Intelligence.
Beautifully engineered.

QUANTUMBLACK
A MCKINSEY COMPANY

1896 Olympic Games, Athens – 100m

2016 Olympic Games, Rio – 100m

In elite sport the smallest edge makes the difference, and the best teams exploit this to outlearn their rivals

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Arms race in innovation

Data has emerged as a fundamental element of competitive advantage

Data driven entertainment

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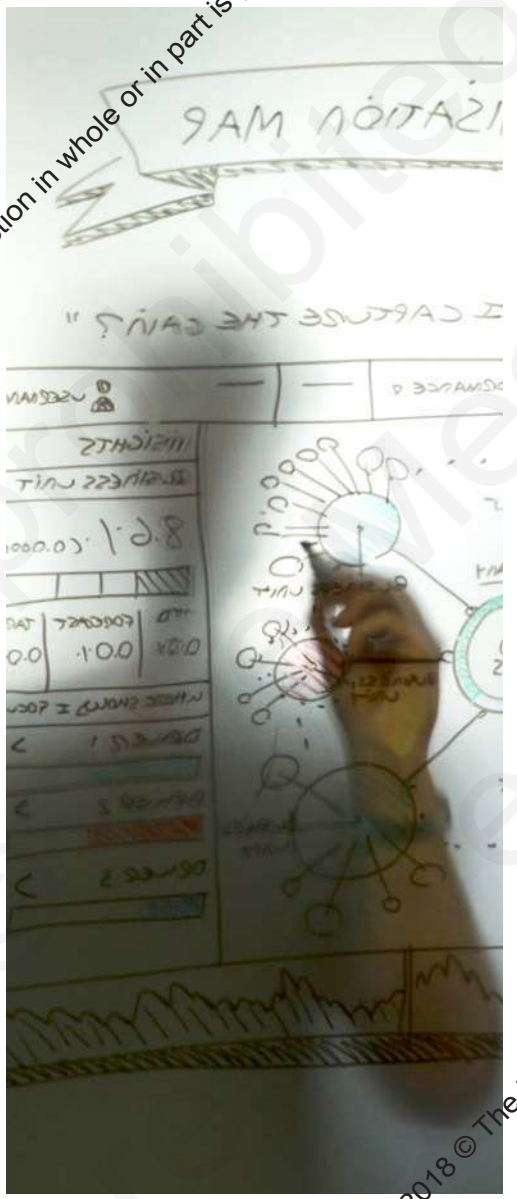
Why now?

