Design Council

Multi-disciplinary design education in the UK

Report and recommendations
from the Multi-Disciplinary Design Network

NOVEMBER 2010

HIGHER EDUCATION FUNDING COUNCIL hefce FOR ENGLAND

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Universities involved in the Multi-disciplinary Design Network

Birmingham City University
Brunel University
Central Saint Martin's College of Art & Design, University of the Arts London
Coventry University
Cranfield University: Centre for Competitive Creative Design (C4D)
De Montfort University
Edinburgh Napier University
Glasgow Caledonian University
Glasgow School of Art
Imperial College London: Design London
Institute of Manufacturing, Cambridge University
King's College London
Kingston University
Lancaster University
Leeds Metropolitan University
London College of Communication, University of the Arts London:
Centre for Competitive Creative Design (C4D)
Northumbria University
Norwich University College of the Arts
Nottingham Trent University
Saïd Business School, University of Oxford
Ravensbourne
Royal College of Art: Design London
Robert Gordon University
University College Falmouth: The Academy for Innovation & Research (AIR)
University for the Creative Arts
University of Cambridge
University of Central Lancashire
University of Dundee
University of Liverpool
University of Nottingham
University of Reading
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University of Southampton
University of Strathclyde
University of Sussex
University of Teesside

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‘We need more entrepreneurs. We need more innovators. We need more scientists, engineers and designers who can turn ideas into working products.’

James Dyson,
Ingenious Britain: Making the UK the leading high tech exporter in Europe

Introduction

Design and innovation are critical to the UK reaching its economic goals. Reigniting the enterprise economy, commercialising science and technology, and embedding innovation in the public sector, all of which are vital for the country's future economic and social success, can only happen if the UK's workforce includes people with the skills to harness design as a tool for productivity and growth.

Over the last few years, universities across the UK have been actively engaged in developing new courses and centres, which enable design students, graduates and researchers to work alongside and in collaboration with other disciplines. In some cases this has led to the formation of new teaching and research centres, while in others the focus has been on creating new postgraduate courses or embedding design within existing ones.

In 2006 the Design Council set up a Multi-disciplinary Design Network, supported by the Higher Education Funding Council for England (HEFCE) and the National Endowment for Science, Technology and the Arts (NESTA), which aimed to facilitate the sharing of knowledge and best practice across universities, to improve curriculum design and assess the impact of these new programmes. As well as organising and facilitating knowledge-sharing events attended by academics from more than 30 universities, it also arranged fact-finding missions to universities and design companies in the US, Scandinavia, China, Korea and the UK. These enabled academics setting up new courses and centres to benchmark their activity against international examples, and hear directly how multi-disciplinary design teaching is seen to be relevant to industry across the world.

This report describes the courses and centres that have been created, with the aim of showing why enabling design and other students to experience multi-disciplinary teams and projects is vital for the UK economy. It also describes how multi-disciplinary design activity is being embedded in the UK's Higher Education Institutions (HEIs).

It ends by making some recommendations for ways that HEIs, supported by policy-makers, could most effectively continue to embed multi-disciplinary design education across a range of subjects. In doing so, the report recognises the challenging context that universities are currently operating in, and encourages individuals and institutions to consider the best ways to embed collaboration and multi-disciplinary course offerings for learners within the future landscape of higher education.

How this report is structured

The Design Council has looked in depth at activity across the country and interviewed senior contacts in its network in order to draw out common themes and illustrate them with representative examples. This report does not claim to provide an exhaustive listing of this activity – nor is it an evaluation which measures the impact of these courses and centres. There are many interesting examples of multi-disciplinary design education activities, with some of them presented in this report, but it is still too early for a significant evaluation. It is also important to note that many other activities of equal merit are taking place at other universities, and new courses are in development all the time.

We begin by showing why today it remains so vital for universities to be exploring different ways to ensure that graduates of all disciplines can experience working in multi-disciplinary design teams. We look at the link between design and innovation, and consider the national and global context for innovation and skills. We then look, in turn, at the benefits of working across disciplines for design students and the benefits for students of other disciplines, such as business studies and the STEM subjects (science, technology, engineering and maths).

We then explore the breadth and variety of multi-disciplinary design education currently being offered by UK universities, and highlight some of the early successes of these new courses and centres. Finally, we suggest some ways in which HEIs could continue to develop and promote multi-disciplinary teaching, learning and research in a challenging economic environment.

Kingston University's 20 Masters courses in Creative Industries & the Creative Economy see students from a range of backgrounds including designers, copywriters, artists and music technicians.

Definitions of multi-disciplinarity

Despite more than 40 years of cross-disciplinary practice in universities there is still a lack of consensus about what the terms 'inter-disciplinarity', 'multi-disciplinarity' and 'trans-disciplinarity' actually mean.[1]

One distinction proposes that 'multi-disciplinarity' describes situations in which several disciplines cooperate but remain unchanged, whereas in 'inter-disciplinarity' there is an attempt to integrate or synthesise perspectives from several disciplines. Trans-disciplinarity, on the other hand, has been taken to involve a transgression or transcendence of disciplinary norms, sometimes 'in the pursuit of a fusion of disciplines, an approach oriented to complexity or real-world problem-solving.'[2]

In Asian universities, we have found that the word 'convergence' is used to describe the coming together of students and staff from design, management and engineering faculties to work on projects, undertake research and learn from each other.

For the purposes of this study, which looks at courses and initiatives which teach design and creative problem solving alongside business and management education and/or technical and science subjects, the term 'multi-disciplinarity' is used.

1 McEwen, L., Jennings, R., Duck, R. and Roberts, H. *Students' experiences of interdisciplinary learning,* Higher Education Academy Report, 2008, p.15.

2 Lawrence, R., Despres, C. R. *Introduction: Futures of transdisciplinarity,* Futures, 36 (4), 2004, p.398 in: Barry, A., Born, G. and Weszkalnys, G. *Logics of inter-disciplinarity,* Economy and Society, 37, 2008, p.27.

