The Strategic University Steel Technology and Innovation Network Presents

Task 4: UK Digital Steel Innovation Hub (DSIH)

Arnold Beckmann, Swansea

Janet Godsell, Warwick

Jonathan Linton, Sheffield

Giovanni Montana, Warwick

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UKRI Engineering and Physical Sciences Research Council

Swansea University Prifysgol Abertawe

The University Of Sheffield.

WMG THE UNIVERSITY OF WARWICK

Academic capability

University	Academic	Expertise
Sheffield	Prof. Jonathan Linton	Operations and Technology Management
Swansea	Prof. Arnold Beckmann	Computer Science
Warwick	Prof. Jan Godsell	Operations & Supply Chain Management
	Prof. Giovanni Montana	Data Science

Aim

The digital steel innovation hub is a dynamic network that provides industrial partners with the opportunity to rapidly identify promising data driven innovations and funding for further development

Broad opportunity for digital steel innovation

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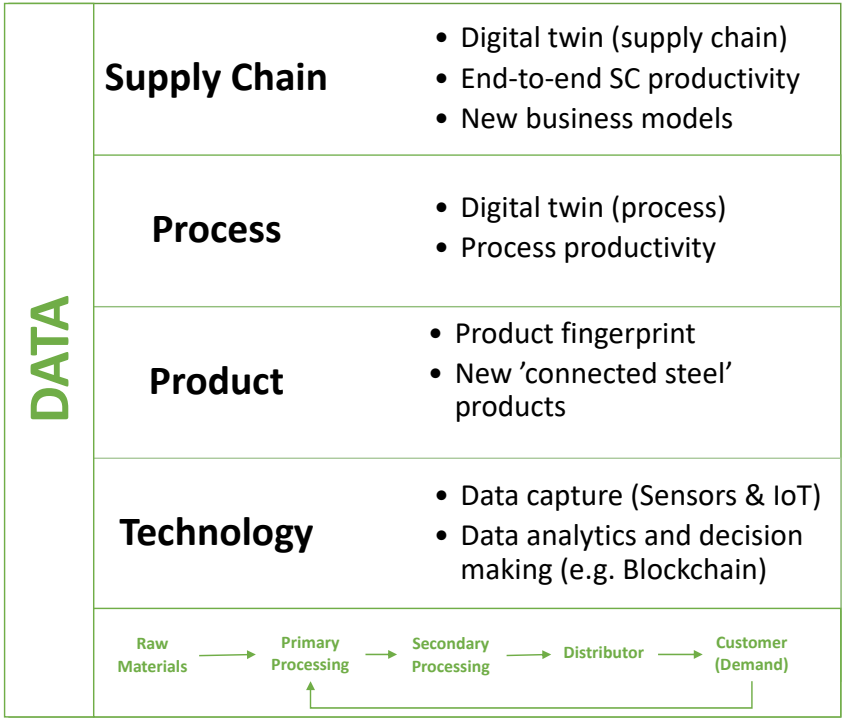
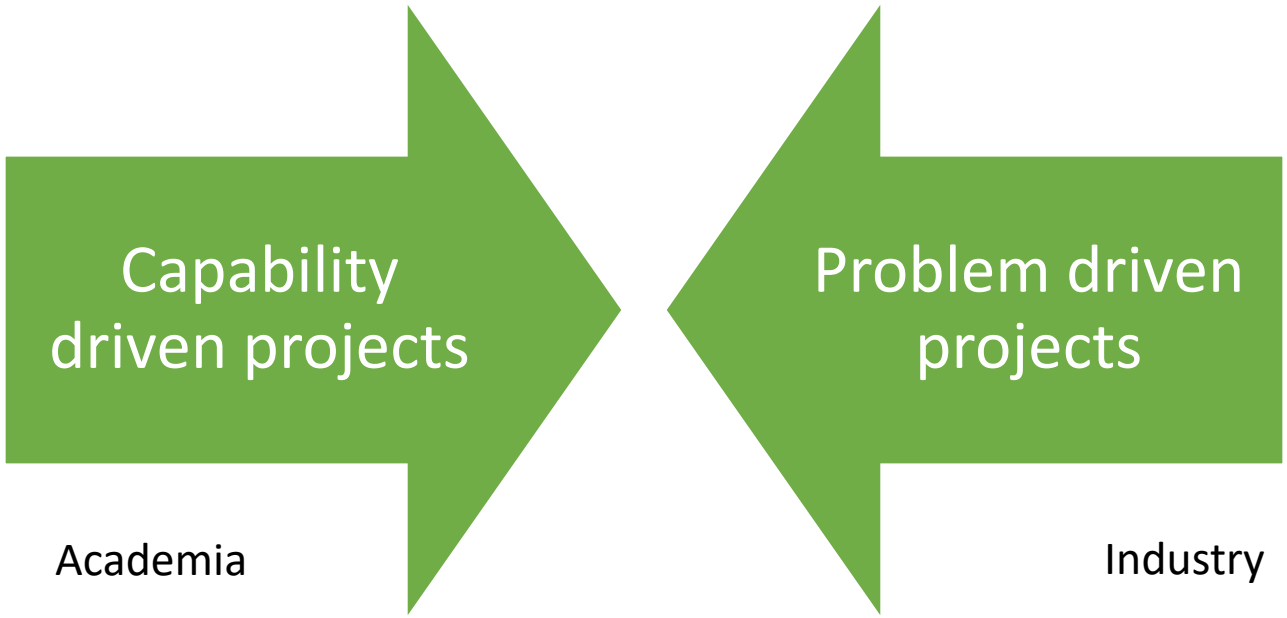