Better algorithms

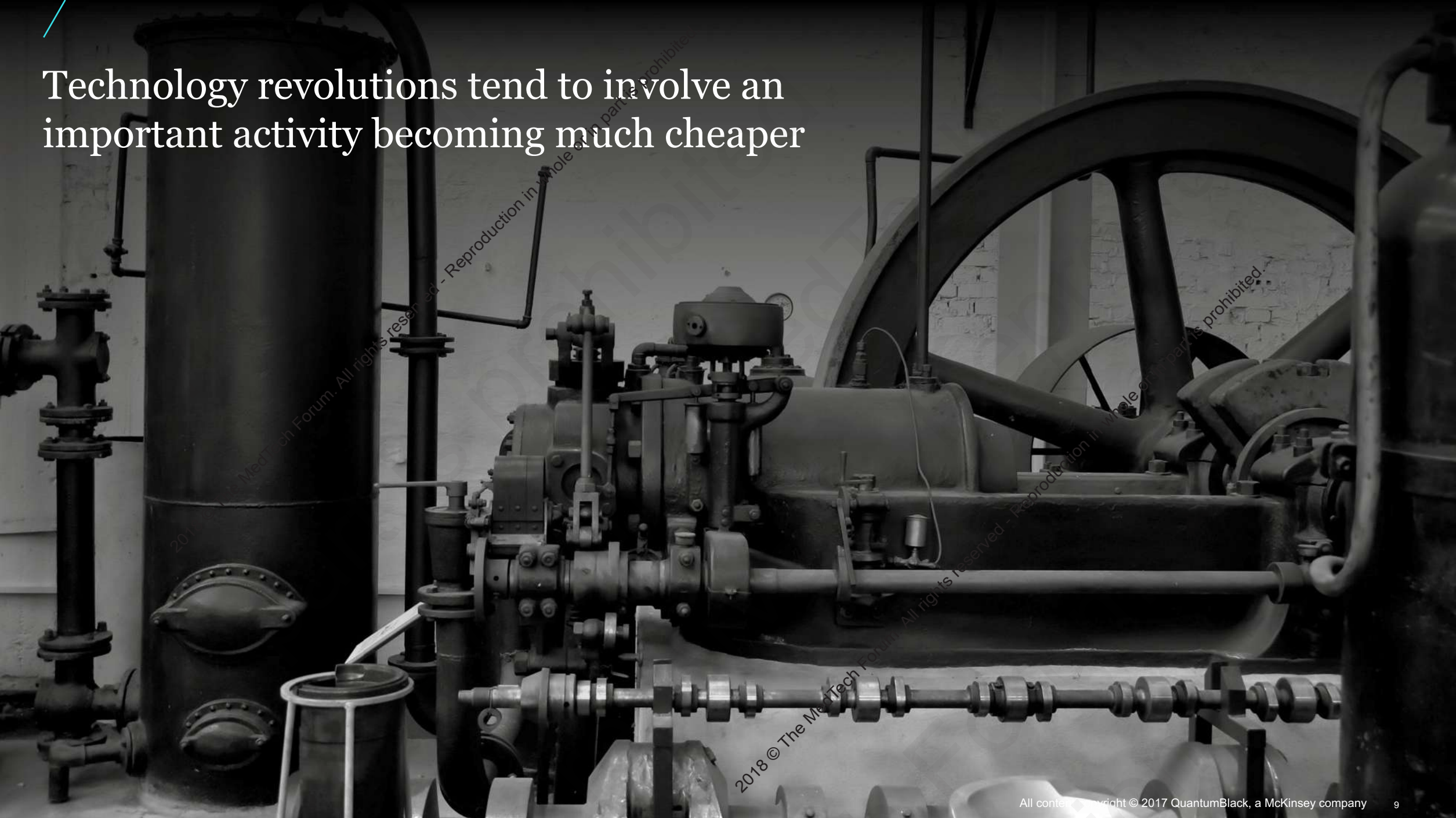


Better GPUs

Cloud

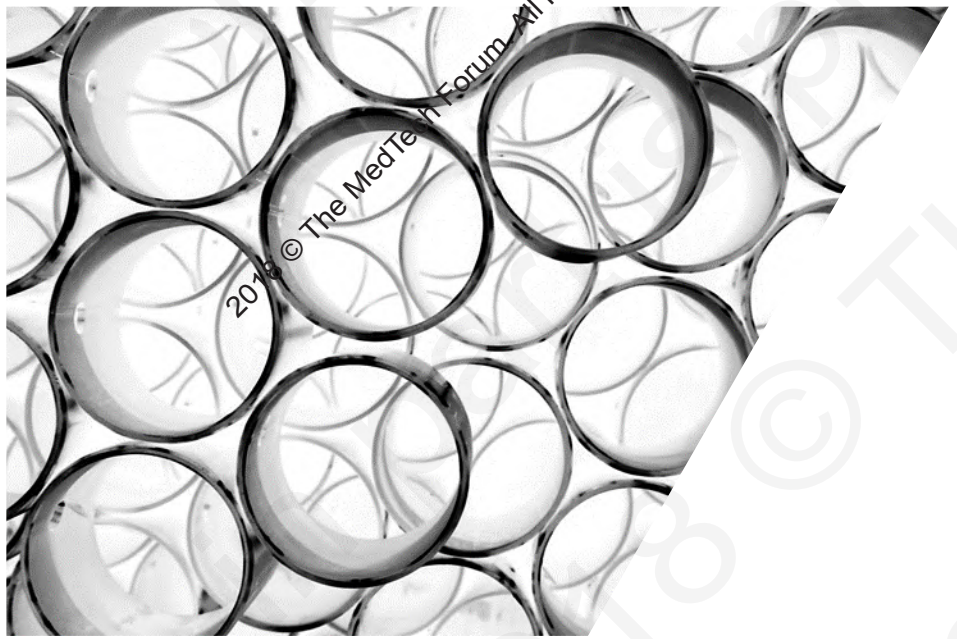
More data

Technology revolutions tend to involve an important activity becoming much cheaper



