

Building the Analytics Factory

October 2019 | K. Barclay & E. Conzo





182 Years | >70K Employees | >100 Countries Worldwide | >\$35B Revenue



Agricultural & Turf



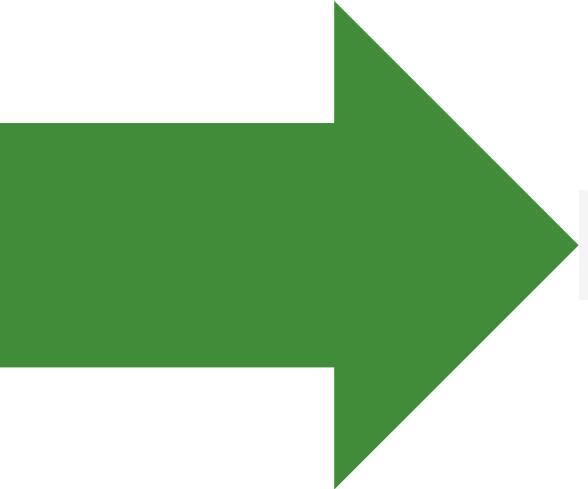
Construction & Forestry



John Deere Financial

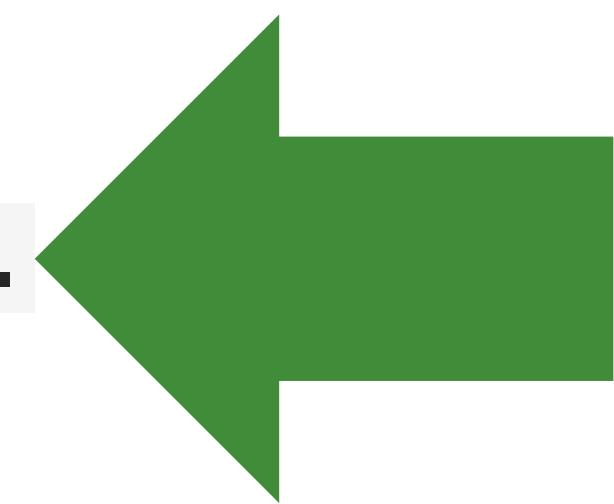


Intelligent Solutions



Significant transformation required.

Lessons learned while operationalizing analytics
in a 180 year old manufacturing company.



Our core strengths remain foundational.

Our Personas for Today



Kira
Innovative & Hip



Liz
Profitable & Efficient

In Real Life



Kira
Innovative & Hip



Liz
...at least innovative



Using advanced methods to solve problems, create efficiencies, and improve our products has always been part of our culture

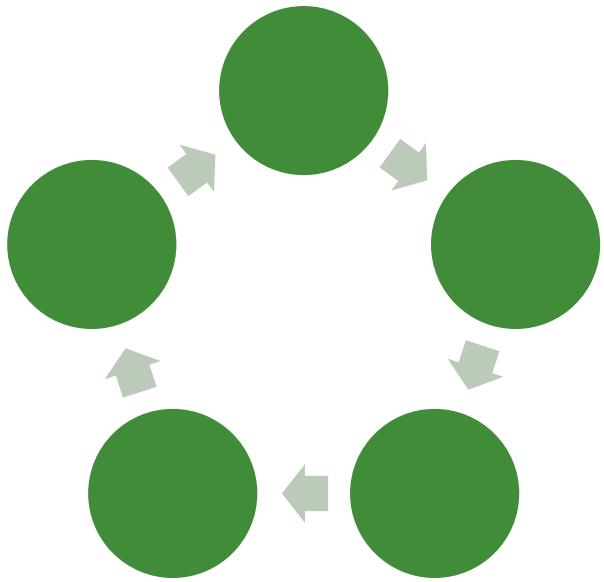


Today, our products and factories look much different.

Process, we know process.

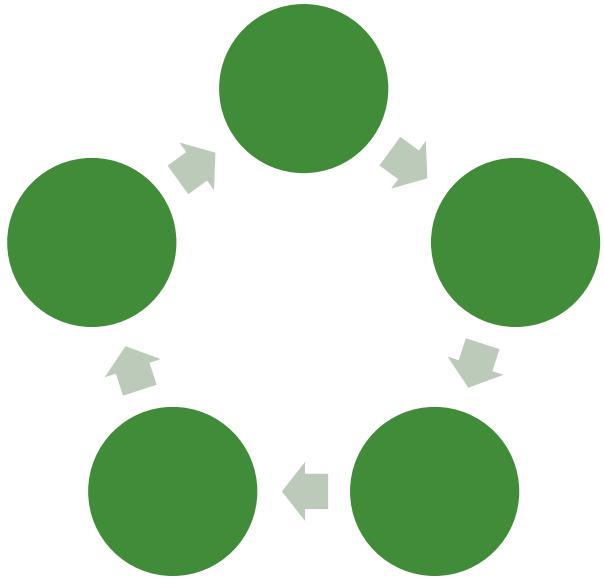


Process, we know process.



Analytics Development

Process, we know process.

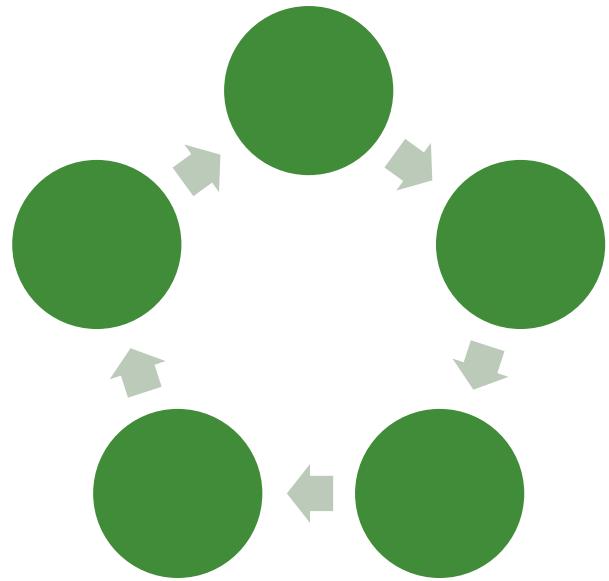


Analytics Development



Traditional Development

Process, we know process.



