

Digital disruption of Dairy

Transforming milk production through innovation & technology.

*Aidan J. Connolly,
President, AgriTech Capital LLC
Author, Contributor Forbes*



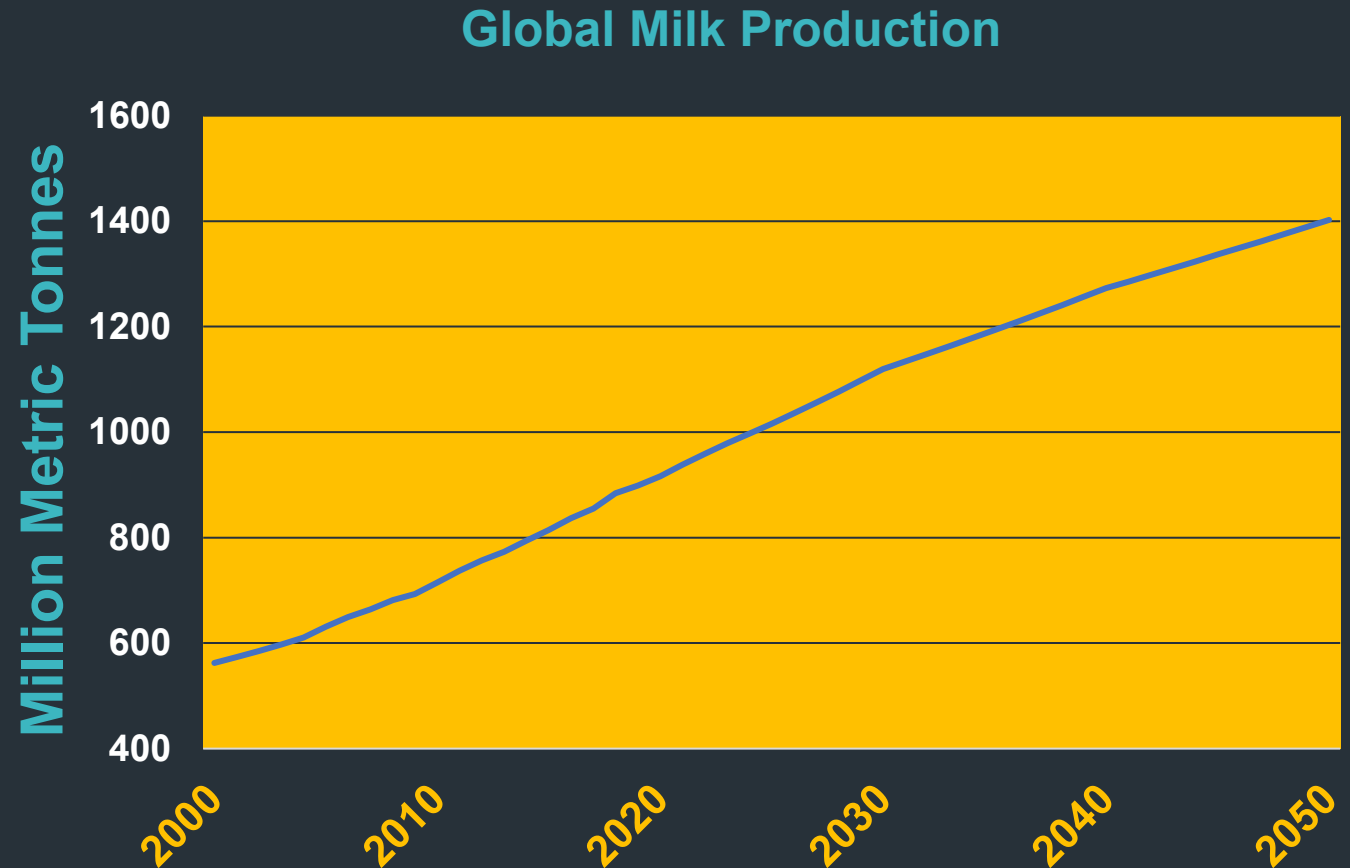
They aren't making more of it..

- Sun,
- Land & Water
- Limited Resources



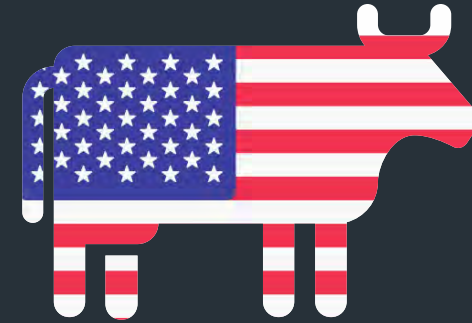
Milk consumption to grow 1.4% p.a., 2021 – 2050

- Global Population growth
- Rising incomes in emerging markets
- Westernization of Asian food habits
- Health-conscious consumers seeking the nutrients from dairy products



Uneven productivity across the globe

Average milk yield



US
av. Cow
10,300 /
year

India
av. Cow
1,600 /
year



Brazil av.
Cow
2,200 /
year



Who has already been disrupted?

World's largest taxi company, but owns no taxis

UBER

Largest accommodation provider, but owns no real estate



World's most valuable retailer has no inventory



Most popular media owner creates no content



Fastest growing banks have no actual money

SocietyOne

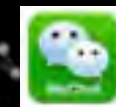
World's largest movie house owns no cinemas

NETFLIX

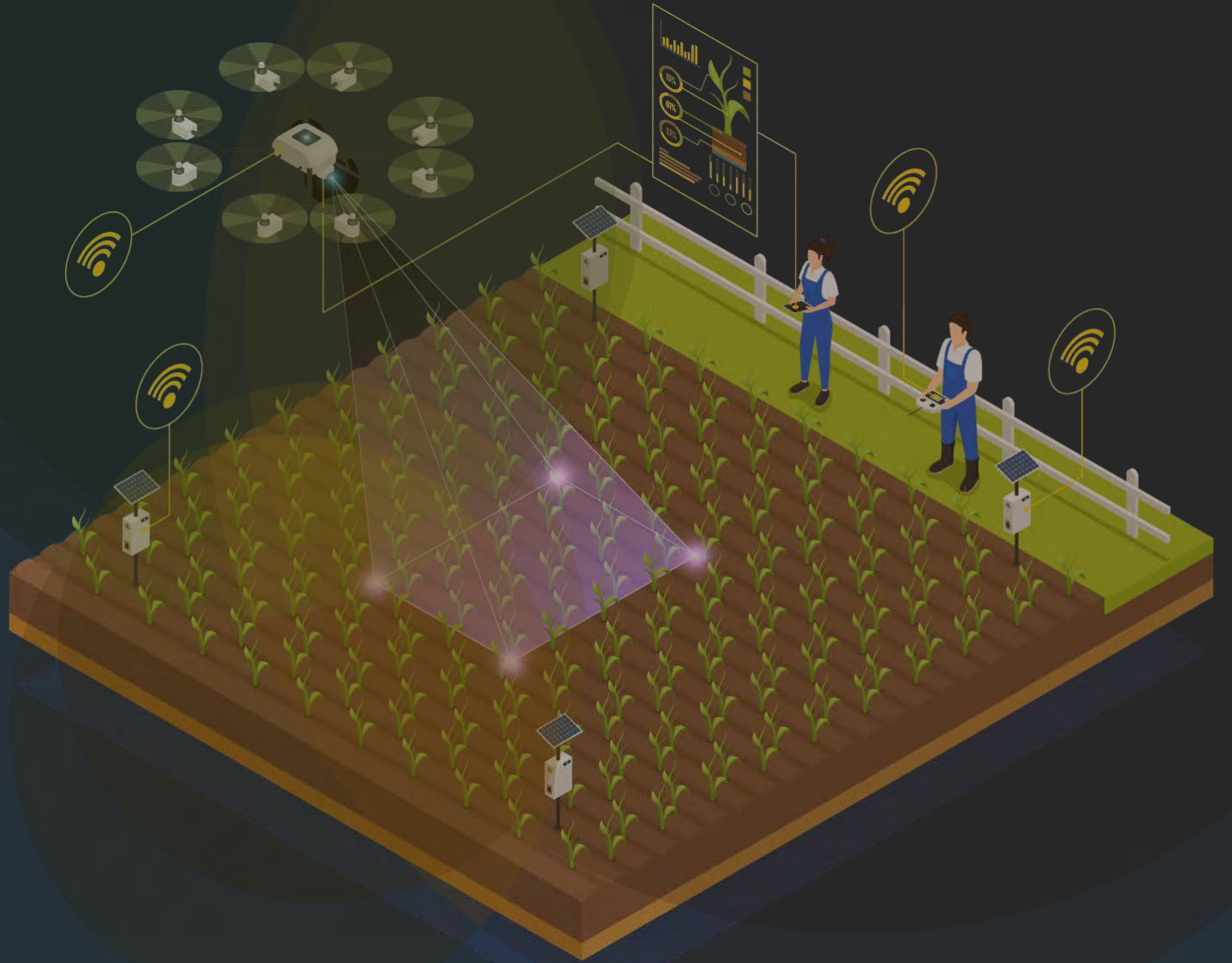
Largest software vendors don't write the apps



Largest communication companies own no infrastructure



**Precision
technology =
precision
agriculture.**





Telematics

Sync your entire operation with a wireless solution for collecting and sharing machinery and yield data in the field.

How do you define a word that seems to have many definitions? Take the word telematics, for instance. "I think many people are confused about what telematics means," says Brian Stark, Farm Works. "It's still a relatively new technology in agriculture. It's what yield monitors went back in the early 1990s."

By definition, telematics is any data collected in the field and wirelessly transferred to another machine or to the office. This wireless solution allows you to communicate between machines, to send data from the field to the office, and to track equipment to maximize productivity and to enhance performance.

Use Smartphones and Tablets

Map your field boundaries, the points of interest, and enter scouting information by using your mobile devices.

Exchange Data from Field to Office

Scout fields, or collect soil sample locations, and send the information back to the office for processing.