Machine intelligence radically reduces cost of discovery

We expect *Augmented Intelligence* to be applied in waves …



Wave 1

Apply to things we've always done

- Weather
- Sales
- Maintenance

Wave 2

Apply to things we couldn't do before

- Autonomous vehicles
- Hospital operations
- Real-world evidence

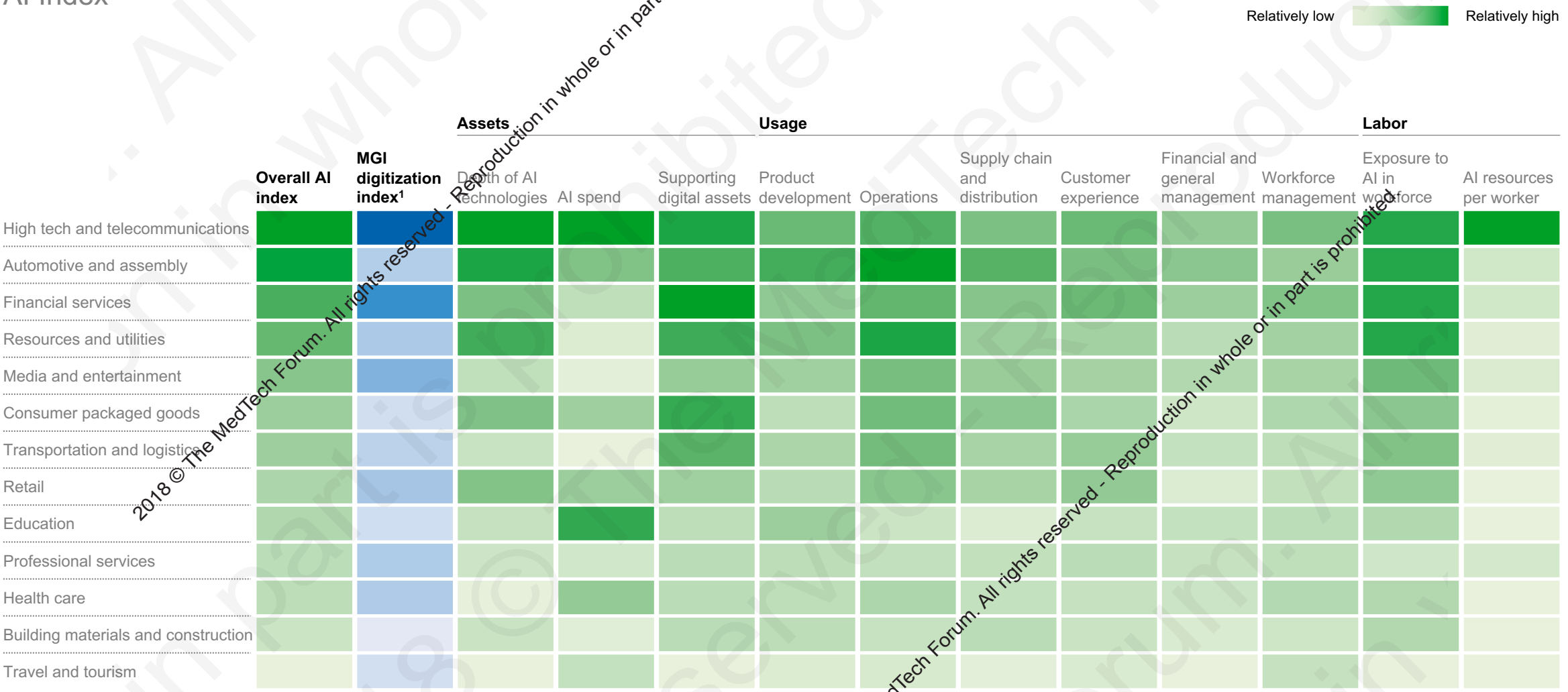
Wave 3

Reimagine the core operating process

- Product development
- Organization design