Brings together…



Platform for further funding

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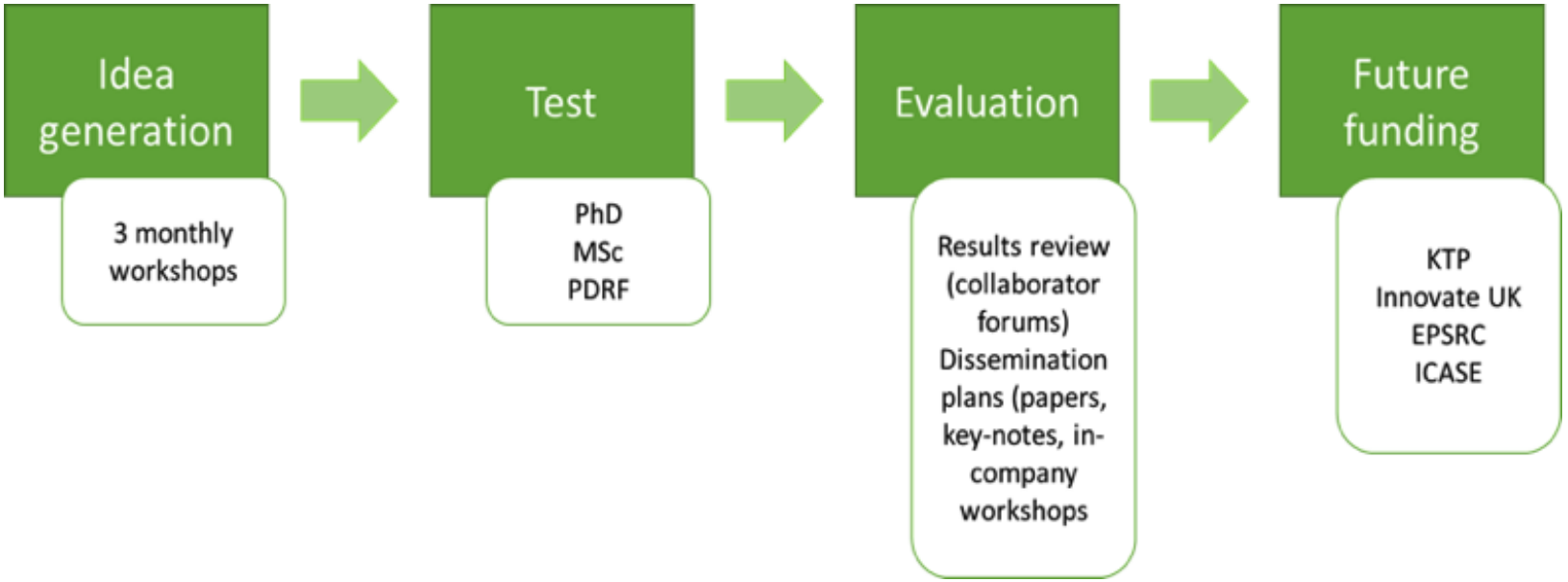