Track Equipment

Know the location of each vehicle in your fleet to improve fuel usage, to reduce application mistakes, and to prevent theft. Analyze fuel consumption (such as fuel levels or usage per hour) to lower your costs.

Transmit Data from Office to Field

By collecting and sending yield data wirelessly to the office during harvest, it simplifies information management and eliminates the need for USB drives to transfer data.

Communicate Between Vehicles

Control the tractor's speed and location from the combine cab to mimic movements of the combine while in unloads.

Swap Data from Vehicle to Vehicle

Eliminate memory cards and USB drives by sharing production data, harvest maps, tank levels, and yield maps wirelessly between vehicles in the same field.

Enhance Performance

Track the time that a machine spends running in a field, moving from field to field, or just idling.

Maximize Productivity

Improve efficiency and reduce downtime by remotely viewing the display screen to see exactly what the operator sees in the cab to ensure equipment is operating correctly, provide training, or to trouble shoot issues.

View Cab Dashboard Information

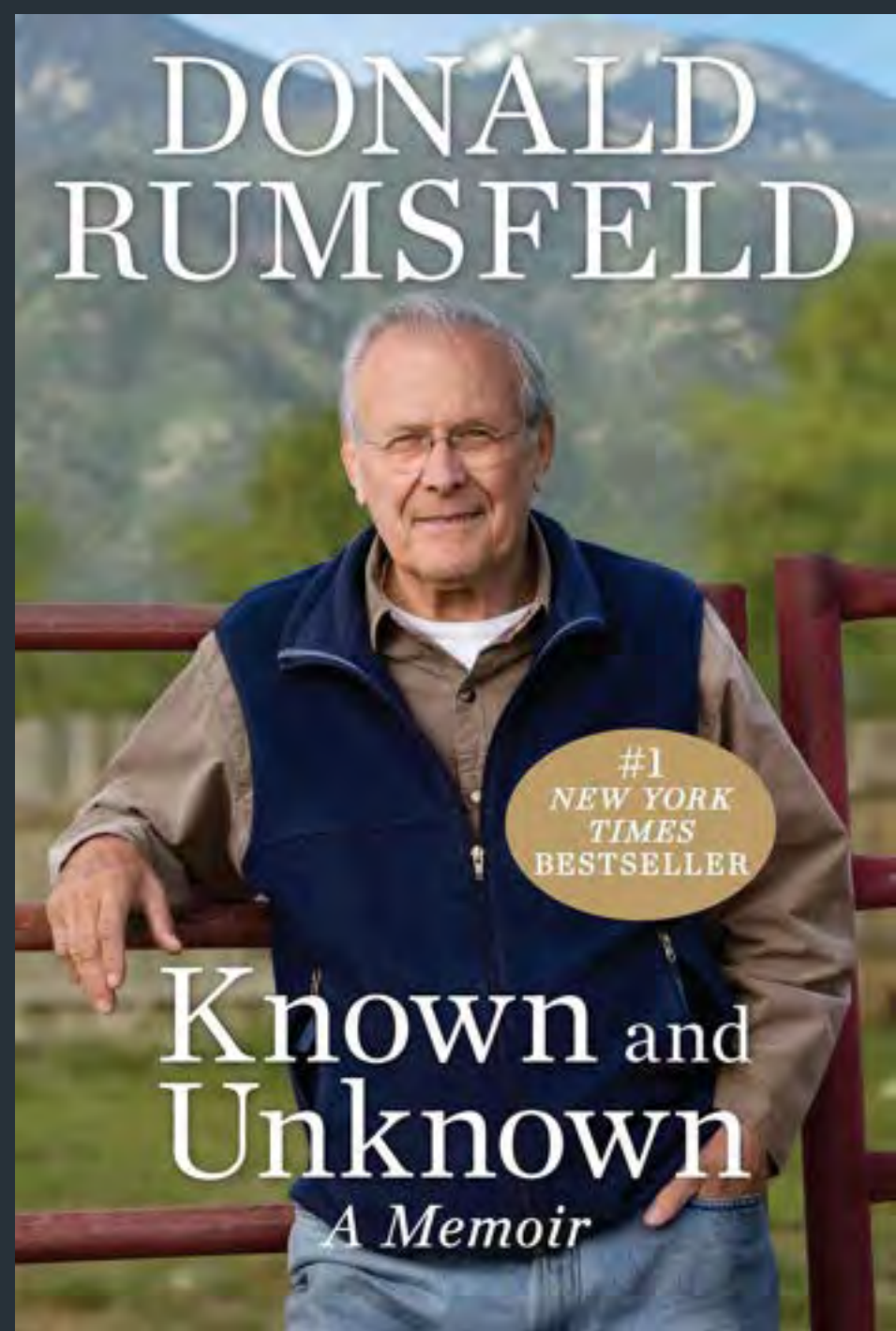
Check fuel usage, battery voltage, oil pressure, coolant temperature, and more by utilizing a virtual dashboard of calculations. Transform that information into performance analysis reports to enhance productivity and efficiency, and to help make timely decisions.

Figure 16. Telematics connects the farm firm

Disruptive technology essential for precision agriculture



*Was
Rumsfeld
a farmer?*





Dairy Farm technology adoption

Biggest problems dairy farmers face?

- Labor costs/access to labor
- Milk output-based management
- Waste management
- Scale
- Farm efficiencies
- Consumer false impressions



Dairy's Data Gaps

Individual data in real time?

- Weight
- Feed & water consumption
- Cow Comfort
- Stress
- Health
- Livability
- Milk Quality

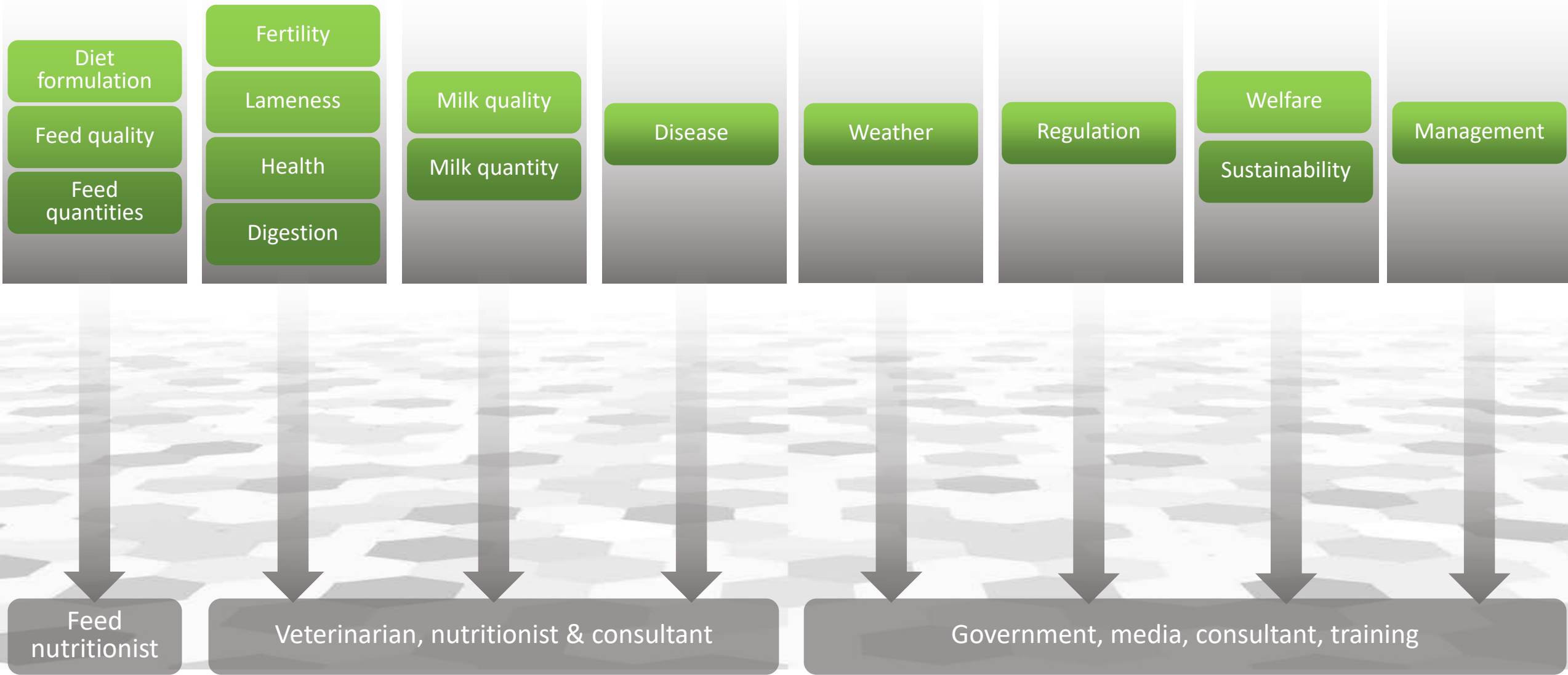
Real-time Environment?