- Business model

Early adopters become serial adopters

AI Index

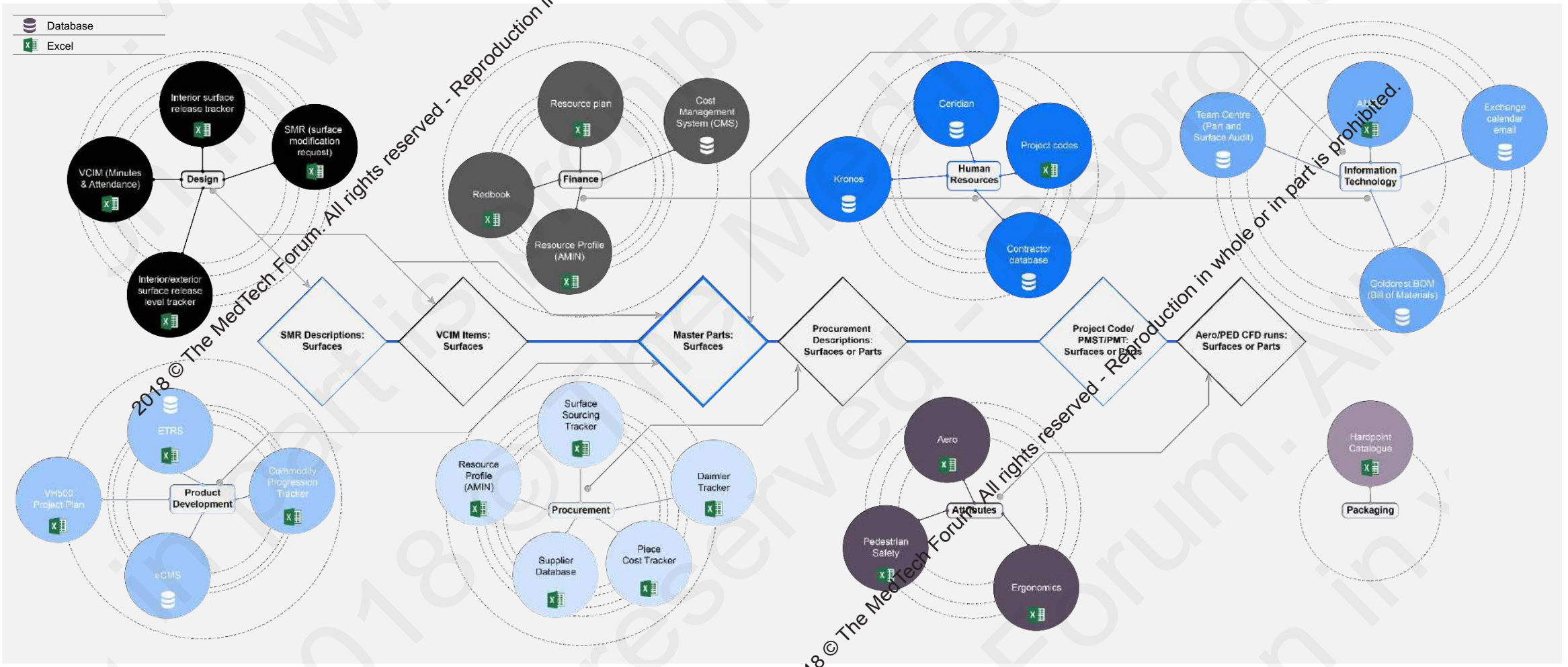


SOURCE: McKinsey Global Institute - Artificial Intelligence: The Next Digital Frontier, June 2017

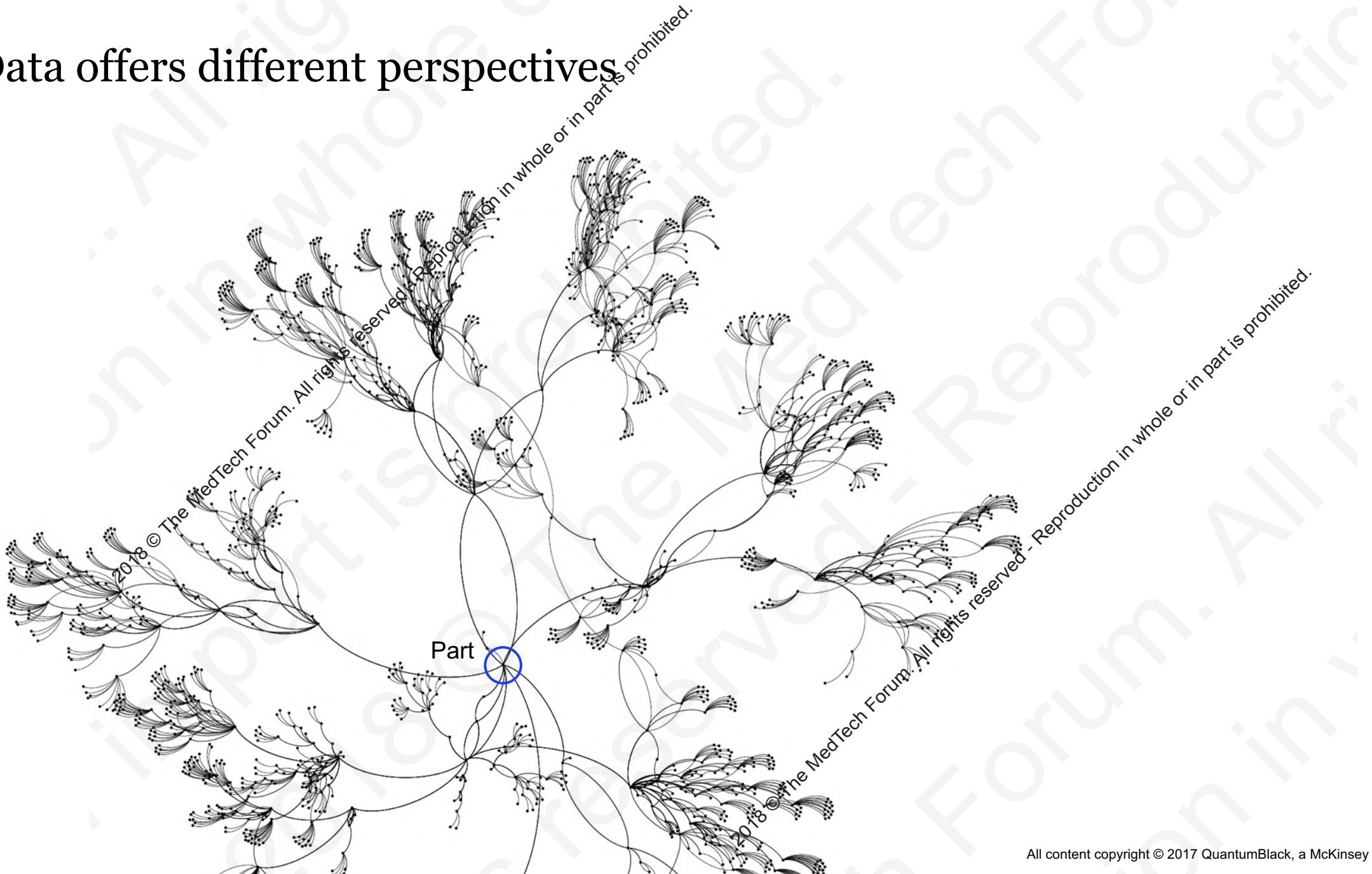
Applying this in the real world.

Re-engineering the product development process

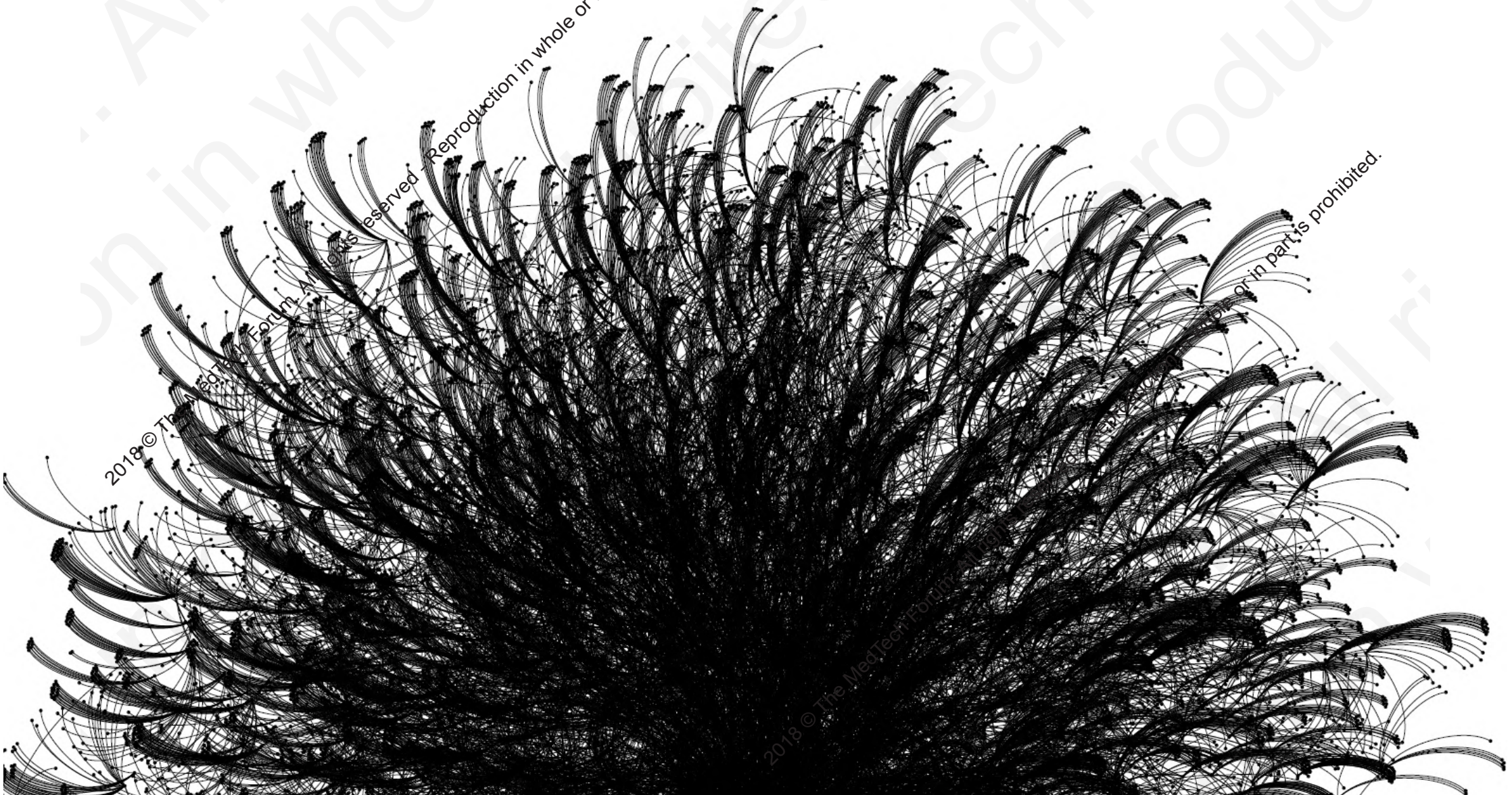
Linked and cleaned the previously unlinked datasets



