Distributed Information and Automation Lab Activities & Industrial Adoption

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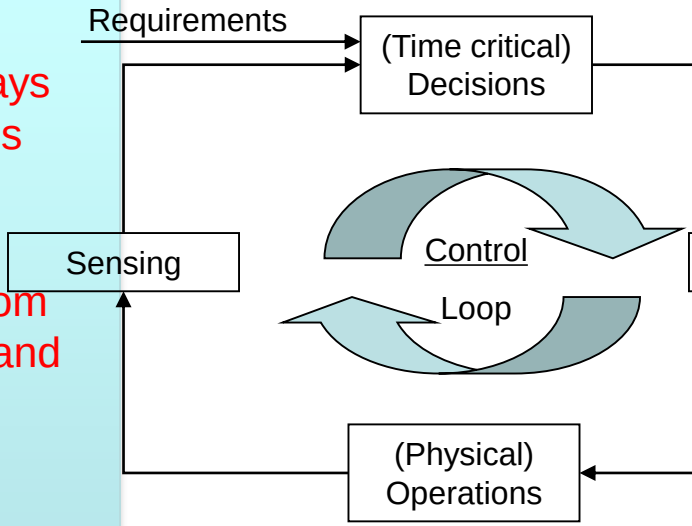
- DIAL Overview
- DIAL and IFM ECS: Towards Adoption
- 3 DIAL Consulting Tools
  - Automation Assessment
  - Information Quality
  - Resilience Audit
- Wrap Up

Distributed Information & Automation Lab

MISSION

- smarter, distributed ways of **automating** systems
- Getting better value from **industrial information** and quantifying it
- Managing systems subject to **disruption and change**



SEGMENTS

- Manufacturing
- Industrial Energy
- Logistics
- Supply Chain
- End of Life
- Service
- Maintenance & Asset Management
- Construction as Manufacturing

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Resilient, Adaptable Production

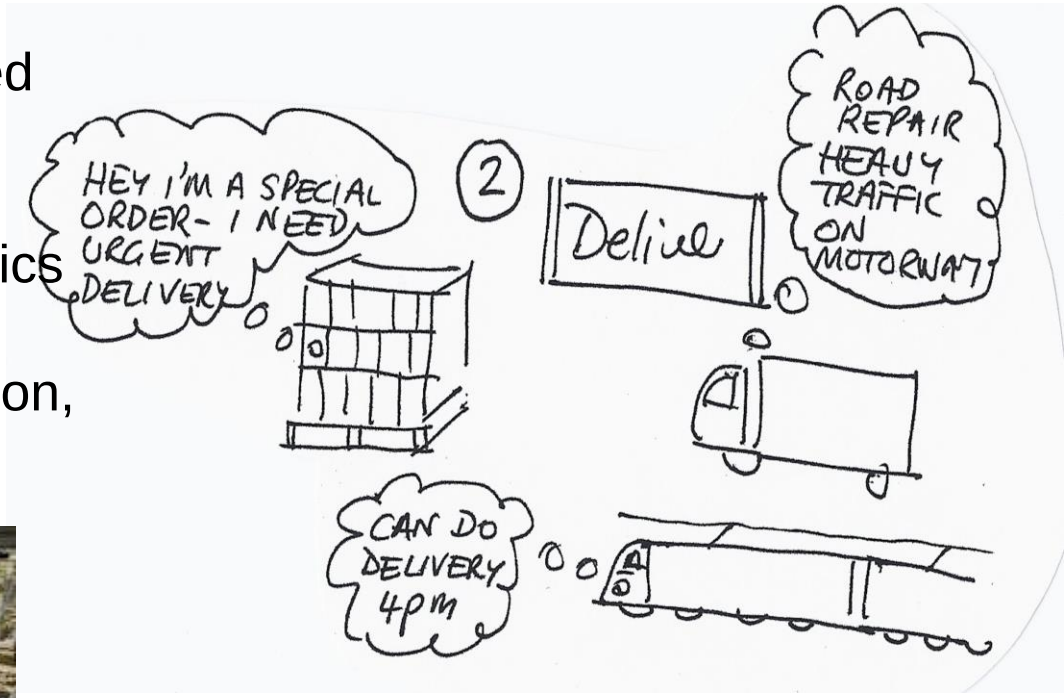
Projects:

