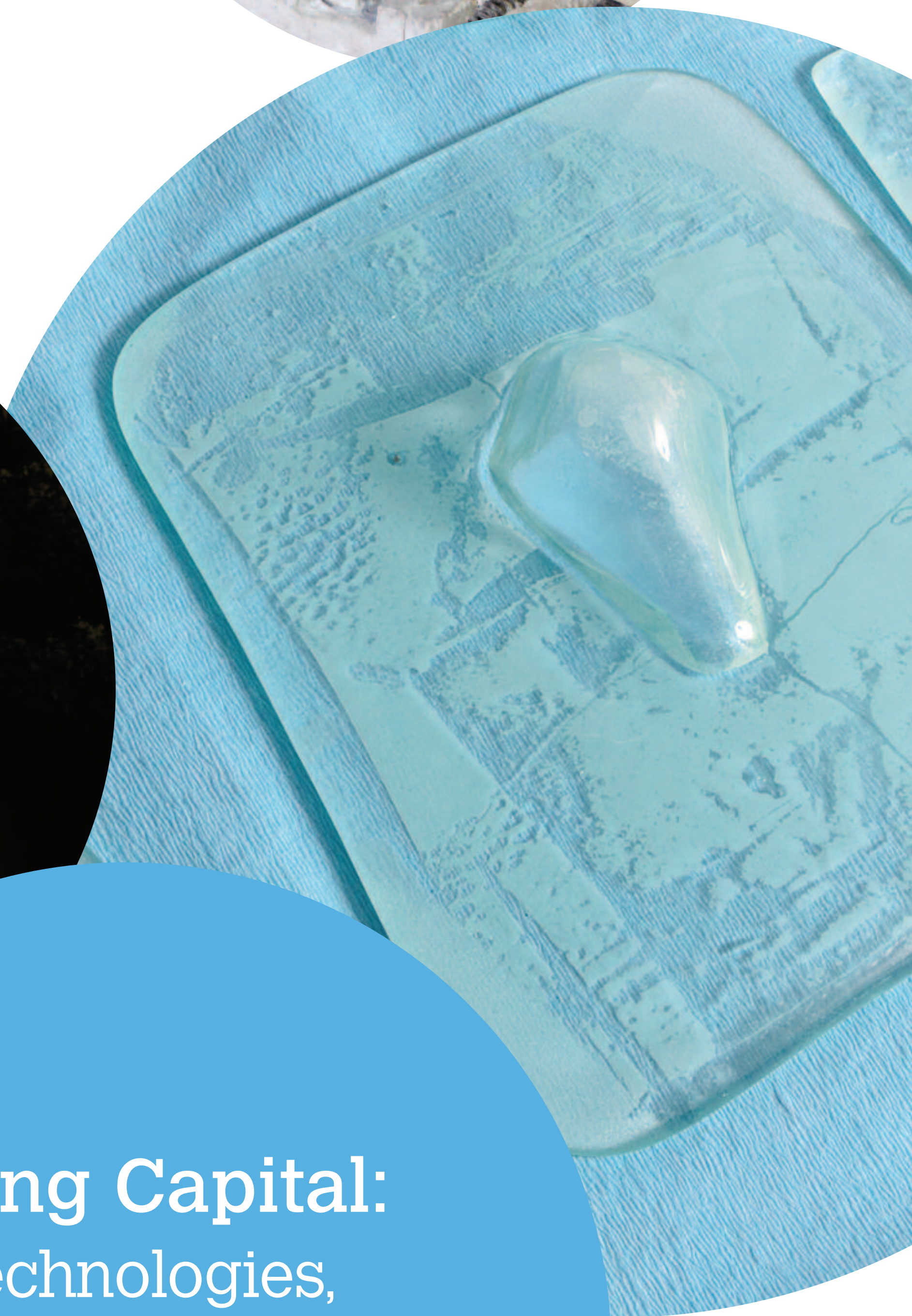

Crafting Capital: New technologies, new economies

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Cover from top:

Glass moulds in Matt Durran's kiln.
The glass is slumped over a plaster/quartz mix.
Photo: Tina Hillier

Glass moulds, Matt Durran.
Photo: Tina Hillier

Metabolic Sphere, 2009, London, Loop.pH.
Photo: Mathias Gmachl

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Introduction

Collaboration accelerates innovation: by working together, people with different but complementary expertise can challenge conventional thinking and find unexpected new directions in their work.

