DIGITAL MANUFACTURING ON A SHOESTRING

Research Workshop

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December 2019
Workshop Aims

• Reflect on business priorities
• Identify potential digital solutions
• Build awareness of digital solutions

• Building the Shoestring data set
  • SME priorities
  • Priority digital solutions

• What might a digital solution look like in your business?
Exercise

• On your cover sheet:

What current challenge in your business would you like to address with a digital solution this year?
The Institute for Manufacturing and its four core themes

Digital  Healthcare  Skills  SMEs
The digital challenge for SMEs

“77% of companies consider missing digital skills as the key hurdle to their Digital Transformation.”

“59% of companies cite high investment and operating costs as another major obstacle.”

[Saam et al. (2016)]

Digitalisation is perceived as *inaccessible* by many companies.

- expensive
- complex
Shoestring = Low Cost Off-The-Shelf-Automation for SMEs

Shoestring Vision:
Increase digital capabilities throughout the company using low-cost, easily accessible “off-the-shelf” components.
Towards Low Cost Digital Solutions

Toolbox of low cost off-the-shelf components

Example: Voice controlled PLC based assembly

- Alexa Voice Service
- Amazon Echo Dot
- Mobile Hot Spot (Android)
- XinaBox CW01, OC03 Relay status read by Omron IO
- Sinric account required (smart home device)

Stop Shuttles
The ShoeString approach

1. Digital requirement assessment
What are the digital solution needs of a small manufacturer?

2. Solutions development
How can available technologies, algorithms and software be combined into accessible solutions?

3. Prototyping / Pilot testing
...of the developed technologies and methods in partner SMEs

4. Incremental integration
Implementing and integrating solutions in an incremental manner

5. Engagement / Dissemination
Application of the approach in a wide array of companies & labs
Digital Requirements Assessment

**Aims:**
- Key order winning area and business constraints identified
- Digital needs in terms of **specific solutions** identified

**Outputs:**
- Understanding of classes of digital solutions
- Priority areas for digital developments in your business
- Specific digital solutions
Workshop structure

1. With A Neighbour:
   - What are your main priorities for Order Winning
   - What is the main business constraint your company faces
   
2. Group Exercise:
   - Identify specific digital solution needs aligned with your
     - Order winning priority
     - Business constraint priority
   
3. Summary / Wrap Up
   - Priority areas across the group
   - Popular solution needs
     - Must have
     - Nice to have
Order winners / Business Constraints

• Priorities:

What is the most important order winner / business constraint for your business?

Chose:
1 x Order winner
1 x Business constraint

Discuss with a neighbour
## Exercise: Digital solution priorities

### Order Winners: Quality

- Automated delivery of warranties and tools to suppliers
- Automated calibration of measuring equipment
- Automated visual inspection of shapes (front of goods)
- Automated weight check and packaging
- Control procedures for equipment maintenance
- Digital traceability of goods
- Stock level control
- Order handling vs. other solutions
- Weather-based scheduling

### Business Constraints: People and Information

- Automated bottleneck identification and operators
- Automated generation of reports
- Automated task scheduling in human administration
- Automated maintenance of equipment
- Automated optimisation of process parameters
- Automated handling and assessment of data for control
- Capacity monitoring of human and machine resources
- Control process to manage the site levels, controls
- Digital cost modelling of iterations and checks
- Digital part control
- Digital filing of critical works, safety and maintenance information
- Digital management and decision
- Quality assurance
- Digital order entry management system
- Digital work instructions
- Process definition and procedures
- Integration of equipment, vehicle, control
- Process control
- Production planning
- Quality control
- Real-time tracking of precision work
- Scrap and rework
- Integration of tools and processes

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**For your priority order winner:** Mark the 3 most attractive solutions on the sheets with 1 green dot each.

**For your priority business constraint:** Mark the 3 most attractive solutions on the sheets with 1 green dot each.

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**Example:**

- [ ]
- [ ]
- [ ]

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**Most relevant:** “We really need this”

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5 min
Exercise: Digital solution priorities

Useful:

“This sounds useful, but is not a priority”

Starting with your priority order winner:
Mark up to 7 other interesting solutions with a yellow dot

Starting with your priority constraint:
Mark up to 7 other interesting solutions with a yellow dot
Workshop Wrap Up

Priority Areas

• Order Winner
  • No1: Quality
  • No 2: Delivery

• Business Constraint
  • No 1: People and processes
  • No 2: Supply chain

Popular Specific Solution Needs

• Must Have
  • No 1: Digitised work instructions
  • No 2: Real time tracking

• Nice to Have
  • No 1: Automated bottleneck ID
  • No 2: Digitised work instructions
  • No 3: Condition monitoring
Being Involved in ShoeString:

- Benefit
  - Stay informed
  - Solution workshops
  - Participation in interviews
  - Participation in pilot studies

Contact details

Email us or pass on a business card and we will add you to a list to keep you updated.

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Barriers to UK Manufacturing Digitalisation

What Is Preventing The UK From Fully Achieving The Vision?

The Made Smarter Review has identified three themes which are limiting the UK’s ability to achieve its potential:

1. **Lack of effective leadership of industrial digitalisation in the UK.**
2. **Poor levels of adoption, particularly among SMEs.**
3. **Under-leveraged innovation assets to support start-ups/scale-ups.**

- The UK is behind other advanced nations in overall productivity (output per worker), which is in part due to lower levels of adoption of digital and automation technology. This is particularly acute among SMEs.
- One of the identified causes is an ineffective and confused landscape of business support, with no clear route to access help and ambiguity about what ‘good’ looks like.
- SMEs, in particular, perceive significant barriers to adoption, such as risks around cybersecurity, and a lack of common standards allowing different technologies to connect.
- Unlike other developed nations, the UK’s tax system is not targeted enough to incentivise the opportunity.
- Businesses also face a skills shortage, particularly in digital engineering capabilities, and are hindered by a fragmented skills system and a lack of systematic engagement between education and industry.
Can low-cost, off-the-shelf devices be combined to address the manufacturing automation needs of SMEs?

- UK government needs to raise industrial productivity.
- The government and manufacturing organisations see information as key to improving their productivity and competitiveness.
- Digital transformation is the process of introducing the latest advancements in control, communication, AI etc. into the manufacturing company and processes.
- How can we ensure these developments are accessible to SMEs?
Commercial, Off-the-Shelf

To solve the cost hurdle, the Shoestring project will use commercial, often consumer-grade off-the-shelf products.
To solve the complexity hurdle, Shoestring will take the approach of catalogues and toolboxes:

**Catalogue of pre-prepared solutions to common problems**
- Companies can quickly see what solutions exist.
- Rapid and easy deployment of solutions.
- De-risked as solutions are pre-tested and low cost.

**Toolbox of components for customised solutions**
- Combine pre-made compatible building blocks to make new solutions.
- Configuration not coding – deskilled implementation.
- Modification of catalogue entries or whole new solutions.
Project Plan

1. **Digital Requirement Assessment**
   What are the digital needs of the small to medium manufacturer?

2. **Solutions Development**
   How can we combine available technologies to create accessible solutions?

3. **Prototyping and Pilots**
   Develop initial prototypes and deploy them at the universities and in manufacturing partners.

4. **Incremental Integration**
   Continue to add to toolbox of solution elements as new challenges discovered.

5. **Engagement and Dissemination**
   Get the results out there and into UK manufacturing companies.