisely!

Analytics-driven hiring and retention
Channel management
Churn reduction
Customer acquisition/lead generation
Customer service management
Fraud and debt analytics
Inventory and parts optimization
Logistics network and warehouse optimization
Marketing budget allocation
Next product to buy/individualized offering
Predictive maintenance

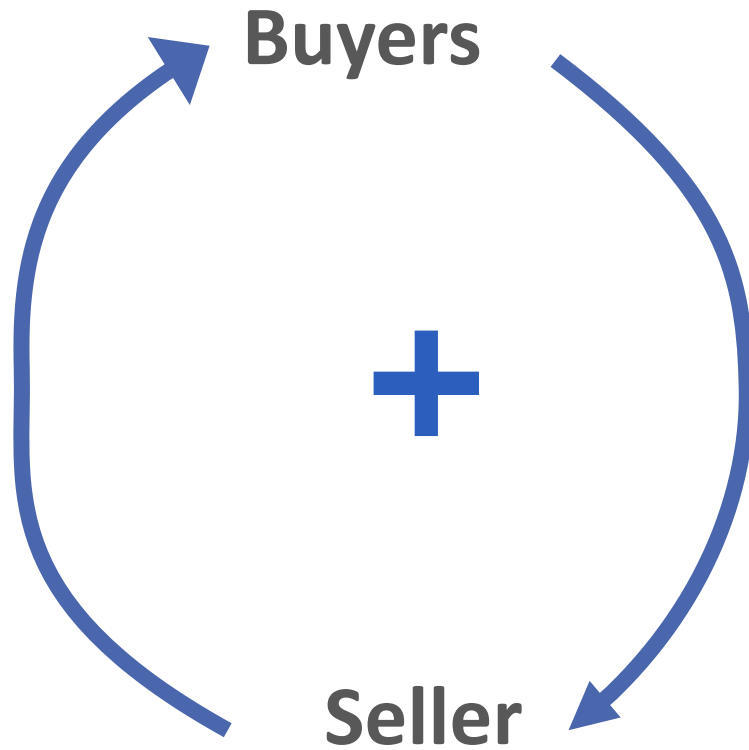
Predictive service/intervention
Pricing and promotion
Procurement and spend analytics
Product development cycle optimization
Product feature optimization
Risk modeling
Sales and demand forecasting
Smart capital expenditures
Task automation
Workforce productivity and efficiency
Yield optimization



