The future of manufacturing: Horizontal Innovation™ - taking tech from one sector to another

Join at sli.do #HorizontallInnovation
What is Horizontal Innovation™

The effective transfer of knowledge and technology from one sector to another
Why now?

Horizontal Innovation™ does currently happen in the UK, but on an ad-hoc basis.

The IET believes there is significant room for an increased and improved national approach.

An approach that is based upon pre-existing technologies and processes.

This has the potential to deliver huge benefits both in time to market and relative costs.

Whilst addressing key societal and business issues.
Solving our biggest challenges

It is only by coming together, sharing our experiences and collaborating will we solve some of societies biggest challenges

Manufacturer and designers are already doing this

But we can and need to do more to solve these global challenges
Challenges such as...
Challenges such as...
Challenges such as...
Challenges such as...
Challenges such as...
Some of greatest challenges may already have an answer...

Help us find them
Dave Seaward
Stewart Lowth
Matthew Burke
Philippa Ryan

Ask questions at sli.do #HorizontalInnovation
IET Horizontal Innovation Webinar

Prepared by
Dr Dave Seaward
10th June 2021
About 3P and the Presenter?

• An Employee Owned, UK, automation company
  ◦ Highly Engineered, Custom Equipment, Project based
  ◦ Scalable assembly for new product development
  ◦ Focus on Pharma and MedTech
  ◦ ~£10 million turnover ~85+ staff (~65+ professional engineers)
  ◦ Doubled in size since 2018

Dave Seaward - 3P Founder
• 154 Patent applications
  ◦ Source: FreePatentsOnline
  ◦ Including Pyramid Teabag
    ◦ A re-imagined “Jubbly”

Recent 3P Awards
• IET Horizontal Innovation Award
• Queen’s Awards for Innovation 2020
• Queen’s Award for Exports 2021
• UK Business Hero 2020
  ◦ Design, Produced and donated 30,000 visors to front line staff
From Mayonnaise to Catheters

Horizontal Innovation
From Man powered flight to Vaginal Rings

- Success through rapid iteration – so called “fail early, fail fast”

Both Developed Using “Fail-Early Fail-Fast”
Horizontal Innovation - Enablers

- Exposure to multiple industries (here are a few of the author’s)
- Multidisciplinary teams
- An Open and Inquisitive Mind with a Passion for Technology supported by the culture
- Embrace failure – fail early and fail fast (enable fast iteration)
- Neurodiversity – the engineer’s brain often sees linkages others don’t
- “Skunkworks” – small able teams unhampered by bureaucracy
  - SME’s don’t suffer from the innovation fatigue inherent in larger organisations
- Encourage “Chance Encounter”
- Senior support, permitting the time and space to “think”
- Note: Triz claims invention can be distilled down to one of 40 inventive principles

Just a few of the products and industries the author has been exposed to
(Other brands are available!)
Stewart Lowth

Ask questions at sli.do #HorizontalInnovation
Rapid Horizontal Innovation: VentilatorChallengeUK Case Study

Presented by: Dr Stewart Lowth – MetLase, Product Development and Innovation Manager
• Established in 2007 as a joint venture between Unipart and Rolls-Royce

• Our founding vision was one of cross-sector horizontal innovation

• 30 Engineers servicing a wide array of industries

• An “Engineering first” business, that makes toolsing to solve complex manufacturing challenges

• Our core technology uses patented laser-cut joining features to build precision sheet stainless steel structures without welding

• More recently, we developed a unique digital platform for adding intelligence to our tooling
In the spring of 2020 the UK Government challenged UK manufacturing to support the need for mechanical ventilators due to COVID-19.

The UK Government and medical regulator established a three pillar approach.

Metlase supported four ventilator programmes during the VentilatorChallengeUK:

<table>
<thead>
<tr>
<th>MetLase, Unipart &amp; Rolls-Royce</th>
<th>Cambridge Consultants &amp; MetLase</th>
<th>Meggitt</th>
<th>Smiths, GKN and Rolls-Royce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillar 3 system (RMVS)</td>
<td>Pillar 3 system (RMVS)</td>
<td>Pillar 3 system (RMVS)</td>
<td>Pillar 2 system</td>
</tr>
<tr>
<td>MetLase developed system</td>
<td>Manufacturing partner, develop production</td>
<td>Support design of external casing</td>
<td>Design and build 74 assembly benches</td>
</tr>
</tbody>
</table>
The Government’s aim was for 30,000 ventilators within a few months, this gave the MetLase team a number of challenges that spread across all four development programmes.