- DISTAL - Disruption Tolerant and Lean Factories [Boeing]
- OPTIMORS PRIME: Organising Production Technology Into MOst Responsive States - 3D PRInt Machine Enabled Networks [EPSRC]

Intelligent, Customised Logistics

Projects:

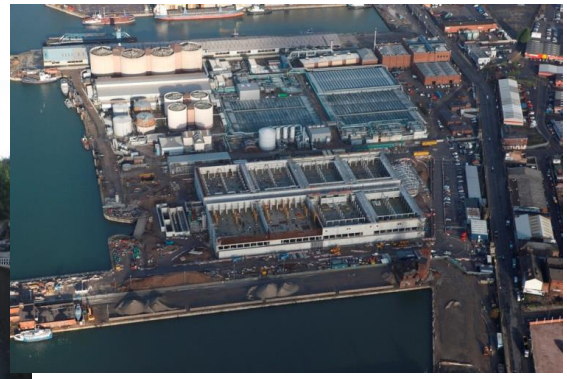
- PhD Projects: Customer Oriented Logistics, Interventionist Order Picking
- ITALI: IT Architectures for Logistics Integration [Y H Global]
- VIPR: Virtual Intelligent Production, Procurement Prediction System [Boeing]

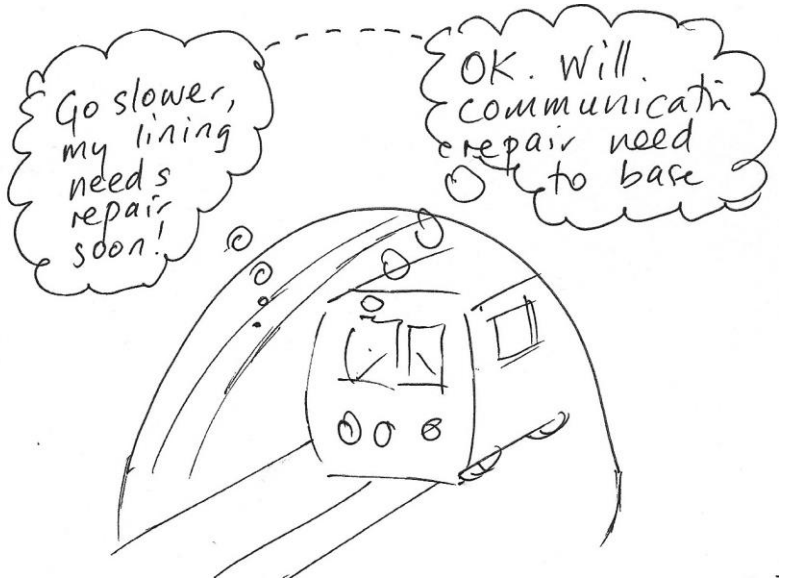


Smart Asset [Information] Management

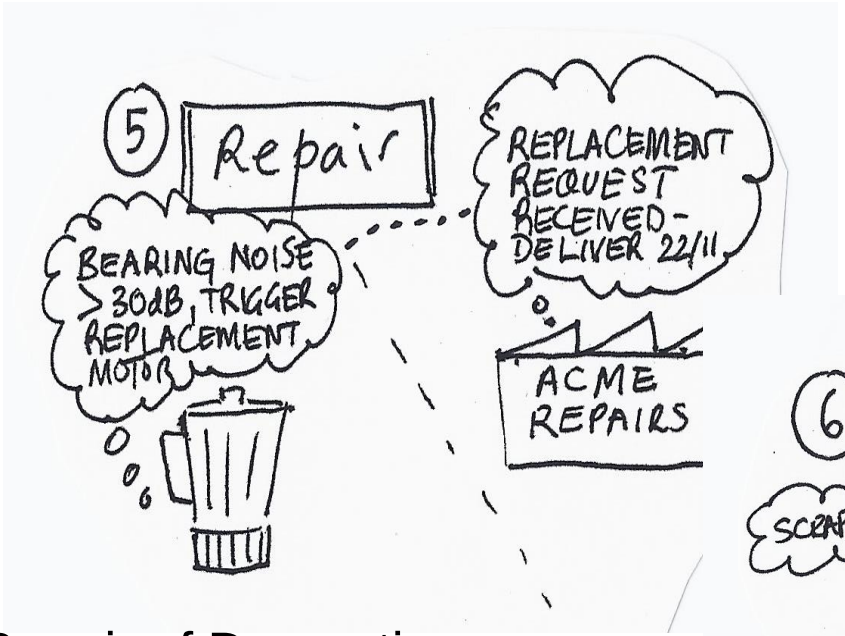
Projects:

- Valuing Asset Information [EPSRC]
- Infrastructure Futureproofing [EPSRC]
- Information Futureproofing [EPSRC]
- Rail fault data management approach and fault-diagnosis tool [Hitachi]





Self Managing Repair & Reuse



Projects:

- Automated Repair of Domestic Appliances
- *Perpetual Products Programme*

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About IfM ECS

IfM Education and Consultancy Services Ltd (IfM ECS) provides a rapid dissemination route for research and education outputs developed at the Cambridge University Institute for Manufacturing (IfM).

- Industrial practitioners help companies of all sizes in all industries to apply research-based improvement techniques.
- Practical solutions based on the latest applied research
- Live feedback to help set the agenda for new research
- Single point of access to relevant expertise from the University of Cambridge
- Education programmes configured to client company needs and context

IfM ECS is a wholly owned subsidiary of the University of Cambridge

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Model 1- Support for Industry Consortia

- Key industry partners working together on common aims
- Typically 1 to 3 year time frame

Programme	Aims
Auto ID	Methodologies for tracking and tracing objects Management of product information networks Quantifying the impact of different Auto-ID technologies Use of Auto-ID technologies in Manufacturing / Logistics Leverage Standards and Services to support Internet of Things
Aero ID	Remove barriers to widespread ID deployment in the aerospace sector through timely and effective R&D
Airport Operations	To improve airport operations, through optimised design of processes, enhanced data sharing between organisations across the airport and the use of new technologies such as Auto-ID

Aero ID Programme

Aim: Remove barriers to widespread ID deployment in the aerospace sector through timely and effective R&D

Structure: 18 month programme, addressing 5-6 key research themes.

Approach: End user driven, cross supply chain, focussed on interoperability

Themes: ID applications, Lifecycle ID, Item tracking, sensor fusion, data synchronisation

Research Team: EPFL, Keio, ICU, Univ SA, Bremen, Cambridge

Outputs: Aero ID Forum – 80 Guests, Data Sync methods, ID Application Matching approach, Part ID Aggregation methods, Value of sensor information

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Model 2 - Company Scoping Projects

- Helping companies articulate and understand a problem
- Validating solution options and solution providers
  - DIAL may not provide the solution
  - IfM ECS may not provide the solution
- Typical examples:
  - Outside core expertise of the business
    - Laing O'Rourke – automation of off site manufacture
    - Travelex – automation of cash handling
  - Where next?
    - Electrolux – Global Network Design

Travelex
Automation of Cash Handling

Travelex worldwide money

Background:

One of the world's largest multi-currency vaults

> 90 currencies, consumer and commercial orders

Intensely manual, severe space and time constraints

Structure: Partner engaged for design and supply of an automated solution

Issue: Internal uncertainty over project scale and management

Support:

1. Identify Technical Hurdles
2. Ensure plans are in place to address these
3. Review Project Definition and Implementation Planning

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Model 3
Consulting Projects

- Working with a client company to solve a specific problem
- May work with other partners
  - Heathrow Airport Operational Freedoms
- May come from scoping work
  - Laing O'Rourke automated joining processes
- May use one or more of DIAL tools
  - Foxconn Automation Assessment

Heathrow Airport - Operational Freedoms

Aim: To investigate how new operational processes can enhance airport performance. Specifically investigating the use of dual arrival, dual departure and special operations for A380 / Small Aircraft.

Structure: Audit function carried out over two trial periods. Interviewing participants, verifying data collection and analysis methods used.

Approach: To provide an independent auditing function to BAA LHR trial activity. Partner organisations include South East Airports Task Force, DfT, CAA, NATS.

Outputs: Experimental design, runway usage modelling, airport performance analysis.