Projects with real impact

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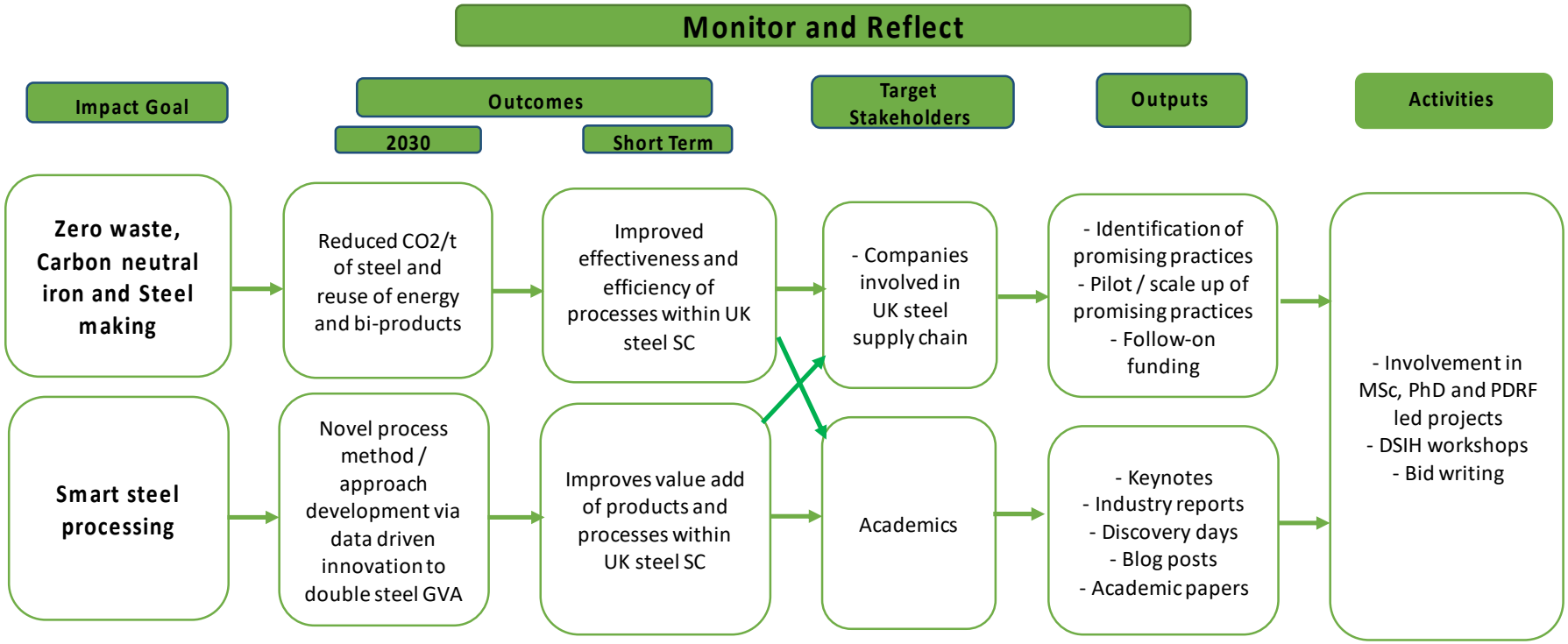
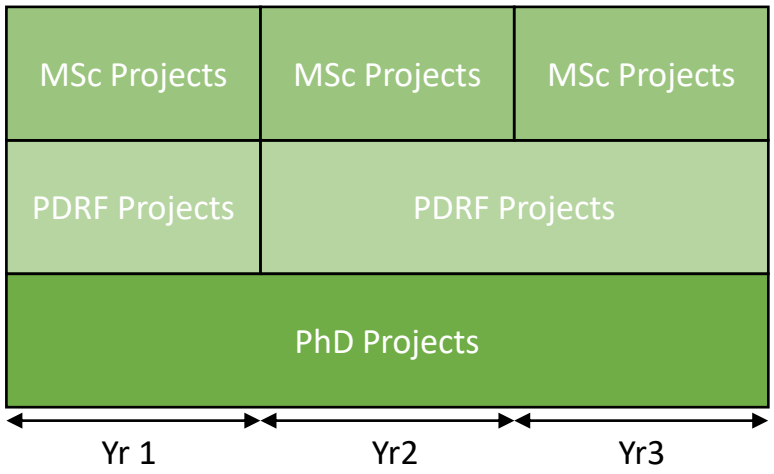