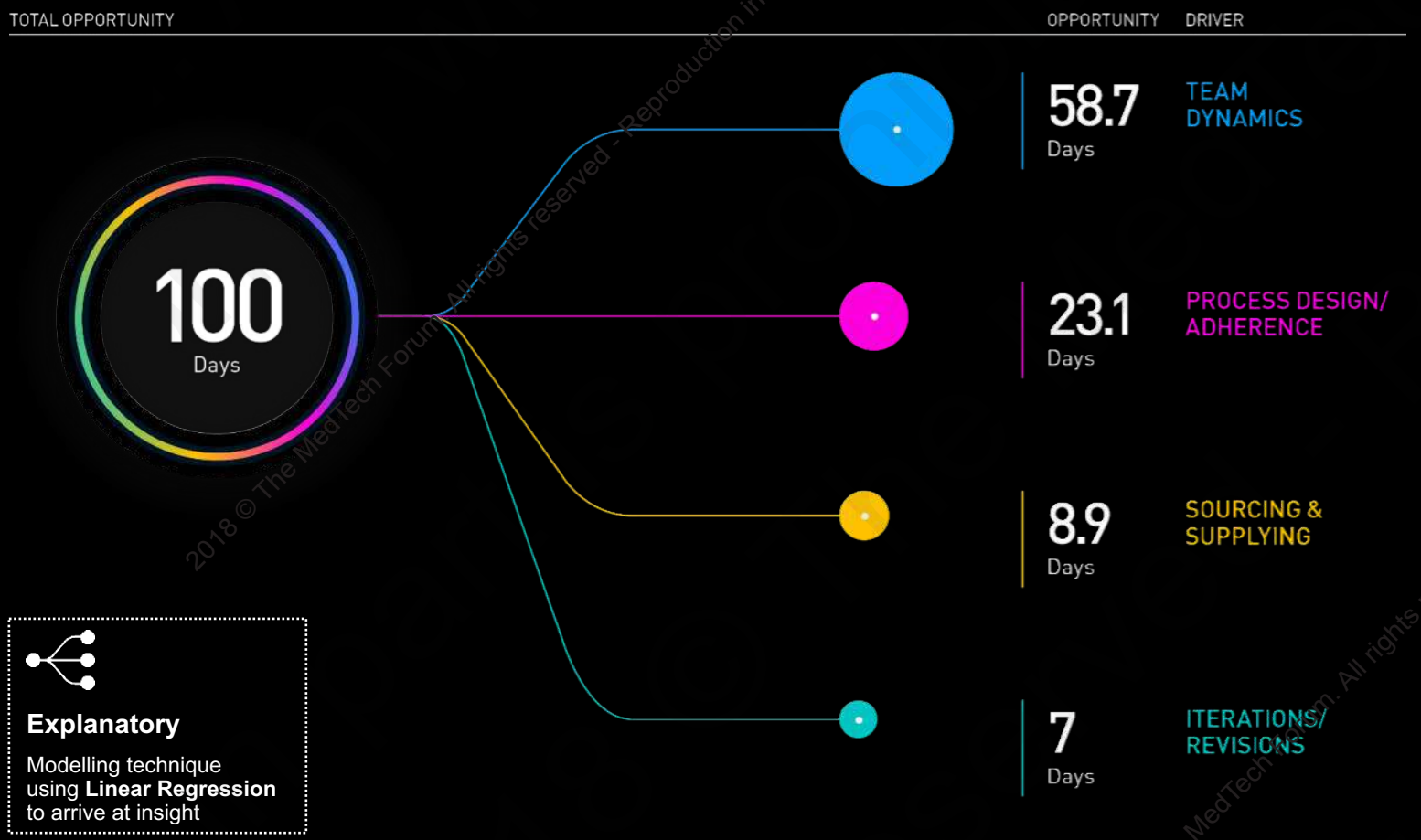
Data offers different perspectives



The car as a network



Explanatory model to understand drivers of performance…

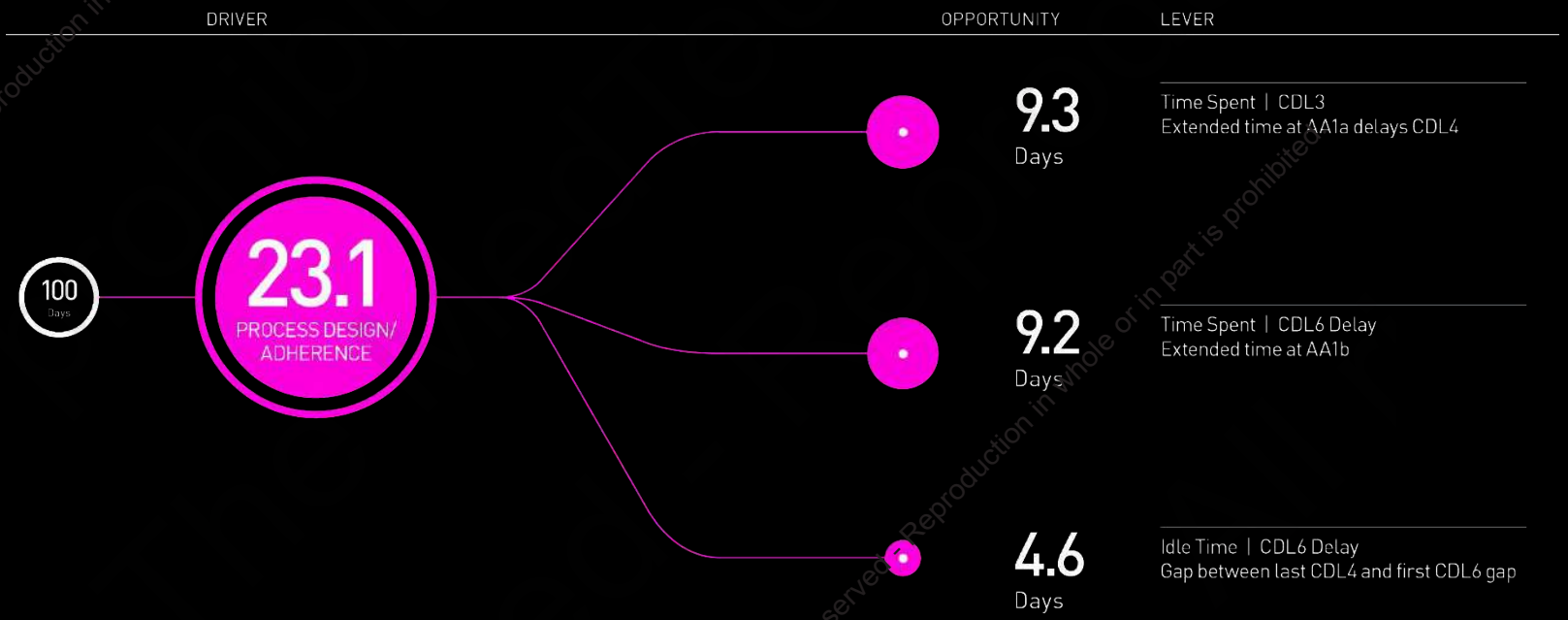


Explanatory

Modelling technique using **Linear Regression** to arrive at insight

...which, in turn, allow precise interventions

- One such factor we uncovered was the significance of aligning the way designers and engineers communicate, and work together
- Because engineers were not waiting for final design sign off before iterating components, time and money was being lost



Reimagining the core operating system of the firm

Product Development

10%

Reduction in time-to-market

11%

Reduction in programme costs

25 data systems

Production

25>80

Uplift in ‘right-first-time’ quality

+ 14 data systems

Launch

Not touched

After-Sales

5/6

Understanding root cause of warranty claims

+ 4 data systems

The opportunity in MedTech.

Advanced analytics can significantly improve efficiency and drive impact across the value chain in MedTech

R&D	Manufacturing	Supply Chain	Market access & commercial	Service	Enabling functions

Example Of Applications (not exhaustive)

R&D

A R&D and clinical trials efficiency

Collect medical data directly from trial participants in their homes and conduct analysis to speed up device performance evaluation, use machine learning to optimize R&D team effectiveness

Manufacturing

Yield optimization

Analyze historical data to identify most critical manufacturing parameters and utilize machine learning to reach optimum process conditions

Supply Chain

Procurement excellence

Forecast future scenarios of customer demand to set the right level of inventory stock and product mix

Market access & commercial

B Field force effectiveness

Optimize sales deployment by predicting propensity to buy of potential leads based on real world data

Pricing

Use machine learning for deal target pricing

C RWE

Identify clinically and commercially relevant patient segments leveraging real world data

Service

D Predictive maintenance

Accurately estimate potential device break-down and analyze most effective preventive action based on historical performance data

E Beyond product services

Develop data services beyond the product, by use of machine learning and augmented reality (e.g., to improve utilization/ throughput, accuracy of procedure forecasting, personalized medicine)

Enabling functions

Overdue payment reduction

Automate customer order and invoicing process to shorten processing time and proactively prevent payment overdue

People analytics

Use big data and machine learning for core HR processes

Illustrative impact we have seen

10% shorter time to market

15+% faster enrollment

10-15% reduction in trial costs

50% yield improvement

15-20% reduced inventory holding cost

5-10% procurement savings

10+% net revenue increase

4-7% higher price

18-27% lower maintenance costs

12% improvements of customers' utilization

10% reduction in overdue payments

50% reduction in high performing employee churn

A Predict what is driving speed of enrollment, costs and quality of clinical trials

300m

Integrated 300 million data entries of so far disconnected internal trial data (Trial Management, Quality, Finance, HR, etc.) with external data (Rx/claims, publications, etc.) into a rich data lake and used predictive algorithms to forecast site-level patient recruitment and quality events

10-20%

Faster enrollment

10-15%

Lower trial costs

5x

Better targeting of site level audits

B Understanding what is driving sales performance

20

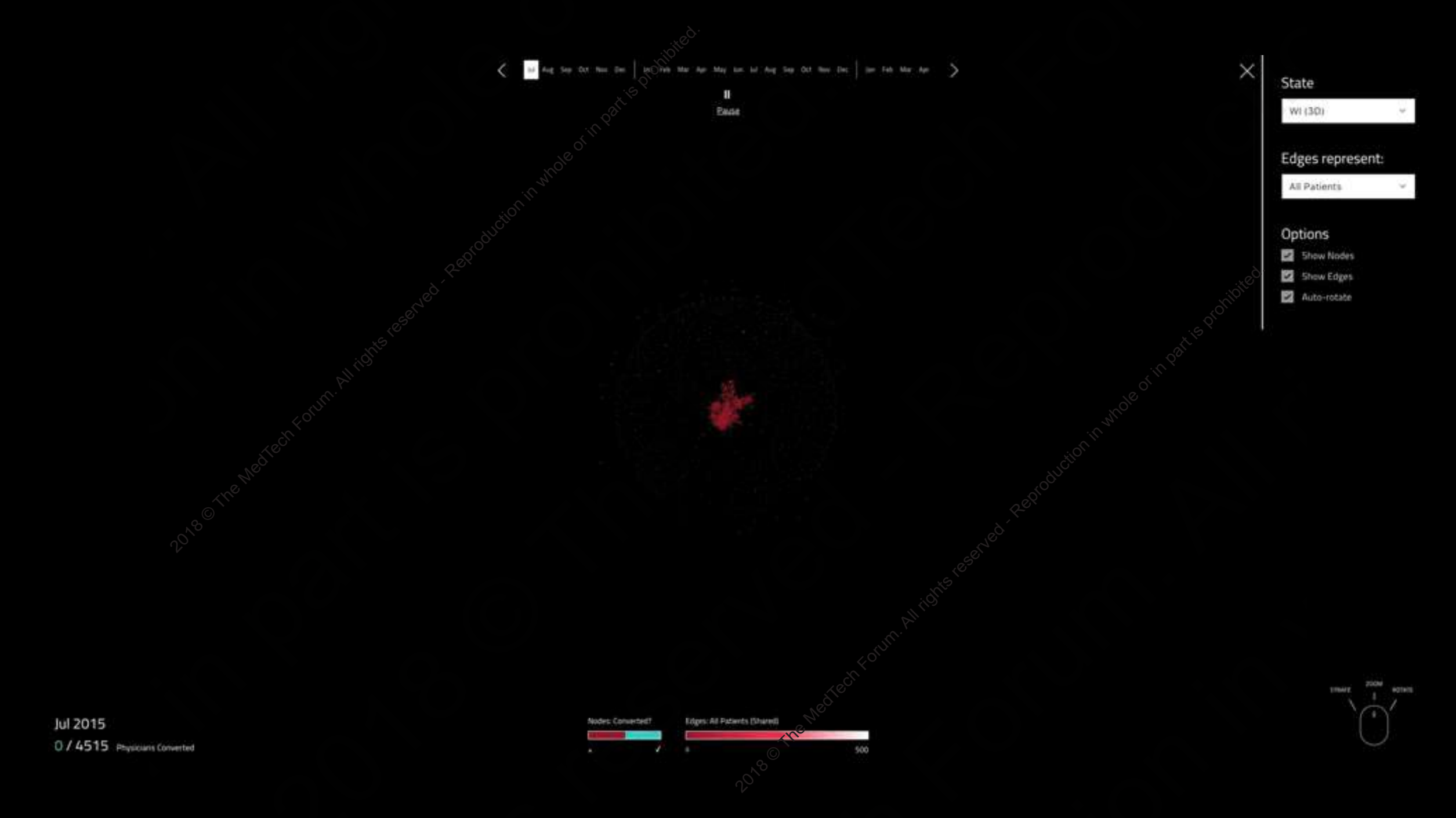
Integrated data sets that the firm had never previously linked, including many it had never used at all, such as CRM, e-mails, and patient diagnostic data