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Model 4 - Co-Development of Tools

- Codified approaches to generic problems
- Informed by industrial engagement and research
- Analytical and process based
- “do it with you not for you”
  - Equip the business for broader roll out
- Specific tool examples
  - Automation Assessment
  - Information Quality
  - Resilience Audit

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Information Risk Assessment Tool

Motivation

Information provides competitive advantage … digital age … Big Data …

Utility company: *"errors in meter readings … errors in customer database … incorrect bills … overcharged customers … loss of customer confidence … … regulator fines … customers leave to competitor"*

Major UK supermarket: *"incorrect inventory data … errors in supplier database … … stock-outs … lost sales … dissatisfied customers … customers leave to competitor"*

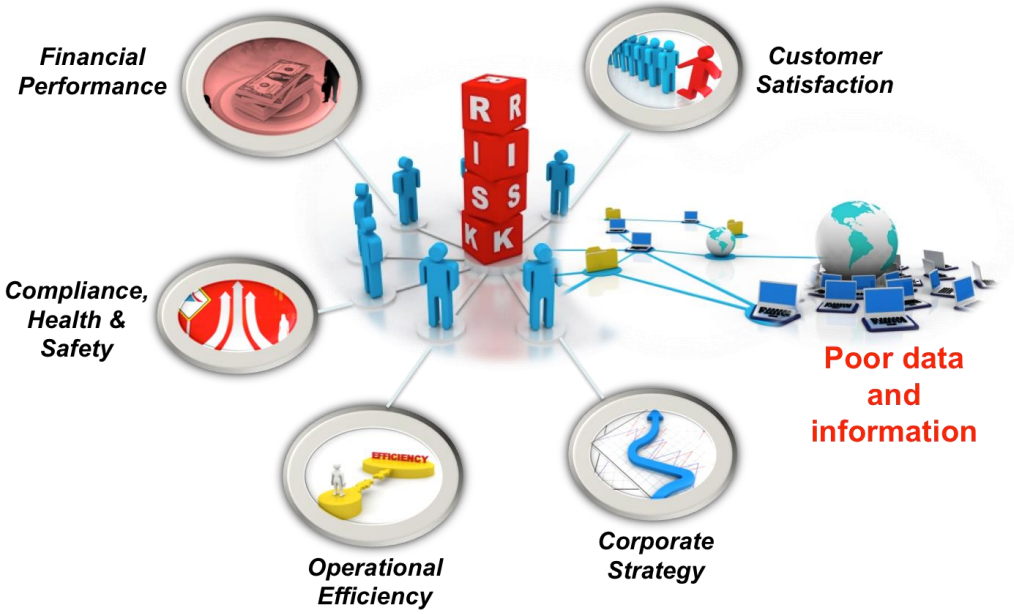
Poor quality information has a direct adverse impact on business performance

Key Questions

… what is the impact of poor quality data on my business?"

… I have lots of problems with my databases… how can I prioritise my improvement projects?"

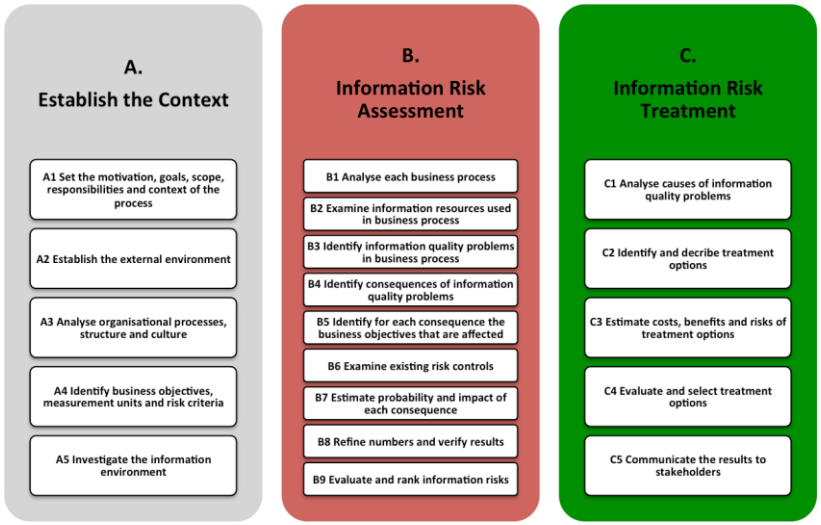
"… is it worth investing in new IS/IT?"