Why the UK economy needs multi-disciplinary teams

If the UK is to recover economically, return to growth, and remain competitive internationally, it needs to innovate. Innovation on a national scale needs to be supported by long-term and forward-thinking policy decisions. As Lord Browne of Madingley explores in the report 'Securing a Sustainable Future for Higher Education', ensuring that the UK's higher education system is producing high quality graduates who can enter the workforce with the right skills is crucial for enabling the country's companies and services to continue to innovate:

> 'Higher education matters because it drives innovation and economic transformation. Higher education helps to produce economic growth, which in turn contributes to national prosperity. [...] Employing graduates creates innovation, enabling firms to identify and make more effective use of knowledge, ideas and technologies.'[3]

The need for innovation also goes beyond national boundaries. Globally, our economies are facing complex challenges in the form of climate change, an ageing population and the need to find new and more sustainable forms of energy and methods of food production and distribution. Solving these challenges in an economically sustainable way (so that, for example, UK companies can take advantage of low carbon technologies) will demand new approaches to innovation, new combinations of skills, and teams of people who can combine their disciplines and expertise in new ways.

'The economic goal of generating more wealth from new science demands multi-disciplinary teams of designers, engineers and technologists designing around the needs of customers.'

–Martin Temple CBE, Chair, EEF

The role of design in mobilising innovation is increasingly recognised. Design can enhance the outcomes of numerous innovation activities, bringing benefits such as increased quality of goods and services, improved production flexibility and reduced materials costs.[4] According to Pricewaterhouse Coopers, top innovators generate over 75% of revenue from products not in existence five years ago.[5] Companies that invest in their design capability and develop a reputation for innovation can avoid competing on price alone: rapidly growing businesses are twice as likely as others to compete on the basis of innovation.[6] In the UK, 45% of firms that don't use design compete mainly on price; only 21% of firms where design is significant do so.[7]

The UK is not the only country to be recommending that universities consider how best to ensure higher education institutions are developing graduates with the right combinations of skills for innovation. A number of high profile design schools in the US have been integrating design and business education for years. More recently, Asian countries including China and Korea have been investing in multi-disciplinary design education. Design is the third most popular university subject in China after English and Computer Science. And in Europe, this year saw the inauguration of an entirely multi-disciplinary university in Finland. More than ever before UK universities must be able to compete in this global landscape.

'Companies that invest in their design capability and develop a reputation for innovation can avoid competing on price alone: rapidly growing businesses are twice as likely as others to compete on the basis of innovation.'[6]

–DTI, Economics paper No. 15

3 Lord Browne of Madingley (2010) *Securing a Sustainable Future for Higher Education.*
4 Cox, G. (2005) *The Cox Review of Creativity in Business: building on the UK's strengths* – citing findings for SMEs in manufacturing from the *Third Community Innovation Survey.*
5 PricewaterhouseCoopers, 2003, *Innovation Survey.*
6 DTI (2005) Economics Paper No.15: *Creativity, Design and Business Performance.*
7 Design Council (2005) *National Survey of Firms.*

‘It is clear that over the last few years Finland has demonstrated its commitment to bringing down the barriers between disciplines to enable and support creativity and ingenuity in both higher education and business.’

–Niti Bhan, Emerging Futures Lab, Aalto Design Factory, Finland

Case study: Finland

Aalto University is a multi-disciplinary university that brings together the University of Art and Design Helsinki (TAIK), the Helsinki University of Technology (TKK) and the Helsinki School of Economics (HSE), and was formally inaugurated in January 2010. It offers multi-disciplinary programmes including the International Design Business Management programme (IDBM), which began as a Masters level module hosted at HSE and is now a Masters degree in its own right.

Aalto University has also established an experimental platform for multi-disciplinary education and innovation, the Design Factory. It is a space where business meets design and engineering in an environment designed to enable conversations, connections and creativity across the traditional barriers of industry, academia, research and hands-on practice. In May 2010, the Aalto Tongji Design Factory was opened in Shanghai, China, and other locations may be established in the future.

Case study: South Korea

‘We’re cultivating “inter-unified” designers of the 21st century’

–Seoul National University

Seoul, which was the International Council for Societies of Industrial Design’s World Design Capital 2010, has appointed a Chief Design Officer for the city with an expansive remit to reshape it for the benefit of its citizens. ‘Design is everything’, Mayor of Seoul, Oh Se-hoon, has said. South Korea has set up a Convergent Design Education Programme, awarding funding to eight universities to enable them to develop multi-disciplinary activities. Universities are working with the Korea Institute for Design Promotion (KIDP) to develop this convergence programme, which is funding curriculum development, and teaching and learning.

The country also sees extensive industry involvement in design education. Samsung has set up and wholly funds a fully convergent programme at Samsung Art and Design Institute (SADI) in South Korea, and also supports several of the other main design universities. About 30% of SADI graduates are employed by Samsung each year.

Aalto University's Design Factory in Otaniemi (Finland) is an experimental platform supporting international and multi-disciplinary collaboration.

Multi-disciplinary Design Network delegates meeting with Korea Institute of Design Promotion (KIDP) in Seoul in April 2010.

‘Design is what links creativity and innovation. It shapes ideas to become practical and attractive propositions for users or customers. Design may be described as creativity deployed to a specific end.’

–Sir George Cox, The Cox Review of Creativity in Business

Design and innovation

Businesses, policy makers, and academics have consistently made the case for the importance of design as a tool for innovation, productivity and economic growth. That design is a link between creativity and innovation has been articulated by many, including Sir George Cox in his ‘Review of Creativity in Business’, the European Commission, Professor Swann in his paper for BIS and Sir James Dyson in his recent report for the Conservative Party.[8] The use of design is linked to improved business performance in a number of measures including turnover, profit and market share. Research has shown this: between 1995 and 2004, the share prices of design-conscious companies outperformed other firms by 200%.[9] For every £100 a design-alert business spends on design, turnover increases by £225.[10]

The imperative for the UK to be an innovation leader requires design’s creativity within a mix of science, business and the public sector. This then suggests that the supply of design skills in the UK’s workforce is linked to the country’s capacity for innovation.