3 types of resource with different cadence…



All 4 CIs to supervise 1-2 related MSc projects / year

50% PDRF – Supply Chain (WMG, JG)
50% PDRF – Data Science (WMG, GM)
100% PDRF – Computer Science (Swansea, AB)

PhD – Technology management (Sheffield, JL)
PhD - Data Science (WMG, GM)

Progress to Date –
Computer Science

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- PDRA in Digital Modelling and Blockchain
  - Advert closed 3rd May 2020, aim to appoint September 2020
  - Expertise in modelling computing systems, model driven software development, knowledge engineering, ontologies, formal methods, distributed ledger technology / blockchain
- PhD project
  - EPSRC funded ICASE PhD studentship in Model-Driven Engineering for Industry with Tata Steel
  - Student: S Beden, started Oct 2019;
    Supervisors: Prof A Beckmann / Dr P James (Swansea University)
    Dr C Hughes, Dr S Thornton (Tata Steel Research & Development)
- BSc project
  - Topic: Modernisation of the Blast Furnace Blend Model System
  - Student: J Morgan, started Oct 2019
    Supervisor: Prof A Beckmann (Swansea University)
    Stakeholder: David Ashley (Tata Steel UK, Port Talbot)

Progress to Date –
Data Science PDRF project: Machine Learning for Sequential Decision Making

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- Recruitment status: On hold
- As part of this project we will develop new technologies based on deep artificial neural networks and probabilistic models for sequential decision making with applications in Smart Steel Processing. We will exploit existing historical data repositories made available by our industrial collaboration and the availability of next-generation sensors that are now replacing traditional sampling methods in extreme environments.
- We will also develop novel reinforcement learning methodologies using deep learning and their applications in digital steel manufacturing
- Ultimately, we will be instrumental in delivering an AI system prototype able to automate and optimise certain processes that still rely heavily on manual intervention.

Progress to Date –
Data Science PhD project

- Recruitment status: A PhD student to start in June

- In this PhD project we will develop advanced artificial intelligence algorithms for sequential decision making for applications in smart steel processing. We will develop novel data-driven techniques that leverage the latest advances in data science and machine learning. We will also establish a “digital twin”, a simulation-based environment to help us test and develop novel reinforcement learning algorithms.

