DIGITAL TECHNOLOGIES FOR IMPROVING PRODUCTIVITY IN FOOD MANUFACTURING

April 2, 2019 (9:30-14:30)

Hosted by,

CENTRE FOR SMART
SUSTAINABLE MANUFACTURING AND RECYCLING TECHNOLOGIES

Internet of Food Things Network Plus

Centre for Sustainable Manufacturing and Recycling Technologies (SMART)

- Established in 2004
- Part of the Wolfson School of Mechanical, Electrical and Manufacturing Engineering based at Loughborough University, UK
- Five areas of research:
  - Remanufacturing & Recycling
  - Servitization and Lowsumerism
  - Sustainable Design
  - Resource Efficiency
  - Eco-Intelligent Smart Manufacturing

http://www.centreforsmart.co.uk/

Internet of Food Things Network Plus

Investigating how AI, data analytics and emerging technologies can enhance and add values to the digitalisation of the UK food production chain

- Interdisciplinary network offering workshops, pilot project funding and an annual conference
- EPSRC-funded: May 2018 – April 2021
- Led by the University of Lincoln
  - with universities of Southampton, Exeter, East Anglia, and the Open University
- https://www.foodchain.ac.uk/
- @IoFTnetworkplus

- Creating a **”data trust”** to address the complexity of the digital **food supply chain**
- Developing a **test bed** to support our projects’ use of data, AI, IoT, robotics, logistics…
- Publishing thought leadership white papers on: **tech, data-sharing and new biz models**

SMART Real-time Resource-efficient Production

David May
Senior Project Manager
Lincoln Institute of Agri-Food Technology

Mathew Simpson
Area Sales Manager – UK & Ireland
CSB-System

Internet of Food Things Network Plus

An EPSRC Network Plus

https://foodchain.ac.uk/

May 2018 – May 2021

Challenges in Food and Drink Manufacturing

David May, Lincoln Institute for Agri-food Technology (LIAT)
University of Lincoln

Loughborough University London

2 April 2019

UEA University of East Anglia · University of Southampton · University of Lincoln · The Open University · University of Exeter · EPSRC Engineering and Physical Sciences Research Council · Research Councils UK Digital Economy Transforming Business and Society

UNIVERSITY OF LINCOLN
AGRI-FOOD TECHNOLOGY

Computer Science

Engineering

Geography

UNIVERSITY OF LINCOLN
AGRI-FOOD TECHNOLOGY

Chemistry

Life Sciences

Maths/Physics

NCFM

IoFT overview

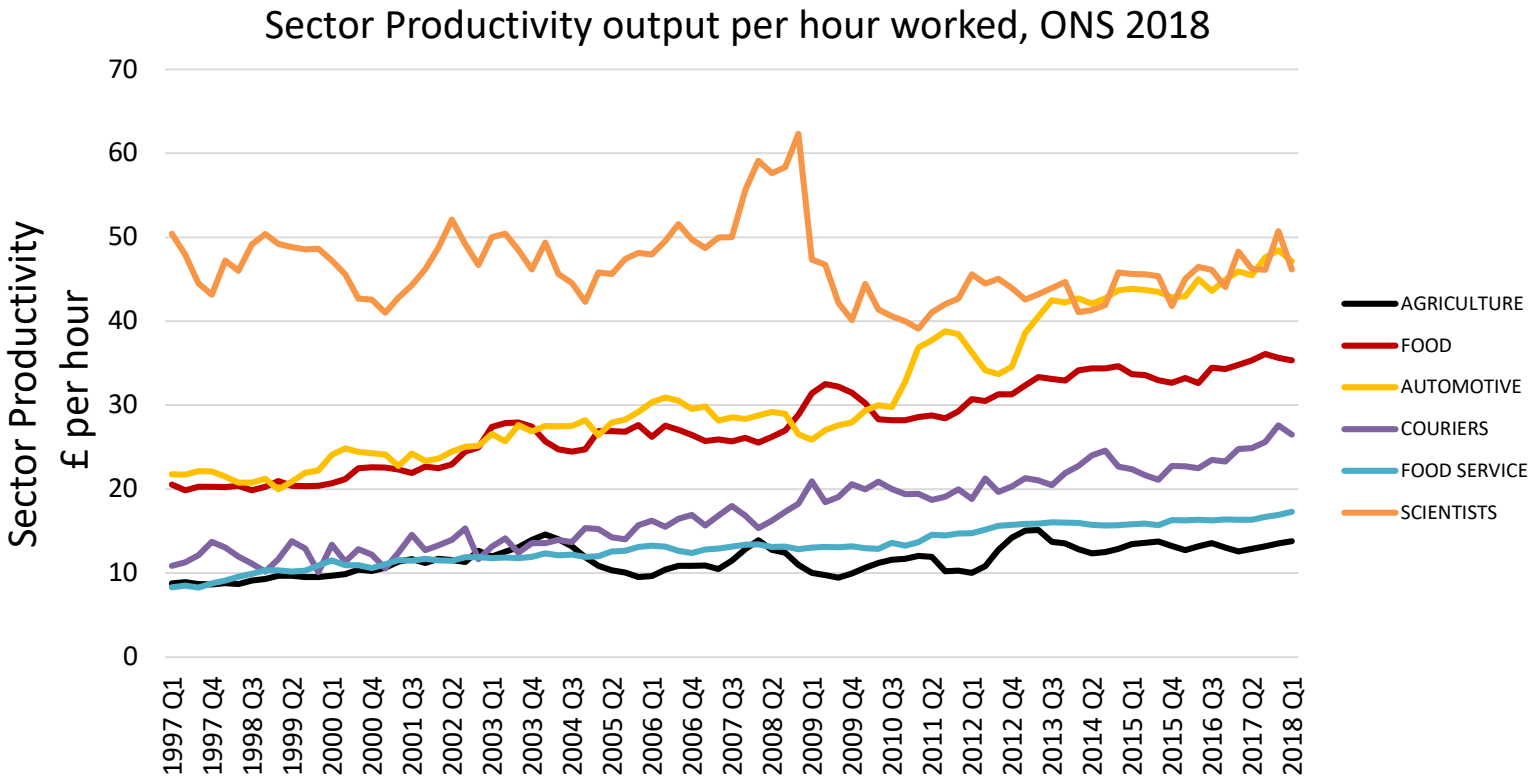
The Internet of Food Things Network Plus

Investigating how artificial intelligence, data analytics and emerging technologies can enhance and add values to the digitalisation of the UK food production chain

- Led by the University of Lincoln
  - in partnership with universities of Southampton, Exeter, University of East Anglia, and the Open University
- Unites: agri-tech, data and computer scientists, chemists, economists, and more…

- Professor Simon Pearson, University of Lincoln (Principal Investigator)
- Professor Jeremy Frey, University of Southampton
- Professor Roger Maull, University of Surrey
- Professor Gerard Parr, University of East Anglia
- Professor Andrea Zisman, The Open University
- Professor Luc Bidaut, University of Lincoln

The need ….