Analytics Development



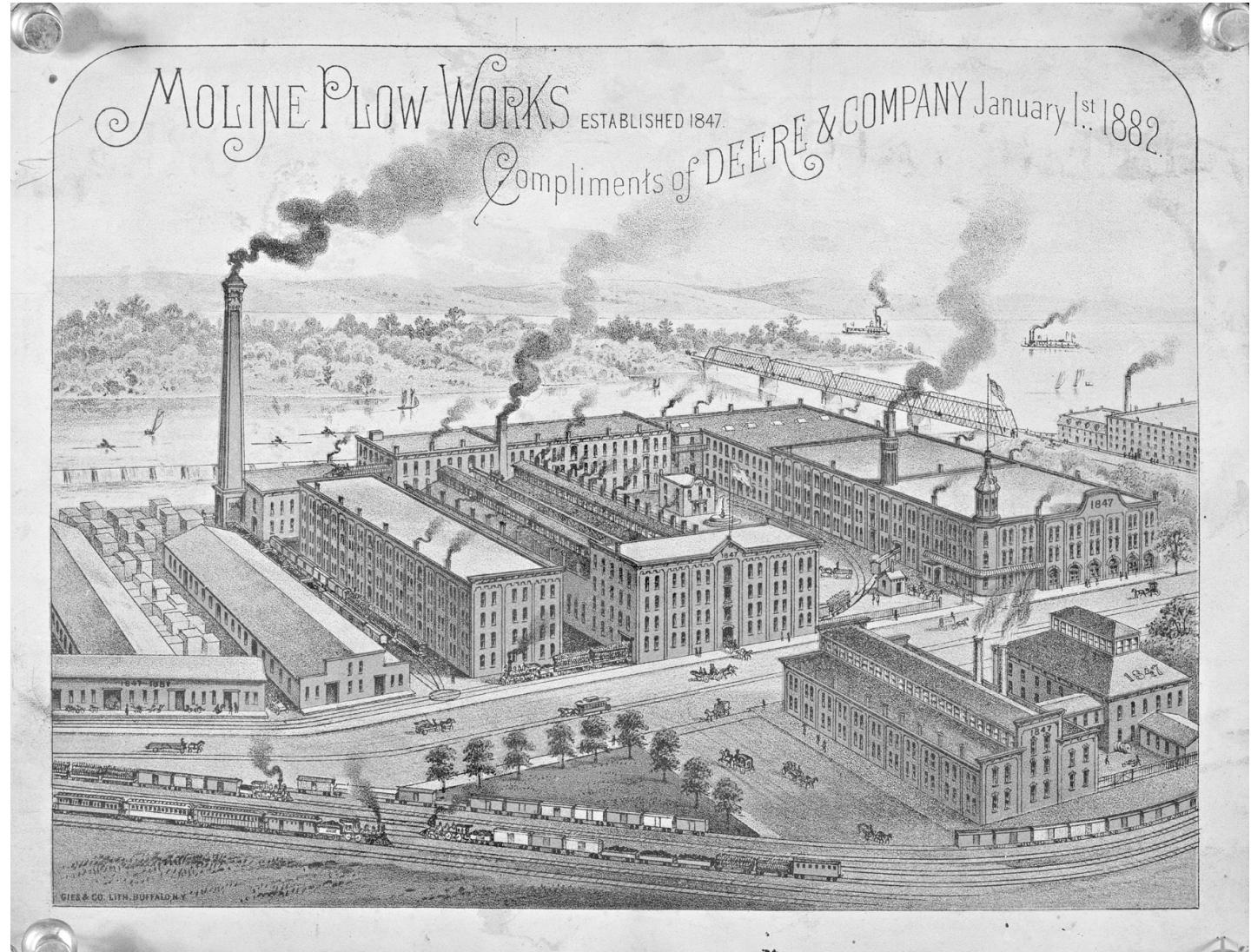
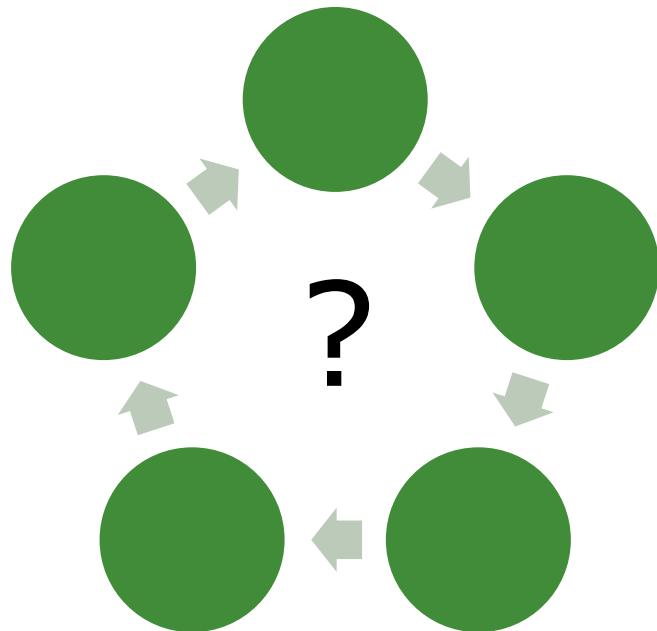
Traditional Development