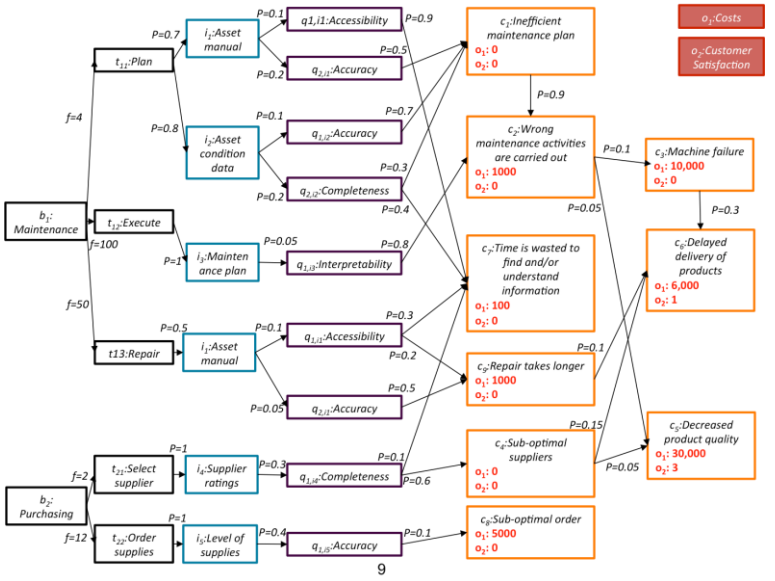


Total Information Risk Management

A structured process…

… supported by a rigorous model





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Case Study: Scottish Water

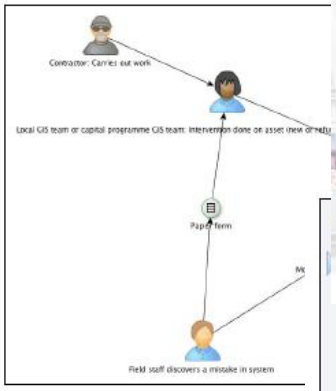
Objective: To quantify the impact of information risks in the area of water supply recovery and bring significant risks to the attention of senior managers.

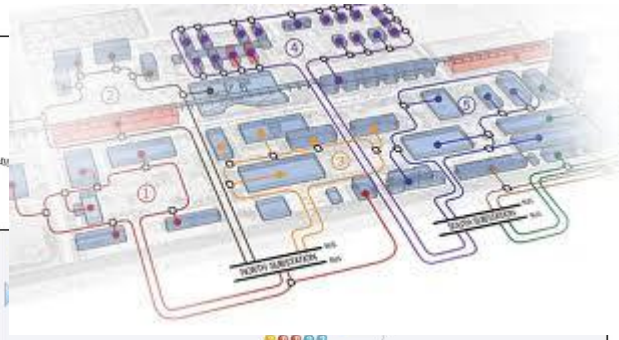
Outcomes:

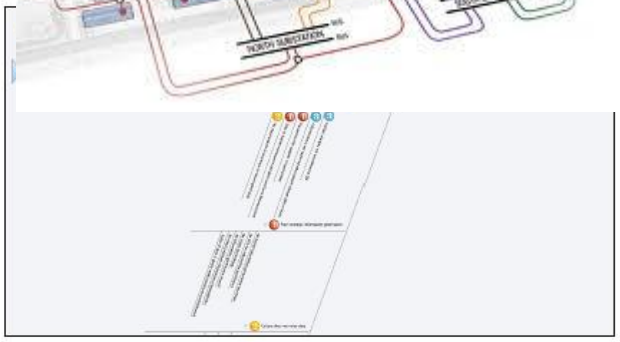
•Identified major data quality issues in the asset management systems.

•Uncovered risks amounting to around £2M per annum.

•Developed a business case for an integrated GIS system and improving information governance.







ID	Process Title	Risk over	yearly			
1	Network Recovery Process	1,215,000 £	4.88	3500	3500	13700
2	Capital Investment Delivery Process	625,000 £	0.28	0	0	500
3	Developer Connections Process	144,000 £	0	100	0	400
	TOTAL	1,984,000 £	5.16	3600	3500	14600