- Air quality: NH₃, CO₂, moisture
- Temperature
- Feed quality
- Safety: Campy, Salmonella
- Traceability; openness for 'Prosumers'

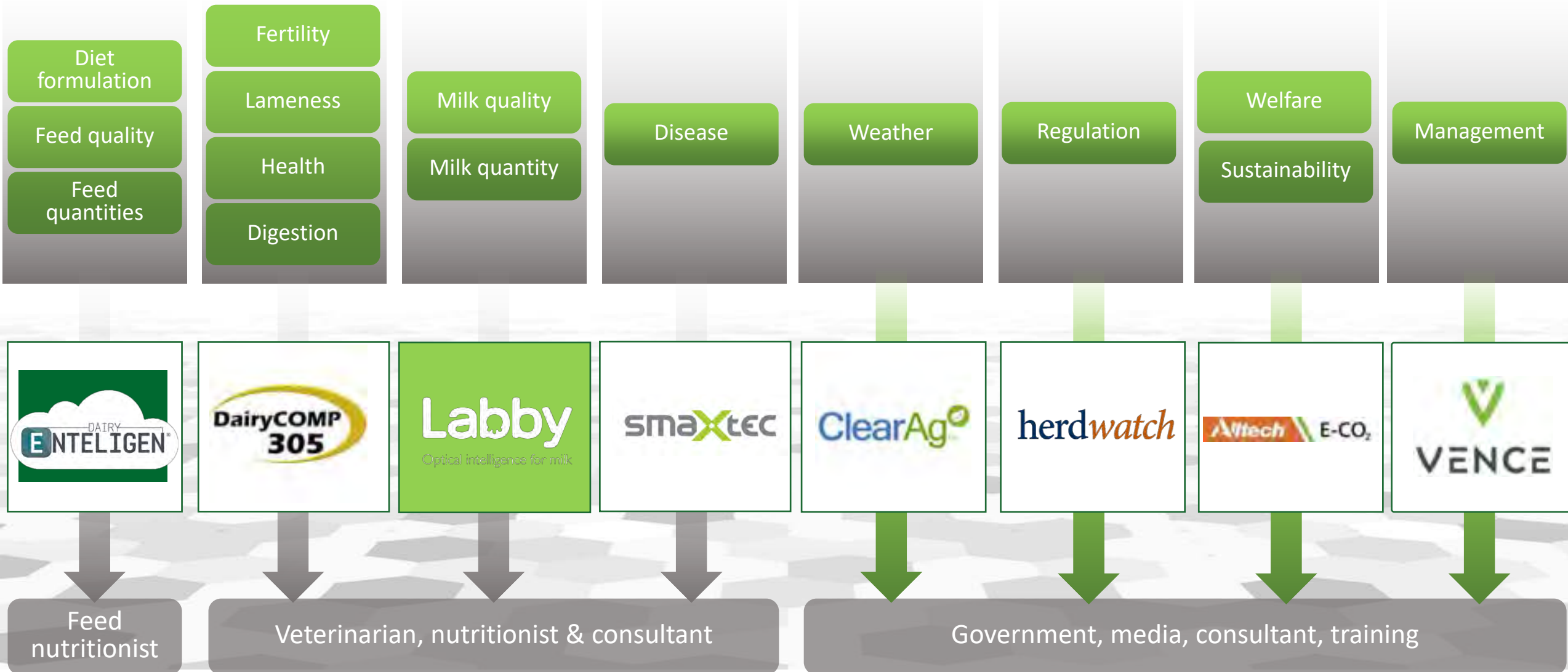
Farmers have a lot to think about!



Supported by EXPERTS...



Insight from SMART TECH...



25.7 33140-4190 x 119 16.11
~~26.7 33140-4190 x 119 16.11~~
 27.4 33630-971 x 5775 18.11
~~28.7 847 154 18.11~~
 28.8 4108-4217 x 971 20.11
 M 971-124 x M
 M 971-2254 x 971
 6.8 1611-155 x 4719 28.11
 M 14253-971 x M
 7.8 64-971 x 7502 P 28.11
~~11.8 14253-971 x 7502 28.11~~
~~14.8 33635-M x 971 28.11~~
 16.8 33635-M x 971 28.11
 20.8 8470-M x M 28.11
 24.8 10037-4896 x 971 28.11
 M 2536-M x 971 28.11
 1.8 14253-971 x 154 28.11
 3.8 14156-M x 7502 P 28.11
 9.9 1684 5108 x 185 0 30.11
 M 3038 155 x 5108 30.11
 M 743 971 x 124 30.11

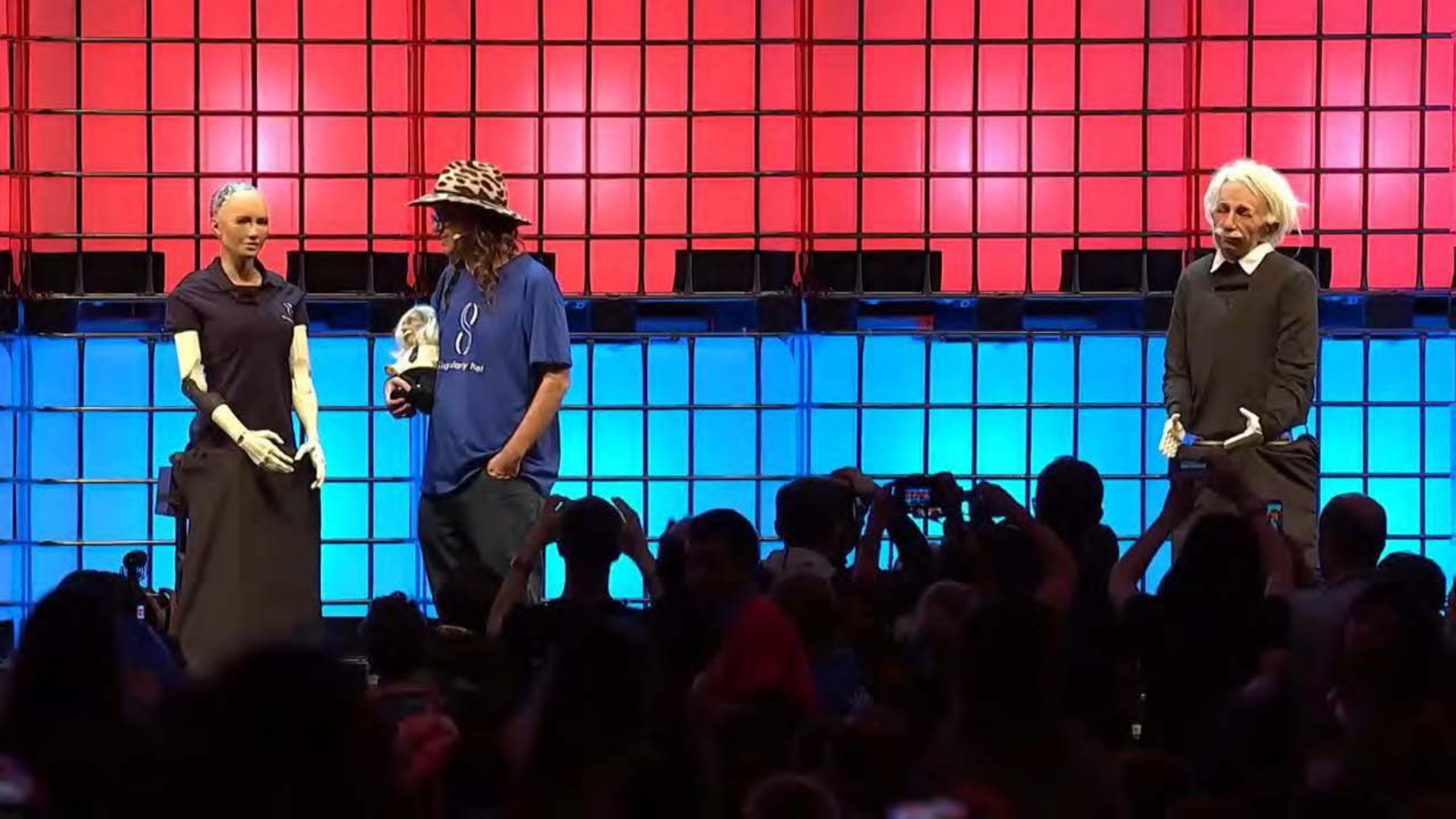
Date From M x M H Points
 11.9 34 971 x 7379 2.1
 15.9 2542 154 x 154 3.1
 M 10040 124 x M
 M 11061 971 x 971
 13.9 1195 5775 x 5775 10.1
 21.9 46 971 x 971 11.1
 23.9 1466 2254 x 2254 14.1
 M 2548 M x M
 M 1603 M x M
 M 14155 M x M
 1.10 1586 124 x 124 22.1
 M 1488 M x M
 6.10 11281 154 x 154 27.1
 M 10153 971 x M
 7.10 154 x M 28.1
 M M x M

RISE



Two robots debate the future of humanity

Ben Goertzel, Hanson Robotics; Sophia the Robot, Hanson Robotics; Han the Robot, Hanson Robotics



Robots will take your jobs, Its OK.
Work is boring



With technology do we have less doctors, nurses?