Understanding our starting point was critical

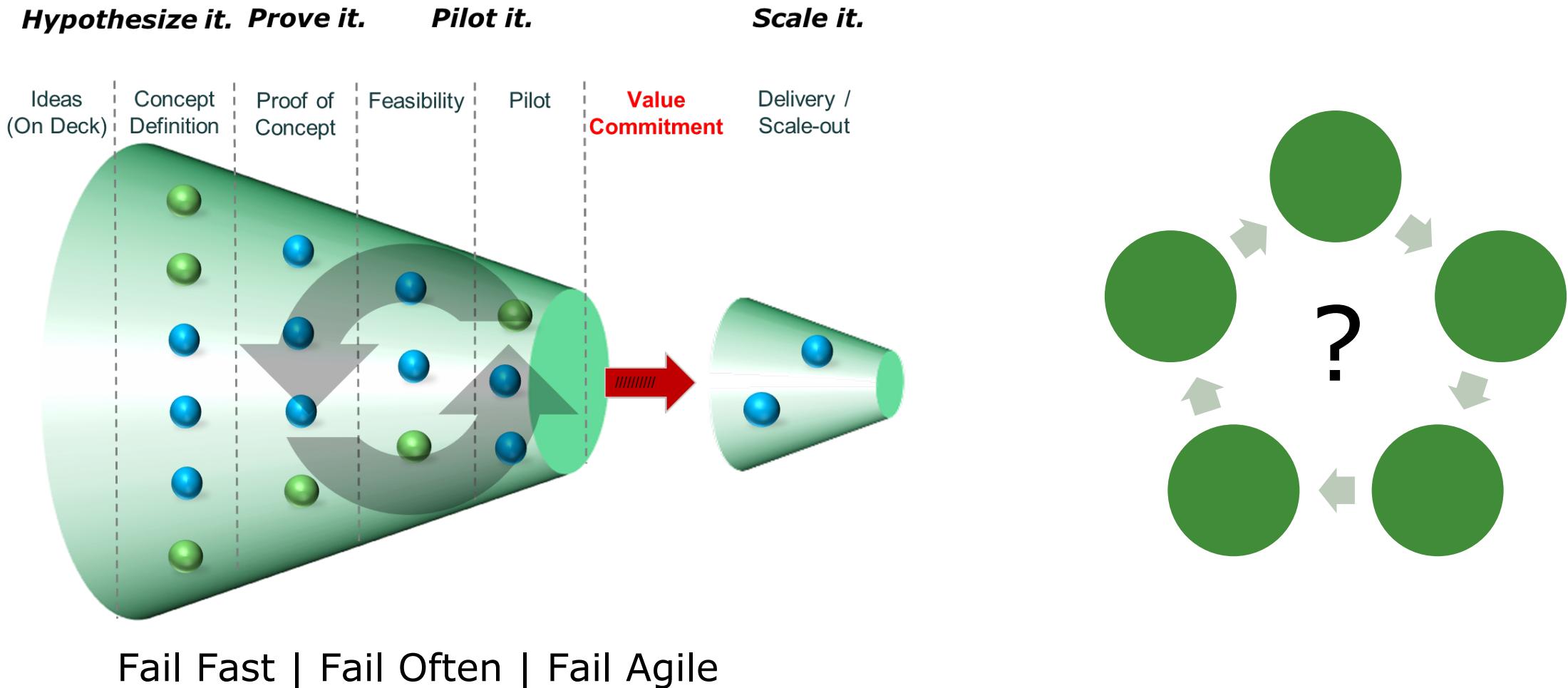
Engagement, when do we talk?



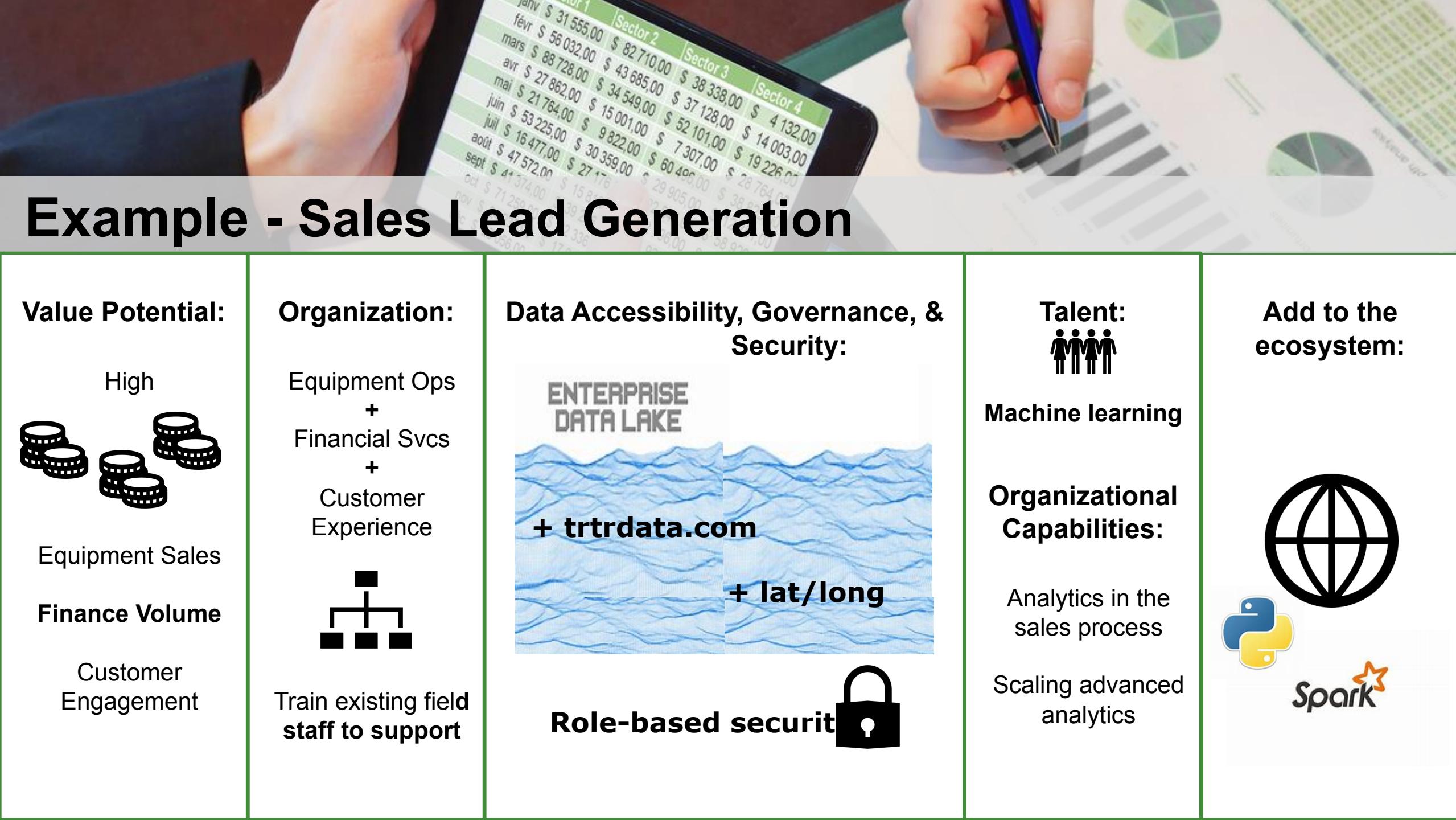
Engagement, when do we talk?