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Automation Assessment Tool

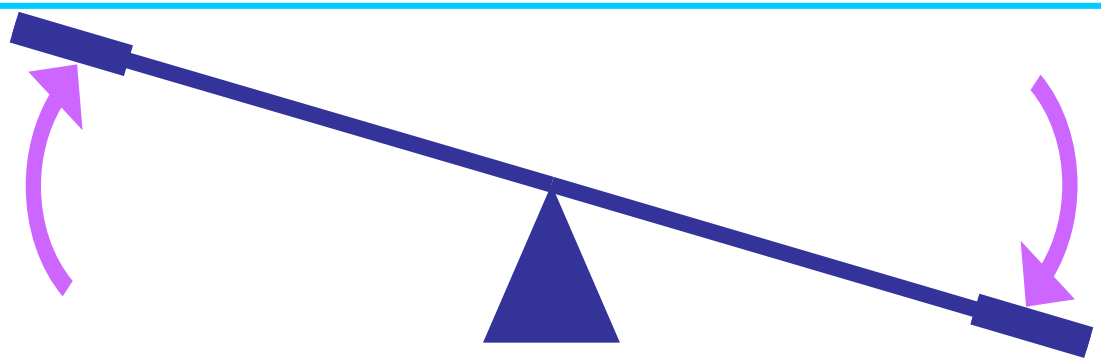
Motivation

- Increase customer demand
- New product launch
- Joe wants me to look at some new Robot

- Labour costs keep going up
- Jack is off with strain injury again
- Keep get product returns with quality issues
- Bill & Fred retire at the end of the year!
- Industry 4.0 ? Data Sharing ?

- Develop / Support a company's automation strategy
- Identify Automation Opportunities & Feasibility Challenges
- Tailored to enhance existing production capabilities
- Collaborative approach with in house production engineers
- Deliver a structured and prioritised implementation pathway
- Semi or fully automated options

Key Questions



Automation Opportunities

Improve operator safety
Reduce labour cost
Increase production rate
Reduce floor space requirement
Improve product quality

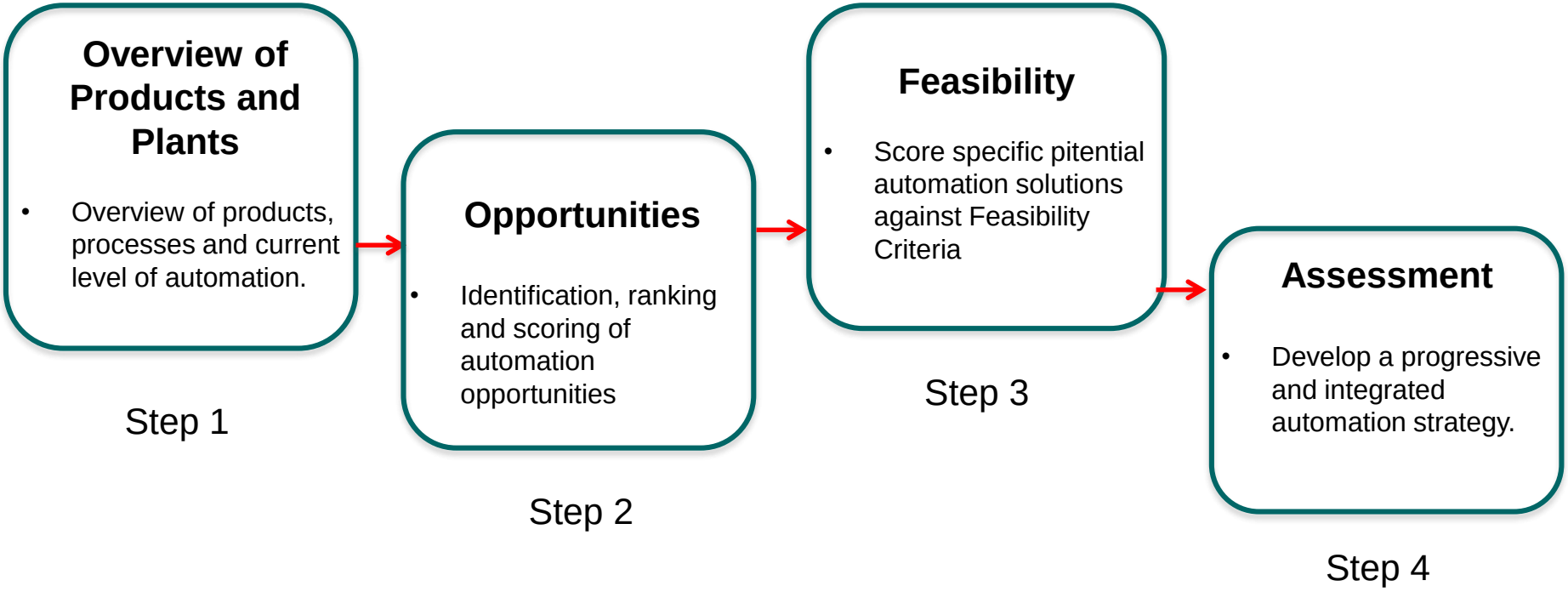
…

Feasibility Issues

Number of assembly operations
Complexity of assembly operations
Ease of Automation
Material delivery (logistics)
Ease of integration