**Development Challenges**

- **Supply chain**
  - Volume of supply
  - Ring-fenced supplies
  - Other teams
  - Disruption

- **Domain knowledge**
  - Ventilator design
  - COVID-19 as disease
  - Regulation route
  - Volume manufacture
  - Safety critical coding

- **Speed**
  - Maintaining quality
  - Changing specification
  - Many new engineers
  - Tracking the design
  - Exhausted team

- We used horizontal innovation to overcome theses issues, pulling in expertise to support and bolster the team where needed.
• Call-to-arms Friday lunchtime, present concept to medical regulator on Monday.

• We developed an innovative “dosed-volume” ventilator using modified industrial components.

• Supports forced ventilation, assistive breathing, Mandatory Minute Ventilation (MMV) modes, along with an adjustable Constant Positive Airway Pressure (CPAP).

• The team produced two prototypes: the first taking ten days, and the second eight days later.
Web: www.metlase.com
Email: sales@metlase.com
Telephone: 0114 383 0610

Dr Stewart Lowth
Product Development and Innovation Manager

Stewart.Lowth@MetLase.com
Mobile: 07584 643 091
WILLIAMS ADVANCED ENGINEERING

Formed in 2010

Spin-out from the Williams Formula One business, now independently owned

300+ staff

Key capabilities:
• Lightweight materials and structures
• Aerodynamics and thermodynamics
• Electrification – energy systems and technologies

Sectors include:
• Automotive and Motorsport
• Defence
• Aerospace
• Energy
FLYWHEEL ENERGY STORAGE

Intended for use by Williams F1 KERS

Mobile system used in buses and trams

Exited to GKN Land Systems in 2014
FLYWHEEL
ENERGY
STORAGE

Same composite rotor technology as the mobile flywheel

Stationary system used in renewable energy micro grids

Exited in 2014
BABYPOD

Design and manufacture by WAE

Carbon fibre construction

Lightweight, compact and easy to handle

Safe – withstands a 20-G shock
AEROFOIL SHELF EDGE TECHNOLOGY

Reduces cold air spill, lowering energy consumption and warming supermarket aisles
AEROFOIL SHELF EDGE TECHNOLOGY

CFD modelling used to optimise aerofoil blade design and installation
AEROFOIL
SHELF EDGE TECHNOLOGY