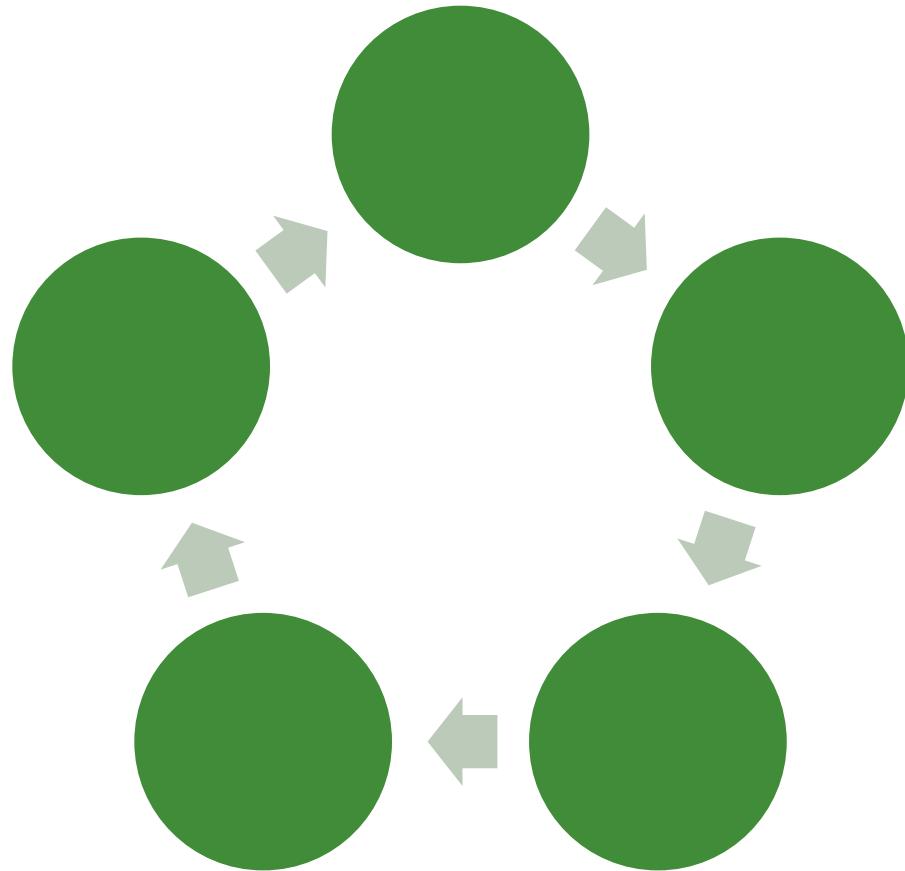
Engagement, when do we talk?



Example - Sales Lead Generation



Engagement, when do we talk?



Maintain transparency, build tools & capabilities over time

Flexibility required



Flexibility required



A close-up photograph of a person's hand pointing a finger at a digital tablet screen. The screen displays a financial spreadsheet with four columns labeled "Sector 1", "Sector 2", "Sector 3", and "Sector 4". The rows represent months from January to December, with values in US dollars. The data shows significant fluctuations, particularly in the first half of the year.

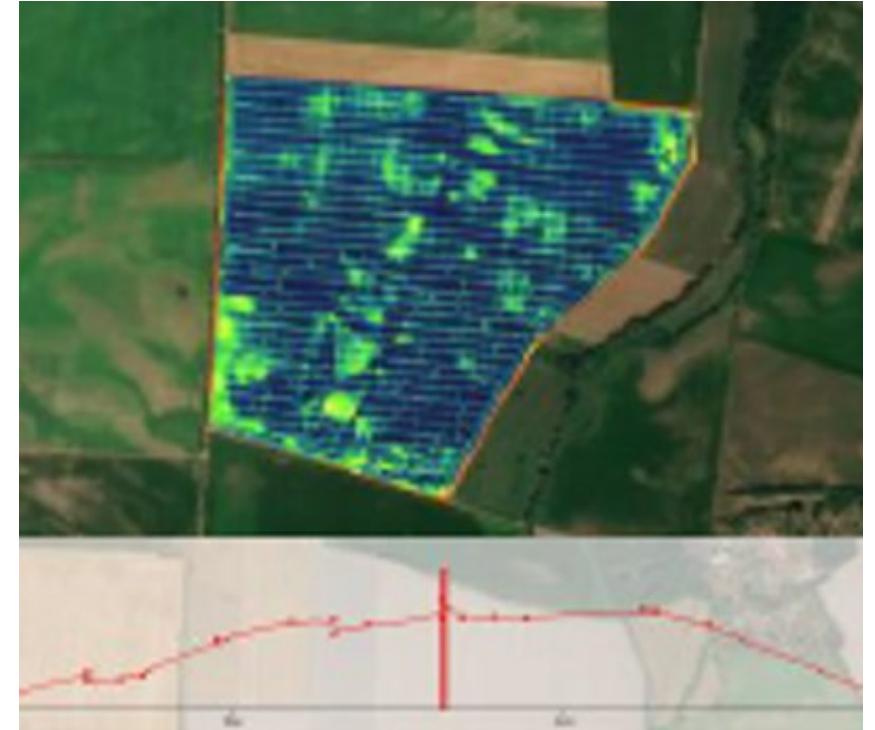
	Sector 1	Sector 2	Sector 3	Sector 4
janv	\$ 31 555,00	\$ 82 710,00	\$ 38 338,00	\$ 4 132,00
févr	\$ 56 032,00	\$ 43 685,00	\$ 37 128,00	\$ 14 003,00
mars	\$ 88 728,00	\$ 34 549,00	\$ 52 101,00	\$ 19 226,00
avr	\$ 27 862,00	\$ 15 001,00	\$ 7 307,00	\$ 28 764,00
mai	\$ 21 764,00	\$ 9 822,00	\$ 60 496,00	\$ 38 825,00
juin	\$ 53 225,00	\$ 30 359,00	\$ 29 905,00	\$ 12 281,00
juil	\$ 16 477,00	\$ 27 176	\$ 2 545,00	\$ 58 929,00
août	\$ 47 572,00	\$ 15 818	\$ 2 796,00	\$ 79 164,00
sept	\$ 41 374,00	\$ 39 266	\$ 922,00	\$ 82 000,00
oct	\$ 71 259,00	\$ 82 336	\$ 82 000,00	\$ 82 000,00
nov	\$ 34 237,00	\$ 17 949	\$ 82 000,00	\$ 82 000,00
déc	\$ 23 056,00	\$ 66 076	\$ 82 000,00	\$ 82 000,00