…

Methodology



Outputs / Results

– Plot different solutions by Opportunity / Feasibility. This graphical method will help prioritise the projects.

Case Study
Foxconn Automation Project

- Foxconn aspiration to improve operations and reduce head count
- Context of:
  - Rising labour costs
  - More automation capability (external)
  - Demanding customers
  - Limited design input
  - Multi-site manufacture – flexible and changing footprint

- External facilitation
  - Step back / overview
  - Stimulate higher level view of automation benefits and issues
  - Structured assessment
    - Foxconn now running roll out programme

Operational Resilience Audit

Why Analyse Resilience?

Effectiveness of operations affected by disruptions?

Unclear exactly why things go wrong ?

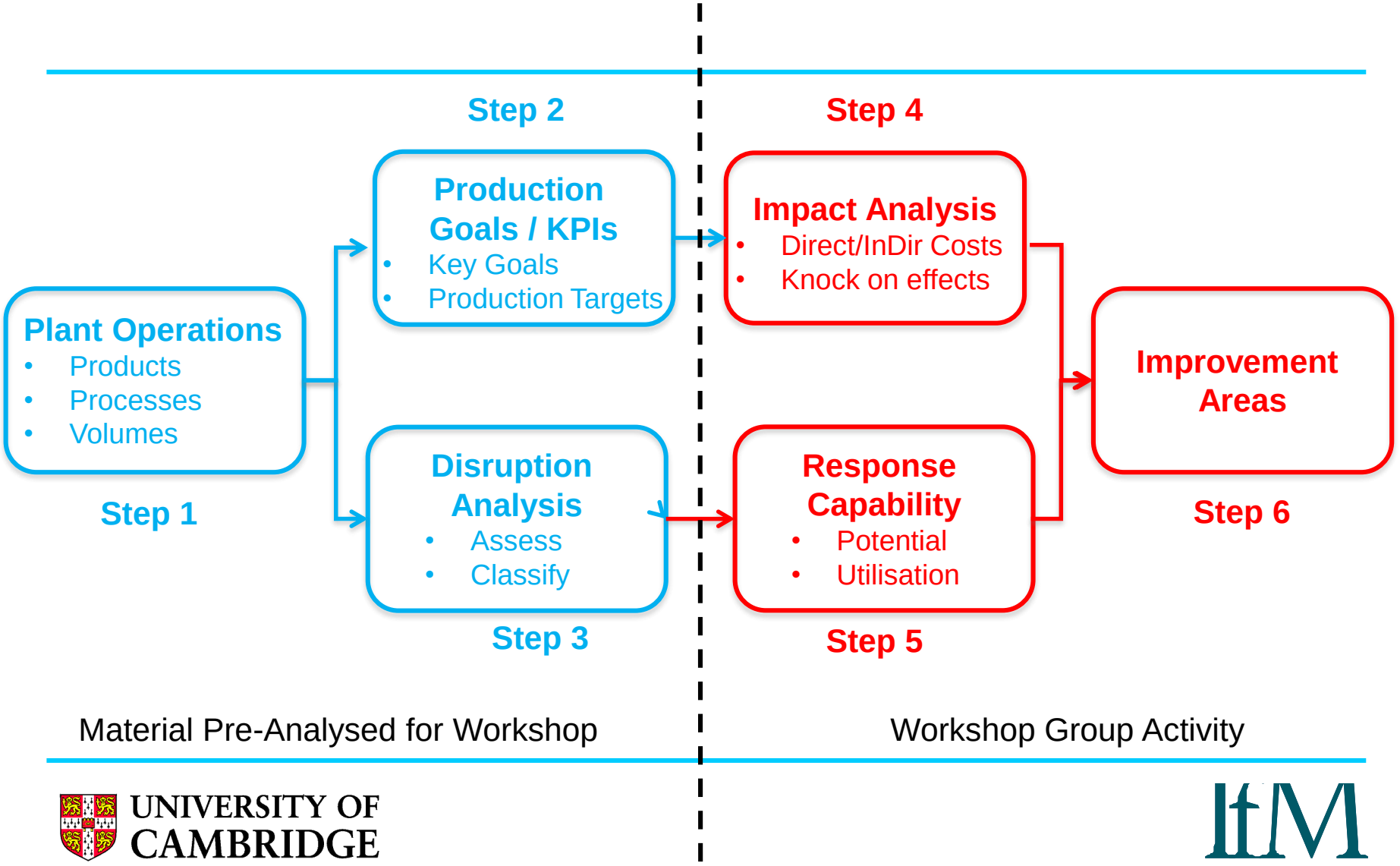
Can the impact of disruptions be reduced?