Cloud

Robots

Artificial intelligence

Blockchain

Big Data

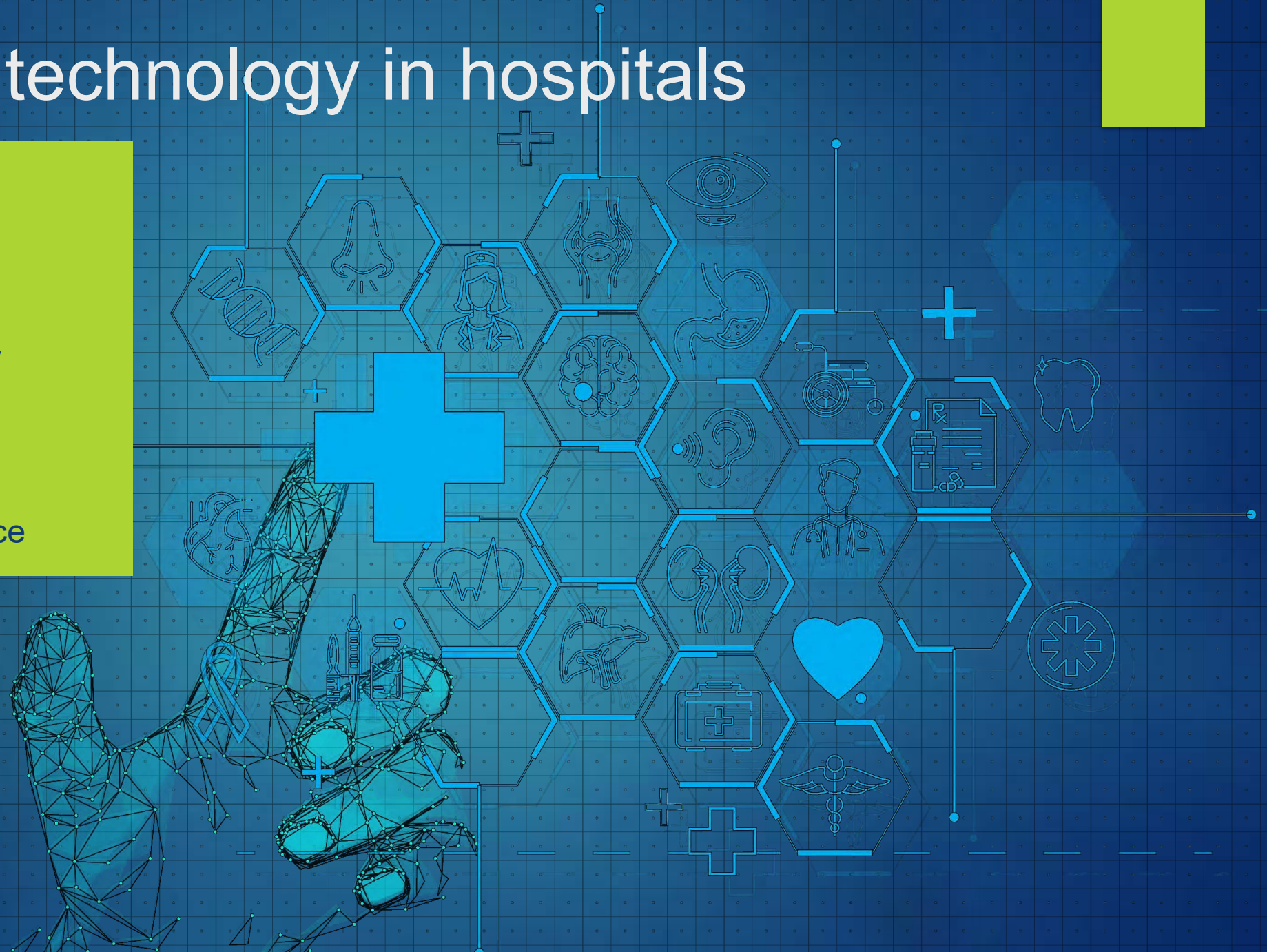
Sensors

Machine vision

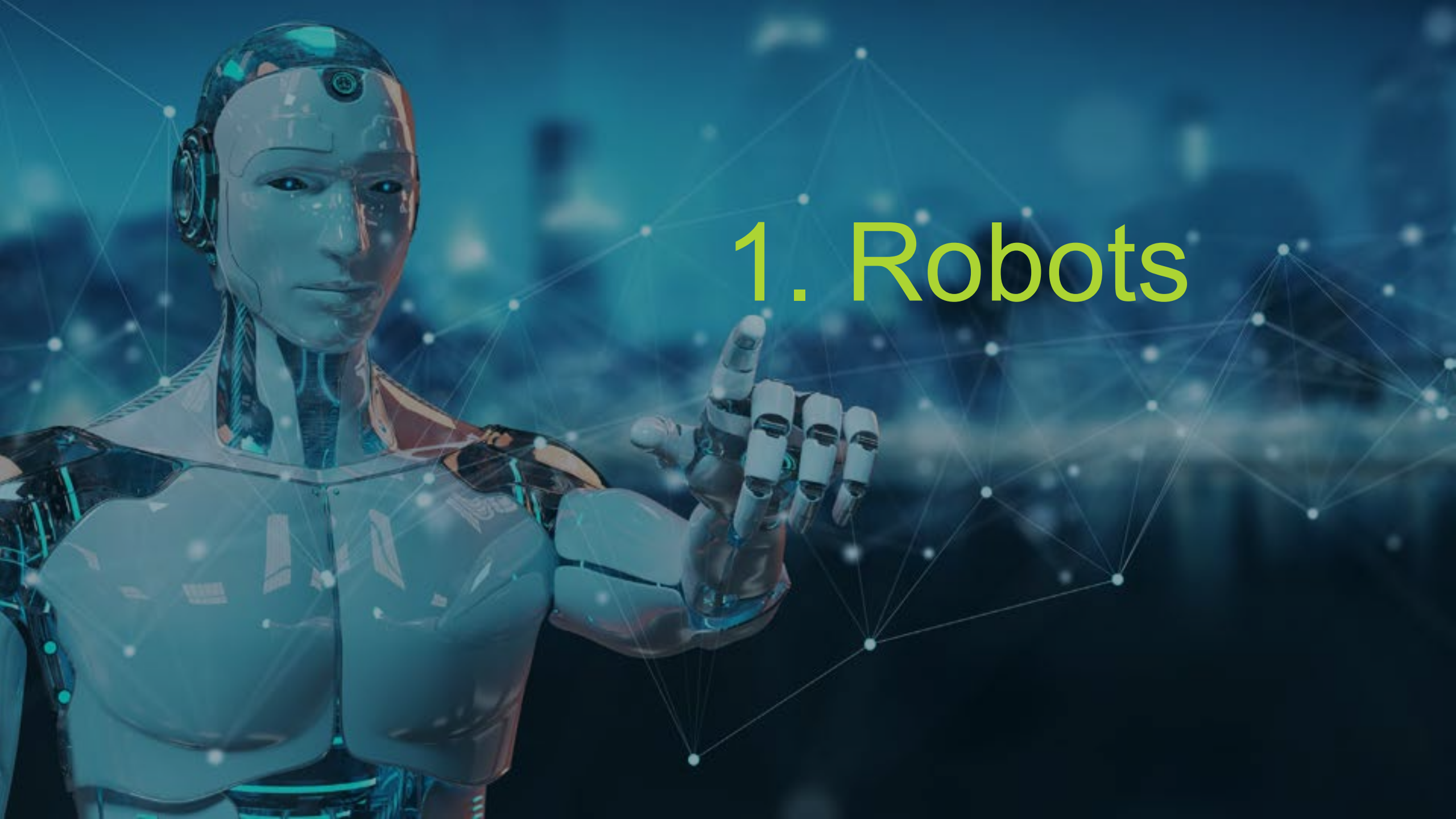


7 Uses of technology in hospitals

- ▶ Robots
- ▶ Sensors (IoT)
- ▶ 3D printers
- ▶ Augmented reality
- ▶ Virtual reality
- ▶ Data analytics
- ▶ Artificial intelligence



1. Robots



Robots in Healthcare

- ▶ Assist with Surgeries
- ▶ Hospital Logistics
- ▶ Workplace safety



Robots in Healthcare

- ▶ Robots have proven to be better at orthopedic surgery than humans – e.g. knees & hips



Robot Logistics

- ▶ Robots delivery samples down corridors from ward to the laboratory more efficiently than, because they don't get distracted, pulled into other jobs!