Project #1:
Targeted Sales Leads

Flexibility required

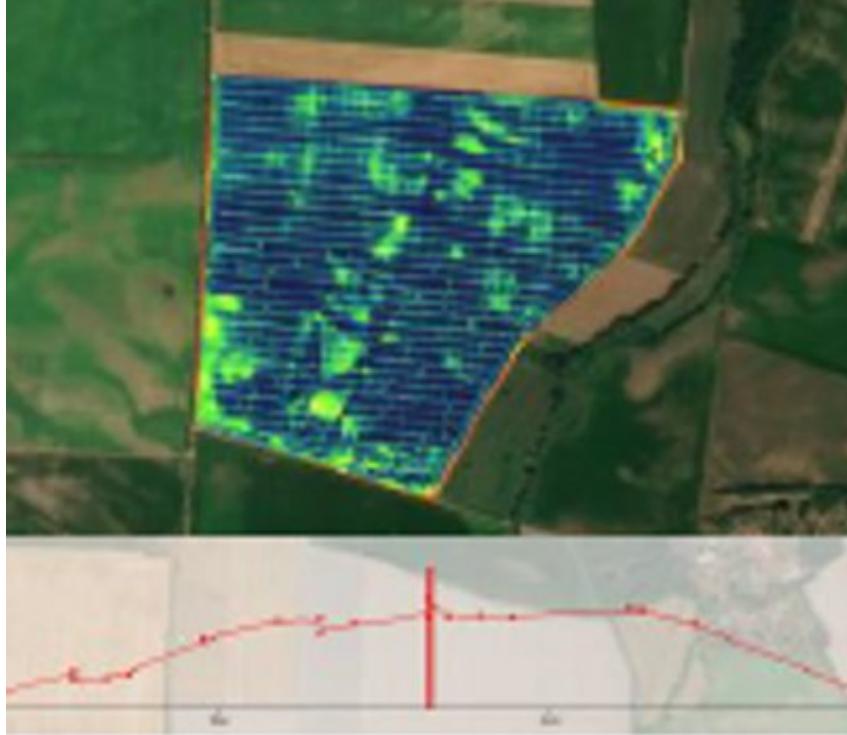


Project #1:
Targeted Sales Leads



Project #2:
Biomass Projections in a Field

Flexibility required



Capabilities

Architecture

Cost to Scale

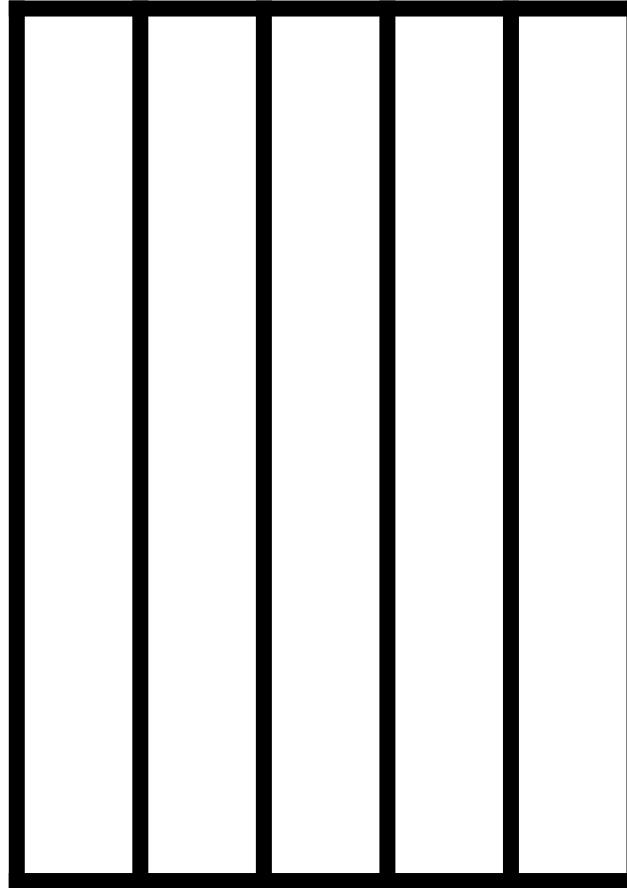
Supportability

Maintain communication, innovate continually

Governance & security, partnerships

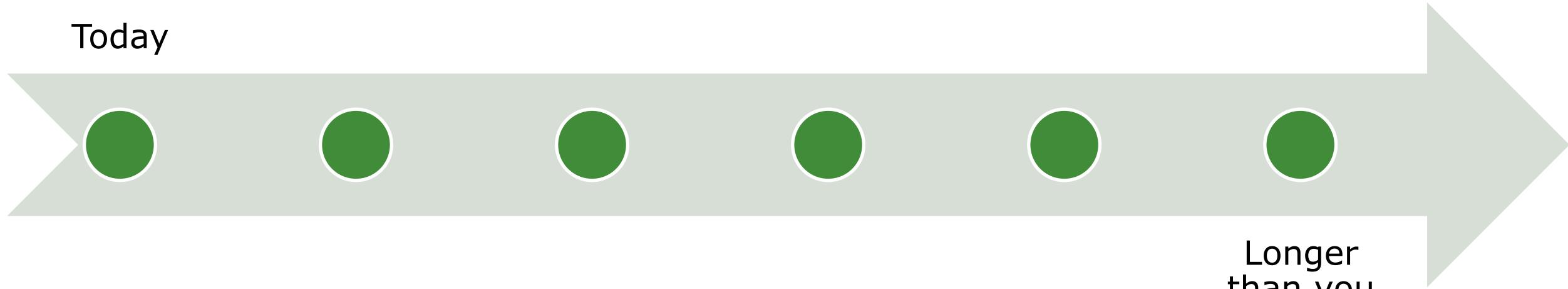


Governance & security, partnerships



Governance & security, partnerships

Today



Longer
than you
want to
wait

Governance & security, partnerships

TYPES OF DATA WE COLLECT

We collect three kinds of data through the John Deere Data Services and Subscriptions, which include the John Deere Operations Center, JD Link™, and other offerings listed at www.JohnDeere.com/agreements:

Production Data is information about the work you do with your equipment and the land where you do that work.

For example:

- field task details
- area worked
- route travelled
- crop harvested and yield data
- agronomic inputs applied

You can see and manage your Production Data in the John Deere Operations Center and mobile apps.

Machine Data is information that indicates machine health, efficiency, and function.

Machine Data comprises:

- machine health indicators, settings and readings
- machine hours or life
- machine location
- diagnostic codes
- software and firmware versions
- machine attachments, implements or headers

Administrative Data is information that helps us support your account and activities in our system.

For example:

- your data sharing permissions
- users linked to your account
- machines, devices, and licenses linked to your account
- number of acres and size of files