In fact, innovation capacity is dynamically linked to skills supply in two ways. Firstly, innovation in the form of new technologies, new industries and new services, drives demand for new skills. This includes what we might traditionally think of as technology-based innovation, such as new markets created by the convergence of mobile phone or digital technologies with new systems and services, as well emerging areas such as nanotechnology. But it also includes process and system innovation, such as new ways of delivering public services, and new forms of organisation and management innovation within companies. Whichever area of innovation we are talking about, new ways of doing things demand graduates and other employees trained in different ways. As industries change and converge, traditional education systems may no longer be supplying industry with people who have an appropriate and useful mix of skills and experience.

Secondly, a supply of differently skilled people drives innovation. While there is no one mix of skills that can guarantee good innovation performance in all circumstances, broadening the mix of skills within teams and individuals is one way to help innovation happen. Skills that are increasingly valued by companies in all sectors include creativity, flexibility and adaptability, communication and negotiation skills, and management and leadership skills that can be deployed within teams and projects as well as within organisations.[11]

Tomorrow’s innovative companies, therefore, need individuals that have had exposure to disciplines outside their individual specialisms, that have experience of working in teams with other disciplines, and that are comfortable deploying their innate creativity and flexibility within teams and projects.

‘Successful innovation demands a systemic not a component approach to designing new products and services. Edison didn’t just design and patent a light bulb – he created an entire new system that changed our world.’

–Nick Leon, Director, Design London

‘T-shaped’ people

It’s important to note here that when we talk about broadening the skill sets of tomorrow’s graduates we are not advocating replacing highly trained specialists with a cohort of generalists. Many people working within the design industry use the McKinsey definition of ‘T-shaped people’ to describe the most effective mix of skills. In ‘T-shaped people’, ‘vertical’ specialist depth, developed mainly through undergraduate qualifications, is complemented by the ‘horizontal’ appreciation and understanding of other disciplines and professional contexts, often developed in postgraduate degrees and early career experience. Tim Brown, CEO of design firm IDEO, which has been a vocal proponent of the need for ‘T-shaped people’, describes these ideal employees as ‘specialists with a passion and empathy for people and for other subject areas’.

‘Prior to this course I would have sought out like minded people with a similar background to my own but I now know that I need to work with people who can bring something new to the table instead of telling me what I already know.’

—Student, MA in Creative Economy, Kingston University

In the next section we explore how multi-disciplinary courses and projects, which require students to work in multi-disciplinary teams, are helping to develop this crucial mix of skills. We look first at the benefits for design students, and then at the benefits that exposure to multi-disciplinary working, design tools and techniques can have for students of other disciplines.

8 Cox, G. (2005) *The Cox Review of Creativity in Business: building on the UK’s strengths;* European Commission (2009) *Design as a driver of user-centred innovation;* James Dyson (2010) *Ingenious Britain: Making the UK the leading high tech exporter in Europe;* BIS (2010) *Occasional Paper No. 2: The economic rationale for a national design policy.*

9 Design Council (2004) *Design Index.*

10 Design Council (2007) *Value of Design.*

11 Tether, B., Mina, A., Consoli, D. and Gagliardi, D. (2005) *A Literature Review on Skills and Innovation. How Does Successful Innovation Impact on the Demand for Skills and How Do Skills Drive Innovation?.*

Ravensbourne's purpose built £70million design and digital media centre on Greenwich Peninsula. Photo: Morley Von Sternberg

Developing tomorrow's designers

Design students in UK universities who have been taught on multi-disciplinary courses or have gained experience of working in multi-disciplinary teams are developing a sought-after mix of skills. Giving design students the experience of working with business schools, science, technology faculties and engineering courses not only closes some of the skills gaps which have been identified by employers, but aims to better prepare tomorrow's design graduates for working in industry. There are perhaps three main areas where this can be seen:

1. By developing the business skills of tomorrow's designers

'Through radically redesigning the educational environment and investing in the latest technologies, Ravensbourne is championing multi-disciplinarity throughout its programmes and curriculum. By removing the traditional barriers between disciplines, it encourages convergence, flow and interaction between both people and specialisms.'

–Chris Thompson, Director of Enterprise and Innovation, Ravensbourne

While UK designers are generally well qualified and their skills and creativity are valued by clients in the UK and across the world, Design Council's research has found specific areas where designers' professional skills needed to be improved.[12] Designers need to be able to understand their clients' businesses and the markets in which those businesses operate. They also need to be able to understand, and articulate, the wider global context in which the products, services and systems they design will exist. Design employers have described that designers often need better communication skills to explain their work and the value of design to new and existing design buyers. And designers are often business owners and managers too, so designers also need entrepreneurial business skills to help them set up, develop and manage their own enterprises, and leadership skills to grow them.

Enabling design students to undertake taught modules on business and management, and to learn about business processes and systems helps to close these skills gaps. Having design students work in multi-disciplinary teams, especially if they are on 'live' briefs for established companies, helps them to develop a deeper understanding of real-life business contexts.

Working in these teams alongside non-designers also gives them valuable practice in communicating the value of a design-led approach to problem solving, or a design-led product or service solution, to colleagues and clients who are not design-trained.

12 Design Council (2007) *High Level Skills for Higher Value.*

2. Broadening designers' knowledge of science and technology

Today's practising designers, particularly those in the fields of product and industrial design and in the digital sector, already have to understand a great deal about current and emerging technologies and this demand will only increase.

Giving design students the opportunity to work with scientists and technologists, and to learn more about these subjects, equips them for a future, which will see the increasing convergence of, for example, internet-enabled technologies with designed products and services. And if new areas, such as nanotechnology, are to result in economically successful products, they will need designers who understand the technology and can work with the subject's experts. Similarly, complex global issues, such as climate change, are already demanding new solutions that can only be developed by teams whose members understand issues outside of their individual specialism.

Students from London College of Communication and London College of Fashion in a one-day workshop on visualising potential applications of nanotechnology, held with Dr Rob Dorey, Head of Microsystems & Nanotechnology at Cranfield University.

