A Manufacturing Innovation Institute

Collaborate. Innovate. Deploy.

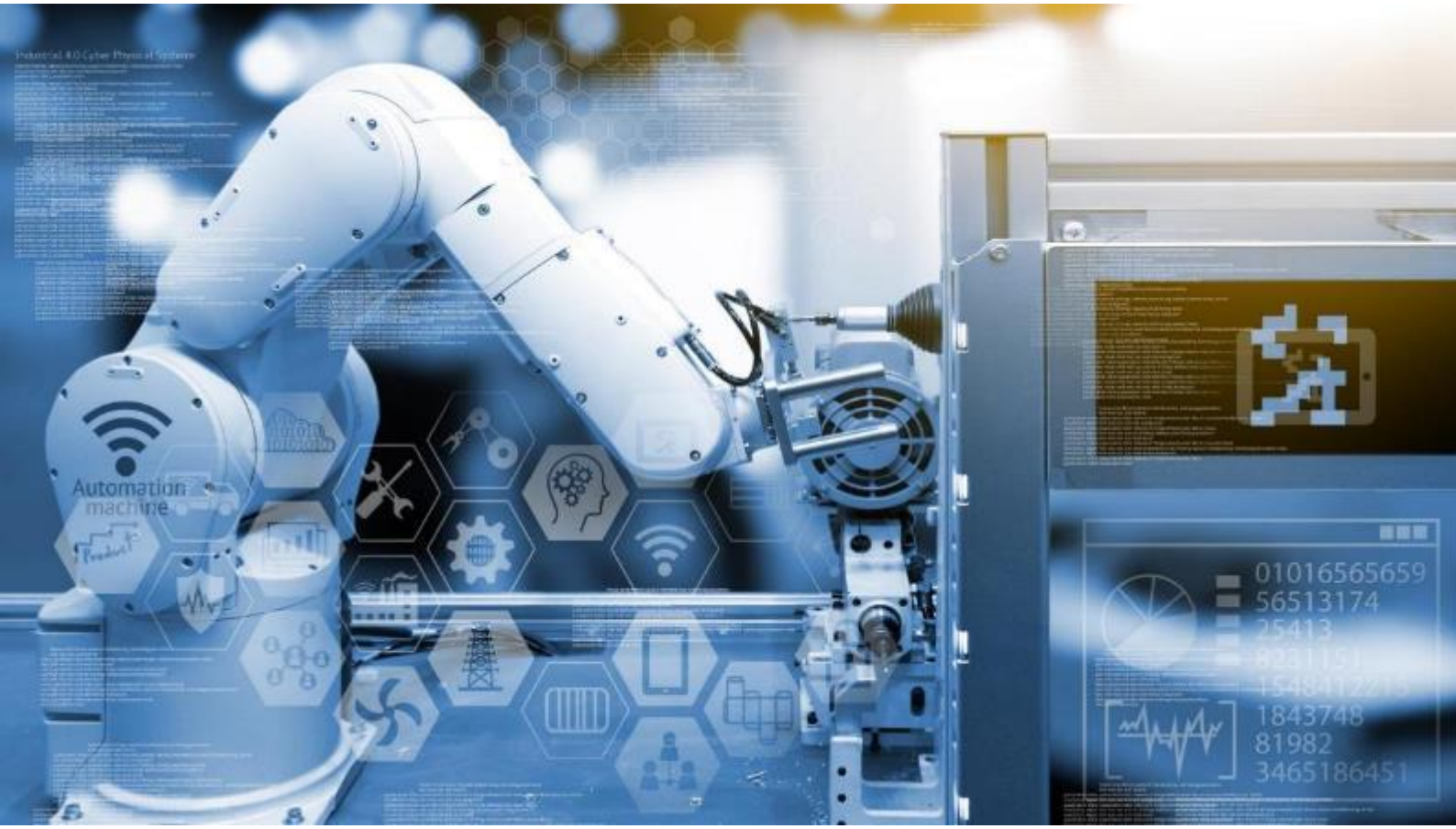
HSSMI final report of results to Scottish Enterprise for:

Industry 4.0 Pilot Study Executive Summary

Final Version 3

6th March 2018

Authored by Dr. David Stewart



A Manufacturing Innovation Institute

AFRC
ADVANCED FORMING RESEARCH CENTRE
UNIVERSITY OF STRATHCLYDE

Executive Summary

Introduction

The High Speed Sustainable Manufacturing Institute Ltd. (HSSMI) in collaboration with the Advanced Forming Research Centre (AFRC), are pleased to submit this final report to Scottish Enterprise on the completion of the Industry 4.0 pilot study. Through the delivery of this project, the team have delivered:

- A robust Industry 4.0 diagnostic toolset, grounded in academic rigour and successfully trialled with 7 businesses from different sectors and of various sizes
- A proven methodology for supporting the delivery of Industry 4.0 support to a range of Scottish businesses
- Diagnostic and roadmapping sessions completed for each of the 7 nominated companies, with comprehensive write ups included, prioritised projects identified and overall ambitions raised
- A better understanding of what Industry 4.0 entails was raised at Scottish Enterprise and SMAS. Moreover, the project helped identify what required skills and competency is needed to facilitate the roll out of the future manufacturing 4.0 service
- A list of Lessons learned that will provide guidance to practitioners to aid future delivery

Definition of I4.0 and relevance to manufacturing

The term 'Industry 4.0' is regarded by many as the promise of a fourth industrial revolution.

