Institution: The Open University

Unit of Assessment: D34 Art and Design: history , practice and theory

Title of case study: Design thinking

1. Summary of the impact

Design thinking has benefited the economic performance of business and particularly the creative industries, changed awareness of design in everyday life, and informed public policy. Users and consumers have benefited from wider understanding of the genesis of products and services and effects on their quality of life. Design thinking research has been instrumental in forming a new business sector that provides design thinking expertise as consultancy. It has changed the processes of designers and design practices, and fed into UK design education policy. Design thinking has crossed discipline boundaries; for example framing new methods and processes in software engineering.

2. Underpinning research

Researchers in Design at the Open University have been instrumental in defining the elements of Design thinking since the 1990s including early work on design cognition, creativity, and expertise. This early work is complemented by more recent research on the social dimensions of designing.

A Design Thinking research community began to take shape at the first international Design Thinking symposium in 1991 at Delft. It was consolidated through a second symposium known as the 'Delft Protocols Workshop' in 1994 where Nigel **Cross** (OU 1970 and currently Professor Emeritus) was the lead organiser with Kees Dorst and Hans Christiaans from TUDelft. The 1994 symposium introduced the key idea of using a common data set from activities of designers at Xerox Parc in Palo Alto. Here a language started to develop to describe and analyse designing behaviour, independent of any particular discipline, in terms of design protocols This innovative methodology has characterised design thinking research ever since. The debates between the different communities in design at the 1994 workshop are presented in **Cross** and Dorst's book (Reference 3.1) *Analysing Design Activity* which remains a primary text in the area.

The 1993 article by Robin **Roy** (OU from 1970 and currently Professor Emeritus) 'Case studies of creativity' (Reference 3.2) provided paradigm examples of creative design and innovation by leading designers. He outlined a broad context for developments in design thinking, examining the motivations of creative and innovative individuals such as James Dyson, their sources of inspiration and methods for developing ideas, including process modelling to assist product development and creative thinking techniques.

The elicitation of design expertise has been central to the subsequent development of design thinking. Nigel **Cross** studied the working methods of expert designer Gordon Murray in the competitive domain of Formula 1 car design (Reference 3.3), revealing that design creativity arises from tight constraints. This counter-intuitive principle has helped researchers understand how problem-solution pairs evolve though a design process.

This 'co-evolution' model developed by Nigel **Cross** with co-author Kees Dorst in their paper 'Creativity in the Design Process' (Reference 3.4) was a major advance in design thinking. Analysing the verbal protocols from nine industrial designers, they discovered a key distinction between design and problem solving. In design the problem changes as the search for an appropriate solution develops.

In his paper 'Designerly Ways of Knowing' (Reference 3.5), **Cross** identified that a distinct design thinking competence is used when a problem is explored through possible solutions. This competence is now sought in business and is marketed through consultancy services. **Cross**' latest book (2011) *Design Thinking: understanding how designers think and work* (Reference 3.6) is a key text on the Stanford d-School reading list. As such it reconnects his research with the designers and their activities studied at the pivotal 1994 'Delft Protocols Workshop'.

Design thinking research has a developing thread on the social aspects of designing. Peter Lloyd

(OU from 2005 and Professor from 2010) explored these at the 'Design Meeting Protocols: Design Thinking Research Symposium 7' (DTRS 7) in 2008. This research was funded by AHRC through a collaboration between Peter Lloyd and Janet McDonnell (Central St Martin's) and drew on the innovative methodology of the Delft Protocols Workshop. A set of common data was analysed by 21 international design research groups, encompassing a wide range of methodologies, research disciplines and design domains. New perspectives on real-world design thinking processes, derived from DTRS7 are presented in Lloyd's 2009 co-edited book *About Designing* (Reference 3.7).

The underpinning work at the Open University charts the conceptual evolution of the term design thinking together with details of practitioner involvement and scholarly events that link together the different communities contributing to this research. A network of connected individuals provides a conduit for the fluid, open exchange of design thinking ideas and concepts. Design thinking has found traction in the current REF period in many professional, academic, and educational settings.

3. References to the research

3.1 Cross N, Christiaans, H, Dorst K (1996) *Analysing Design Activity*, Chichester, Wiley. This has become a primary point of reference, presenting exemplar applications of protocol analysis.

3.2 Roy, R. (1993) Case Studies of Creativity in Innovative Product Development, *Design Studies,* 14, pp 423-443. Voted best paper in *Design Studies*, 1993.

3.3 Cross, N., Clayburn-Cross, A. (1996) Winning by Design: The Methods of Gordon Murray, Racing Car Designer, *Design Studies*, 17, pp 91-107. This paper is mentioned on a public automotive industry discussion list as "very instructive and highly inspirational".

