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## IMPRESS - reInventing Manufacturing via Products with REconfigurable Shape and Stiffness

### Project Team:



**Lupo Manes**  
Research Assistant, UoL



**Paolo Paoletti**  
Senior Lecturer, UoL



**Jonathan Butters**  
CEO, Butters Innovation

### The project team and timeframe

The project is lead by Dr Paolo Paoletti, Senior lecturer in Control a University of Liverpool and Academic Lead for the @LERT (@Liverpool Engineering Robotic Technologies) lab. He has expertise in robotic hardware and software design, and in intelligent manufacturing. Lupo Manes is the Early Career Researcher in the team, currently completing his PhD in robotics which revolves around the design of innovative mechatronics devices. The industrial partner, Butters Innovation Ltd, has been developing world-class industrial design solutions for the medical, care, industrial, scientific and consumer sectors since 2008. They will provide advice and feedback on the design, and ensure relevance of the results for the design and manufacturing industry.

The feasibility study will run for 6 months, with an initial phase dedicated to design and simulation and the last part focused on creating a proof-of-concept demo of the envisaged technology.

### What does the project demonstrate?

IMPRESS' aim is to explore how recent advances in modular robotics can be successfully exploited to introduce a radically novel approach to design and manufacturing, where smart cm-sized programmable units dynamically reconfigure in 3D to form complex structures, sense the environment and change the structure's response. The feasibility study will answer two main research questions: i) can small modules capable of self-assembly into structures of variable shape and stiffness be designed? and ii) what are the requirement for the designer and the final user to interact with IMPRESS technology to tailor designs? If successful, this technology will unlock a radically novel manufacturing approach where digital and physical are intertwined and blended into a single cyberphysical product.

### Additional information regarding project, and key highlights wanting to address

This project builds on previous research in the field of programmable matter. However, no current design and/or manufacturing techniques can produce smart, reconfigurable and stiffness-tunable products. IMPRESS aims at creating the first incarnation of such products.



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