Sector Productivity output per hour worked, ONS 2018
Sector Productivity £ per hour
70
60
50
40
30
20
10
0
1997 Q1
1997 Q4
1998 Q3
1999 Q2
2000 Q1
2000 Q4
2001 Q3
2002 Q2
2003 Q1
2003 Q4
2004 Q3
2005 Q2
2006 Q1
2006 Q4
2007 Q3
2008 Q2
2009 Q1
2009 Q4
2010 Q3
2011 Q2
2012 Q1
2012 Q4
2013 Q3
2014 Q2
2015 Q1
2015 Q4
2016 Q3
2017 Q2
2018 Q1
AGRICULTURE
FOOD
AUTOMOTIVE
COURIERS
FOOD SERVICE
SCIENTISTS

How is technology making food processing and manufacturing smarter?

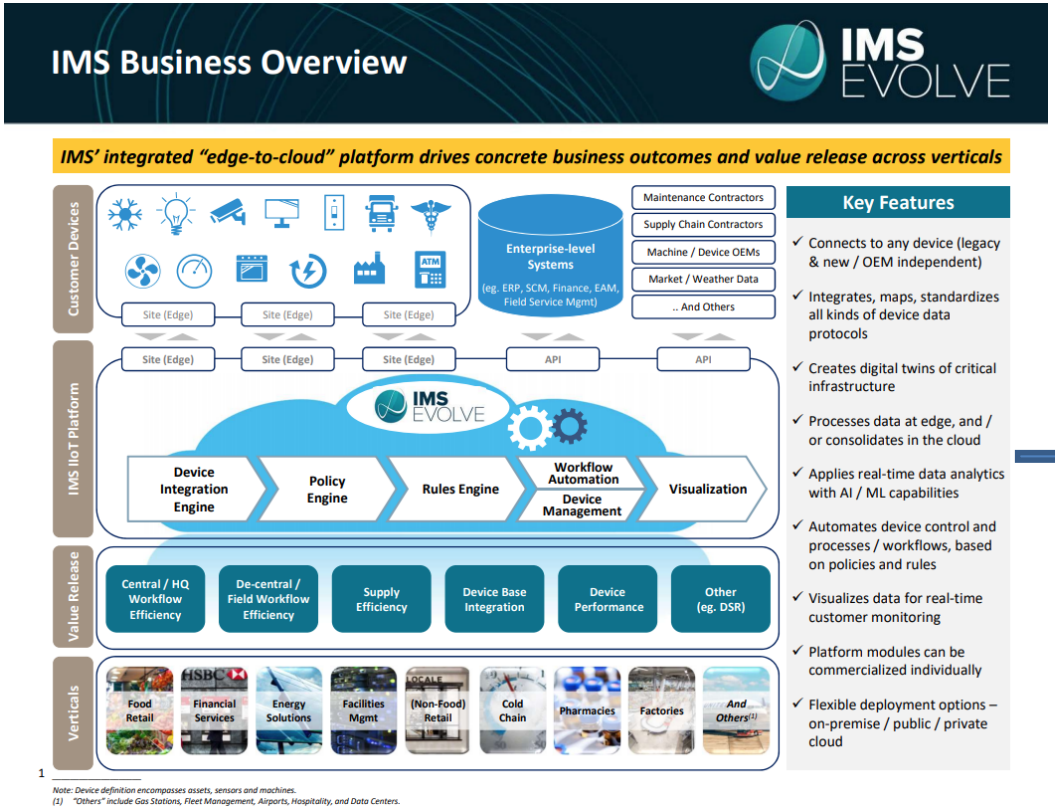
Made Smarter Review

VALUE AT STAKE FOR THE FOOD AND DRINK INDUSTRY IS ESTIMATED TO BE £55.8BN BETWEEN 2017-2027

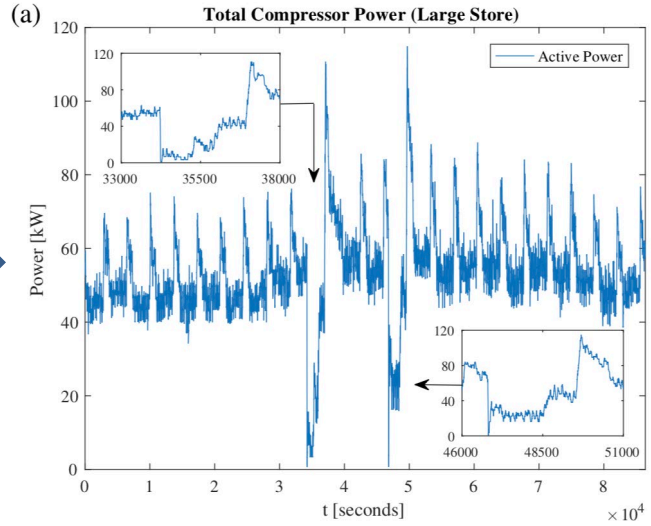
VALUE LEVER DESCRIPTION	VALUE TO INDUSTRY (£ BN)	VALUE TO INDIVIDUALS	VALUE TO SOCIETY
Revenue growth through new revenue streams	£3.2	• £2,266 saving per household due to improved waste management • 25% increase in product satisfaction related to customisation of products	• 32 million tCO_2e reduction throughout the food supply chain in 2027[1], due to more efficient production processes and reduction of waste. This represents a 29% reduction in overall food emissions in the UK • 17.6 mn tonnes of food waste reduced over the next decade • An estimated 27,370 injuries avoided over the next decade from implementation of digital technologies • Potential to reduce the number of food poisoning cases by up to 4.5m through better traceability in the supply chain and monitoring of shelf life
Cost reduction through digitally enabled R&D	£0.5		
Cost reduction through digitally enabled manufacturing and asset maintenance	£13.2		
Cost reduction through digitally enabled supply chain management	£1.1		
Cost reduction through automation of labour	£24.7		
Cost reduction due to increase in resource efficiency	£13.2		
Total value to industry	£3.2 — £55.8		

1) Reduction of emissions is not presented as a cumulative figure, rather as the reduction saving potential in 2027

How can technology improve resource efficiency and reduce food waste?



Food refrigeration and IoT



Blockchain as a unifying platform?