- information about how you use your account

Business + technical teams build councils and policies

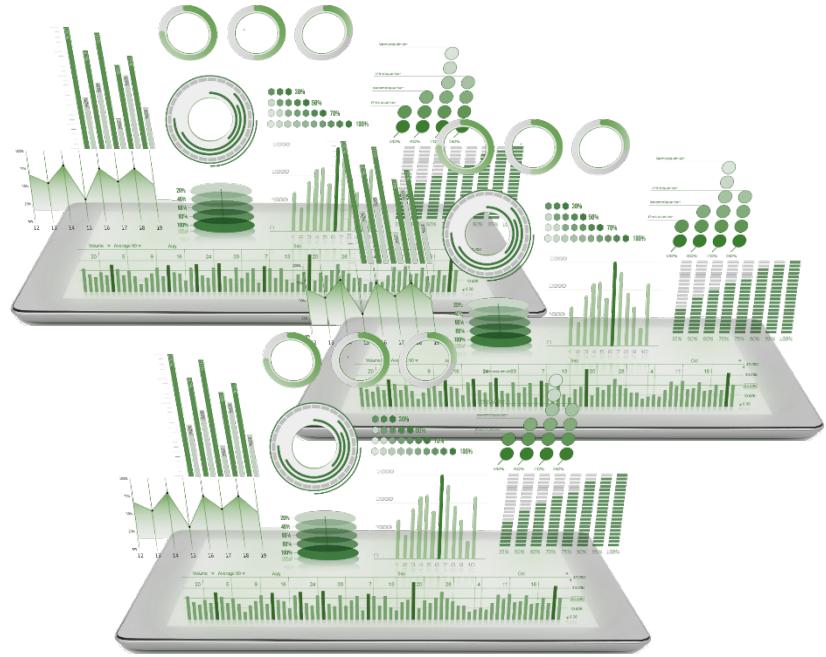
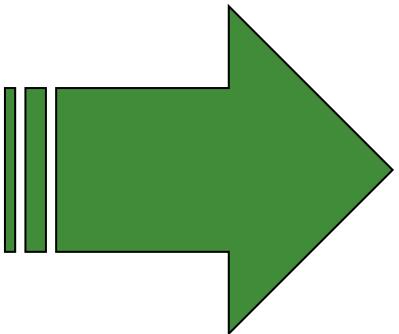
Efficiency expected at scale



Efficiency expected at scale



Proof of Concept or Pilot



Production

Efficiency expected at scale



R, Tableau, Python...



Scala, Python, Java...

New capabilities to operationalize models, IT innovations

Quality, still paramount



Quality, still paramount



How many shortest-length paths are there to get from your house to the doughnut shop?

$\binom{n}{k} = \frac{n!}{(n-k)!k!}$

4 up's
↑
↗ right's
→

$\binom{11}{7} = \binom{11}{4} = 330$ paths

$4 \quad 12 \quad 25 \quad 45 \quad 74$
 $8 \quad 13 \quad 20 \quad 29$
 $\Delta^3 \quad 5 \quad 7 \quad 9 \quad 2 \quad 2$

Onto

There are six dogs to give 13 tacos.
Use a 'stars and bars' diagram to illustrate the first and sixth dog get 3 tacos, the second dog gets none, the third dog gets 5 and the fourth dog gets one.

$(A \cup B \cup C) \cap (A \cap B \cap C)$

$\binom{w}{k} = \frac{w!}{(w-k)!k!}$

$e^{\pi} + 1 = 0$

$T \quad T \quad T \quad T \quad T$
 $T \quad T \quad F \quad T \quad T$
 $T \quad F \quad T \quad T \quad T$
 $F \quad T \quad T \quad T \quad T$
 $F \quad T \quad F \quad T \quad F$
 $F \quad F \quad T \quad F \quad F$
 $F \quad F \quad F \quad F \quad F$

$P \quad Q \quad R \quad P \vee Q \quad P \vee R \quad (P \vee Q) \wedge (P \vee R)$

$\sum_{i=1}^{n-1} a_i - a_n = 4$
 $\sum_{i=1}^{n-2} a_i - a_n = 4$
 $\sum_{i=1}^{n-3} a_i - a_n = 4$
 $\vdots \quad \vdots \quad \vdots$
 $+ a_1 - a_n = 4$
 $a_n - a_n = 4n$
 $a_n = a_n + 4n$

Find $\sum_{i=1}^n i = 1 + 2 + 3 + 22 + \dots + 342$.