Progress to Date –
Operations & SCM

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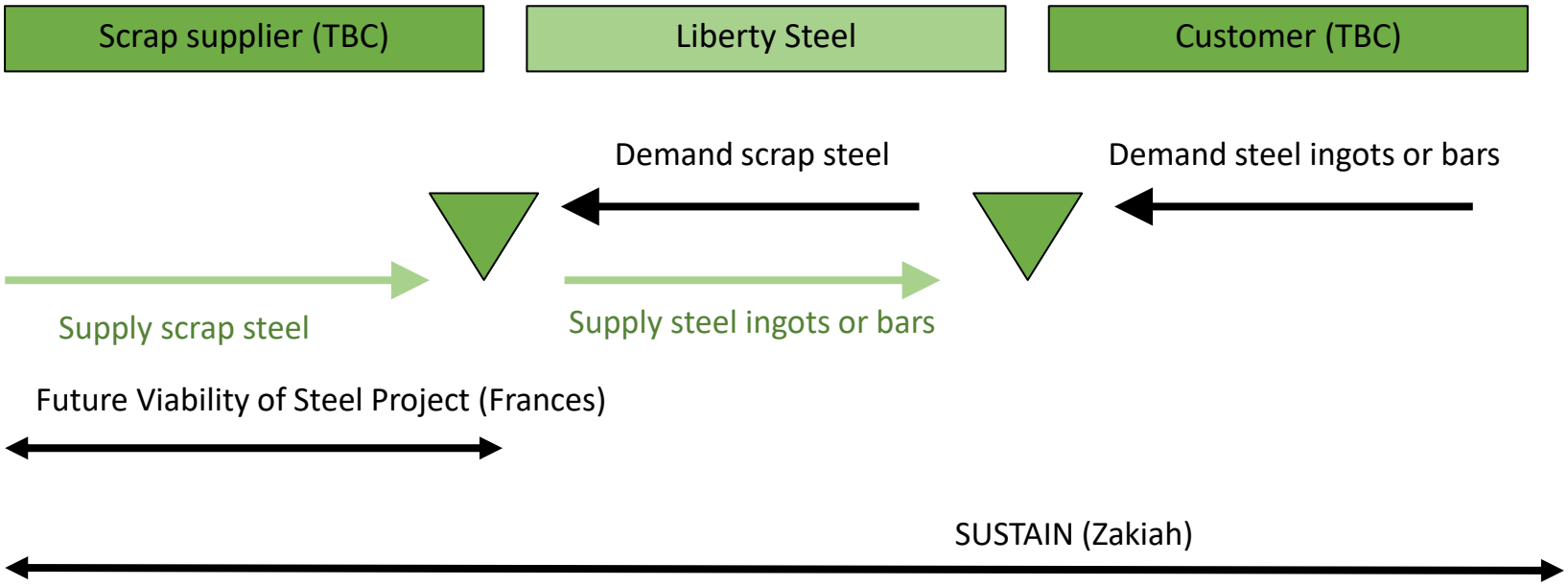
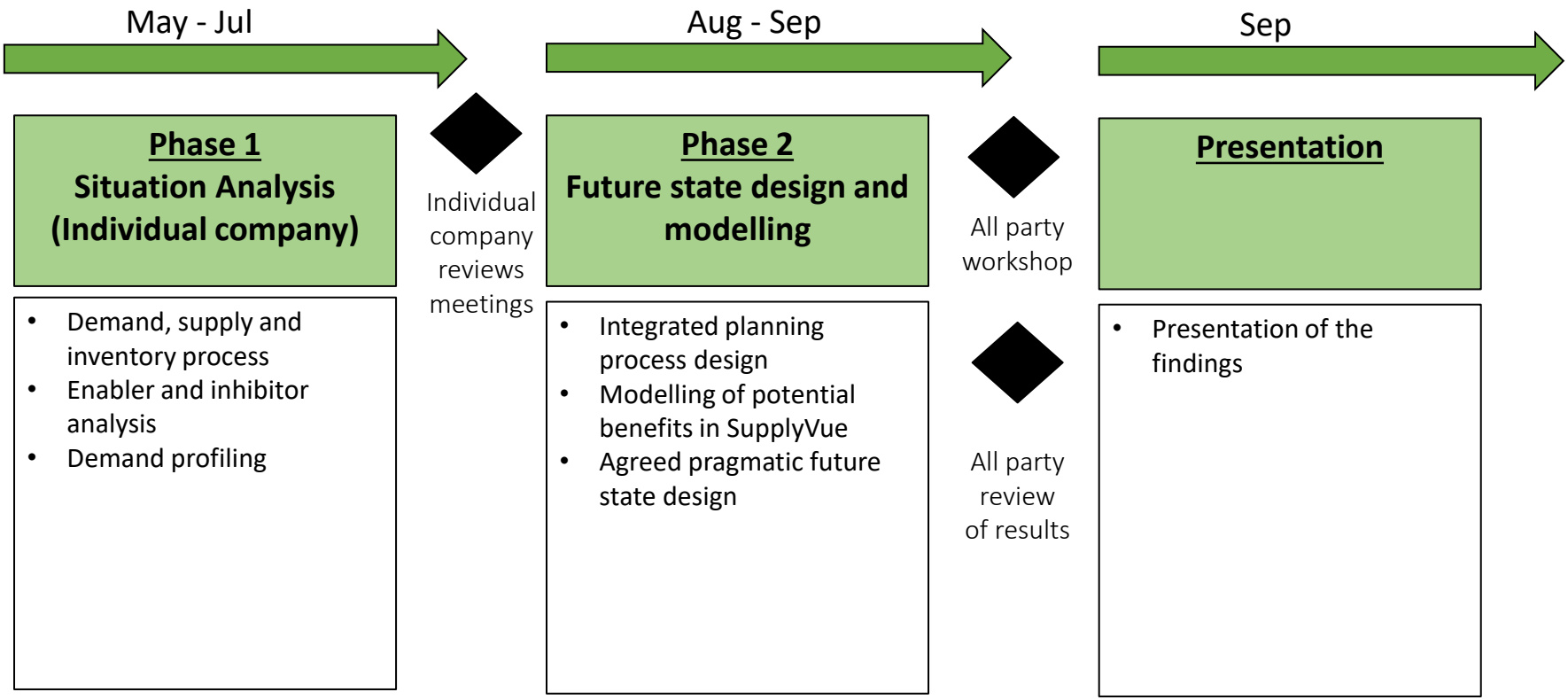
OSCM Approach