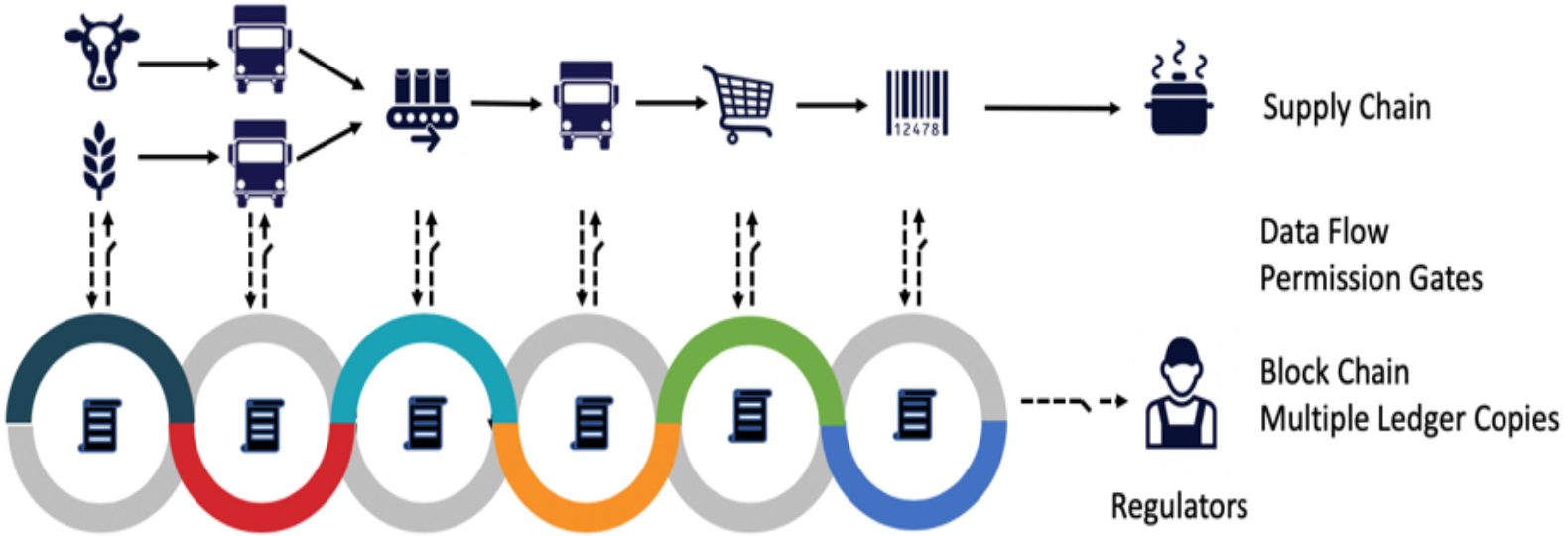
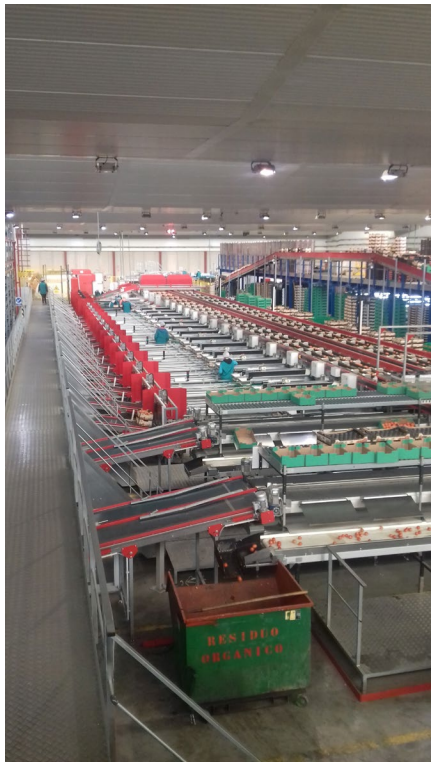


Fig. 1. A schematic diagram demonstrating the flow of data within a food supply chain connected by distributed ledger technology

Are Distributed Ledger Technologies the panacea for food traceability? Simon Pearson, , David May , Georgios Leontidis , Mark Swainson , Steve Brewer , Luc Bidaut , Jeremy G. Frey , Gerard Parr , Roger Maull , Andrea Zisman. Global Food Security Volume 20, March 2019, Pages 145-149

IoT and Tracking

- Internet of Things: “gives the opportunity for devices to communicate not only within close silos but across different networking types and creates a much more connected world.” Caroline Gorski, the head of IoT at Digital Catapult
  - Temperature control is critical to optimising shelf life and so reducing food waste
  - Data can be collected from devices via Wireless Sensor Networks, wired sensors, RFID, infra-red, data loggers etc.
  - Challenges: mobile coverage, costs, compatibility, legal, data sharing



Robotics

- Robotics appearing at all stages from field, to factory, to kitchen
- Robotic devices range from large scale to small
- Cost implications for business transformation
- Capital expenditure v. service models: new biz models = opportunities
- Robotics draws on other new tech: visualization, AI/ML, 3D printing…

The Role of Data Sharing?

- Industry 4.0: flexible multi-scale approach for food and drink
- Digitalisation: data, data science and cyber-security
- Linking to other data: satellite/weather, crop, health, economic
- Agri-food tech also linked to other globally important challenges such as land and water use, climate change, and health and well-being

Food is digitising…
To keep in touch….
please join…….

Internet of Food Things
Network Plus

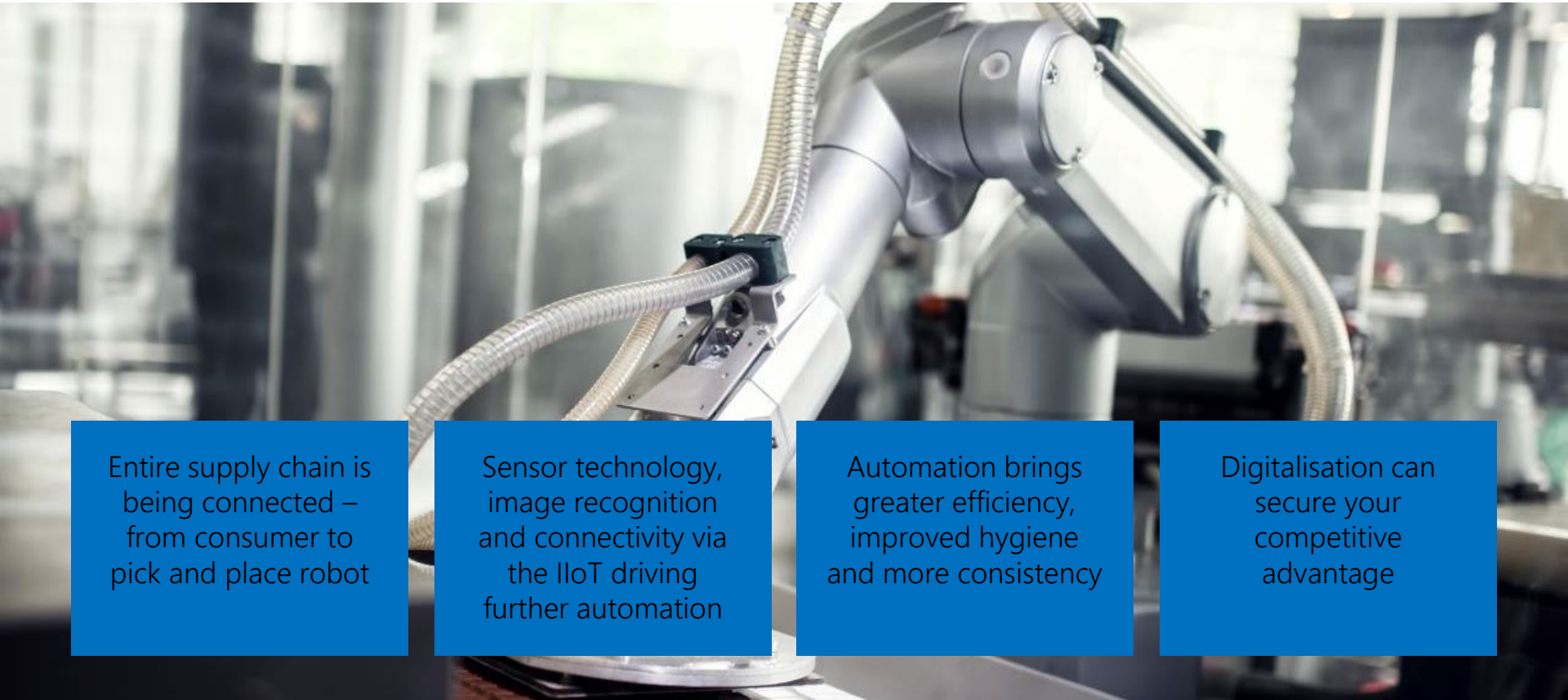
Smarten up Your Factory

Modules for the Smart Food Factory

Mathew Simpson – CSB-System

The Smart Food Factory is already developing step by step and progress is accelerating.