"The integration of digital based technologies and platforms that connect up the product, people, plant, business and supply chain together, to create intelligent and proactive manufacturing systems that create value for the organisation"

In terms of the distinct types of technologies and systems that are encapsulated under this definition, the following are regarded as the building blocks that, when combined and harnessed, make up an Industry 4.0 system:

- Virtual Reality & Augmented Reality immersive environments
- Big data analytics and advanced algorithms
- IoT platforms
- Cloud Computing
- Cyber security
- Advanced human-machine interfaces
- Ai & Machine learning
- Robotics & automation
- Machine to machine communication

- Connected and mobile devices
- Smart sensors & monitoring systems

The integration and harnessing of Industry 4.0 technologies and platforms presents a massive opportunity for Scottish manufacturers to create value and drive sustainable growth. It has been highlighted in Scotland's Manufacturing action plan as a key enabler for boosting productivity, quality, flexibility and reducing cost and is seen as a catalyst to help stimulate innovation and investment in Scottish manufacturing sectors to better compete globally.

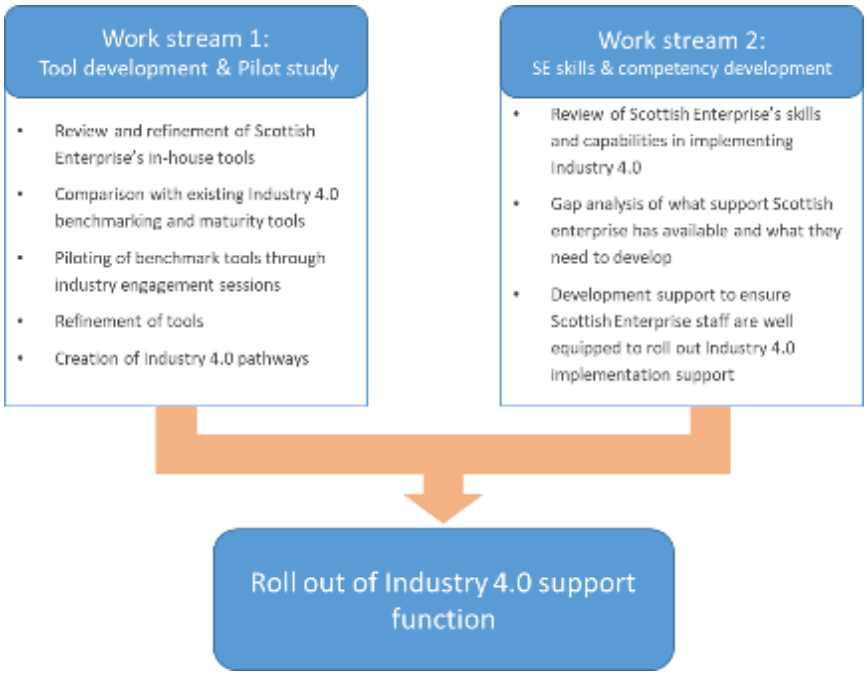
Objectives and approach of the study

The purpose of this study was to assist Scottish Enterprise deepen their understanding of Industry 4.0 through the development and pilot of a diagnostic and roadmapping toolset with a cohort of 7 Scottish manufacturers.

The overall objectives of the study were as follows:

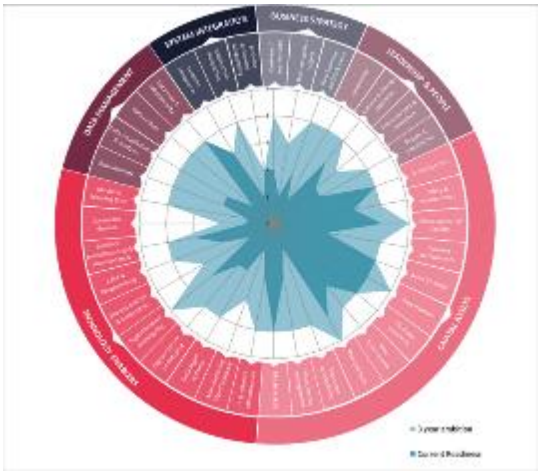
1. Through company engagements pilot a benchmarking tool from which learning can be gained to refine it for roll-out.
2. Engage with the steering group to explore what support Scottish Enterprise has available to assist companies implement Industry 4.0, and identify any gaps
3. Drawing reference from the benchmarking tool create Industry 4.0 pathways that set out sequential steps for each business participating in the research