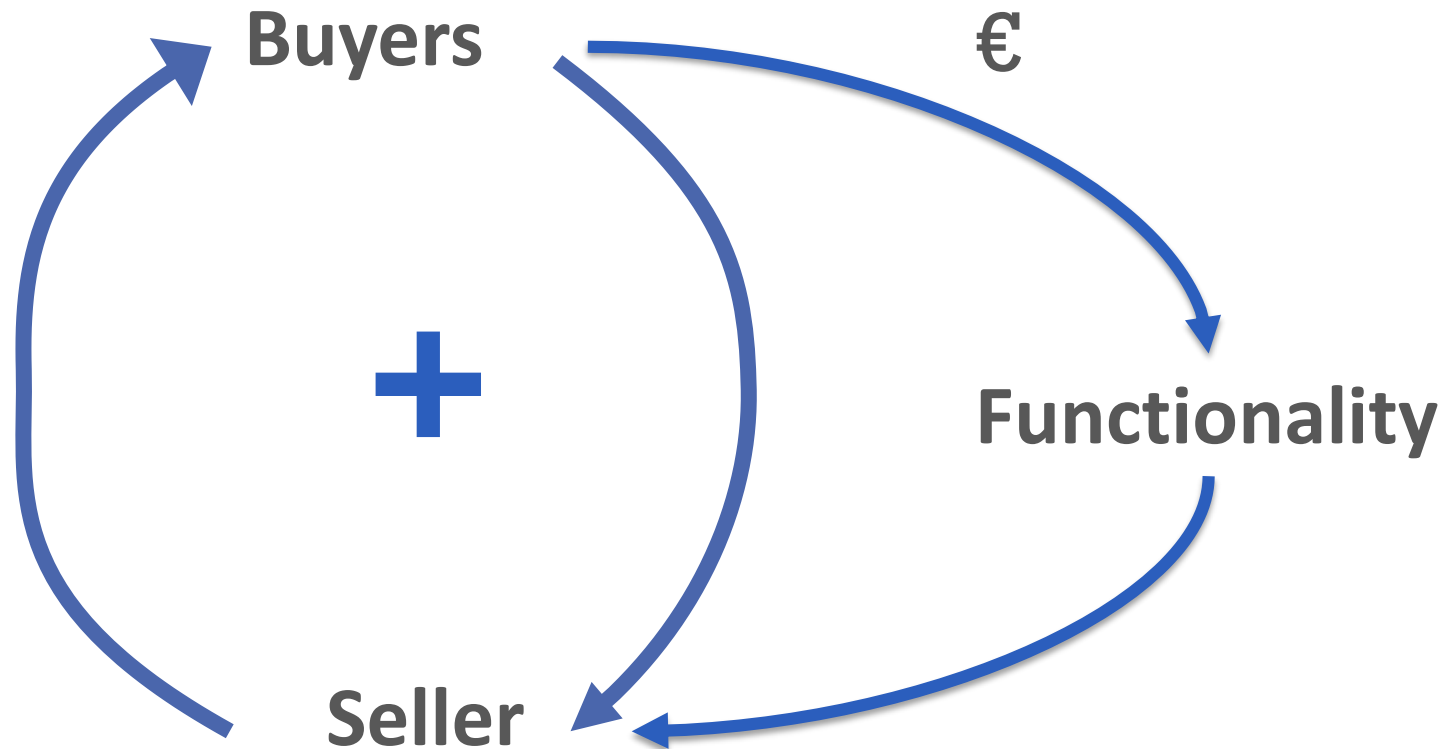
Positive feedbacks



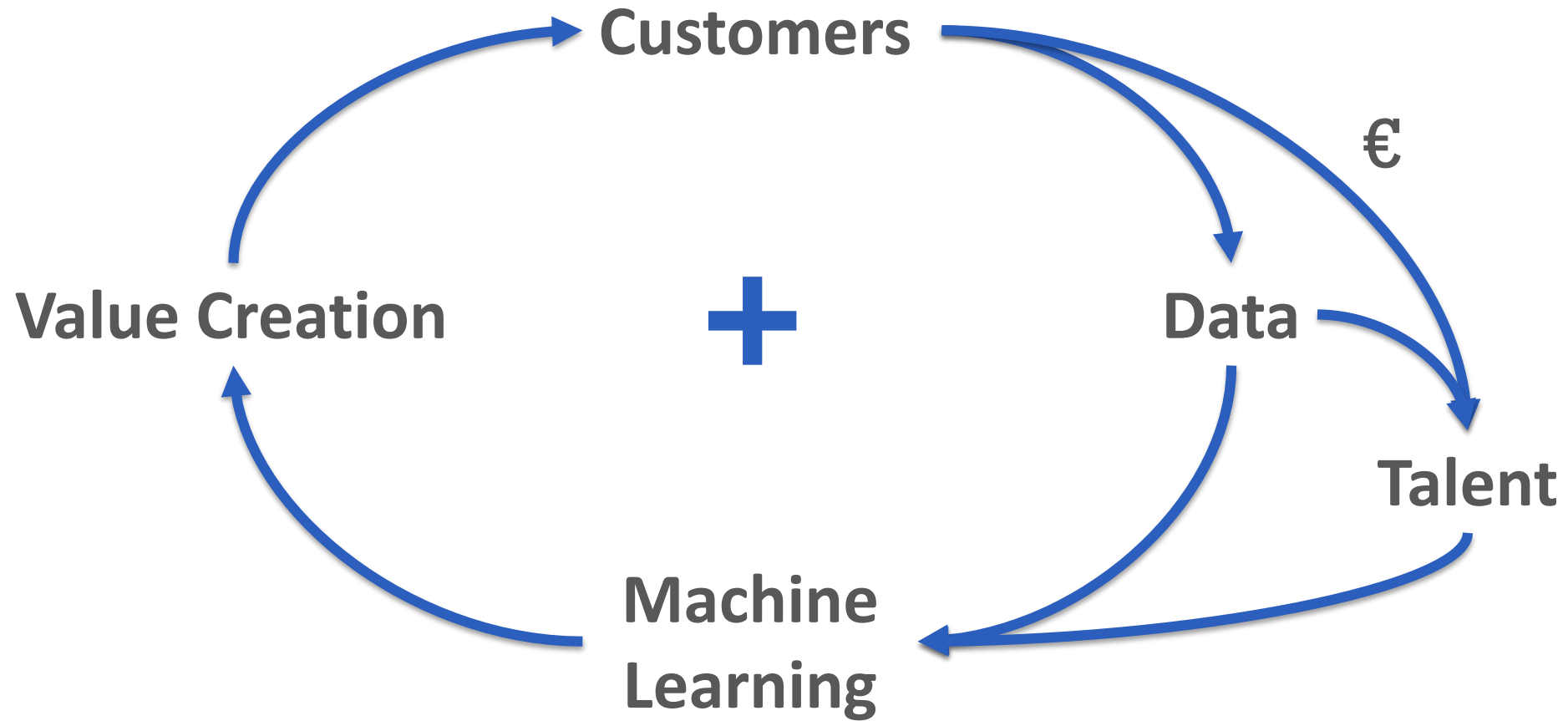
Positive feedbacks



Positive feedbacks



Early Mover Advantages in AI



2010 2011 2012 2013 2014 2015 2016 2017 2018



CleverSense DNNresearch DeepMind Jetpac Emu Dark Blue Labs Vision Factory Granata Timeful Moodstocks Api.ai Halli Labs AIMatter Banter



Siri *Novauris Technologies Perceptio Vocal IQ Emotient tuplejump SensoMotoric Lattice Regaind Init.ai Pop Up Archive



Face.com Mobile Technologies Wit.ai Masquerade Technologies Zurich Eye Ozlo



Evi Technologies *Orbeus Harvest.ai Angel.ai Sqrri



Indisys Saffron Technology Nervana Systems Itseez Movidius



Netbreeze Equivio SwiftKey Maluuba Genee