CSB-System



Entire supply chain is being connected – from consumer to pick and place robot

Sensor technology, image recognition and connectivity via the IIoT driving further automation

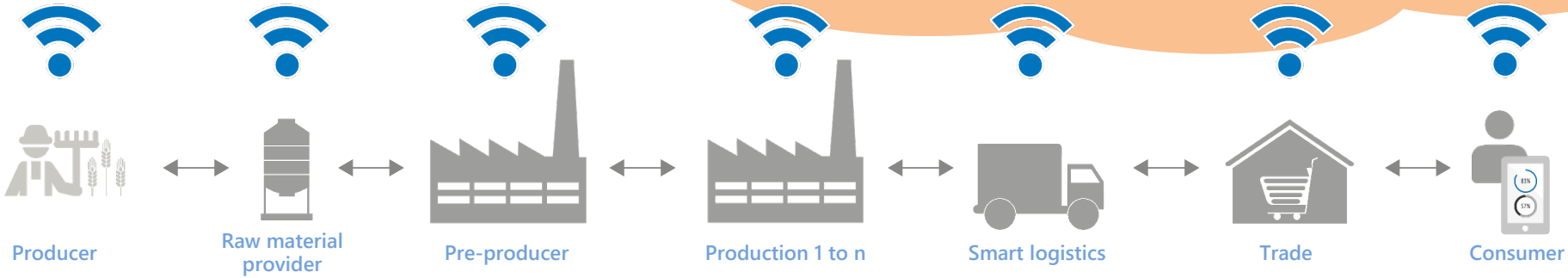
Automation brings greater efficiency, improved hygiene and more consistency

Digitalisation can secure your competitive advantage

In the Smart Food Factory, information will flow up and down the supply chain much faster.

- Orders placed by smartphone can be directly received into the retailer or manufacturer's ERP system
  - Production demand can be generated before retailer stock is even consumed

- Production lines can be controlled by the ERP software and machines can report their own service needs
  - Finished products can be automatically booked and entered into the ERP system



In the Smart Food Factory double work is eliminated and supply is more accurately matched to demand

The technologies already exist to build your Smart Food Factory today…

- EDI for sales orders entry to significantly reduce manual entry and keying errors.

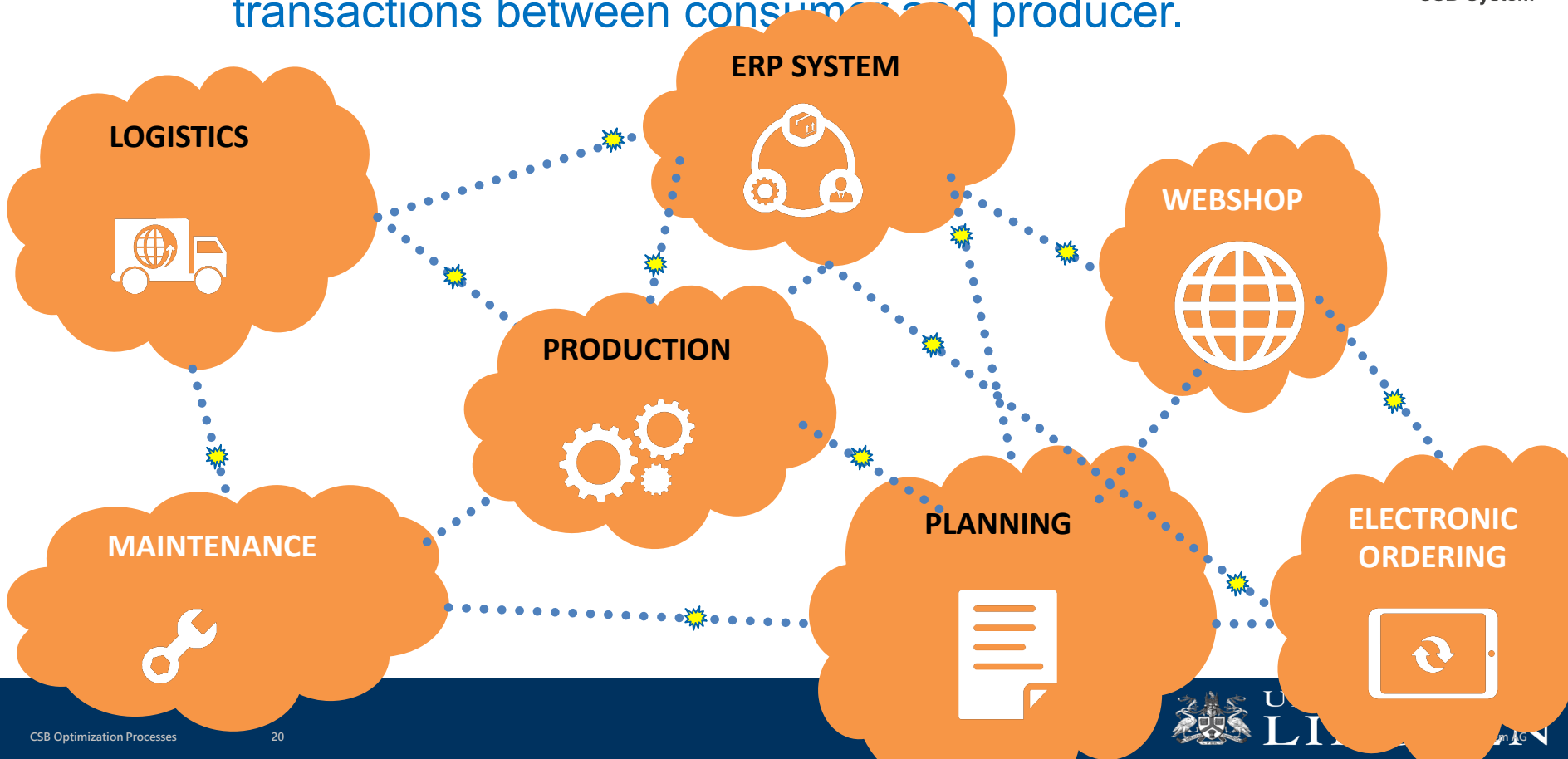
- Connect your scales to your ERP system. Directly confirm and record weights to the system via interfaced scales.

- Invest in vision systems to check seals or distinguish between good and bad products.

- Integrate your planning system. Planning is half the battle. Wastage, errors and stress are reduce with better planning.

- Install automatic temperature loggers and capture the data directly.