25%

Faster initiation of first sale

10%

Increase in sales from avoiding dormant accounts



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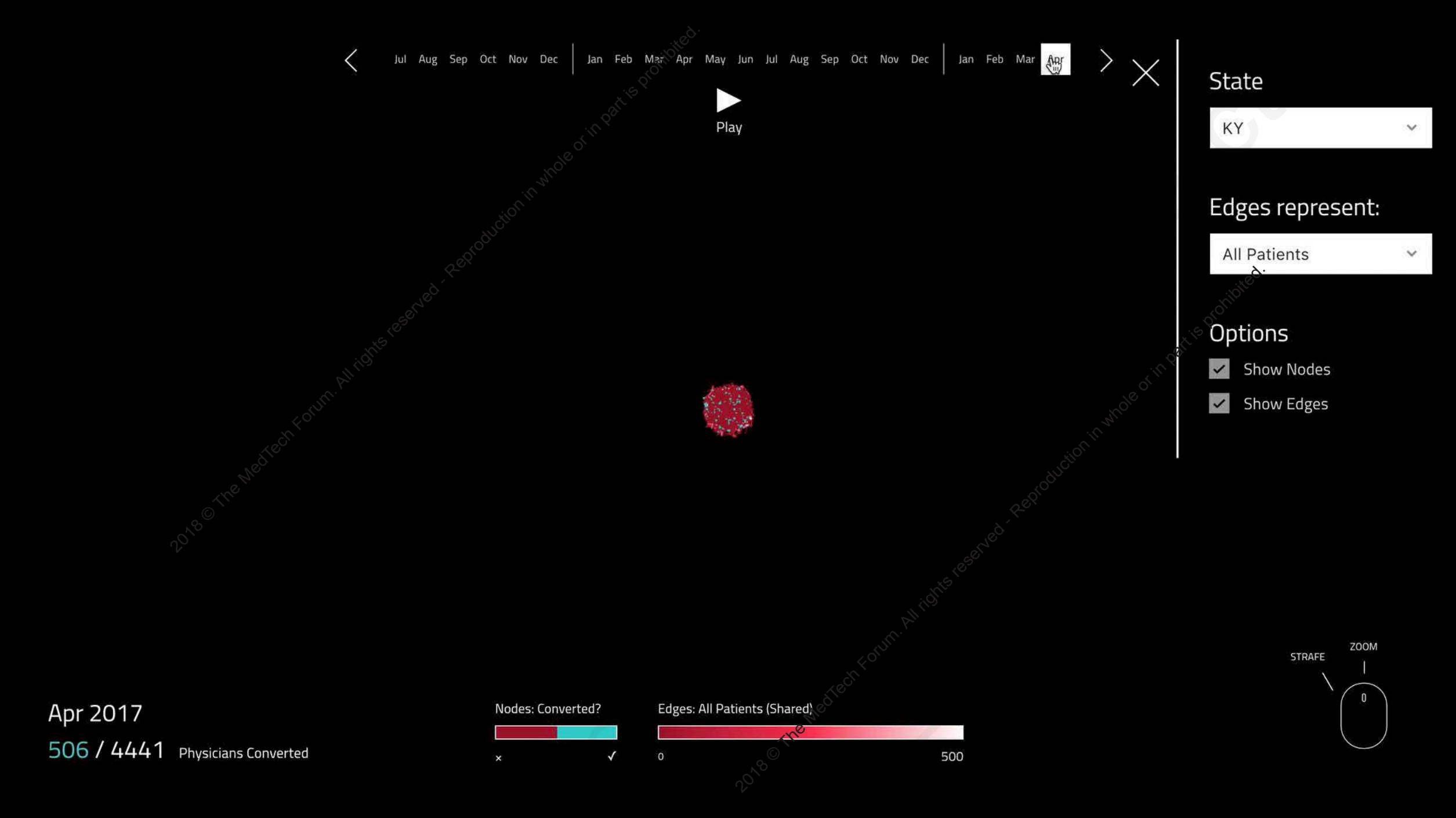
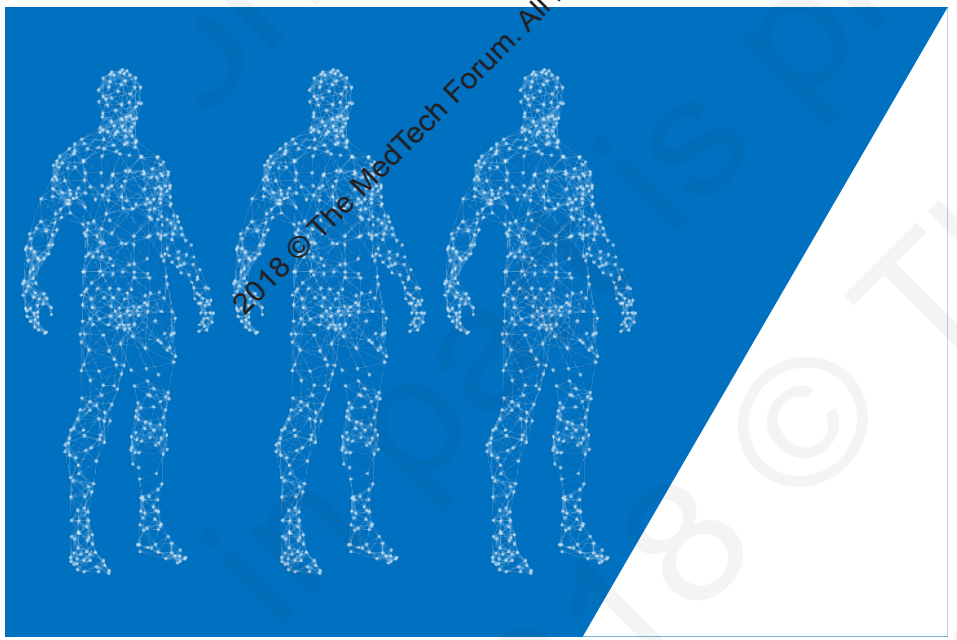


C Identify clinically and commercially relevant patient segments in which drug has better efficacy and cost profile than competitors



65m

Detailed 10years of EMR & claims data with 65mn patients Available now, & everyone can access

Replicated findings from previous research to show robustness of the approach and data

58%

Identified 4 clinically relevant patient segments where drug meaningfully outperforms competitors – segments together cover 58% of patient population