1.4 million aerofoils installed in more than 4,000 stores across 10 countries

At least 15% energy saving in store
EARLY STAGE VENTURE CAPITAL

LAUNCHED IN NOVEMBER 2016

£66M RAISED, £44M DEPLOYED

HARDWARE TECHNOLOGY & INDUSTRIAL SOFTWARE FOCUS
## FORESIGHT WILLIAMS TECHNOLOGY FUNDS

<table>
<thead>
<tr>
<th>Company</th>
<th>Investment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MIRICO</strong></td>
<td>£1.6m</td>
<td>Laser dispersion for gas detection</td>
</tr>
<tr>
<td><strong>Geospatial Insight</strong></td>
<td>£1.7m</td>
<td>Satellite imagery and data analysis</td>
</tr>
<tr>
<td><strong>Cagealco</strong></td>
<td>£3.2m*</td>
<td>Clean propellant aerosol valve technology</td>
</tr>
<tr>
<td><strong>codeplay®</strong></td>
<td>£1.1m</td>
<td>Automotive AI software platform</td>
</tr>
<tr>
<td><strong>Oxford Space Systems</strong></td>
<td>£2.1m</td>
<td>Booms and antennas for nanosatellites</td>
</tr>
<tr>
<td><strong>u-tonomy</strong></td>
<td>£1.2m*</td>
<td>Remote management of gas networks</td>
</tr>
<tr>
<td><strong>iNOVO Robotics</strong></td>
<td>£3.0m*</td>
<td>Collaborative robot arms for SME manufacturing</td>
</tr>
<tr>
<td><strong>open bionics</strong></td>
<td>£1.5m</td>
<td>3D printed bionic prosthetic arms</td>
</tr>
<tr>
<td><strong>RE:FEYN</strong></td>
<td>£3.3m*</td>
<td>Mass spectrometry using light</td>
</tr>
<tr>
<td><strong>synaptic®</strong></td>
<td>£2.0m</td>
<td>Remote monitoring of the electrical grid</td>
</tr>
<tr>
<td><strong>INSPIRE</strong></td>
<td>£2.5m*</td>
<td>Metrology for automated manufacturing</td>
</tr>
<tr>
<td><strong>FreeFlow</strong></td>
<td>£1.9m*</td>
<td>Smaller e-bike powertrain technology</td>
</tr>
<tr>
<td><strong>NovoSound</strong></td>
<td>£1.5m</td>
<td>Flexible ultrasound for industrial applications</td>
</tr>
<tr>
<td><strong>ROVCO Ocean Insight</strong></td>
<td>£2.0m</td>
<td>Subsea infrastructure survey robotics and AI</td>
</tr>
<tr>
<td><strong>LIVING OPTICS</strong></td>
<td>£1.5m</td>
<td>AR/VR collaboration for engineering design</td>
</tr>
<tr>
<td><strong>Mixergy®</strong></td>
<td>£1.6m</td>
<td>Smart hot water tanks</td>
</tr>
<tr>
<td><strong>amt</strong></td>
<td>£2.75m*</td>
<td>Post processing for 3D printing</td>
</tr>
<tr>
<td><strong>flusso Cambridge</strong></td>
<td>£1.5m</td>
<td>Flow sensors</td>
</tr>
<tr>
<td><strong>AUDIOSCENIC</strong></td>
<td>£1.1m</td>
<td>Immersive 3D audio soundbars</td>
</tr>
<tr>
<td><strong>Cambridge GaN Devices</strong></td>
<td>£0.8m</td>
<td>GaN semiconductor chip power devices</td>
</tr>
<tr>
<td><strong>MACHINE DISCOVERY</strong></td>
<td>£0.8m</td>
<td>AI-driven simulation software</td>
</tr>
<tr>
<td><strong>VECTOR Photonics</strong></td>
<td>£0.8m</td>
<td>Semiconductor laser company</td>
</tr>
<tr>
<td>To be announced</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Investments subject to final approval.
SEEKING INVESTMENT?
WHAT I LOOK FOR

DEEP MARKET UNDERSTANDING
First market, first customers, sales cycle

CUSTOMER ENGAGEMENT
Working with the decision makers

SEEKING PAID TRIALS
Reduced reliance on grants

DISCOVERY TO DELIVERY CULTURE
Ready for the transition from technology to product
Philippa Ryan

Ask questions at sli.do #HorizontalInnovation
The UK innovation ecosystem

<table>
<thead>
<tr>
<th>Policy</th>
<th>Strategy</th>
<th>Fund</th>
<th>Connect</th>
<th>Collaborate</th>
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</thead>
<tbody>
<tr>
<td>Department for Business, Energy &amp; Industrial Strategy</td>
<td>UK Research and Innovation</td>
<td>Innovate UK</td>
<td>CATAPULT</td>
<td>ktn</td>
</tr>
</tbody>
</table>

Philippa Ryan MIET
Knowledge Transfer Adviser
UKRI Research Councils

Key areas of investment:

- Industrial Strategy Challenge Fund
- Global Challenges Research Fund
- Strategic Priorities Fund
- Strength in Places Fund
- Future Leaders Fellowships
- Fund for International Collaboration

https://www.ukri.org/
Innovate UK

• is the UK’s innovation agency

• connects businesses to the people that can help them, and funds business and research collaborations in all economic sectors, value chains and UK regions to accelerate innovation

SMART grants for R&D
Knowledge Transfer Partnerships
Innovation Loans
SBRI Competitions
Young Innovator Awards

https://www.ukri.org/councils/innovate-uk/
Innovate UK Edge

Delivers innovation and growth support.

Grow your business by protecting and harnessing IP, improving innovation management and connecting to the innovation ecosystem globally.