Robotic cleaning + Disinfection*

*Covid accelerated use



DeLaval Robotic Milking Machine



Lely Milking Machine





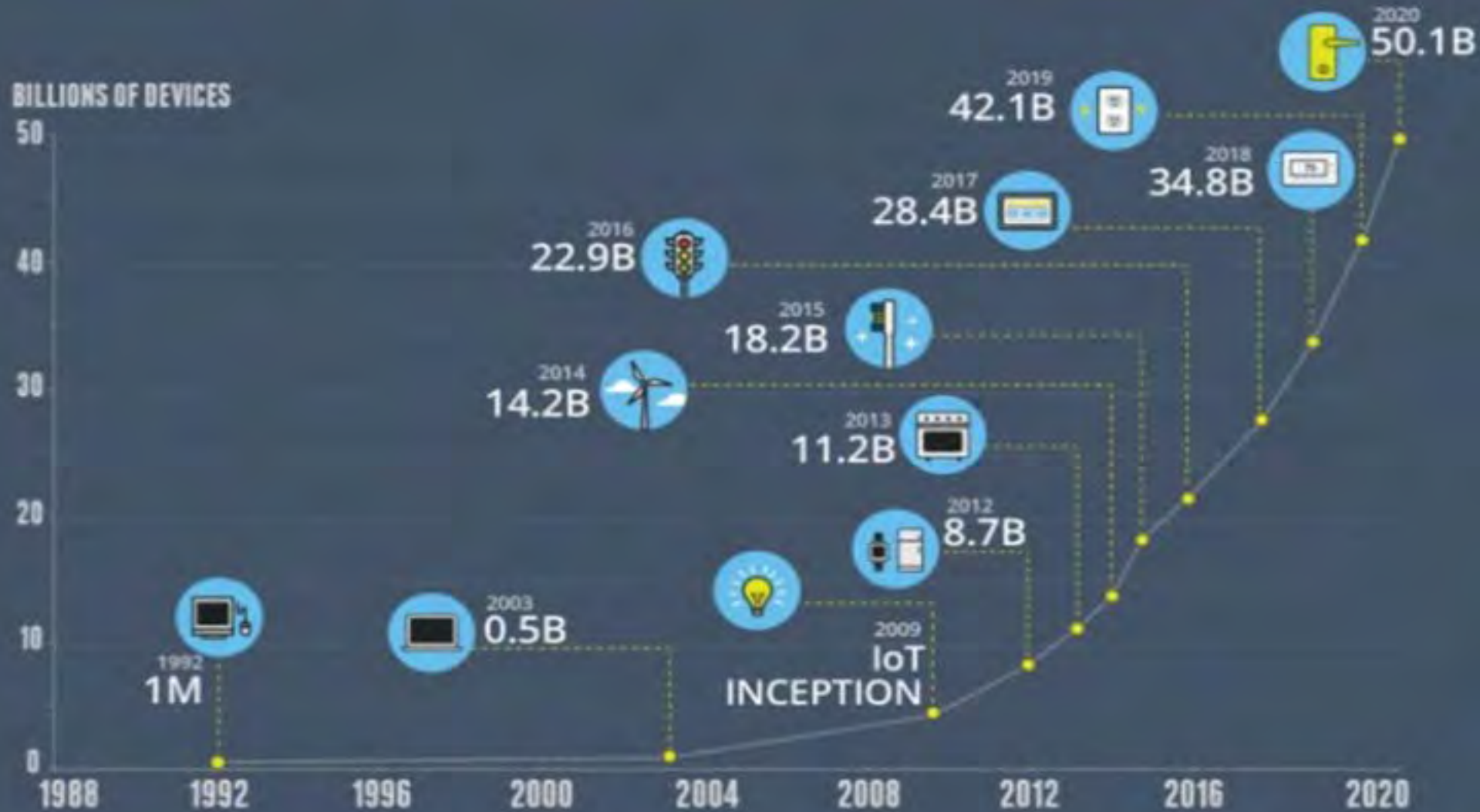


- New generation “soft robots”
- Not metal
- More delicate tasks

2. IoT Devices



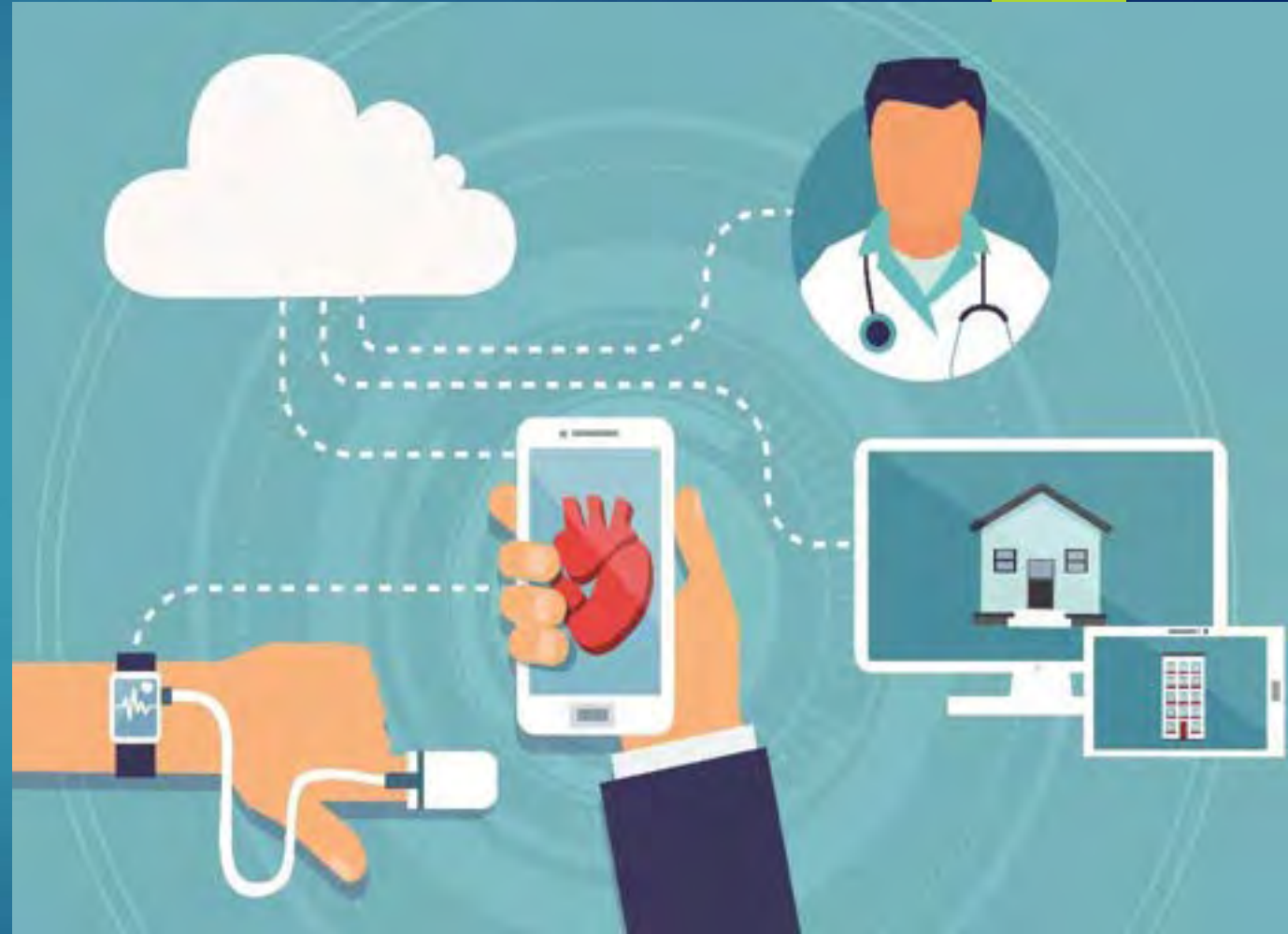
Growth in the Internet of Things (IoT)



The number of connected devices will exceed **75 billion** by 2025

2. IoT Devices

- ▶ **Patients & Staff wear tracking devices**
 - Collect vital information on patients movement, health
 - Keep track of doctors, nurse to send them to the place where they are needed in emergency.
- ▶ **Healthcare Equipment**
 - Track location & usage of expensive hardware.



Tokihiro Fukatsu (Japanese
pioneer)

TekWear, IntelliScout, MooCall

SCR

-individual cow management



I.O.T. / SENSORS

Wearable sensors:

- Identification
- Monitor movement
- Estrus cycles
- Healthy vitals, coughing
- Rumen function



Who to look for?

- SCR – health monitoring
- EmBediVet – tracking device under cows skin
- Ingenera – udder health sensors
- Moocall – Heat sensors and calving
- Afimilk – pedometer for cows
- Cow Manager
- Nedap

Also

- Labby – Hand held Milk SCC detection



Better data enables better control

End-to-end Visibility, Transparency and Traceability

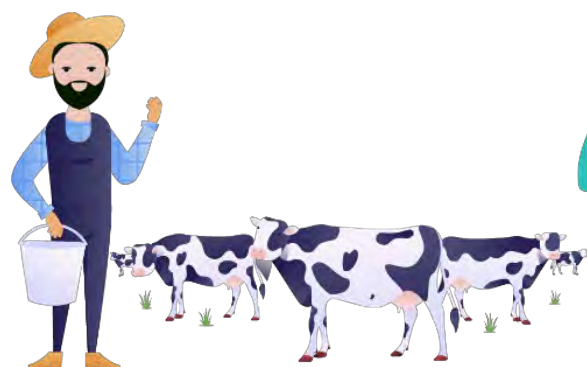
**Real-time herd
health
monitoring**

**Milk quality
management**

**Pathogen
detection**

**Milk yield
prediction**

**Supply chain
optimization**



Dairy
Farmers



Vets
group



Animal
nutrition



Animal
feed



Animal
genetics



Dairy
processing

Two Products Forms *work independently or seamlessly together*



SUCCESSFUL THROUGH PROVEN BOLUS MEASUREMENT.

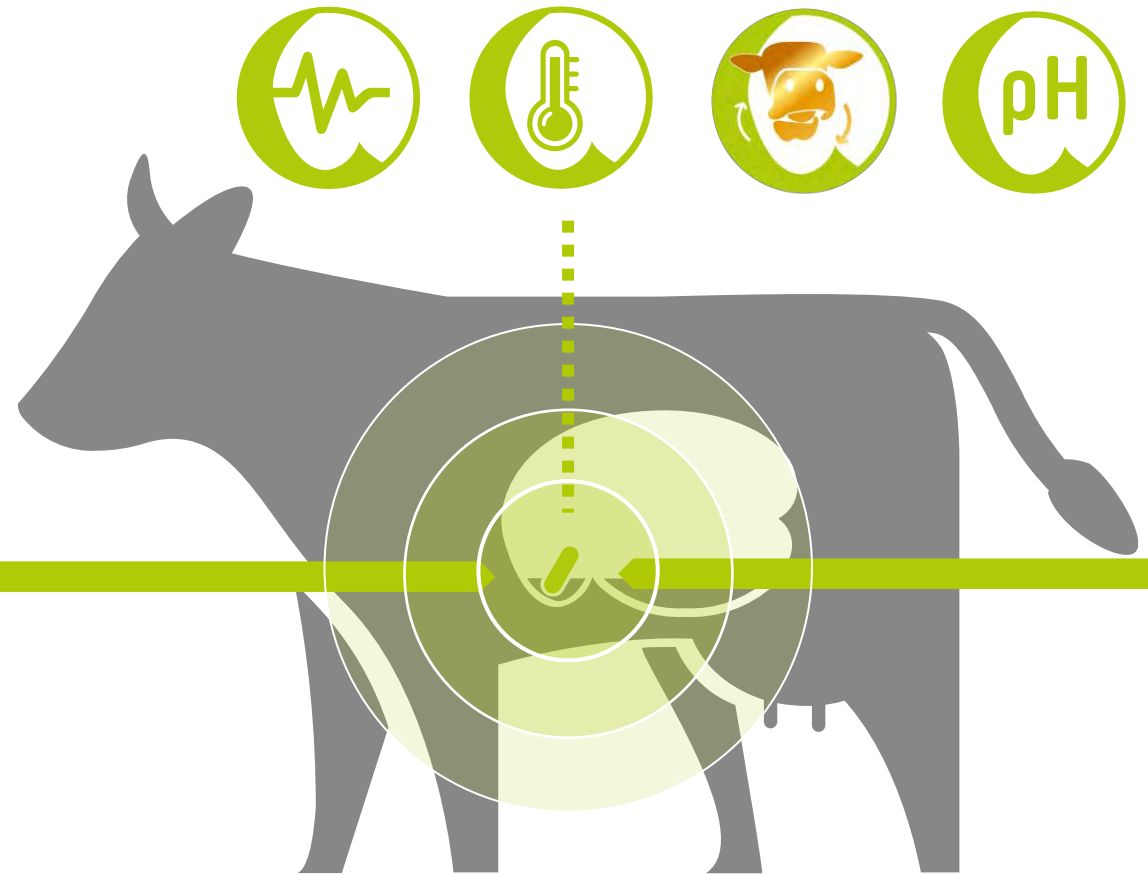
+ OPTIONAL
RUMEN pH

INNER BODY
TEMPERATURE

+ MOVEMENT ACTIVITY

+ RUMINATION with
smaXtec TruRumi™

The unrivalled precise*, robust and
reliable technology.