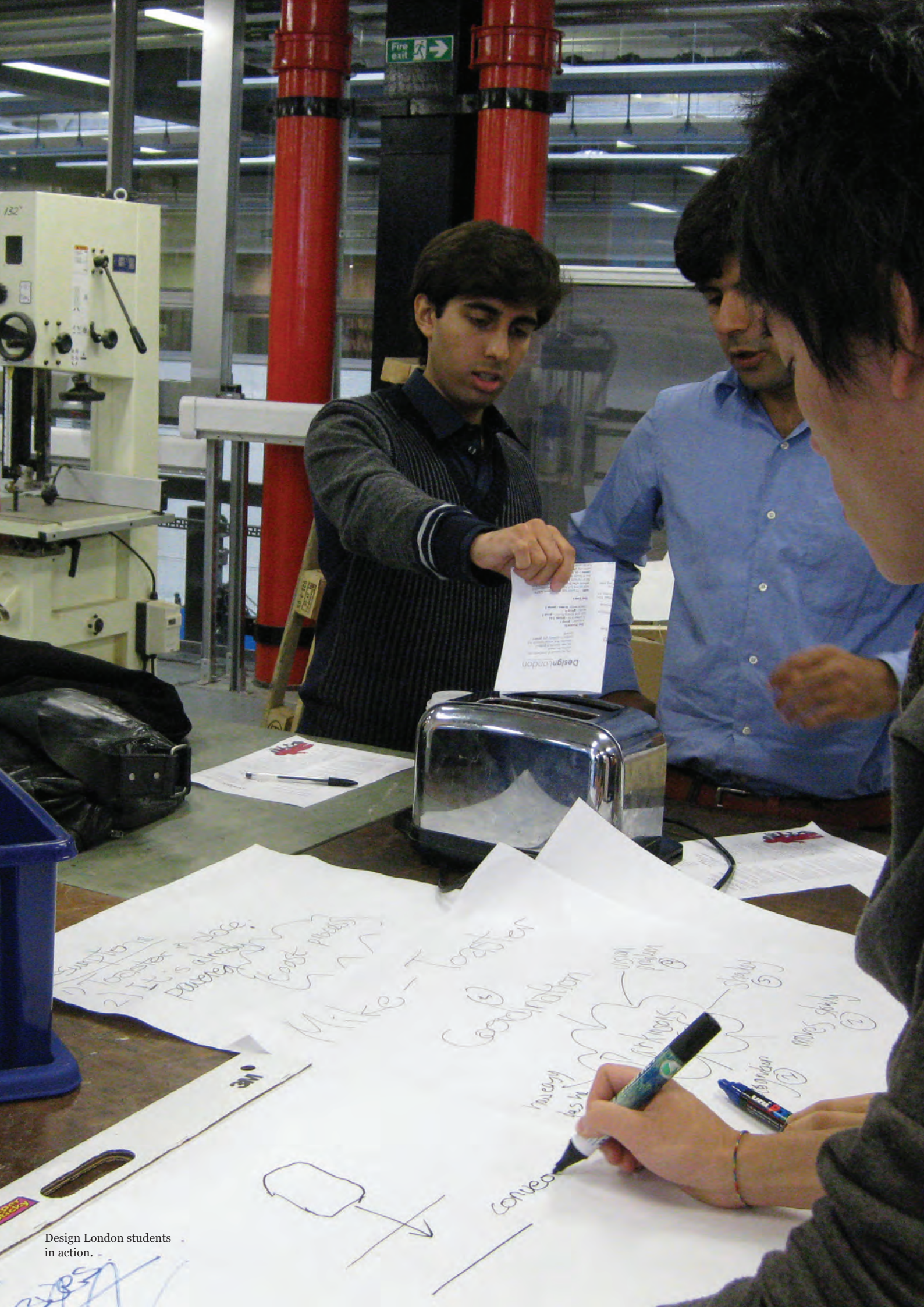
‘Working in collaborative groups tests us on many levels. The experience of decision making, leadership, and idea/ego management within group activities is essential.’

–Edward Blazey, Multi-disciplinary Design Innovation student, Northumbria University

3. Helping designers to understand manufacturing and engineering

As well as understanding new technologies, it is important that designers of manufactured goods understand materials and production methods. Both tooling and volume manufacturing is increasingly undertaken overseas, and ensuring consistent quality from offshore manufacturing demands a higher level of understanding on the part of the designer. Similarly, production methods are developing and will continue to change. Designers will need to understand where it is appropriate to shift away from traditional tooling and towards rapid manufacturing, small batch production and mass customisation. And ensuring that tomorrow’s products are environmentally sustainable demands that tomorrow’s designers know more about design for disassembly, remanufacturing and recycling.

Giving product and industrial design students the opportunity to work with engineering students, materials scientists and computing specialists will help to ensure that this understanding is embedded in product development teams.



Design London students in action.

Developing design and creativity in business and STEM subjects

Multi-disciplinarity is not, of course, a one-way street. The benefits felt by individual students who have gained knowledge from outside their own discipline, or experience of working in mixed teams with other specialists, are not limited to designers. While in many universities design departments and academics have championed the introduction of multi-disciplinary courses and projects, and design-led approaches have acted as the glue that brings courses, faculties or researchers together, these activities are not solely focused on enhancing the teaching and learning of design by bringing other disciplines into the design curriculum. Other disciplines, particularly business studies and entrepreneurship, computing and science, engineering and technology subjects, also benefit from connecting with design disciplines. The resulting benefits to all these students include addressing skills gaps identified by employers.

1. Introducing creativity and team-working to management and business education

'I think MDI [Multi-disciplinary Design Innovation] did allow for greater risk taking... and improving the ability to learn from mistakes. It helped me find out how I can contribute. It broadened my horizons.'

