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Evolvable Precision Assembly Systems - Towards Open, Adaptable and Context-Aware Manufacturing

The concept of co-evolution of products, processes and production systems in response to evolving external drivers such as new materials, technologies, services, and communications has been a subject of debate. Recent works have identified adaptability, changeability, self-resilience, self-improvement and co-creation as key facets of future responsive and flexible production systems. Despite achievements to date, the fundamental challenges remain and new theoretical foundations are needed for next generation precision manufacturing systems that can *self-build and evolve* as a function of *changing* complex networks of product requirements, processes and environment interactions in a predictable, measured and responsive way. To achieve such open emergent behaviour, manufacturing systems require new levels of context-awareness, standardized 'plug and produce' configuration methods, equipment module design and new multi-stage/multi-scale algorithmic capabilities and interfaces capable of delivering this new behaviour. The keynote will report on two current strategic programmes funded by the UK Engineering and Physical Science Research Council in Cloud Manufacturing and Evolvable Assembly Systems based on a multidisciplinary research approach predicated on an innovative intertwining of several foundational research challenges in complex adaptive systems, cloud technologies, product-process-system evolution, data analytics, knowledge modelling, emergence engineering, and open manufacturing.

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