For scientists, engineers and technologists, collaboration with artists and other creative professionals brings particular benefits, capable of producing new scientific thinking. These benefits can be summarised in a three-part model:

Thinking style. Creative idea generation, flexible thinking and risk-taking complement scientific thinking with its focus on investigation of known problems. Creative people bring cyclical thinking to the scientist's more linear approach, and their capacity for lateral thinking complements the scientist's deeper, narrower focus.[i] [ii]

The human element. Creative people engage with society, the human condition and our place in the wider world. Intellectually and viscerally – as well as creatively – they can help to connect abstract, scientific or technological developments with the needs of the real world.[iii]

Skills. Creative people have high level skills in visualising, recognising and modelling patterns and systems in ways that can advance scientific thinking. For many, this work is supported by superior manual dexterity and observational skills, acquired through drawing and model making.[iv]

The Craft Dimension

Craft makers today work in a far greater range of contexts than is widely realised, collaborating – like other creative people – with scientists, technologists and engineers.

Below, we highlight five innovations - in biotechnology, engineering, materials science, manufacturing and digital & communications technology - that demonstrate the distinctive value added to these collaborations, by makers.

Biotechnology

The world's first tissue engineered organ transplant took place in July 2011, saving the life of a throat cancer patient.

Glass maker Matt Durran played a crucial role in developing the technology behind the operation, specifically in creating moulds for the tissue that could withstand the fierce heat of a bio-reactor. Without Durran's work, surgical research colleagues at the Royal Free Hospital report, the project would have stalled. As a result of the collaboration, Durran's moulds are being used to develop tissue engineered noses and other organs.

Other makers are trialling new ways of controlling the growth of bioengineered human cells that could drive further innovation in the field. Biojewellery, a collaboration between Royal College of Art and Guys Hospital researchers, is exploring the potential for engineered human bone tissue to be grown into new shapes, supported by a bioactive scaffold. Similarly, Marta Lwin's work with artificial skin cells is investigating how epithelial cells can be grown into pre-determined forms, then dyed and sealed to create a new material to be used in jewellery and other consumer products.

Manufacturing

Makers can create growth in traditional manufacturing companies by enabling them to adapt to new markets and client needs.

This growth can be technological. Metalworker Trish Woods' work in pewterware manufacturing, for example, is producing new colours and surface finishes designed to expand the industry's market potential. Meanwhile, glass maker Dr Vanessa Cutler's work with water-jet cutting companies has expanded the technical capabilities of an entire industry sector.[v]

Growth can also occur in terms of a company's culture and skills base. Research has shown how, by working side-by-side with skilled factory workers, makers can help to build innovative manufacturing companies with the creativity required to respond effectively to clients' increasingly diverse needs.[vi]

In the post-industrial economy, makers are working in similar ways with new digital manufacturing technologies such as 3D printing. Ceramist Michael Eden, who has developed a unique way of combining a non-fired ceramic coating with rapid prototyped plaster and gypsum, is one example. Other makers such as Tavs Jorgensen work with data capture, finding ways of using new manufacturing technologies to transform hand gestures – for example – into solid form.

Together, these makers and others are not only creating new visual vocabularies for these emerging technologies, but are also extending the capabilities of manufacturing industry suppliers.

Engineering

The urban ecosystem Metabolic Media enables food to be grown and harvested in small, urban spaces. Its biomimetic structure weaves an electric pump – powered by geotextile solar cells – into a flexible frame that feeds, waters, monitors and supports the growth of climbing plants.

The system was conceived by textiles specialist Rachel Wingfield of Loop.pH, 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 (Loop.pH 2011).

Other makers bring human-centred approaches to the design of public buildings that add value to architectural construction projects. Textile maker Ptolemy Mann, for example, uses her knowledge of how colour theory applies to different surfaces and materials to help patients to find their way through the building. As Jonathan Wilson – from client Ansen & Allen Associates – explains, Ptolemy's input adds significant value to his company's work, improving the building's look and functionality in a cost-effective manner.[vii]

In each case, makers' specialist knowledge and skills have particular roles to play in finding new solutions to engineering and construction challenges.