$S_n = \sum_{i=1}^n i = 1 + 2 + 3 + 22 + \dots + 342$
 $+ S_n = 342 + 337 + 332 + 327 + \dots + 47$
 $2S_n = 349 + 349 + 349 + 349 + \dots + 349$
 $2S_n = 349 + 68$
 $S_n = \frac{349 + 68}{2}$
 $S_n = 11866$

Original:
 $\exists x \forall y (x \geq 2y \rightarrow x > y+1)$

Converse:
 $\exists x \forall y (x > y+1 \rightarrow x \geq 2y)$

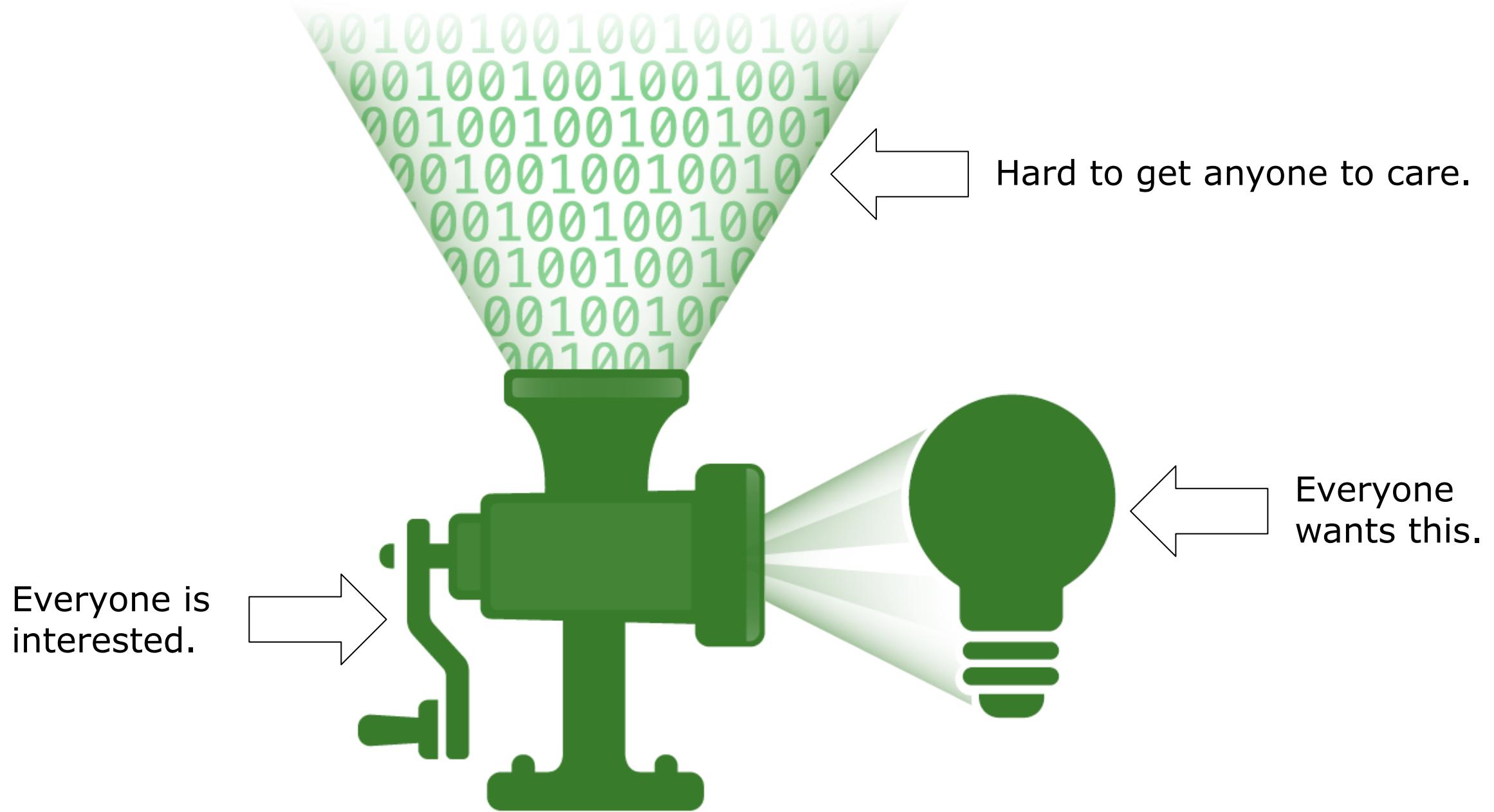
Negation:
 $\neg [\exists x \forall y (\neg(x \geq 2y) \vee x > y+1)]$
 $\forall x \exists y (x \geq 2y \wedge x \leq y+1)$

