From Cell to System – Making Innovation Work

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Theme 1: Business, Economy, Innovation

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Introduction:

Interdisciplinary collaboration is an established route to innovation: by working together, it is argued that professionals with different yet complementary backgrounds can create new ways of approaching problems and finding solutions.[i] Increasingly sophisticated yet accessible online platforms have enabled both individuals and organisations to build teams around shared interests and issues, rather than conventional professional disciplines.[ii]

Craft is part of this trend, and craft makers are increasingly collaborating with professionals from other disciplines. In this way, they are undertaking a wide range of projects and roles in sectors including tourism, healthcare and engineering - amongst others - as well as across the creative industries.[iii]

This paper focuses on the work of craft makers collaborating with STEM subject (science, technology, engineering, mathematics) professionals. Such collaborations have, in the past, produced extraordinary objects and raised public awareness of scientific concepts. However, the central proposition of this paper is that craft has a different and under-recognised role – that of driving the development of new technologies and science and engineering based systems, products and services themselves.

Product innovation:

In July 2011, glass maker Matt Durran contributed to the world's first tissue-engineered organ transplant, a trachea for a cancer patient pioneered by the surgical research department of the Royal Free Hospital, London.[iv] Durran's glass moulds overcame a technical impasse, by withstanding the tissue bio-reactor's heat whilst retaining the desired form. As a result, they are now being used to develop tissue-engineered human noses and internal organs.[v]

Other makers working in the medical and therapeutic fields have undertaken an equally prominent role in the technological innovation process. Professor Paul Chamberlain, originally a furniture designer, is patenting a medical drug delivery device designed to reduce the 23% risk of fatality posed by mis-connection of traditional Luer connectors.[vi] Dr Graeme Whiteley used model making as the key methodology for developing new forms of limb prosthetic[vii] that are now the basis of Elumotion, a robotics hardware company specializing in the replication of biological motion.[viii]

In the environmental technologies field, textile maker Rachel Wingfield's company, Loop.pH has transformed geotextile structures and solar cells into an urban ecosystem – named Metabolic Media – that supports, feeds and monitors plants using a photovoltaic-powered fuelling pump system. Working with the National Laboratory for Sustainable Energy in Denmark, Loop.pH is now developing this concept into large tensile surfaces and building facades capable of providing shelter, shade and night-time light for emergency shelter relief.[ix]

Materials innovation:

Makers' knowledge of materials and skill in transforming them has produced many innovations in this field. Textile maker Philippa Brock, for example, produces conductive woven fabrics, to be used in conjunction with electronic components. Brock's work incorporates textile touch and stretch sensors, galvanic skin response sensors, and circuitry for both power and data, in an approach that bridges functionality with aesthetics and user considerations.[x]

The new materials developed by makers can unlock further innovation amongst architects and designers. Recent research documents furniture maker Guy Mallinson's patented Bendywood©, used in the Stirling Award winning Laban Centre, and glass maker Professor Jim Roddis and Gary Nicholson's Resilica, used in the Costa Coffee and Pitcher & Piano chains and in Thomas Heatherwick's *Blue Carpet.*[xi]

As well as devising new materials, makers are adept at finding new applications for existing technologies. In traditional manufacturing settings, research has demonstrated their potential to enable innovation on an organisational level, making new use of existing skills, materials and industrial processes.[xii] In the post-industrial manufacturing economy, meanwhile, they are stretching the capabilities of new technologies such as water jet cutting and rapid prototyping, thereby extending the technical and visual vocabularies of industrial suppliers.[xiii] [xiv]At the intersection with biotechnology, Biojewellery and Marta Lwin demonstrate how bioengineered bone tissue and skin can be used in innovative, new ways with far wider possible application, when engaged creatively by makers.[xv] [xvi]

Systems Innovation:

Finally, literature and anecdotal research reveals a role for makers in the creation of the new tools, systems and processes that support innovation. Dr Jane Harris has developed digital tools that depict textiles realistically in multi-media environments,[xvii] whilst Ann Marie Shillito's Cloud 9 - a haptic interface and software suite - creates a new range of creative expression by bringing the experience of touch into computer aided design.[xviii] Investigating the potential for new technologies to engage consumers as active participants in design, the Autonomatic Research Cluster at University College Falmouth is developing new systems of generative production and distributed consumption.[xix]

Context and analysis:

The above exemplars demonstrate that makers are contributing to STEM-based innovation in ways that are not widely reported or analysed. To their work with scientists, technologists and engineers, they appear to bring complementary knowledge and skills, a distinctive form of creative thinking and a particular sensibility towards people's engagement with the material world.

Combined, craft and the STEM disciplines appear to offer significant new opportunities for innovation, particularly in product design, biotechnology and post-industrial manufacturing. This potential appears, moreover, to extend beyond the creation of new objects and materials and the reimagining of existing technologies towards the fundamental reshaping of contemporary systems of production and consumption.

There is significant potential for this phenomenon to be explored and expanded, in an academic setting. It is notable that many of the exemplars listed above were initiated and supported by universities. To these collaborations, universities brought a critical perspective, dissemination opportunities, research facilities and the profile needed to source industry partners, as well as research funding. Their success suggests that practice-based research and knowledge transfer partnerships, supported where appropriate by external partners, offer the opportunity to transform research in both craft and STEM disciplines by enabling collaboration between them.

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