*see [Performance study Raumberg-Gumpenstein, 2020](#)



3) 3D Printers in hospitals



- ▶ Print equipment
- ▶ Print replacement parts
- ▶ Printing patient models for pre-operative surgeons to practice
- ▶ Print bones, teeth, implants, replacement limbs.



3D Printing Dairy



4) Augmented reality in hospitals







Computers can see spectrums of light that humans cannot.

e.g. Identifying pathogenic bacteria in the food chain

Food producers can use AR to layout planting options in a field, or demonstrate the impact fertilizer could have on a field.

Use of QR codes

- ▶ Hema (the supermarket) owned by Alibaba uses QR codes to allow consumers to watch content, videos of the provenance of the food on the shelf.



5) Virtual Reality in Hospitals





Who to look for?

- DeLaval virtual reality farms, 360 degrees
- “Haptic Cow” fiberglass model of the rear of a cow combining virtual reality with robotics

McDonald's launched its 'Follow our Foodsteps' campaign in (UK)

Consumers & food:



74%
want to know
more about
prod.

20%
can't explain
food prod.
Process

41%
have never
been on a
working farm

83%
never advised
about careers
in food/ag

60%
never
considered a
career in
food/ag

The Metaverse meets the Food Chain

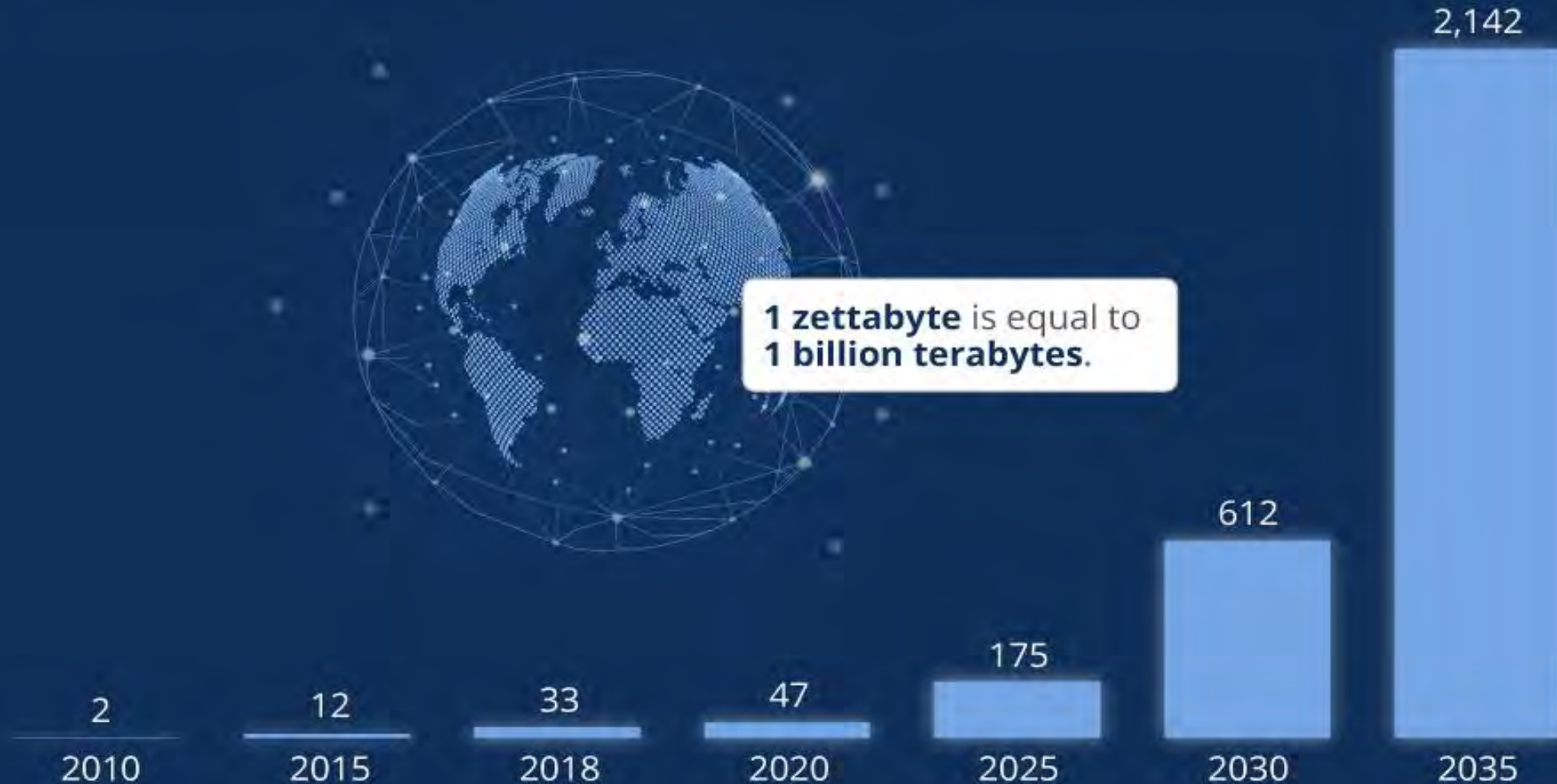
5 applications of extended reality in the food chain

- ▶ Enhanced Observation
- ▶ Origin & Provenience
- ▶ Operative Training
- ▶ Efficiency & Safety
- ▶ Consumer Experience



Global Data Creation is About to Explode

Actual and forecast amount of data created worldwide 2010-2035 (in zettabytes)



Is data the new oil?

Having more of it doesn't make you rich!





DAIRY ■ NEWS ■ MARKETS ■ PROFITS



The dashboard displays the current milk price at \$15.62, with a change of +\$0.01. Below the price is a table showing the price history for the current month, with columns for DATE, LAST, and CHANGE. The table shows a steady increase in price from February to July, with a slight dip in August and September.

DATE	LAST	CHANGE
Feb 2021	\$15.62	+\$0.01
Mar 2021	\$16.26	+\$0.20
Apr 2021	\$17.09	+\$0.18
May 2021	\$17.35	+\$0.12
Jun 2021	\$17.58	+\$0.16
Jul 2021	\$17.71	+\$0.10
Aug 2021	\$17.77	\$0.00
Sep 2021	\$17.77	-\$0.10
Oct 2021	\$17.88	\$0.00

COLOSTRUM QUALITY

The dashboard displays a list of news articles related to dairy farming. The articles are arranged in a vertical list, each with a small image and a headline. The headlines include topics such as managing hypothermia in calves, care for dairy farmers, ag groups' stance on U.S. trade, Biden's climate change strategy, and the Central Plains Dairy Expo.

- Vet shares tips for managing hypothermia in...**
February 16, 2021 Sub-zero temperatures across the U.S. have...
- Care Personally, Challenge Directly**
Taylor Leach February 15, 2021 Effective leaders have the ability t...
- Ag Groups Say Strong Chance U.S. Joins the Ne...**
Tina Morgan February 15, 2021 As President Biden focuses on COVID...
- Biden's climate change strategy looks to pay farm...**
Emma Newburger February 12, 2021 KEY POINTS: The Biden adm...
- Central Plains Dairy Expo Coming in Person to Sioux...**
January 25, 2021 The Central Plains Dairy Association (CPDA) board m...

Central Plains Dairy Expo

‘farms over 1000 cows are 5X more PROFITABLE’

REGIONAL PROFITS

NORTHWEST	
Herd Size	Profit/Cow
Under 250	\$171.93
250-1000	\$269.20
1000-5000	\$554.16
Above 5000	\$863.65

MIDWEST	
Herd Size	Profit/Cow
Under 250	\$105.89
250-1000	\$349.50
1000-5000	\$718.18
Above 5000	\$625.41

NORTHEAST	
Herd Size	Profit/Cow
Under 250	\$171.93
250-1000	\$269.20
1000-5000	\$554.16
Above 5000	\$863.65

SOUTHWEST	
Herd Size	Profit/Cow
Under 250	(\$20.42)
250-1000	\$281.34
1000-5000	\$515.41
Above 5000	\$508.12

SOUTHEAST	
Herd Size	Profit/Cow
Under 250	\$57.79
250-1000	\$222.35
1000-5000	\$596.19
Above 5000	\$663.03

7) Artificial Intelligence





AI is probably the most
important thing humanity
has ever worked on.

Sundar Pichai

CEO of Google

& its limitations



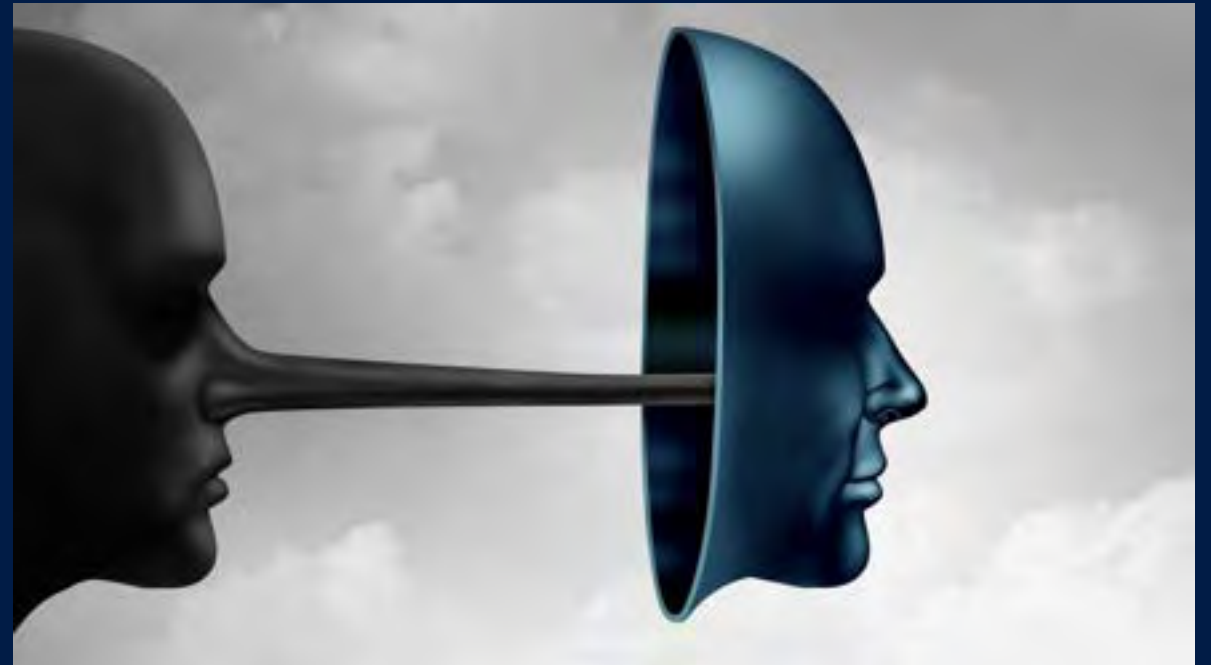
*‘Artificial intelligence is
NEITHER Intelligent NOR Artificial!’*