Materials science

New 'smart' fabrics that connect people with their physical environment and the internet are being developed by textile maker Philippa Brock. The woven fabrics are conductive and can incorporate touch, skin and environmental sensors whilst connecting wirelessly to mobile phones and other web-enabled devices.The new materials have significant potential application in the development of high performance clothing and biomimetic architecture, as well as in the fashion industries.

Philippa's work is aligned with the 'Internet of Things', one manifestation of a growing interest in materials and products capable of communicating with users and with each other. An 'Internet of Things' ideas lab – run by the Crafts Council and Watershed in Bristol in November 2011 brought together 60 makers, engineers and technologists to explore new ideas. The day showed intense connectivity between craft and new technologies in this field, for example in creating smart objects that could enable the remote monitoring of health outputs.

In parallel to these advances, makers are also developing new building materials, capable of driving innovation in architecture and profit in the construction industries.

The contribution made by these innovations to architecture is already recognised by the industry, with Guy Mallinson's Bendywood© contributing to the fluid aesthetic of the Laban Centre, winner of the 2003 RIBA Stirling Award. They have also proved themselves to be highly scalable. PricewaterhouseCoopers has projected direct profits of almost £3.25m and royalties of up to £930K over 25 years for Resilica™, a recycled glass and resin composite developed by glass makers Professor Jim Roddis and Gary Nicholson.[vi]

These examples show how research and development conducted by makers, in partnership with industry, can leverage growth in other industries, from fashion to healthcare.

Digital & Communications Technology

The haptic sketchbook software Cloud 9 was developed by metalworker Ann Marie Shillito. It allows people to 'feel' materials – their resistance and the way they respond to touch – whilst working through a computer interface.

This software creates significant new potential for innovation and growth. Particularly when used in connection with remote 3D printing services such as Shapeways and Ponoko and market testing services such as Ulule and Kickstarter, it creates new opportunities for independent makers to prototype and market test new products. Other makers are also creating new tools, systems and processes that support innovation. Dr Jane Harris, for example, has used her textiles knowledge to develop new tools for rendering textiles in digital environments. Her work, which creates digital textiles that hang and move with greater realism than previously achieved, has application in educational software development, as well as in the retail and gaming industries.[ix] Ceramist Dr Katie Bunnell, meanwhile, is developing new systems for distributing personalised and remotely manufactured ceramic tableware. Katie's Autochina system provides the customisation that is attractive to consumers, whilst reducing both warehousing costs and environmental impact through new supply chain efficiencies. In each case, makers are looking beyond the production of individual craft objects, to create new innovations in systems, tools and processes through their engagement with new technologies.

Craft's Contribution

The examples given above show how collaboration between makers and scientists can:

- Produce **scalable innovations**, capable of enabling growth across a range of industry sectors.
- Unlock **further innovation potential** within the creative and scientific communities, by creating new tools, materials and knowledge.

Makers bring distinctive craft knowledge and skills to collaborative working that are crucial in unlocking this innovation potential. In pinpointing how exactly makers add value, it is useful to return to the three-part model of creative scientific collaboration identified previously:

Thinking style: reflection-in-action
Designers and architects work with representations of objects and buildings, in the form of digital renderings, drawings and prototypes. Makers, conversely, engage directly with objects and materials. Whether forging metal or sintering resin with a 3D printer, the maker's thinking is characterized by the immediacy of shaping and refining ideas through active experimentation.

Sociologist Richard Sennett proposes that this form of 'reflection-in-action,' specific to craft thinking, enables innovation by working with – rather than against – the restrictions of a given situation. In this analysis, craft thinking applies both to engineering and to team working: Sennett describes the craftsperson as a 'sociable expert', able to facilitate innovation by stretching the competencies of others within reasonable parameters.[x]

This type of thinking has increasing application in a digital world, according to David Gauntlett – another sociologist interested in craft thinking. In Gauntlett's view, craft makers – as specialists focused as much on process as on outcome – are well placed to engage with the creative tools and community culture developing through Web 2.0.[xii]

The human element: immediacy, intimacy + social making
Makers' sensibility towards how people engage with the material world gives them a unique edge when it comes to human-centred innovation. Partly, this is because makers often work closely with their clients and customers. In contrast to designers – whose relationship with end users is distanced by the supply chain – makers typically work to commission and sell direct. This experience develops an intimate understanding of how people respond to materials and objects – emotionally and sensually, as well as in terms of function. And for makers, this knowledge is transferable to projects where interaction with the end user is less direct. Perhaps more profoundly, makers' understanding of the 'human element' can reflect a strong impetus to address human and societal issues in their work. For many makers, concerns around global sustainability drive innovation in products, services and business practices. For these 'social makers', creating objects that last, often from ethical materials, can be a way of addressing societal issues on an individual scale.