Live interactive tool deployed for cross-functional team to explore patient segments and build actionable clusters

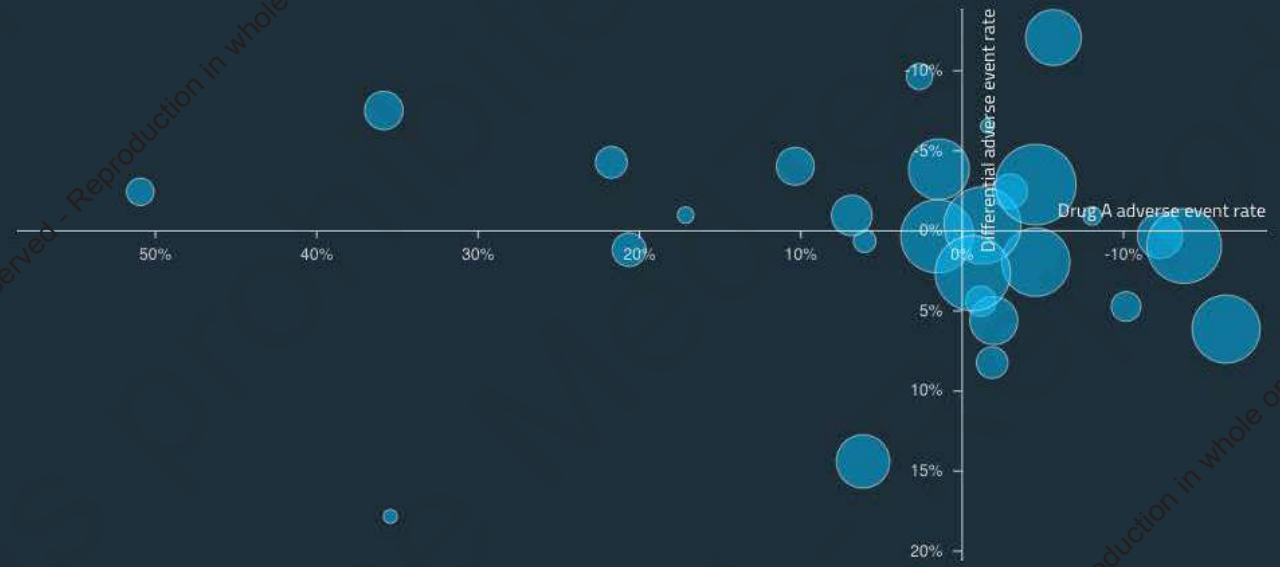
Efficacy: (•) All adverse events ( ) Effective adverse events

Bubble size

(•) No. of Drug B patients
( ) Total cost per adverse event
( ) Incremental adverse-event-related cost per patient

Legend

Patient segments: Drug A vs. Drug B



Segments

Search list

Drug A outperforms Drug B, and performs better than average

Male patients

Obese patients

Patients aged >=53 and <61 years at treatment start

Patients aged >=61 and <70 years at treatment start

Patients aged <53 years at treatment start

Patients in regions with >=23% and <26% college education rates

All Patients

No. of patients - Drug B

Total in analysis
10,268

No. in segment
10,268

Perc. in segment
100.0%

Incurred incremental cost (pppy)

Total: -$1.50

Additional cost:
-$1.30

Disorder marked cost:
$0.20

Adverse event marked cost:
-$0.20

Incurred cost (per adverse event)

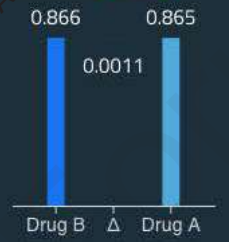
Total cost
$1,358

Disorder marked cost
$40

Adverse event marked cost
$178

Adverse event rate differential (pppy)

Difference: -0.1%

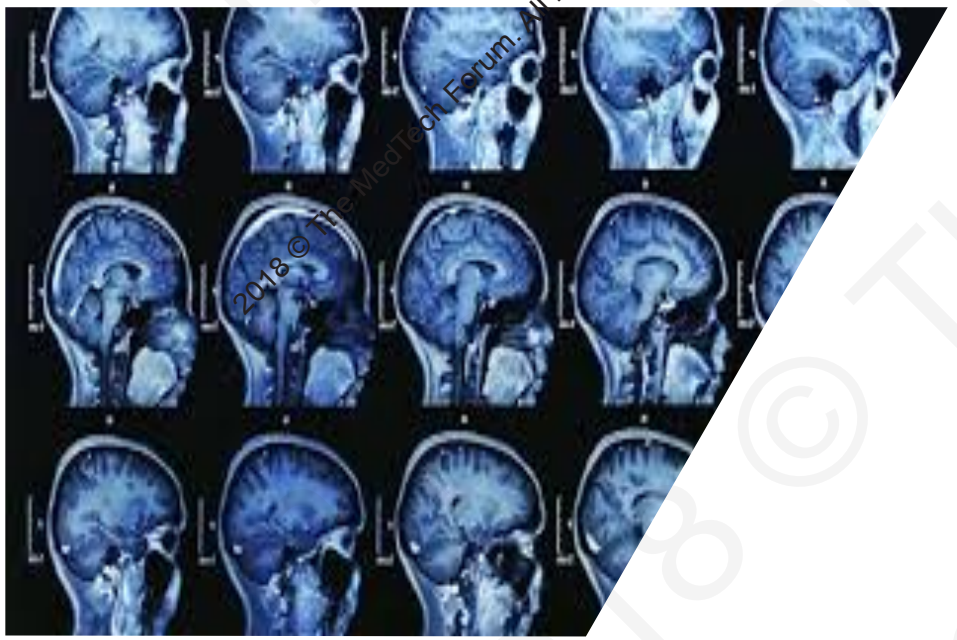


Adverse event rate by efficacy (pppy)

Effective
Drug B: 10%
Drug A: 9%

Ineffective
Drug B: 90%
Drug A: 91%

D Reducing service cost of MRI scanners with analytic troubleshooting & condition based maintenance



50,000

Unique instrument with 1GB per instrument plus 10 years service data

25%

Predicts common service events 90 days ahead of time

$300m

Saving opportunity of $35m/yr in North America and $300m/yr globally

E Developing service to increase theatre utilisation without compromising quality

800k

Procedures across 16 hospitals over 8 years

35%

Improvement in procedure forecasting

12%

Increase in theatre suite utilisation

Lessons and scars.

Patterns we've spotted along the way

1

Start with what you have

- Leveraging latent internal and external data as an asset; think of 'edge data'
- Embrace the taboo of 'garbage' data, instead invest in data provenance
- Variety more important than volume, so invest in 'machine readable' connectivity

2

Build feedback loops

- Focus on using your data to help you continuously improve
- Instrument everything; your process, your product, your people
- Capturing, interpreting and exploiting data at scale and at pace to outlearn your rivals

3

Build capabilities not models

- It's not about the analytics; it's how you embed them into the operating model
- Cascade performance driven use case to benefit from 'network effects'
- Leaders invest in 5 building blocks: data & analytics, IT, process (incl. action and judgment),governance, and people / culture

Making it happen.