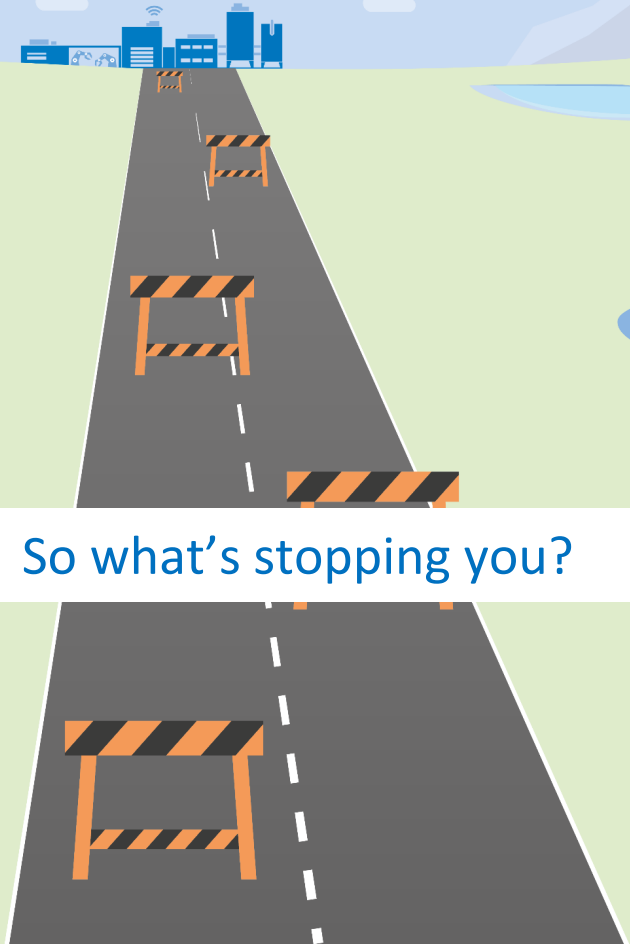
The nervous system of the Smart Food Factory is the ERP system. It connects the shop floor & the top floor and manages transactions between consumer and producer.



Biggest Obstacles to Digitisation:

3.07	Legal uncertainty
3.22	Missing norms and standards
3.24	Insufficient IT security
3.36	Missing digital infrastructure (broadband expansion)
3.41	Missing contacts to digital service providers (suppliers)
3.59	Missing knowledge about the purchasing behavior of consumers
3.64	Capital / other resources
3.77	Interfaces to customers and suppliers
4.02	Missing knowledge of the technical possibilities
4.10	Missing competences of your employees

(CSB Digitisation Survey, 2018)



So what's stopping you?

A real smart food factory: EDEKA Südwest Fleisch in Rheinstetten is the largest and most advanced meat processing plant of Germany's biggest supermarket group.

CSB-System

Start of operations in July 2011

Turnover 635 million €

Annual tonnage 125,000 tons

Customer base approx. 1300

Sales items approx. 2500

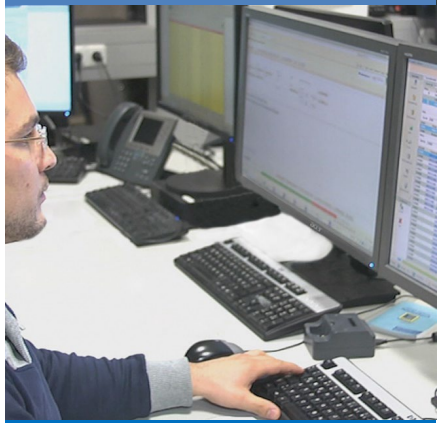
Employees approx. 800

EDEKA relies on food specialist ERP software for planning, controlling and optimizing all resources at the facility in Rheinstetten.

CSB-System

Highlights of the solution

Control centers



Perfect interplay of ERP & MES: Two CSB control stations permanently monitor 800 individual processes

Grading

Fully automatic no-contact & absolutely hygienic grading of pork sides in Receiving

Planning

Best-practice cutting & production planning for more than 20 lines

Inventory

Automated management & control of inventory technology, weigh labeling & picking

UNIVERSITY OF LINCOLN

ProMessa: same production space, same staff, double output – Smart Food Factory.

CSB-System

Sales volume
> 70 million €

>175 employees

> 400
sku's

1,000
stores per day
6 days a week

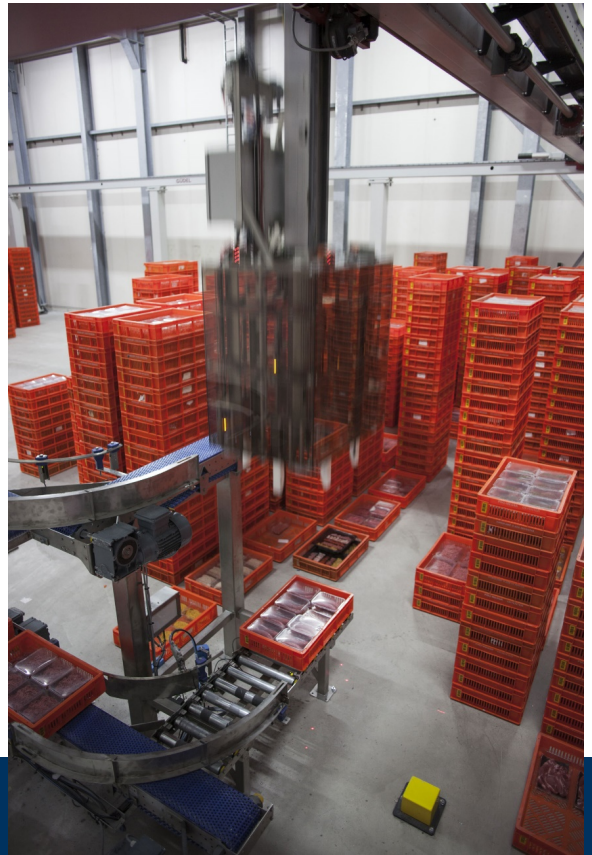
Deventer
Netherlands

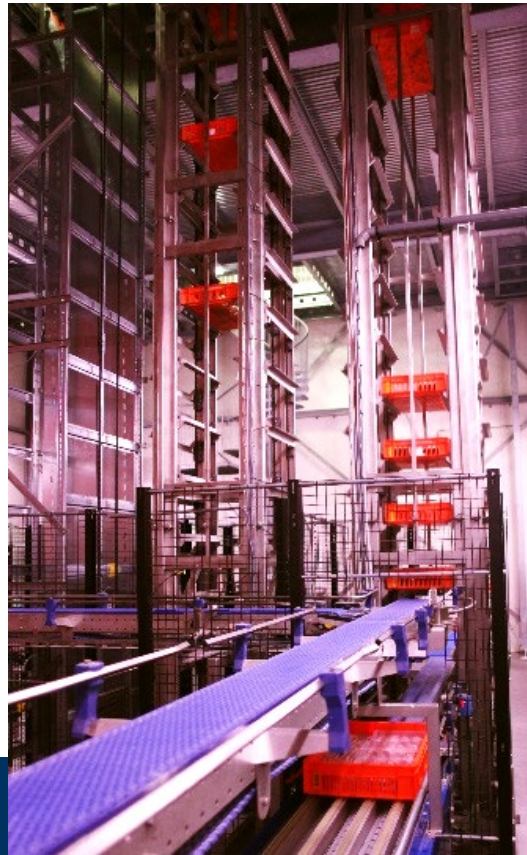
Automated buffer storage warehouses allow de-coupling of production and labelling.