—Student, Masters in Multi-disciplinary Design Innovation, Northumbria University

Employers across all sectors and industries report that some graduates are not equipped with the right skills for today's businesses. In particular, employers mention that graduates do not have problem solving skills and team working skills. Nearly a quarter of firms responding to the CBI 'Education and skills survey 2010' expressed dissatisfaction with graduates' problem-solving skills – their ability to use creative thinking to develop appropriate solutions to problems.[13] Employers in the UK have also reported that some graduates lack communication, entrepreneurial and networking skills, as well as an understanding of how businesses operate.[14]

Introducing business studies and MBA students to design tools and techniques can help them develop the creative thinking and innovation skills that employers also identify as being critical for business success. Experience of working in multi-disciplinary teams is vital to equip graduates with the skills needed by business. This type of exposure to design also helps business students understand the value of design in future roles as clients and buyers.

13 CBI (2010) *Ready to grow: business priorities for education and skills. Education and skills survey 2010.*
14 CIHE (2007) *International Competitiveness: Competitiveness and the role of universities.*

2. Embedding design in science and technology

Businesses and policy-makers alike have also identified that the UK needs to take steps to ensure it can commercialise its science base in order to remain competitive. Recent reports by Hauser and Dyson have identified that we still lag behind other countries in our ability to commercialise science, and specifically that we need to make stronger links between design, science and technology. Martin Temple's review of the Design Council confirmed this point:

> 'Although design's role in the economy is widely acknowledged, and it is understood that many successful high-tech businesses like Apple and Dyson are design as well as technology driven, this link is not strong enough in the early stages of commercialisation. There is a lack of awareness and use of design by UK scientists to help identify market needs and make new concepts viable and appealing.'[15]

Design, and particularly a user-centred design approach, is often crucial in commercialising technology because it enables products and services to be created to meet a 'market pull' – i.e. what customers and users want or need, whether they express this or not – rather than the 'technology push', which can see companies trying to put technologies in the marketplace in a form or a time that users are not ready for.

Introducing design thinking tools to science and technology students is one way in which we can improve the UK's ability to capitalise on emerging technologies. The Design Council / HEFCE / BIS project Innovate for Universities, which provided design mentoring to 30 emerging technologies at six technology transfer offices in universities across the UK, has found that design can support the commercialisation of technologies in a number of ways (see next page: Commercialising technology through design).

3. Emphasising design and creativity in STEM subjects

If business studies students and science and technology specialists can benefit from the introduction of creative thinking and idea generating techniques, greater understanding of user needs and the practical tools of early and rapid prototyping, testing and iterating, then this is also true for engineering students. The Royal Academy of Engineering has identified that developing the creativity and innovation of engineering students through design and project work is vital if engineering education is to produce graduates with the right skills.[16]

'Students from any field or skill can be exposed to other disciplines giving them the ability to apply "design thinking" in all aspects of industry.'

–Tania D'Souza, MDes Innovation and Creativity in Industry student, C4D

Current emphasis on, and investment in STEM subjects in universities provides a great opportunity to fully embed design tools, techniques and capabilities into teaching and research. This would help to enable the economic goal of generating more wealth from new science through multi-disciplinary teams of designers, engineers and technologists designing around the needs of customers.

It's also possible that multi-disciplinary courses, which teach design tools and techniques alongside more traditional science, technology and engineering subjects could also help to attract more undergraduates to study science and engineering subjects. The Engineers and Engineering Brand Monitor, for example, which measures young people's attitudes to engineering, notes that while art and design is the favourite subject among 7-11 year olds, 'this group does not tend to associate being an engineer with the designing and creating that they enjoy so much in the classroom'.[17]

Commercialising technology through design

Evaluation of the Innovate for Universities programme demonstrated that design can support the commercialisation of technologies by:

– Reducing risk, by helping to clarify project objectives and focus on the most profitable markets.
– Identifying new markets or products for a technology, through facilitative brainstorming sessions which encourage divergent thinking.
– Influencing the speed at which commercialisation outcomes are achieved, by supporting the product development process through visualisation and prototyping.
– Increasing the potential value attached to a product or technology, by helping to develop a clearer proposition to take to investors.
– Supporting TTOs' portfolio management, by providing objective evidence as to whether a commercialisation project warrants further investment.
– Changing the direction (product, or route to market) that a commercialisation project takes, by helping to identify alternative applications for a technology.

For more on the Innovate for Universities project, see www.designcouncil.org.uk/our-work/Support/Innovate-for-Universities/

15 Temple, M. (2010) *The Design Council: a review*, p.20.
16 Royal Academy of Engineering (2007) *Educating Engineers for the 21st Century.*
17 Engineering UK (2009) *Engineering UK 2009/10.*

Methods of embedding design and multi-disciplinary team working in HEIs

Sir George Cox's 2005 'Review of Creativity in Business' made specific recommendations about the role that universities should play in 'equipping tomorrow's business leaders, technologists, engineers and creative specialists' with the skills needed to help the UK compete with emerging economies in a global market.

Cox proposed the creation of 'centres of excellence [...] that specialise in multi-disciplinary programmes encompassing both postgraduate teaching and research.' The focus would be on Masters level programmes which would 'bring together the different elements of creativity, technology and business', enabling students from different backgrounds and with varying levels of industrial experience to work together. The outcome, said Cox, would be 'executives who better understand how to exploit creativity and manage innovation, creative specialists better able to apply their skills (and manage creative businesses) and more engineers and scientists destined for the boardroom.'

In the five years since 2005 a wide range of courses, centres, research programmes and knowledge transfer initiatives have been established. HEIs across the UK heeded the call to arms to invest in new ways of teaching and researching ways in which design works alongside and in collaboration with other disciplines.

It's immediately obvious that there is no one way to introduce multi-disciplinary design education into an institution. These activities and initiatives are being driven and championed by the universities themselves and come in a wide range of forms, sizes and costs. As such, it's worth outlining the breadth of approaches and highlighting noteworthy examples.

Collaborations between institutions

Some of the most high profile of the initiatives to embed multi-disciplinary approaches into postgraduate research and teaching are the centres where two or more institutions have chosen to collaborate.