Contrapositive:
 $\exists x \forall y (x \leq y+1 \rightarrow x < 2y)$

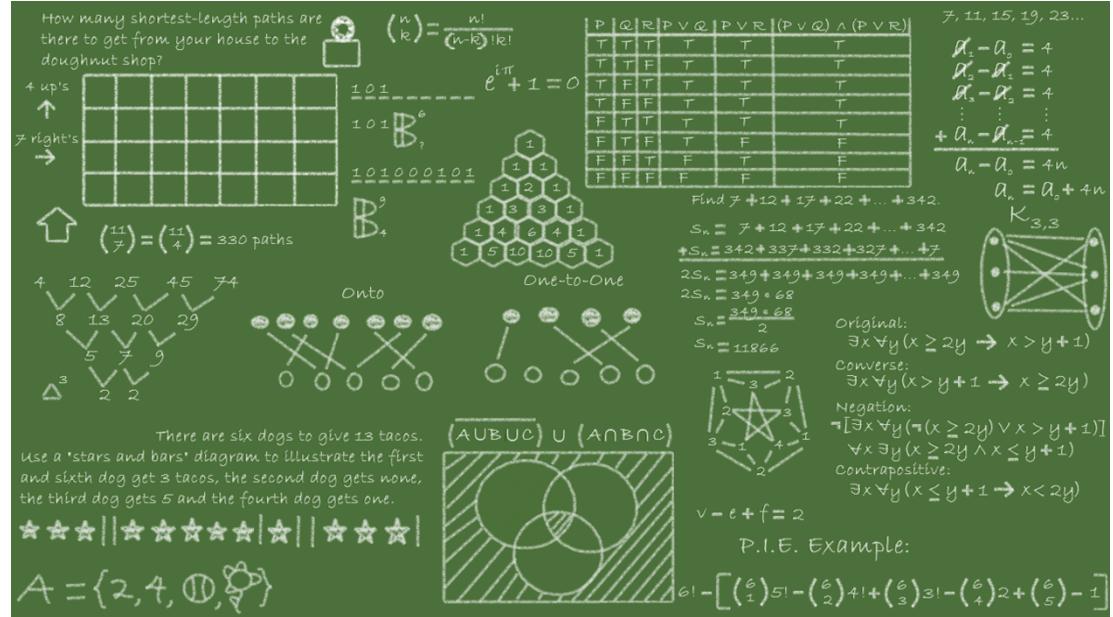
$v - e + f = 2$

P.I.E. Example:

$6! - \left[\binom{6}{1} 5! - \binom{6}{2} 4! + \binom{6}{3} 3! - \binom{6}{4} 2! + \binom{6}{5} 1! \right]$

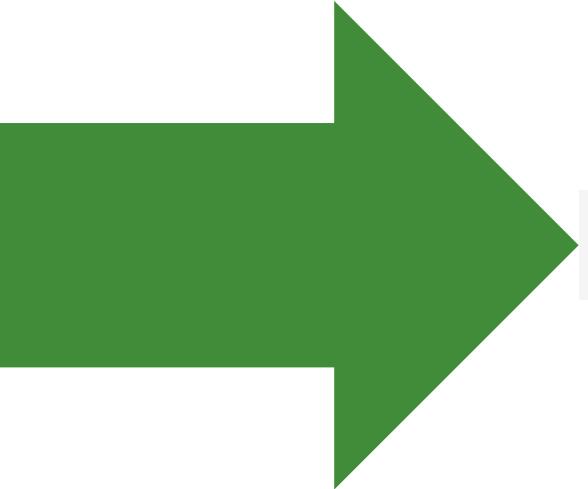


Quality, still paramount



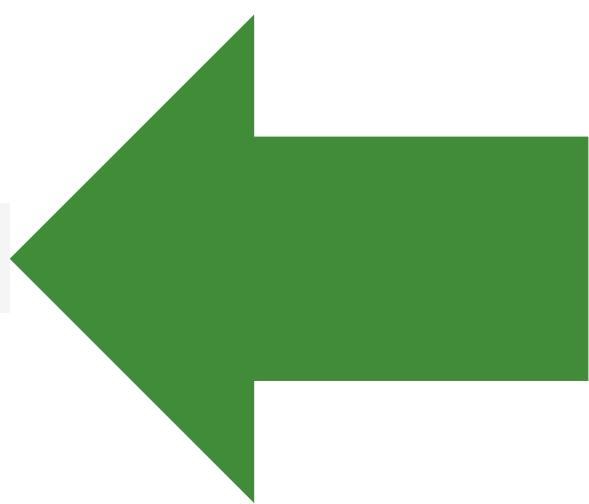
- ✓ XXXXX
- ✓ XXXXX
- ✓ XXXXX
- ✓ XXXXX

Analytics teams define/maintain data & model quality parameters

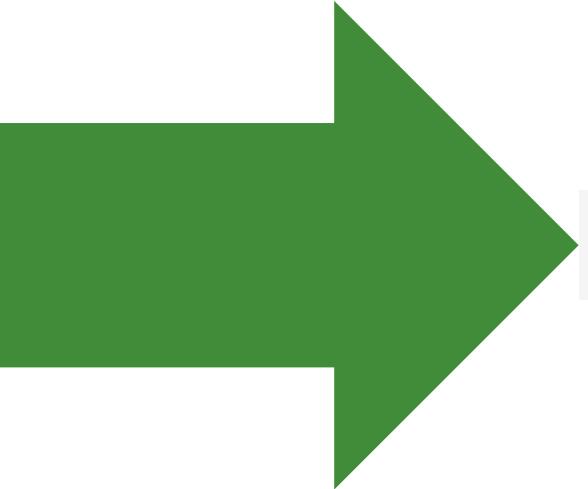


Significant transformation required.

We could think of long established processes as a hinderance to innovation – but we've found that these can actually give us an edge when leveraged correctly for analytics.



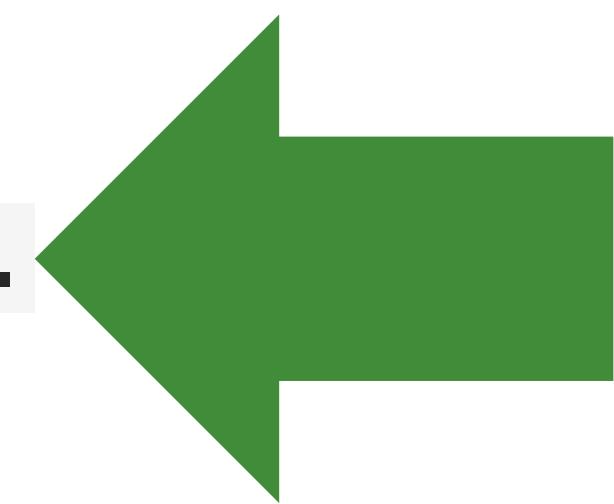
Our core values remain foundational.



Significant transformation required.

Process | Engagement | Flexibility

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Our core values remain foundational.

Integrity | Innovation | Quality

What's Next: Agriculture being managed at the plant level



Organizational alignment

Technical specialization

....and we're hiring!