CSB-System

Fully automated inventory:

- Small quantity items in traditional single storage position high-bay storage
- Fast moving products are stored at the fast mover warehouse / portal gantry warehouse
- Automatic stock removal towards 4 WPL lines





ProMesssa applies the label at the last minute and can deliver a single SKU to a single store.

- 4 WPL lines with connected goods-to-person picking sorters
- Production and storage are based on forecasts, without order reference
- Customer-specific labeling only during picking

Advantages:

- Optimized batch sizes in production
- Low logistics costs per unit
- Reduced storage quantities, reduced shortages

Digital Technologies for Better Food Processing

Mathew Simpson

mathew.simpson@csb.com

Tel. +44 (0)20 3151 0414

CSB-System AG
An Fürthenrode 9-15
52511 Geilenkirchen
Germany

Telephone: +49 2451 625-350
E-Mail: info@csb.com
www.csb.com

Digitalised Tools to Build a Resilient and Productive Food Supply Chain

John Titmuss
Director
Inflexion Point

Keston Williams
Technical Director
Barfoots Limited

John Titmuss

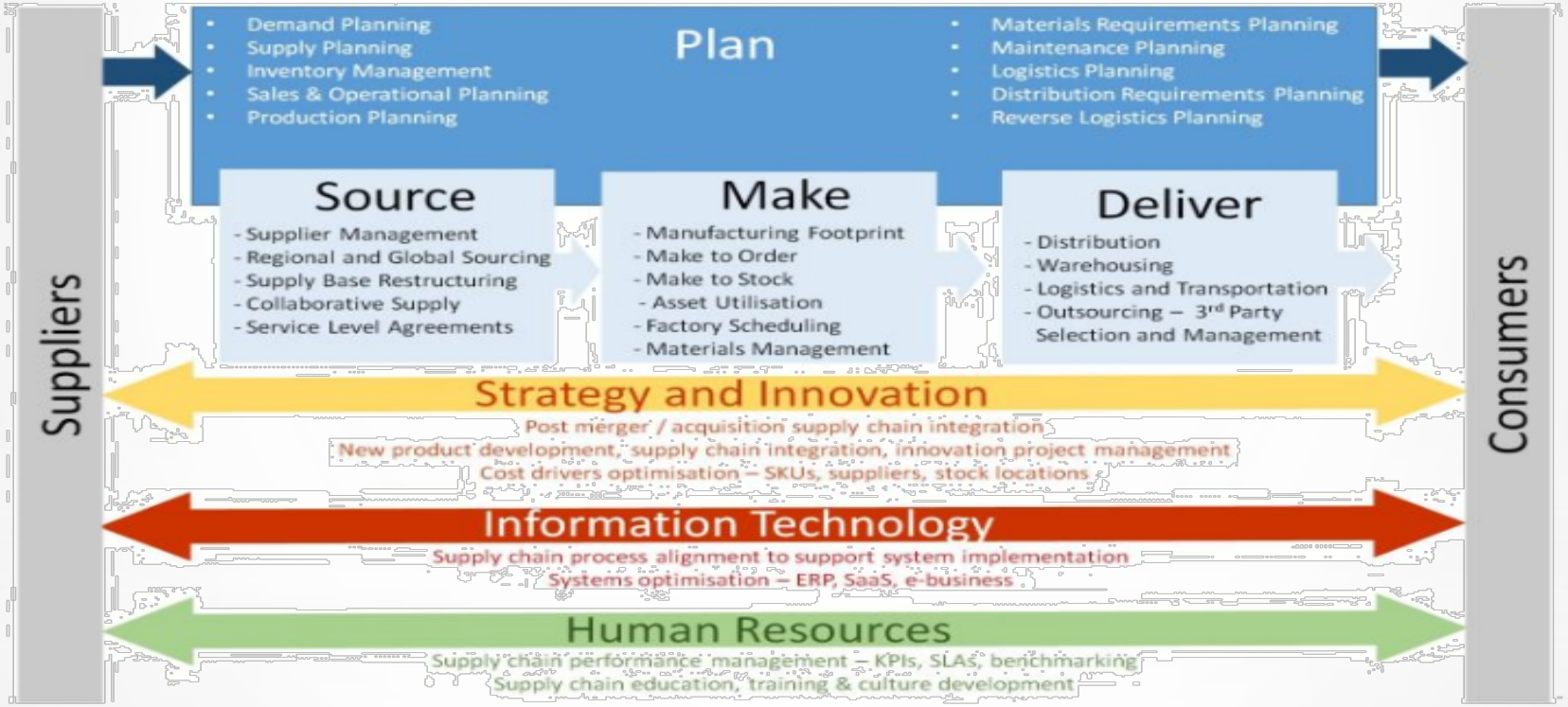
www.linkedin.com/in/john-titmuss

johntitmuss@inflexionpoint.co.uk

Food & The Digital Supply Chain

- *The connected supply chain*
- *An example of ‘digital’ in practice.*
- *Policy considerations*

The Connected Supply Chain



Inflexion Point

An Example


MANAGED SUPPLIER NETWORK
SPEND ANALYTICS
CATEGORY MANAGEMENT
SUPPLIER MANAGEMENT
SOURCING
CONTRACTS
EPROCUREMENT
INVOICING
INVENTORY MANAGEMENT
SUPPLY CHAIN COLLABORATION
QUALITY MANAGEMENT
JAGGAER ONE
THIRD PARTY APPLICATIONS

Policy Considerations

- ❑ Knowledge
- ❑ Strategy Development
- ❑ Training & Tailored Support
- ❑ Funding
- ❑ Setting the environment