Skills: materials knowledge + making skills
Sennett famously stated that it takes 10,000 hours to learn a craft.[xiii] In the course of this immersive learning process, makers develop unparalleled craft skills and knowledge about the materials and techniques employed in their work. This knowledge and skill is largely tacit, and is often hidden within the creative process; yet its usefulness in science, technology and engineering is significant. Makers appreciate the physical qualities of materials and their appropriateness for different uses. They understand affordances and tolerances – how far sheet glass can be slumped without warping and how frequently ceramic can be pierced by laser cutter without cracking. And they are highly skilled in stretching the capabilities of materials and processes. Each of these areas of expertise can result in innovations in engineering, science and technology – from a new use for a disused piece of manufacturing equipment, to an improved quality of online gaming environment.

Looking to the Future

This is a time of great potential for makers to drive innovation in science, technology and engineering. The rapid pace of technological change is enabling innovation-focused collaboration between specialists from different disciplines, whilst the proliferation of online collaboration platforms is reinforcing a new culture of shared innovation.

These new ways of working currently remain at the cutting edge of craft and science/technology/engineering practice. They need to become more accessible if collaboration is to fulfil its potential and require both practical tools and a range of routes for connecting new collaborators.

To develop further, they will need:

- More flexible and accessible knowledge transfer programmes designed to encourage participation from independent freelancers and from companies and Higher Education Institutions of various sizes.
- Advocacy, brokerage, mentoring and management services bringing together makers and companies working in the science, technology and engineering fields, and able to communicate the advantages of collaboration to professionals from different backgrounds in order to minimise risk and to optimise innovation potential.
- Online communities, networking sites and collaboration tools designed to promote and enable collaboration between individual makers, scientists, technologists and engineers.
- Promotion of cross-curricular learning in schools. Whilst this is arguably not easily achieved within recent or current curriculum policy, cross-curricular learning remains the best way to embed the collaboration habit on both sides.
- Political and institutional separation of the arts and humanities from the sciences, technology and engineering risks the demise of the dynamic, cross-disciplinary energy we see here. However, this risk can be countered with specific, focused interventions designed to connect craft makers with scientists, technologists and engineers. With vision and strategic investment, collaboration between these complementary professional groups can help to deliver government policies on innovation and growth.

References

i Glinkowski P and Bamford A (2009). *Insight and Exchange: An evaluation of the Wellcome Trust's Sciart programme.* London: Wellcome Trust; 2009

ii Naimark M (2003). *Truth, Beauty, Freedom, and Money: Technology-Based Art and the Dynamics of Sustainability.* A report for Leonardo Journal supported by the Rockefeller Foundation. http://www.artslab.net/ [accessed 18 November 2011]

iii Maeda (2011). http://www.guardian.co.uk/technology/2010/nov/14/my-bright-idea-john-maeda [accessed 18 November 2011]

iv R S and Root Bernstein M M (1999). *Sparks of Genius.* Boston: Houghton Mifflin.

v ibid

vi Yair K, Press M and Tomes A: Crafting Competitive Advantage: Crafts knowledge as a strategic resource, *Design Studies* vol 22 no 4

vii Schwarz M and Yair K (2010). *Making Value: Craft & the economic and social contribution of makers.* London, Crafts Council

viii Ibid

ix Schwarz M and Yair K, op cit

x Marshall J and Bunnell K (2009). Developments in Post Industrial Manufacturing Systems and their Implications for Craft and Sustainability, In *Making Futures: the Crafts in the Context of Emerging Global Sustainability Agendas* Vol 1, 2009

xi Sennett, R. (2009). *The Craftsman.* London: Penguin Books

xii Gauntlett, D (2011). *Making is Connecting – The Social Meaning of Creativity*, from DIY and Knitting to YouTube and Web 2.0, Polity, Cambridge, UK

xiii Sennett op cit

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