Design London builds on a heritage of cross-institutional collaboration between Imperial College Business School, Imperial College Faculty of Engineering and the Royal College of Art. Design London was created in 2007 and offers teaching, research, a business incubation unit, an Innovation Technology Centre and a programme of industry services and executive education called 'Design Connection'.

The **Centre for Competitive Creative Design (C4D)** is a partnership between Cranfield University and the London College of Communication, University of Arts London, also created in 2007. It offers taught Masters courses run in tandem across the two institutions, and runs a research programme as well as services for industry.

With funding over three years of £5.8million and £3.5million respectively, these centres represent some of the UK's most substantial investment, from HEFCE and other partners, in multi-disciplinary design education. Design London is perhaps the broadest centre in scope, and is one of the few to explicitly link multi-disciplinary team-working to business incubation, giving some of the most tangible outputs only three years since the centre's inception.

The Centre for Competitive Creative Design (C4D) is a new addition to the Cranfield University campus near Milton Keynes. Photo: Angelisa Conby / Martin Grant.

Design-led modules and projects within MBA programmes

Collaborations between institutions have also enabled MBA students at a number of business schools to experience design tools and techniques, and work within multi-disciplinary teams. **Design London** delivers design-led innovation modules on four MBA courses at Imperial Business School under the heading of Innovation, Entrepreneurship and Design (IED). By February 2010, Design London had taught its seventh cohort of MBA students, 366 in total. It also teaches a four-day MBA elective on Innovating and Designing Services.

Saïd Business School, University of Oxford, has been offering an MBA elective in Design Leadership since 2005. It has run projects, which have seen groups of up to 48 MBA students a year working with designers from institutions including the Royal College of Art and London College of Communication, and one of the projects involved work with the social enterprise Soul of Africa. In addition, all 225 MBAs taking the Entrepreneurship Project have access to design-led idea generation workshops.

MBA students at Design London event.

‘I tell the MBAs who take my elective that I’m not trying to turn them into designers but I want to make them a bit more designerly. But in a sense they are already designers of projects, ventures and service ecologies.’

—Lucy Kimbell, Associate Fellow, Saïd Business School, University of Oxford

Multi-disciplinary Masters courses

Many of the institutions developing ways to embed multi-disciplinary team working into design teaching have chosen the route of developing Masters courses where modules are shared across schools or faculties.

Northumbria University's 'Wall of Words' is one of the tools used to enable students to learn in a multi-disciplinary way. Students write phrases, which are new to them, on the wall so that members of the group from other disciplines can help to explain unfamiliar terms and concepts.

Northumbria University offers a Masters in Multi-disciplinary Design Innovation, run by the School of Design in collaboration with Newcastle Business School and the School of Computing, Engineering and Information Sciences. Launched in September 2008, the degree can be awarded as an MA or an MSc depending on the focus of the final semester's work.

Kingston University offers a suite of Masters in Creative Economy (MACE) courses. Launched in September 2007, these multi-disciplinary, one-year full-time (two-year part-time) courses are directed by the Faculty of Business and Law in partnership with the Faculty of Art, Design and Architecture and cover five areas of study: Built Environment, Design Industries, Heritage and Visual Arts, Performing Arts, and Media.

C4D has developed a Masters course – the MDes Innovation and Creativity in Industry – which is offered at both Cranfield University and London College of Communication. The courses run concurrently with the two cohorts of students coming to work together at specified points within the curriculum.

The Multi-disciplinary Masters programme at **Nottingham Trent University** draws together students and staff from five schools – Art, & Design, Architecture, Design & Built Environment, Business, Science & Technology, and Animal, Rural & Environmental Sciences while **Teesside University** has developed an MSc curriculum that brings together expertise in Product Design, Business, Marketing and Sustainability.

Manchester Business School faculty have developed a design management course that brings together graduates on the specialist MSc programmes: Marketing and Corporate Communications. MBS has also a number of MBA internships with creative businesses, such as WPP, and they specialise in creative management, which is an area pioneered by the School.

At the University of Nottingham Institute of Enterprise and Innovation (UNIEI) students work on modules that include creative problem solving and innovation management.

The **University of Nottingham Institute for Enterprise and Innovation (UNIEI)** at Nottingham University Business School offers a programme of one-year multi-disciplinary taught Masters courses, which link creativity, entrepreneurship and innovation with other disciplines and schools within the university. UNIEI now offers Masters courses that link creativity and entrepreneurship with electronic and electrical engineering, molecular medical microbiology, food production management, crop biotechnology, sustainable energy, computer science, cultural studies, and communication.

There are also a number of courses which are using multi-disciplinary approaches to teach sustainable design, including the MA Sustainability, Innovation & Design at **Lancaster Institute for the Contemporary Arts at Lancaster University,** where design students work with other university departments such as the Management School, Environment Centre, InfoLab21, and Sociology. Similarly, the Design for Development MA at **Kingston University** offers modules in human rights, political communications and campaigning, people management, leadership and innovation taught in a multi-disciplinary approach.

Multi-disciplinary research, PhDs and Doctoral Training Centres

Doctoral Training Centres are another way in which HEIs are able to bring multi-disciplinary teaching and research together, and see designers working with other postgraduates from a range of disciplines to undertake problem-based research across disciplines.

Professor Rachel Cooper joined Lancaster University with a remit to develop collaboration between departments and research centres.

HighWire at Lancaster University is a Doctoral Training Centre for students with backgrounds in computing, design and management who undertake a four year MRes+PhD programme in a range of subject areas that focus on understanding and applying innovation to the digital economy.

At the **Horizon Research Institute at Nottingham University** there are four designers among 18 PhD candidates conducting research into the digital economy and ubiquitous computing. At this multi-disciplinary Doctoral Training Centre the PhD researchers work in a four-year programme that combines taught elements, including Innovation and Technology Transfer with industry engagement and practice-led research.