www.madesmarter.uk
www.gov.uk/government/collections/business-basics-programme

John Titmuss

www.linkedin.com/in/john-titmuss

johntitmuss@inflexionpoint.co.uk

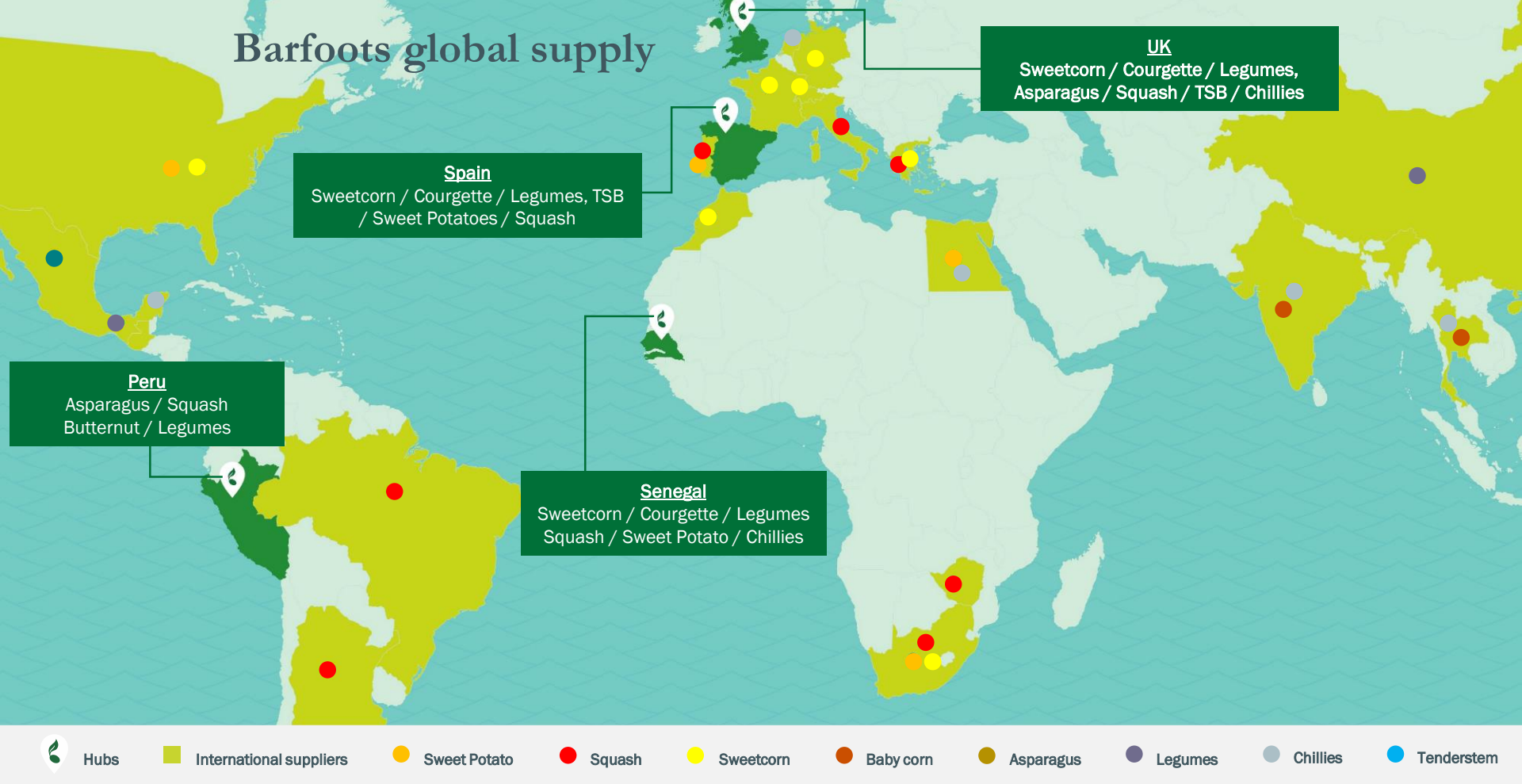
Food & Drink Sector Council-
Innovation Working Group

Keston Williams

Technical Director, Barfoots

FDSC
The Food and Drink Sector Council

Barfoots global supply



Products

Asparagus

Baby Corn

Beans

Chillies & Chilli Plants

Courgette

Peas

Rhubarb

Squash & Pumpkins

Sweetcorn

Sweet Potatoes

Tenderste m®

Prepared

FDSC
The Food and Drink Sector Council

The Food and Drink Sector Council

Purpose

- To act as the Sector Council representing the farm-to-fork food chain in partnership with Government

Objective

- To improve the productivity and sustainability of the industry

Ways of working

- Providing a mechanism to develop industry-led solutions
- Strengthening partnerships between UK Government and industry
- Engaging relevant Government departments and organisations

FDSC
The Food and Drink Sector Council

7 Work Streams

- Innovation Working Group
- Agriculture Productivity
- Nutrition
- Workforce & Skills
- Logistics
- Packaging & Waste
- Exports (& Imports)

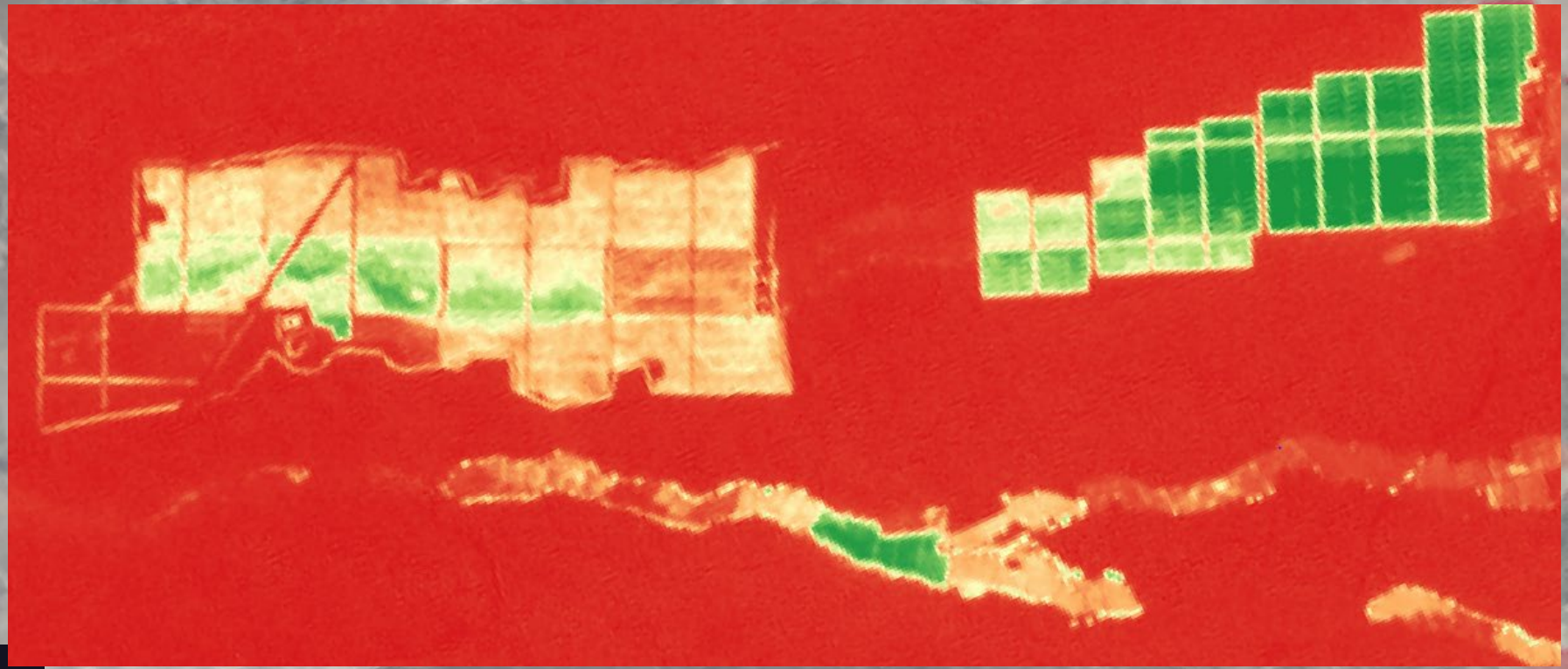
FDSC
The Food and Drink Sector Council

The Role of the Innovation Working Group

What we have done to date…

The Big Idea

FDSC
The Food and Drink Sector Council



FDSC
The Food and Drink Sector Council

Innovation
Working Group

Keston Williams

Keston.Williams@Barfoots.co.uk
Tel: 07725 422952
@Williams_keston

FDSC
The Food and Drink Sector Council

Digitalised Technologies to Serve and Retain Consumers

David Sprent
Global Supply Chain Executive

Marc Jansen
Data Scientist
Gousto

Digital Technologies to Improve Productivity in Food Production

David Sprent

2nd April 2019

Supply Chain Challenges

- Greater Focus on Value Chain
- Fragmentation of customers and new channels
- Proliferation of Products
- Scrutinization of Supply
- Sustainability and reduction of waste