Seth Godin

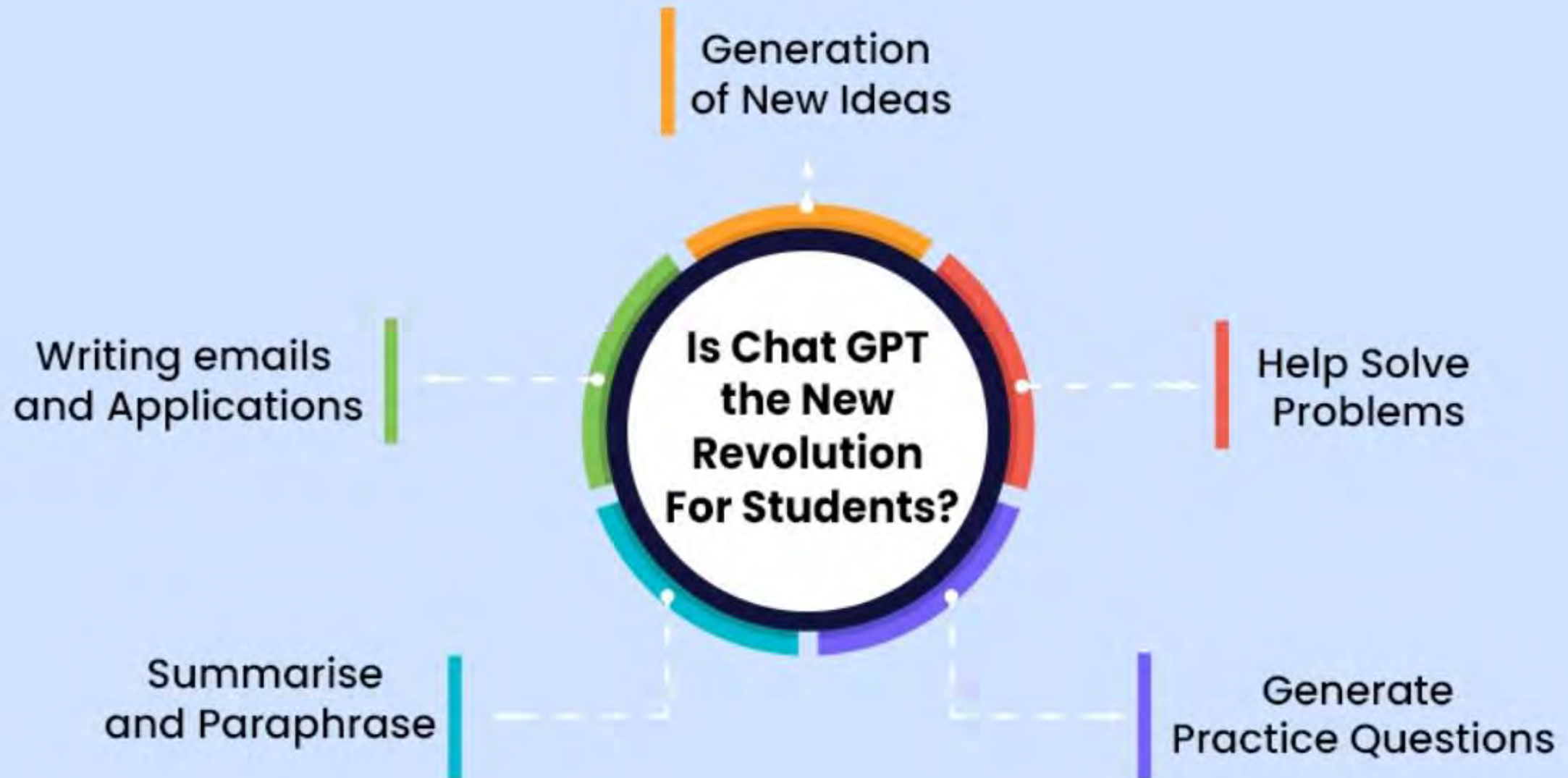


Is Artificial Intelligence really Intelligent?

- AI is an imprecise, misleading term.
- AI can sometimes fool humans, but it is not self-aware
- AI is highly prone to error & to making up results
- 'Hallucinations'.



Chat GPT



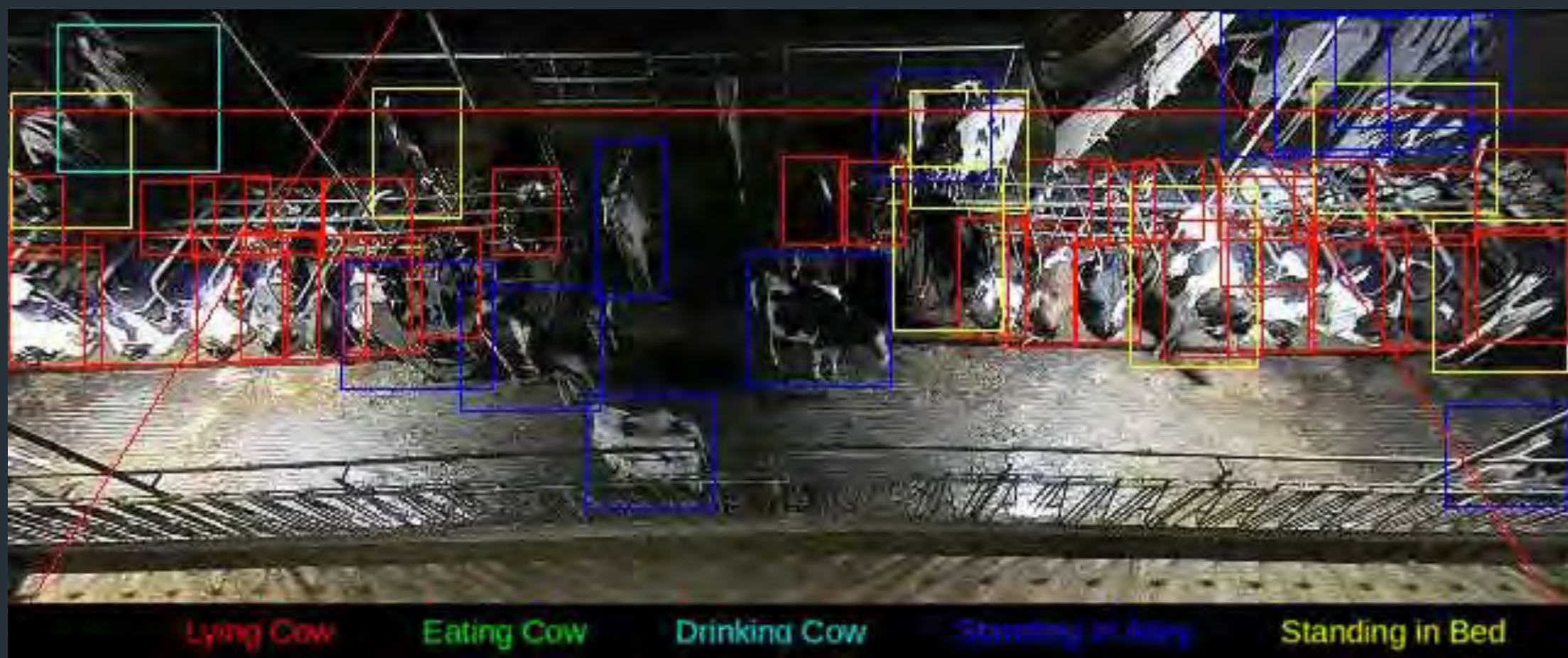
Simulating human intelligence & mimic actions

ARTIFICIAL INTELLIGENCE

- Constant monitoring herds
- Easily scalable, No hardware on the cows
- Monitoring staff – Milking, feeding
- Proactively find problems
- Eliminate human errors

Capture & analyze images from the barn





Poultry house



- Avoid bird flu contact

Feed mill



- Avoid contamination of feed

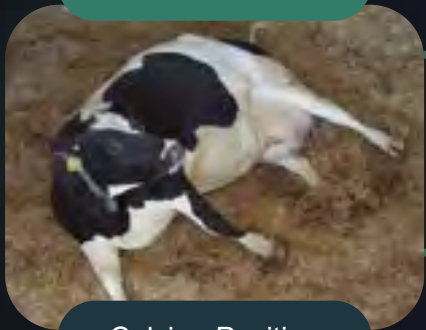
Dairy house



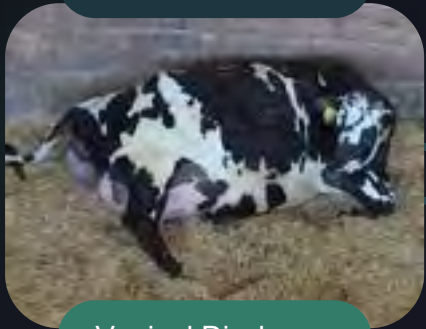
- Avoid bird flu contact
- Save feed cost



Tail Raising



Calving Position



Vaginal Discharge

Calving AI



The Maternity Warden monitors calving symptoms over time and alerts workers once a critical threshold is reached.