'Winners' have taken a few critical decisions to lay the foundation

Detailed on next page

Reporting lines, policies, standards

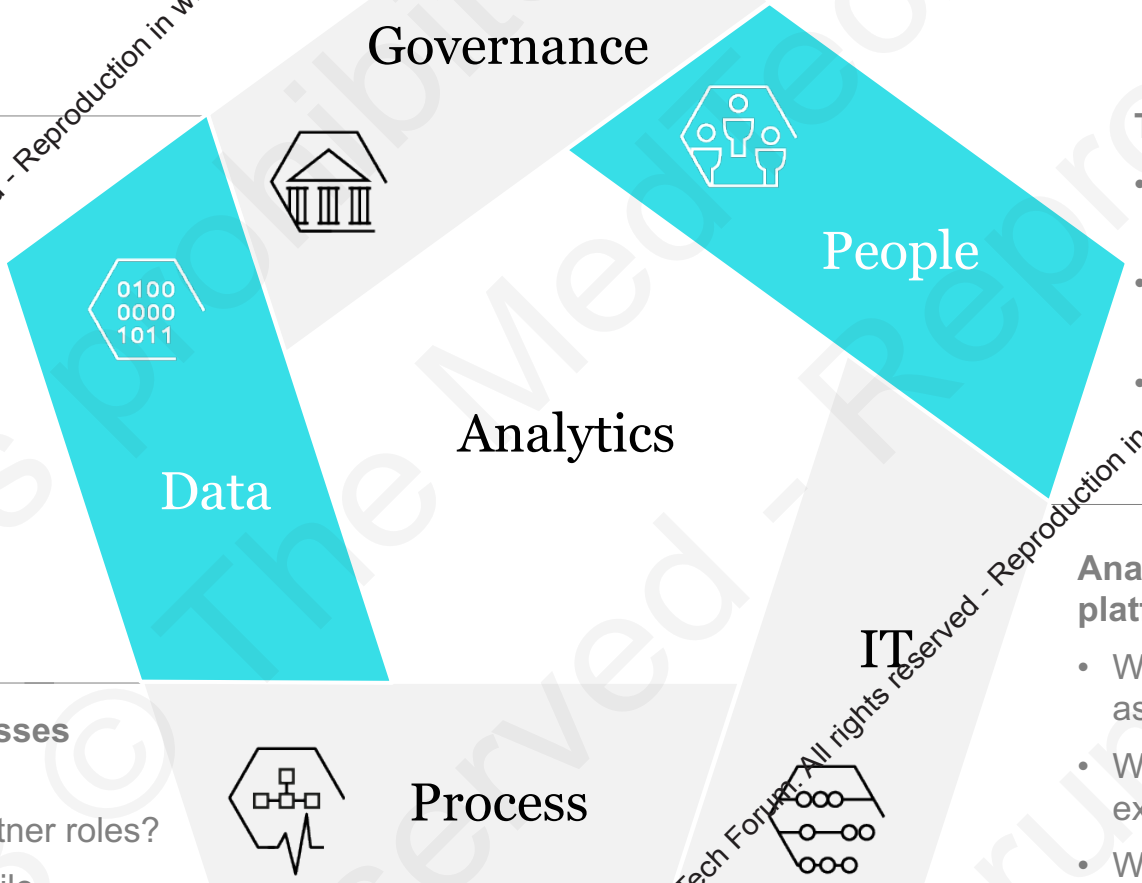
- How to structure the analytics function?
- Will we enforce global standards?

External data partnerships, data lakes

- How do we design win-win partnerships with distinctive data providers?
- What are do we need to consider regarding legal and privacy requirements?
- How do we tackle data security?

Business/IT interactions, internal processes in analytics "function"

- Do we create new analytics business partner roles?
- How do we design processes to be as agile as possible?
- What business processes need to be adapted which ones automated?



Talent, skills

- What skills gaps do we fill in first?
- How do we attract & retain talent?
- How do we manage change?

Analytics, data mgmt., visualization platforms/tools

- What global platforms do we build as enterprise capabilities?
- What does this imply for the existing system landscape?
- What is the role of cloud-sourcing?
- How shall data be visualized?

Data: new paradigm needed

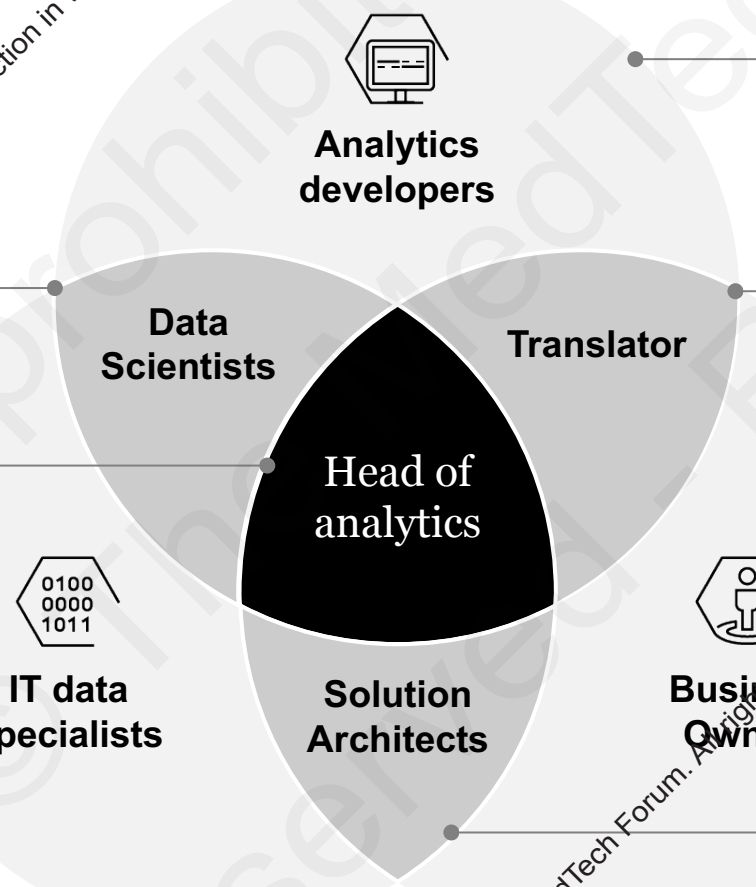
From		To
Data as by-product of the corporation to be managed internally	New data sources	**Data that can be acquired of created** (e.g., sensors, public application, interfaces, crowd-surfing)
Traditional warehouse structured process to implement new data elements	Orchestration of data	**Test-and-learn** "data lakes" environment to make data available quickly
"Boring data" (e.g., structured, internal, and centralized data)	Unstructured data	**Diverse data** (e.g., unstructured external and distributed data
Receive dos and don'ts from legal	Privacy and legal considerations	**Really understand and actively shape corporate policies**
Local data access restricted by physical location (e.g., home office desktop)	Data security	**"Democratization" of data while keeping data security** in any location, time, or device (e.g., iPad)

People: new capabilities needed

Analyze Big Data through advanced analytics to get strategic/business insights

Drive the design and execution of the overall Big Data and analytic strategy
Provide link across IT, analytics, and business

Support the design, development and maintenance of the data architecture



Responsible to develop the software to program with Big Data

"Translate" business needs into advanced analytics language (e.g., define data requirements)

Define the content of the data they own and are responsible for data quality

Ensure future data requirements and delivery roadmap is robust and complete

Forget about perfection, focus on progression and compound the improvement

Sir David Brailsford, CBE

Thank you.
Q&A.