Meeting of the RDM-RSC Network at the University of Exeter, 9 December 2015

FUTURE DIRECTIONS IN MANUFACTURING: NOTES ON PRESENTATION SESSIONS

A meeting, led by the University of Exeter, was held on 9 December 2015 at the University of Exeter Science Park to explore future directions in manufacturing, especially additive and other manufacturing approaches applied in the context of a circular economy, with a review of impact these may have on redistributing manufacturing supply chains and networks. The meeting was the fourth full network meeting of the EPSRC-supported Redistributed Manufacturing for the Resilient, Sustainable City research network. It was attended by in the order of 30 persons.

Introduction

Dr Oana Ghita and Dr Silvia Berretta of the University of Exeter gave a general introduction to the network and to the specific topic of the meeting, noting that the objective is to consider how manufacturing will look in 50 years, in which issues such as resilience, scares resources, climate change, sustainability, remanufacturing, additive and hybrid manufacturing will come into play. The introductions were then followed by six presentations, the first three focused on technical developments in manufacturing and the next three on more socio-technical developments of the organisation of manufacturing in society. There was an overall focus in the presentations on developments especially in maintenance and repair operations (MRO).

The presentations were followed in the afternoon by extensive discussions, which are summarised below. As leading questions, each group was asked:

1) **What industrial sectors could benefit more from Re-Distributed Manufacturing (RDM) and why?**

The attendees identified several industrial sectors, which could benefit best from the concept of Re-distributed manufacturing: **textile (handmade), furniture, precision engineering, optometric, dental, medical, marine and renewables.** In general, RDM applies well at high value products at low volume scale.

RDM could also be beneficial for **food and drinks** (local sources), **open-sources and open-hardware farming equipment, machinery and tooling** following the Caterpillar model. In electronics parts could also be remanufactured or re-used to some extent (some parts could be too customised for a specific product).

Domestic middle level/middle price **furniture** products made of local materials and with local final customisation is something not available at the moment on the market and could be an opportunity for RDM.

Manufacturers that rely on **computer controlled and micro-scale technologies** and micro-scale could see many benefits in the implementation of RDM strategies such as: labour reductions, manufacture of complex components, ability to change scale quickly, safety enhancement and management of parts with obsolescence.

2) **How Re-Manufacturing, Additive Manufacturing and Hybrid manufacturing link to the industrial sectors identified in Task 1? Discuss the strengths and weaknesses**

Furniture sector
Strength: supply chain available in UK
Weaknesses: reverse logistics, business consistency of the return (not predictable), waste legislation, consumer perception, remanufacture culture, need for a change in apprentice.
Farming and machinery sector
Strengths: consistent demand, steady sector
Weaknesses: sectors does not respond to innovation very quickly (may be unwilling to adopt new processes or business models), perception of safety (may not be willing to use remanufactured parts or buy different products).
Household goods sector: DIY, entire home – made, life - cycle of the product
Strengths: better products, consumer better engaged, more choice of products
Weaknesses: IP issues, shorter life cycle, health and safety
Automotive sector
Weaknesses: Requalification required; not all parts are suitable for remanufacture, perception issues – remanufactured products perceived as not being as good)
Strengths: Good for product with assemblies (industrial equipment); maintains traditional skills, ensures product longevity through maintenance

3) **Please discuss what impact these forms of manufacture will have on the political, economic and social environment.**

Traditional re-manufacturing
Social: Skills and jobs creation; improve local economy, environmental benefits, less waste, more aware consumers; minimal levels of trust relating to expected quality levels [consumer confidence]; peoples mind set such as “nice to buy”, “new is better than reused”, “use and dispose mentality, “products continuously being improved by more energy efficiency devices”.
Political: improve local economy, less resources and extractions, devolution, resilience, Minimal amount of standards and legislation available, waste directives either do not align with RDM; concerns surrounding the legal obligation and responsibilities – IP; **Economic:** Market has to be created, lower economic growth with long term plans versus short term earnings, better local economy, less waste, less use of raw resources, shipping industry and transportation adjustments, new warranties for remanufacture
Hybrid manufacturing
Social: Skills and jobs benefits; improve local economy, environmental benefits, less waste, more aware consumers; **Political:** improve local economy, less resources and extractions, devolution, resilience, longer term barriers (lower short gains but long term gains)
Additive manufacturing
Social: Community better skilled, better connected with material and progress; **Political:** Market domination; **Economic:** Swap out of existing technologies ->mid-level services, the high levels required for certification would take a lot of time and cost; the business would have to offer more services and be flexible, costing more.