Digest (May) Transforming productivity of steel industry supply chains	**Survey (Aug)** Exploring the role of digital technologies in improving steel productivity	**Case study with Liberty Steel (May to Sep)** Improving the productivity of Liberty Steel (Stockbridge) and a named customer and a scrap supplier through the implementation of an integrated planning process.

Project scope brings together 2 project resources



2-phase approach



Progress to Date – Operations & Technology Management

PhD project: Utilization of Machine Learning for Learning from Process Data

- PhD Project – Utilization of Machine Learning for Learning from Process Data – PLS (a technique pioneered in intelligent design for pharmaceuticals) will be utilized to assess process data and extract further insights from Industrial Design of experiments.
- Expected outcomes, include:
  - Insight into which existing sensors provide redundant data
  - Underlying factors associated to data that have an impact on desired outcomes
  - Insight into obtaining desirable characteristics and avoiding undesirable characteristics by direct or indirect control of specific settings and sensor readings
  - Insight into the extent that existing process sensors/data measurement model underspecify outcomes/characteristics of product
- Current status
  - Awaiting administrative approval to advertise and recruit student
- Interests and Strengths
  - Technology Innovation Management
  - Digitalization
  - Business Model Innovation
  - Opportunity Recognition (new utilization of existing technology and products)
  - Process Management (e.g. see project on prior slide)
  - Sustainable/Close Loop Supply Chains
  - Environmental Management and Product Life Extension

Engineering and
Physical Sciences
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The
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Of
Sheffield.

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