Innovate UK EDGE offers a range of services to help ambitious, innovative SMEs scale up and grow. We help businesses:

- Exploit new innovations
- Enter new markets
- Source funding

https://www.innovateukedge.ukri.org/
The Catapult Network supports businesses in transforming great ideas into valuable products and services.

We are a network of world-leading technology and innovation centres established by Innovate UK.

We deliver impact across the UK economy, enabling businesses to thrive in global markets.

ACCELERATING BUSINESS GROWTH, STIMULATING MARKETS

https://catapult.org.uk/
KTN exists to connect innovators with new partners and new opportunities beyond their existing thinking – accelerating ambitious ideas into real-world solutions.

Agri-food
Chemistry
Design
Electronics
Geospatial
Industrial Maths
Manufacturing
Photonics
Robotics & AI
Sensors
Transport
Biotechnology
Creative Industries
Digital
Energy
Health
Infrastructure
Materials
Quantum
Security & Defence
Space
Water

Updates on funding opportunities
Showcase events for networking
News, Case Studies
Reports, Perspectives
Innovation Networks
Innovation Programmes

https://ktn-uk.org/
Innovation Networks

Through our Innovation Networks, we’ve united some of the best minds and greatest thinkers from across the UK in areas of innovation, development and new technologies.

Specialist collaborations produce results that just wouldn’t be possible if people are thinking and working in isolation. They share their deep understanding and expertise to generate creative and practical ideas that aim to find answers to some of the world’s most significant challenges.

https://ktn-uk.org/programme/innovation-networks/
KTN-iX™ (KTN-innovation eXchange) is a cross sector program supporting innovation transfer by matching industry challenges to innovative companies from other sectors. It does this through putting large businesses with technical needs in contact with companies who have the right innovative solutions, for faster development of novel solutions.

https://www.ktninnovationexchange.co.uk/

"Posting our challenges on KTN’s Innovation Exchange has allowed us to have a cross-sectoral approach and added an element of reach that has proved invaluable. The responses have allowed us to explore applying solutions from other sectors like medical X-Ray technology to some really tricky problems."

Andy Cooney,
Technical Manager at Sellafield
We connect regional, national and global innovation

Our **Global Alliance** programme drives international collaborations with governments, societies, enterprises, institutions and people from every corner of the globe.

**Global Expert Missions** (GEMs), funded by Innovate UK and delivered by KTN, drive the sharing of expertise across borders and foster global collaboration. They help to build international strategic partnerships and provide insight into innovation opportunities for the UK.

[https://ktn-uk.org/global-alliance/](https://ktn-uk.org/global-alliance/)
Innovation is the lifeblood of any business, but how do you access and embed the cutting edge expertise needed to make it happen?

A Knowledge Transfer Partnership (KTP) project may be the answer.
Knowledge Transfer Partnerships (KTPs) link ambitious businesses with the UK’s world class knowledge bases to deliver innovation projects led by inspired graduates:

- Embed expertise, generate new knowledge, expand capability and foster a culture of innovation
- Drive competitive advantage through accelerated innovation and the creation of Intellectual Property
- Gain direct and cost-effective access to the UK’s world-class research facilities

The Best KTP 2020
Aquacheck Engineering, Manchester Metropolitan University and Dario Chiantello revolutionised the traditional standpipe by drawing on expertise in electronic engineering and embedded systems to develop a smart water standpipe that utility companies can use to remotely monitor water use.

https://www.ktp-uk.org/
Thank you for listening

Philippa Ryan
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philippa.ryan@ktn-uk.org
07860 863649
Meet the Panel

Jeremy Hadall (Moderator)
Chair, IET Design and Production Sector Executive Committee

Dr Dave Seaward
Director, 3P Innovation Ltd

Stewart Lowth
Chartered Mechanical Engineer and the Product Development and Innovation Manager, MetLase

Matthew Burke
Head of Technology Ventures, Williams Advanced Engineering

Philippa Ryan
Knowledge Transfer Advisor, The KTN

Ask questions at sli.do #HorizontalInnovation
Your views are important to us

We welcome your views and collaboration both today and beyond to help us achieve this. This ensures that we can keep professionals and wider society reliably informed about the key issues of today, while horizon-scanning to understand the trends and developments that will impact the engineers of the future.

To get involved contact us sep@theiet.org