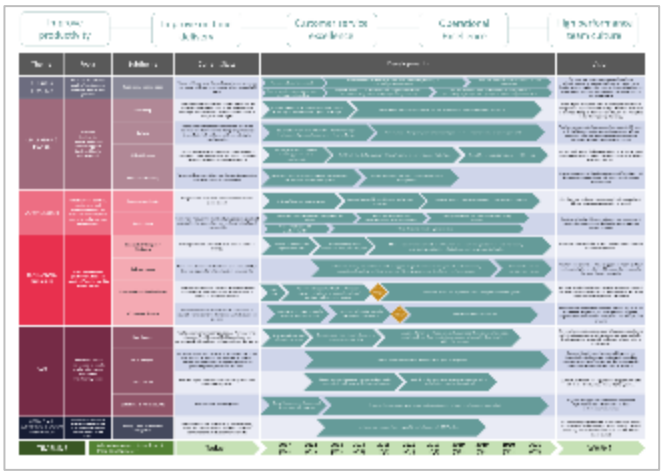
The approach to deliver these objectives was to break down activities into 2 parallel workstreams which converge at the end to enable the roll out of the Industry 4.0 tools:



Results from the study

The project resulted in the delivery of a robust Industry 4.0 diagnostic toolset, grounded in academic rigour and successfully trialled with 7 businesses from different sectors and of various sizes (figure below). The tool is made up of 6 thematic areas and broken down into a further 37 subthemes.





Using the developed toolset and diagnostic Industry 4.0 roadmaps were completed for each of the 7 nominated companies, with comprehensive write ups included, prioritised projects identified and overall ambitions raised.

A skills / competency review of Scottish Enterprise's in-house capability was conducted to identify the current level of knowledge, skills and capabilities across 7 of Scottish Enterprise's teams for supporting

the practical implementation of Industry 4.0 business support. Skills Development Scotland were also engaged within this activity.

The skills review highlighted that a combination of both hard technical skills and soft management / people skills are required to facilitate the identification and integration of relevant Industry 4.0 technologies for businesses in Scotland. These skills have been categorised against 4 suggested phases of industry 4.0 support:

- Phase 1: Engagement, understanding & opportunity identification
- Phase 2: Solutions development
- Phase 3: Implementation & demonstration
- Phase 4: Aftercare support

It was noted that SMAS's industrial practitioners and SE's Digital specialists are well placed to lead the diagnostic and roadmapping sessions, with further support delivered by the Workplace innovation, Account Management, and Sustainability teams based on the specific needs of the companies'. We envisage that the majority of SE's support will be delivered during phase 1 and phase 4 as this is where the majority of the teams' skills lie. To facilitate further integration of industry 4.0 technologies within Scottish businesses, SE's existing products and services should be utilised and tailored to create specific support packages.

The review also identified a need for continuous professional development in technical skills linked to Industry 4.0, particularly hard technical skills, possessed by the SE teams to support businesses in the development and implementation of digital technologies. Skills here include: programming, development of algorithms, electrical engineering and user interface design. Where appropriate, we recommend that SE signpost the companies to relevant service providers who do possess these skills to aid with the technical development and implementation.

On the whole, the teams' confidence and understanding on Industry 4.0 increased but further training is required.

Recommendations

Upon completion of this project, the following recommendations have been made to Scottish Enterprise to facilitate the roll out of the manufacturing 4.0 service:

Recommendation 1: Following on from the success of the project, we recommend that SE leads on rolling out a new Manufacturing 4.0 service that adopts the methods outlined in this report.

Recommendation 2: We recommend that training is provided to the wider SMAS and Digital teams to assist with the roll-out of the service

Recommendation 3: At the diagnostic stage of the service we recommend that SMAS and Digital Specialists are both involved, to ensure relevant skills are available across the six industry 4.0 themes

Recommendation 4: We recommend greater visibility is given to how Scottish Enterprise intervention and support can be applied and packaged to support the implementation of Industry 4.0 pathways

Recommendation 5: We recommend that SE considers extending its range of Expert Support products to include an Industry 4.0 Expert Support product. This will increase the capacity to support companies with this activity

Recommendation 6: We recommend that Scottish Enterprise engages with participant companies to develop Case Study material that can be shared and placed online to inspire other companies to engage in this activity.

Recommendation 7: We recommend that SE explores the practicality of procuring an online or app based solution for facilitating the diagnostic and pathway sessions and to speed up the processing and analysis of results.

Recommendation 8: We recommend that SE shares learning with other regions and uses this as a platform for continuously improve its Industry 4.0 service.