The **Design Innovation Research Centre at the University of Reading** is a new Engineering and Physical Sciences Research Council (EPSRC) funded 'Challenging Engineering' exploration group, set-up to lead research that develops innovative engineering solutions for shared design inquiry. As an exploration group, it is developed out of and being incubated within the Innovative Construction Research Centre, one of the EPSRC's Innovative Manufacturing Research Centres. The research is developing new tools and processes for the design of buildings and infrastructure in the digital economy. The Centre is a new kind of engineering research space, an open and networked laboratory, which is multi-disciplinary, international and engaged with industry.

Multi-disciplinary design education working with business

Multi-disciplinarity is also at the heart of a number of universities' business engagement and knowledge transfer programmes, whether this takes the form of services for business or live projects set by industry and worked on by postgraduate students.

Design London was appointed by the London Development Agency as the delivery partner for the Design Council's business growth programme, Designing Demand, and working in partnership with Grant Thornton it has delivered a range of executive education courses and business support programmes to 350 participants from 250 of London's small and medium sized enterprises.

Organisations such as Procter & Gamble, the NHS, Ford, Lewisham Council and Nissan have run individual research projects with **C4D** as well as setting live projects for student groups. Procter & Gamble, for example, ran a project to facilitate the development of ideas for product development using consumer insight and rapid product modelling techniques, which informed their management's high-level product planning sessions.

'I had a company that was failing. As a result of involvement with [the Masters in Multi-disciplinary Design Innovation at Northumbria] University, we now have a successful company, two new patents and a complete new business model to explore.'

—Chris Duffy, MD, Fendor

All students on **Northumbria University's** MA/MSc course in Multi-disciplinary Design Innovation undertake live projects with industry clients. More than 50 students have worked in this way, identifying tangible commercial opportunities for SMEs from the North East region, as well as demonstrating approaches to innovation in collaboration with international blue-chip organisations, public sector bodies and charities. Recent projects have involved students developing products and services to briefs set by Unilever, the BBC, Barnados, the MS Society and the Traffic Penalty Tribunal at the Department of Transport.

The Masters programmes at **Nottingham Trent University** sees staff and students from across disciplines come together to to address a new set of product innovation challenges posed each year by between four and six collaborating companies.

Multi-disciplinary Masters programme at Nottingham Trent University: Feedback by the Low Info team at an interim presentation of ideas by students on the MA Product Design course.

Researching multi-disciplinary teaching and learning

An additional and important area of work in multi-disciplinary design education involves research into how multi-disciplinary teams function, and what are the ways in which multi-disciplinary approaches are taught and learned.

The **Innoversity** project at **Kingston University** has been compiling a rich archive of data on how teams work together by using video to capture the interactions of multi-disciplinary teams on the MA in the Creative Economy courses, and a researcher from the Psychology department is profiling students' learning styles and behaviours.

Academics at **Northumbria University** are researching pedagogical approaches to teaching multi-disciplinary teams, while others at the **University of Nottingham** are researching how design practices might encourage the entrepreneurial imagination.

New courses and centres in development

Many other universities across the UK are developing multi-disciplinary courses and programmes, or are embedding multi-disciplinary approaches into existing course provision.

Ravensbourne relocated to a purpose-built £70million design and digital media centre on Greenwich Peninsula in October 2010. The building and its technologies have been designed to encourage multi-disciplinary working and collaboration between courses, sectors, education and business. All spaces are open and flexible with product design, graphic design, architecture, innovation, animation, engineering, fashion, immersive technologies and other disciplines being taught side by side. Postgraduate research students and businesses share the same spaces and facilities with the aim that this will enable them to develop new innovations, bring new ideas to market and test new concepts and prototypes.

University College Falmouth graduates working on the 'Share the Road' project tested service ideas' viability with local residents. Photo: Emma Dyer.

University College Falmouth's proposed **Academy for Innovation & Research (AIR)** is a £9million investment in a design innovation centre that will enable researchers and business development staff to work with businesses in flexible project teams. Large scale development projects, expected to begin in Autumn 2012, will focus on new applications for superfast broadband, health and wellbeing and sustainable transport. At the heart of a new building expected to open in 2010 will be a technology-rich, 3D-enabled, interactive 'Sandpit' for creative idea generation and planning of R&D projects, plus a range of flexible spaces for multi-disciplinary, live project work.

Teesside University has redesigned its undergraduate programme in product design in order to integrate engineering with design, and it will be offered as a BA or BSc from 2011. The remit of student projects on the course will be widned to allow input from other schools in a way that is directly relevant and highlights the interrelationship between disciplines in product development.

And **De Montfort University** is completely restructuring its postgraduate art and design provision to include multi-disciplinary creativity and action research modules, with external organisations setting the students live briefs.

Multi-disciplinary teams at ImaginationLancaster using the configurable exhibition and performances spaces in the LICA building.

Conclusion

Multi-disciplinary approaches are being embedded into design, business, science and engineering education in universities across the UK in a wide range of ways. Academics are developing new courses and new ways of assessing students, and are forging new partnerships and collaborations with colleagues in other schools, departments and institutions. Universities are also working closely with businesses to ensure that the courses they offer and the research they produce is meeting the changing needs of industry, and that students are gaining experience of working on live multi-disciplinary projects.

It is testament to the leadership, creativity and tenacity of the academics involved in setting up and running multi-disciplinary courses and centres that so many initiatives are already under way, and that new programmes are in development. Indications of the impact of these activities are already emerging. Academics and course leaders report increased numbers of student applications for multi-disciplinary courses, a high demand from students for multi-disciplinary activities and increased levels of satisfaction from students on these courses. Course tutors also report that graduates exposed to multi-disciplinary team working have a more holistic outlook when solving problems, and better capacity to influence people and negotiate change. 'Recruiters and careers specialists have identified that these graduates are far more self-aware than other postgraduate students they have encountered,' said a tutor at Northumbria University. Another described the process as transforming graduates 'from a position of uncertainty about their future direction, into employable, confident movers and shakers'.

However, , it is important to remember that most of the activities detailed here have been in existence for only two or three years, and represent just the beginning of a long-term commitment on the part of their institutions to embedding multi-disciplinary team working into higher education. Academics in our network have frequently commented that it takes time to build relationships between colleagues and institutions, to appoint staff with the appropriate skills and experience to teach these courses, to test, iterate and refine new methods of teaching and new administrative models, to market new courses and recruit students onto them. The process of collating meaningful data on graduate destinations, in order to measure the impact of these courses, is also just beginning.