Latest labor events:

01:57 PM

02:11 PM

02:13 PM



Good Alert

Did not check

False positive



Fast Maternity Warden Payback

Unquantified benefits:

- Farms already pay labor to watch maternity, at large farms, these are full time positions
- If the calf dies, so does the farm's genetic investment.

Average US Dairy Farm

2-10%

Stillbirths

4-11%

Exits <60 DIM



Less Stillbirths

Calf deaths up to 48 hours after birth. Caused by dystocia, malformations, accidents, or acts of God.



Easier Calvings

Abnormal or difficult birth at any stage in labor results in direct negative effect to dam (leads to culling) and calf (leads to stillbirths)



Less Exits <60 DIM

~7% of exits occur within the first 60 days in milk. Leading causes are dystocia, resulting in metritis and failure to breed back.

SUCCESSFUL THROUGH PROVEN BOLUS MEASUREMENT.

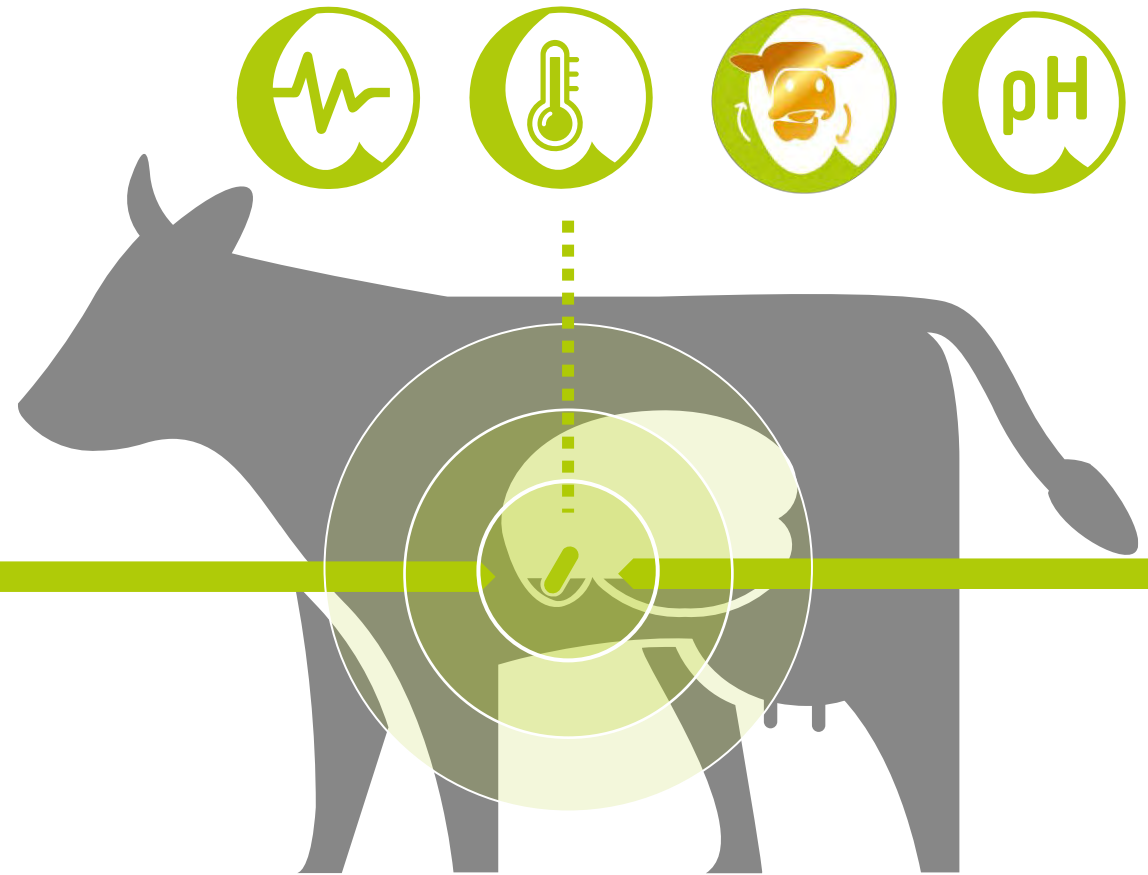
+ OPTIONAL
RUMEN pH

INNER BODY
TEMPERATURE

+ MOVEMENT ACTIVITY

+ RUMINATION with
smaXtec TruRumi™

The unrivalled precise*, robust and
reliable technology.



*see [Performance study Raumberg-Gumpenstein, 2020](#)



OVERVIEW

ITEMS

EVENTS

TESTDAYS

LACTATIONS

DAILY MILK

PEN CHANGES

PEDIGREE

PARTNERS

View

LAST 24HS

LAST 7 DAYS

LAST 30 DAYS

Need Help? [Learn More About SmaXtec](#)

Integrated with **smaXtec**

Premium smaXtec bolus provides three types of data: pH, temperature, and activity

2

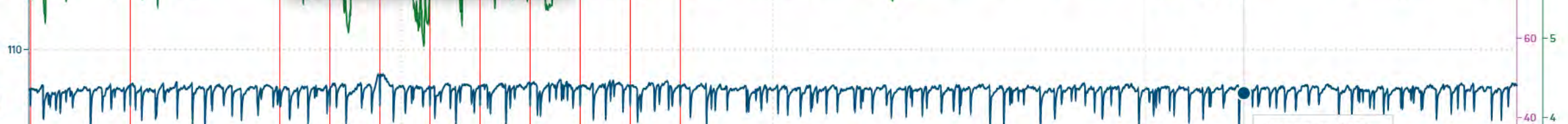


05/22/19 07:00 PM sk of acidosis
05/22/19 07:00 PM crease in average pH
05/22/19 07:00 PM ed efficiency

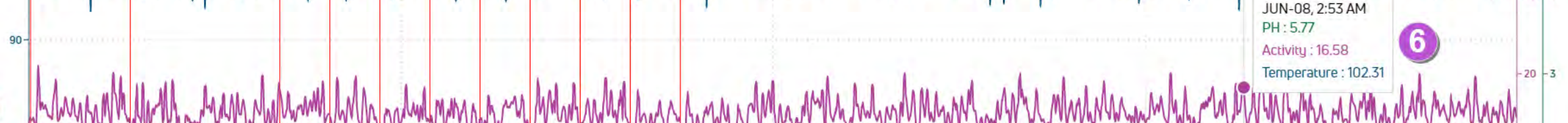
3



4



5



JUN-08, 2:53 AM
PH : 5.77
Activity : 16.58
Temperature : 102.31

6

■ TEMPERATURE ■ ACTIVITY ■ PH

SMART FARMS & DIGITAL DISHES: 40 EXPERTS FORECAST AI'S IMPACT ON FOOD & FARMING



Aaron Beydoun



Adrian Percy



AJ Shelman



Anthony Howcraft



Ashley Sweeting



Bonnie Brayton



Claudia Roessler



Damien McLoughlin



David Hunt



Dean Cavey



Ed Eggers



Einar Knudsen



Galina Sutovskaya



Haven Baker



Jack Bobo



Jason Lusk



Jean-Martin Bauer



Joe Jennings



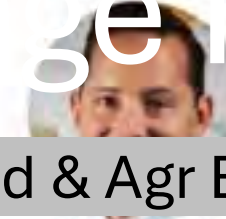
João Ribeiro da Costa



John Foltz



John Herlihy



Jonah Kolb



Jose Tomas



Joseph Byrum



Julia Somerdin



Kevin Gohil



Marcos Fava Neves



Mary Shelman



Naira Hovakimyan



Pia Brantgarde



Rahul Mehendale



Rob Dongoski



Robert Wolcott



Rory McInerney



Shail Khiyara



Shari Rogge-Fidler



Shoumen Palit



Sylvain Charlebois



Tim Hassinger



Wolfram Schlenker

How will AI change food

Contrasting the AI experts with Food & Agr Experts



Aaron Beydoun



Adrian Percy



AJ Shelman



Anthony Howcraft



Ashley Sweeting



Bonnie Brayton



Claudia Roessler



Damien McLoughlin



David Hunt



Dean Cavey



Ed Eggers



Ejnar Knudsen



Hadar Sutovsky



Haven Baker



Jack Bobo



Jason Lusk

AI EXPERTS V FOOD & AGRI EXPERTS

How do their predictions of the future vary?



Jean-Martin Bauer



Joe Jennings



João Ribeiro da Costa



John Foltz



John Herlihy



Jonah Kolb



Jose Tomas



Joseph Byrum



Julia Somerdin



Kevin Gohil



Marcos Fava Neves



Mary Shelman



Naira Hovakimyan



Pia Brantgarde



Rahul Mehendale



Rob Dongoski



Robert Wolcott



Rory McInerney



Shail Khiyara



Shari Rogge-Fidler



Shoumen Palit



Sylvain Charlebois



Tim Hassinger



Wolfram Schlenker

We created a virtual panel



Dairy Farmer, Row Crop Farmer, Midwest CoOp retailer, Major Grain Trader, Feed company, Food company
Business Professor & Agtech startup.

‘DRIVE’

Data First (Fix your data)

Run Purposeful Pilots

Insiders Preferred (not consultants)

VIPs must follow the rules (esp. Boss)

Execute Now (JDI!)

TAKE HOMES?

- 1) Download ChatGPT today
- 2) Ideally, pay for the better version
- 3) Practice learning how to develop Prompts

Jobs of the future are not about.. Your college – Who your parents are – Your IQ. They are about who can harness the power of AI. LEARN IT NOW

Better?

- ▶ Doctors
- ▶ Nurses
- ▶ Carers
- ▶ Homecare



What have we learned from healthcare?

- ▶ **Be customer-centric?**
 - don't make our solution answer no real questions
- ▶ **What outcome do we want?**
 - don't try to change their problem to fit with us
- ▶ **Cost-effective**
 - don't fall in love with the tech



Digital disruption of Dairy
Transforming milk production through innovation & technology.

Aidan J. Connolly,
President, AgriTech Capital LLC
Author, Contributor Forbes

Cow centric



**The survivors in
farming will be the
ones who adopt
technology fastest.**



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