Routes to building resilience of operations?

Resilience Auditting Approach

- Originally developed for manufacturi production.
- Used in numerous companies [Britvic, Alcatel, Boeing, Alled Steel & Wire, Unipart, … Luton Airport]
- Assumption that conditions are predominantly “steady” and disruptions infrequent
- Used to assess historical, real disruptions and ability to manage them.

Disruption Audit Approach



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Disruption Audit

The output of the Disruption Audit can help:

- Prioritise improvements to current processes (Process Capabilities, Operational Adherence & Stability, Material Specifications.)
- Identify the requirement for new process capabilities to better cater for disruptions.

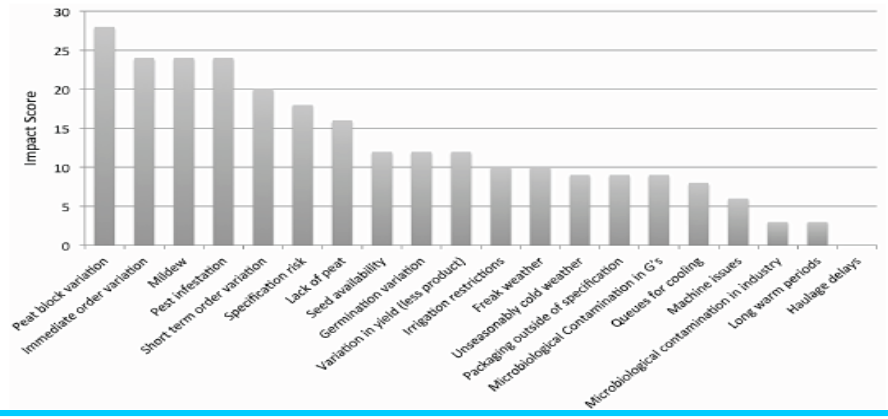
Internal Actions

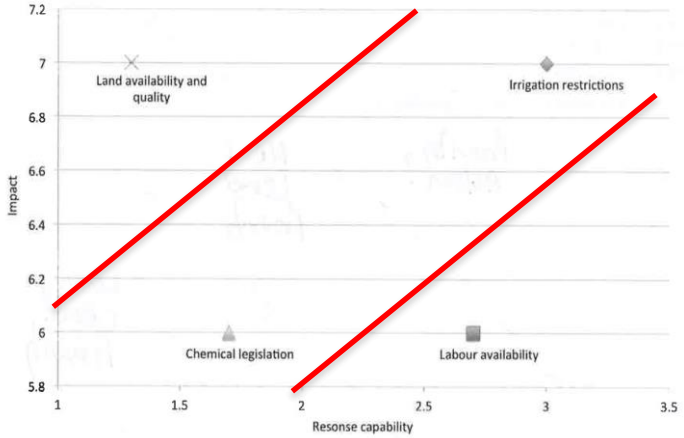
- Focus the development of next generation processes. Providing flexible production capabilities, for new products, using new technologies, with changing business demands.

Longer Term Actions

Case Study: G's Growers

- responsible for the growth and selling of 104 different products,
- supplied to major grocery retailers, wholesale distributors etc
- Iceberg lettuce a key product
- Short & long term issues





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Wrap Up

smarter, distributed ways of **automating** systems

• Getting better value from **industrial information** and quantifying it

• Managing systems subject to **disruption and change**

Current Adoption Pathways

- Industrial research projects
- Adoption / transition projects
- Software handover / adoption
- Consulting tools
- Industry White papers