The current context for universities

As academics in our network are all too aware, this is a challenging time for UK universities. Substantial reductions in funding from central government have been coupled with far-reaching changes to the fee structure recommended by Lord Browne's report.

Members of our network increasingly see this as an opportunity as well as a challenge. Many universities feel that emphasising their multi-disciplinary courses, programmes and research will serve to differentiate them and will become an integral part of their institution's ability to compete internationally. For others, the connections with industry embedded within the development of their multi-disciplinary courses – whether this is achieved using live client projects, mentors from business, visiting lecturers or student placements – will enhance the employability of their graduates. Indeed, one of the founding principles behind the development of multi-disciplinary team working within higher education has always been about creating graduates with the skills that industry needs. Universities that offer these courses are already ahead of the curve on the employability agenda, developing skills and experience across disciplinary boundaries.

However, all this activity is still only taking place in a relatively small number of universities. With this in mind, we put forward four broad recommendations for further development of multi-disciplinary design education in the UK.

Recommendations

1. The Department for Business, Innovation and Skills should work with relevant partners to develop a strategy to support and extend the adoption of multi-disciplinary design education in the UK

In 'Ingenious Britain: Making the UK the leading high tech exporter in Europe', James Dyson suggests that the Government should 'learn the lessons from Design London over the next year to examine how the model can be applied to other universities, courses and incubators'.[18]

We recommend that the Department for Business, Innovation and Skills should work with all relevant bodies to develop a formal strategy for the promotion and long term development of multi-disciplinary design education in the UK. This would build on the foundations created by the Multi-disciplinary Design Network initiative and would support universities willing to work in this area.

Lack of a cohesive strategy for multi-disciplinary design education will have a negative impact on current and future programmes, with a risk of potential benefits and investment made so far being lost. Other global economies, such as South Korea or China, are already heavily investing in multi-disciplinary design education infrastructure. If the UK is to remain the world's leader in design, science, engineering and innovation it needs to create a greater level of support for multi-disciplinary design education at a policy level.

18 Dyson, J. (2010) *Ingenious Britain: Making the UK the leading high tech exporter in Europe,* p.31.

2. The Multi-disciplinary Design Network should continue

Academics in our Network have been extremely positive about having a mechanism through which to share knowledge, experiences and learnings. We recommend maintaining the Multi-disciplinary Design Network with a greater focus on reaching out to science, technology, engineering and business audiences, as well as recruiting more universities to be involved in the Network.

The Design Council will look into a future sustainable model for the Network and discuss it further with its policy, education and industry partners.

3. More universities should develop a greater integration of design and design thinking methods with STEM and business curricula

Current emphasis on, and investment in STEM subjects in universities provides a great opportunity to fully embed design tools, techniques and capabilities into teaching and research. We recommend that universities further explore this area of multi-disciplinary design education. This will play an important role in the UK's socio-economic recovery through developing a new generation of scientists, engineers, designers and technologists to design products and services around the needs of customers and our society.

Our report indicates that the demand for multi-disciplinary education is increasing amongst students and we expect that this will increase in the future. Where possible, HEIs willing to explore multi-disciplinary design education models should draw on the experiences of their colleagues in the institutions mentioned here.

'We should continue to press the value and shared knowledge that has already been generated by the Multi-disciplinary Design Network, otherwise we will be overtaken by other countries that already see advantage in this form of education and ways of working.'

—Tutor, Northumbria University

4. The Network should undertake detailed, quantitative research to assess the impact of multi-disciplinary education in design, business and the STEM subjects

Reforms to higher education funding outlined in the Browne Report include recommendations that universities should provide students with more information on employment prospects.

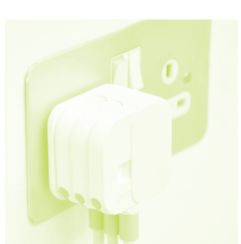
We recommend that universities, working in conjunction with higher education funding and research councils, undertake detailed research into the impact of multi-disciplinary design courses and programmes. This would include:

– Destinations of graduates from multi-disciplinary Masters programmes, MBAs and PhDs from Doctoral Training Centres
– Testimonials from businesses involved in multi-disciplinary design projects, including financial assessments of the impact of working with universities where appropriate
– Student recruitment levels and a deeper understanding of the reasons why students choose multi-disciplinary courses, as well as assessment of their expectations and satisfaction levels.

This report summarises a wider range of activities undertaken by the Multi-disciplinary Design Network, which was set up in 2006 to support a key recommendation made by the 'Cox Review' for the establishment of multi-disciplinary 'centres of excellence' that combine design, science, management, engineering, technology, and the creative arts.

The Network is supported by the Design Council, HEFCE and NESTA and aims to facilitate the sharing of knowledge and best practice across universities to improve curriculum design and assess the impact of these new programmes. The Network's activities have involved knowledge sharing events hosted by universities and overseas fact-finding trips, which were then followed by reports. There are also case studies showcasing some of the multi-disciplinary design education models adopted by universities across the UK.

More information about the Network and downloadable reports are available online: www.designcouncil.org.uk/our-work/investment/Multi-disciplinary-design-network/



The **Multi-disciplinary Design Network** was formed in 2006 and is run by the Design Council, in partnership with NESTA and HEFCE.

Design Council is the national strategic body for design. Its mission is to inspire and enable the best use of design in the UK so that it is the most competitive, creative and sustainable nation.

The **Higher Education Funding Council for England (HEFCE)** distributes public money for teaching and research to universities and colleges. In doing so, it aims to promote high quality education and research, within a financially healthy sector. The Council also plays a key role in ensuring accountability and promoting good practice.

The **National Endowment for Science, Technology and the Arts (NESTA)** is an independent body with a mission to make the UK more innovative. They invest in early-stage companies, inform policy, and deliver practical programmes that inspire others to solve the big challenges of the future.

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