3.4 Cross, N., Dorst, K. (2001) Creativity in the Design Process: Co-Evolution of Problem-Solution, *Design Studies*, 22, pp 425-437. This paper is the third most downloaded *Design Studies* article in ScienceDirect, twelve years after publication.

3.5 Cross N. (2007) *Designerly Ways of Knowing,* Basel, Birkhäuser, ISBN 978 3 7643 8484 5. The author was interviewed about this book for *Rotman Magazine*, (*Rotman on Design: The best of design thinking from the Rotman Magazine*, Eds Roger Martin, Karen Christensen, Toronto 2013) and also Stanford University's *Ambidextrous Magazine* (interview transcripts are available at http://design.open.ac.uk/cross/index.htm).

3.6 Cross, N. (2011) *Design Thinking: understanding how designers think and work*, Berg, Oxford, ISBN 9781847886361. This book is one of only three listed as recommended reading at the D-School, Stanford University Design School http://dschool.stanford.edu/recommended-reading/.

3.7 McDonnell, J., Lloyd, P. (2009) *About Designing: Analysing Design Meetings*, London,Taylor and Francis:CRC Press (REF 2014 Lloyd Output 1). A review by Brian Lawson, *Design Studies* (2010) 31(1) pp 92-3 highlights key contributions: 'The book is a tremendous manual of current techniques and ideas for investigating design. It describes the state of the art, as it were. It also explicitly grapples with design as a social process conducted by a range of stakeholders… Some established ideas in design process such as co-evolution turn nicely into tools for investigating client-designer meetings'.

4. Details of the impact

Design thinking in business

Roy's early studies of design and creativity (Reference 3.2) and **Cross**'s work (Reference 3.1) in the Design Thinking symposia, particularly the Delft Protocols Workshop of 1994, provided persuasive, foundational arguments on the value of design thinking to economic performance. IDEO, one of the world's largest design consultancies, used these findings and developed design thinking as a major thread of its business. This thread was led by David Kelly, one of IDEO's cofounders in 1991, and applied by the CEO Tim Brown in 2003 to transform IDEO's core business; replacing 'design' with 'design thinking' in a move from designed object to design process. These principles (Source 5.1) remain at the core of IDEO's business. More broadly, several practitioners have applied design thinking as a major element in their business. Specifically we point to Liz Sanders (Source 5.2), founder of MakeTools, and recently at SonicRim,

a global design consultancy.

In 2004 David Kelly founded Stanford University's cross-disciplinary design 'd.school', where design thinking is an underlying theme. The impacts of design thinking on business are further exemplified through the fact that a major force behind the d-school was Hasso Plattner, cofounder of global IT solutions company SAP. Further evidence for the wide uptake in business are two Radio 4 *In Business* programmes on the theme of design thinking in the last 4 years (Source 5.3).

Industrial strategy and public policy
Key concepts in design thinking, especially those in creativity and the exploration of problem-solution pairs, arose from industry case studies on expert designers such as James Dyson (Reference 3.2) and formula one designer Gordon Murray (Reference 3.3). These and other industry cases have been pivotal in changing how design is taught and practised in a range of domains, including software design (see below).

In 2002 Steven Kyffin (then Senior Director of the Design Research and Innovation at Philips Design, Eindhoven), when presenting industry cases for a OU course T211 Design and Designing (2005-2012), emphasised the impact of Nigel **Cross'** work on Philips' product development strategy. Currently, as Dean of Design at Northumbria University, he champions design thinking in educating new generations of design practitioners.

Many designers, for example Kenneth Grange (Source 5.4), can attest to the influence of the OU's design thinking research on professional practice. Wider influence on public policy is evident in several ways. including the role of Kees Dorst (co-author with Cross of 3.1.and 3.4) as a policy advisor to Barak Obama's 2012 presidential election campaign on the applications of design thinking to societal problems (Source 5.5). Creativity and design thinking are now recognised as important elements in policies for economic growth both nationally and internationally: for example, the UK Design Commissions 2012 report on design education and growth (Source 5.6) and the discussion by Tim Brown at IDEO of the role of design thinking at the Davos World Economic Forum in 2008 (http://designthinking.ideo.com/?p=95).

Public engagement and awareness of design in everyday life
Design thinking research has changed public awareness of design, connecting the professional and practice concerns of designers with the perceptions and needs of design users and consumers. For example, the Gordon Murray case detailed by Nigel **Cross** (reference 3.3) figures on the widely accessed public AutomotiveForums (Source 5.7) discussion lists under a 'Winning by Design' thread. Also OU researchers have a wide reach through public access to extensive OpenLearn and iTunesU design materials (Source 5.8).