Online Shopping

Supply Chain Design Criteria

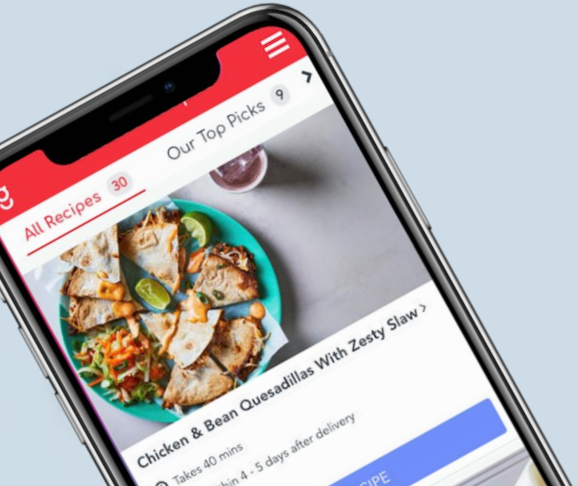
- Customer Focused/Demand Driven
- Collaboration across the Value chain
- Development of Talent in “Digital”
- Greater use of Analytics and Information
- Balancing Local focus and Global scale

Digital Technology Opportunities

- Machine Learning capability to analyse customer data to define, design and operate a segmented supply chain
- Advanced analytics to understand and automate demand sensing for improved supply chain agility
- Use of Sensors(IoT) to collect data to optimise and automate processes(eg traceability, temperature, tracking)

gousto

Good food all round



Fueling family life through good food with zero waste

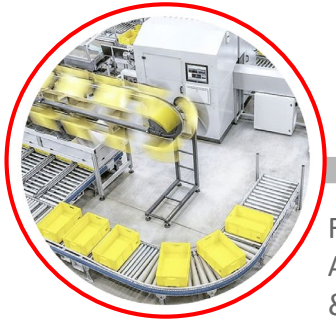
Simple model, zero food waste by design

- You pick your recipes from our menu
- We deliver a box of wholesome ingredients in exact proportions with step-by-step recipe cards
- No planning, no supermarkets, no waste

Leading proposition

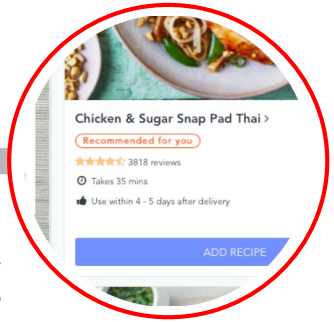
- Most choice (40 recipes per week)
- Most delivery options
- From £2.98 per portion

Gousto has a unique AI position



Forecasting,
Automation
& Optimisation

Personalisation &
Recommendations



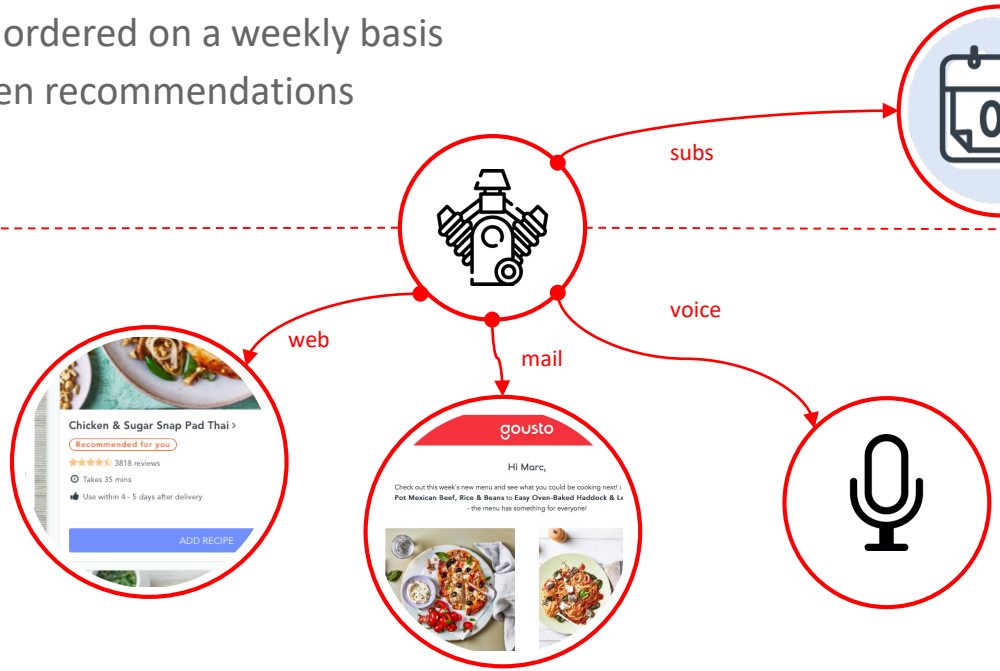
Most choice (40+ recipes)

+

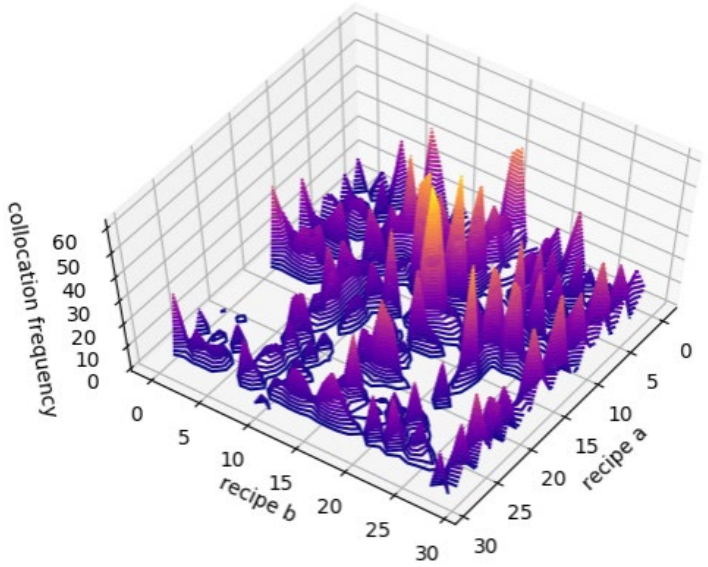
Every customer sees their own,
personalised menu

Shifting demand through personalisation

- >40% of recipes ordered on a weekly basis follow data-driven recommendations



Supercharing material flow with demand patterns



- Leveraging consistent customer order patterns helps streamline slotting and routing in our fulfilment centre
- Shorter paths mean higher throughput: +90% in 18 months through AI alone

Marc Jansen
Data Scientist

@marcchristiaan

Good food all round

Briefing Document

* Completed and distributed to all attendees in June. For questions or comments regarding the event or the briefing document please contact either of the coordinating organizations.

Centre for SMART
Wolfson School of Mechanical, Electrical
& Manufacturing Engineering
Loughborough University
+44 (0)1509 22540

smart@lboro.ac.uk

Internet of Food Things (IoFT) Network Plus
University of Lincoln
Riseholme Park
Lincoln
+44 (0) 1522 882000

sbrewer@Lincoln.ac.uk