The Design Thinking symposium series continues to be an influential force across the discipline, both in practice and public domains. Its evolution from a focus on individual designing towards social contexts and collaboration has lifted it into the public domain. Data from real-world social aspects of design thinking in architecture and engineering came to the fore in the 2008 DTRS 7 symposium. The building that formed the subject of the study in architecture – Milton Keynes crematorium - has since won national awards. These ideas, through Peter **Lloyd** as OU series advisor, strongly influenced the production, by Mike Christie at Renegade, (Source 5.9), of the Channel 4 television series *The Secret Life of Buildings*, watched by 3 million people and achieving national media coverage (Channel 4,Evening Standard).

Cross-over between disciplines
The application of design thinking in the domain of software engineering has changed its professional practice and education. In particular DTRS methods were directly applied at the US National Science Foundation funded 'Studying Professional Software Design' (SPSD) workshop in 2010 at UC Irvine, co-chaired by Andre van der Hoek (Source 5.10). This impact can be traced through the Design Thinking symposium series, especially DTRS7 where Fred Brooks made significant contributions. He references design thinking in his 2010 book *The Design of Design: essays from a computer scientist* (Source 5.11). This served to confirm an original aim of design thinking, namely to cross discipline boundaries through establishing principles of design which are independent of domain. This impact was validated in SPSD with contributions by leading design thinking researchers including Nigel **Cross**. More indirectly SAP through supporting the Hasso Plattner Institute at the Stanford d-school, evidences that design thinking underpins the design of

major software products and services. Such transformation of a professional practice through analysis and reflection by researchers and practitioners has been a feature of the impact of design thinking across discipline boundaries.

5. Sources to corroborate the impact

Design thinking in business

5.1 Tim Brown: TED: http://www.ted.com/speakers/tim_brown.html, Harvard Business Review Article June 1, 2008 http://hbr.org/2008/06/design-thinking/ar/1, and Design Council: http://www.designcouncil.org.uk/about-design/How-designers-work/

5.2 Founder at MakeTools and SocicRim has applied design thinking in many industry sectors. SonicRim, a leading global design consultancy, reviews reference 3.7 as 'giving a clear sense of which perspectives have been most generative and what insights have had the greatest impact'. http://sonicrim.com/2012/05/design-thinking-understanding-how-designers-think-and-work/

5.3 BBC Radio 4 'In Business' episodes: 'Grand Design' (26 April 2009) and 'Design Thinking' (23 August 2013) (http://www.bbc.co.uk/programmes/b00jv9n0 and /b038hkl7

Industrial strategy and public policy

5.4 Designer, Kenneth Grange Design

5.5 Kees Dorst: video 'Interpreting design thinking' describes how design thinking can help businesses reframe problems in order to solve them. He acknowledges he builds on 40 years of design thinking research (http://vimeo.com/12256495).

5.6 UK Design Commission: *Restarting Britain* 2012 "we discovered many brilliant examples of good design thinking being applied, with positive results, to public or governmental challenges" and cited Lloyd's paper 'Does design education always produce designers?' 1st International Symposium on Design Education Paris 18-19th May 2011 (http://www.policyconnect.org.uk/apdig/research/report-restarting-britain-2-design-public-services). Barry Sheerman MP, the Group's Co-chair, is 'a long-running campaigner for greater use of design thinking in public policy formation' http://www.policyconnect.org.uk/apdig/people/parliamentary-officers

Public engagement and awareness of design in everyday life

5.7 'Automotive Forums: Public discussion (700k subscribers) of Gordon Murray's approach to 'Winning by Design' http://www.automotiveforums.com/vbulletin/showthread.php?t=1074130

5.8 Design materials that are publicly available OpenLearn and iTunesU, include 'Design in a Nutshell' http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/design-and-innovation/design/design-nutshell. Visitors Apr-July 2013 OpenLearn 29,649; YouTube 356,969

5.9 The Secret Life of Buildings: Producer/Director Mike Christie at Renegade, three-part Channel 4 series 15/08/2011 (3 million viewers when broadcast on 15 August 2011 and available to view on 4oD). A public blog for comments is available on the Channel 4 website at: http://www.channel4.com/programmes/the-secret-life-of-buildings/articles/tom-dyckhoff . Comments include "This programme has got people thinking and talking about architecture. …..it has captivated people's imaginations". Also Evening Standard follow-up Article: http://www.standard.co.uk/lifestyle/london-life/open-for-business-facebook-and-bbc-opt-for-openplan-offices-8179776.html

Cross-over between disciplines

5.10 Andre van der Hoek (UCIrvine, Chair Informatics and co-convener of SPSD 2010) Studying Professional Software Design (SPSD); workshop UC Irvine 2010: Marian Petre (OU Computing) and Nigel Cross had key roles at SPSD see *Software Designers in Action: A Human-Centric Look at Design Work,* CRC Press 2013.

5.11 Brooks, F: Attended Lloyd's DTRS7 workshop in 2008, and his book *The design of design: essays from a computer scientist,* Boston, 2010, cited (on pages 6 and 10) Luck's paper in reference 3.6.