

ROBIN ROY

A low-angle photograph of the London Eye Ferris wheel against a clear blue sky. The white metal structure of the wheel is prominent, with several glass-enclosed capsules visible. The perspective is from below, looking up at the wheel's arc.

# CREATIVE DESIGN AND INNOVATION

How to Produce Successful  
Products and Buildings

Using many real-world examples and cases, this book identifies key factors and processes that have contributed to the creation of successful new products, buildings and innovations, or resulted in some failures. Such factors include the creativity of individuals and groups, their sources of inspiration, the processes of creative design and innovation, and the characteristics of the products, buildings and innovations themselves.

Much has been written about creativity and innovation, but what helps to foster creativity, enable creative ideas to be translated into practical designs, and ensure those new products or buildings succeed as innovations on the market or in use? This book discusses these elements through the author's origination and analysis of examples and case studies ranging from the revolutionary innovation of the smartphone, through radical innovations in domestic appliances and sustainable housing, to creative designs of contemporary jewellery. The broad range of examples and cases include product and fashion design, filmmaking and fine art as well as industrial design, engineering and architecture, offering lessons for creatives, designers and innovators from many subject backgrounds. Analysis of the different factors, successes and failures are presented in text boxes throughout the book to allow readers to easily understand the key lessons from each example or case, with over a hundred colour visuals, diagrams and charts for illustration.

This book is a must-read for a broad audience interested in creativity, design and innovation, including practitioners in design, engineering, architecture and product management, and students and instructors of those subjects.

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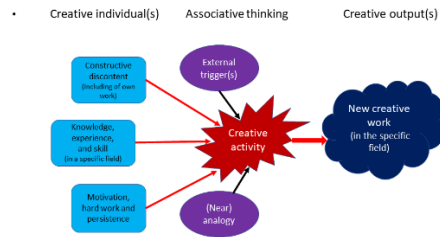
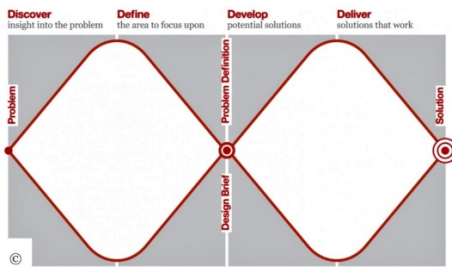
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## Chapter 1 Creativity, design and innovation: introduction and framework

This chapter introduces the book, provides definitions of creativity and innovation, and discusses how design is the bridge between creative ideas and their implementation as an innovation on the market or in social use. The main content of the book comprises specially written examples and case studies, mostly of innovations in products and buildings. These cover the spectrum from revolutionary innovations, such as the iPhone, through radical innovations in sustainable architecture, and innovative products and buildings, to creative designs such as contemporary jewellery. The aim of the book is to identify common patterns for success or failure in creative design and innovation through an analysis of these examples and case studies to provide guidance and lessons for designers, engineers, architects, product managers and entrepreneurs, and teachers and students of those subjects. The chapter discusses different levels of innovation and proposes five categories from revolutionary innovations to creative product designs. It then describes the primary, secondary and tertiary sources used to author the books' examples and case studies representing these five levels. The chapter finishes by summarising some of the literature on creativity, design, and innovation used to inform the analysis of the examples and case studies.



## Chapter 2 Creativity and innovation in engineering, design, architecture, arts and media

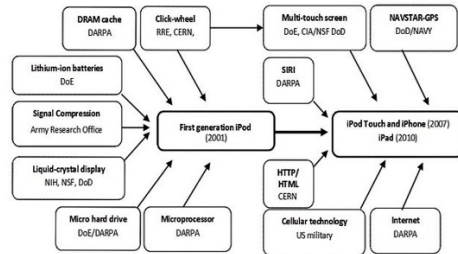
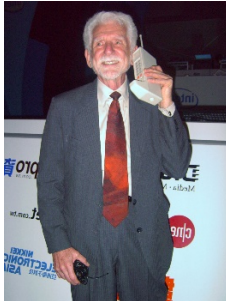
This chapter provides fourteen short examples of creativity and innovation in engineering, industrial design, architecture, product and fashion design, media, and fine art. These examples introduce some of the factors, processes and lessons associated with the creation of successful, or unsuccessful, products, buildings, and innovations. It starts with a set of criteria for assessing the success or failure of the products, buildings and innovations discussed in this chapter and in the extended case studies in the book's other chapters. Examples in this chapter include: The Thames Barrier; a cardboard bicycle; the Apple iMac; a residential building for St John's College, Oxford; The London Eye; a nature-inspired lamp; men's fashion; the film *Alien*; and Barbara Hepworth's sculptures. The factors, processes and lessons illustrated by these examples are summarised at the end of the chapter. They include the importance of a creative person's background, their possessing a 'repertoire' of relevant knowledge, skills, and experience, a willingness to work hard on projects, and the importance of collaboration. Also, the role of a big idea or 'primary generator' to start and drive a project, the application of 'associative thinking' such as using analogies, and of different forms of modelling for creative design and innovation.



## Chapter 3 Revolutionary innovation: the smartphone

This chapter discusses a revolutionary innovation, the smartphone, including a detailed case study of the Apple iPhone project. It begins with a brief account of four of the technological and product innovations which led to the iPhone – digital cellular radio, energy-efficient microprocessors, the portable mobile phone, and early smartphones. The iPhone case study then focuses on the conception, design, development, and introduction of this revolutionary innovation including paths that proved unsuccessful such as the Motorola 'iTunes phone' and an iPod phone. The iPhone project illustrates the immense multidisciplinary team effort, time and cost required to realise the vision set by Apple's CEO Steve Jobs of a smartphone operated via a multitouch screen. The chapter concludes with a discussion of some of the complementary assets – cellular networks, third party apps, and manufacturing supply chains – and on continuous evolution on which the success of the iPhone depends.

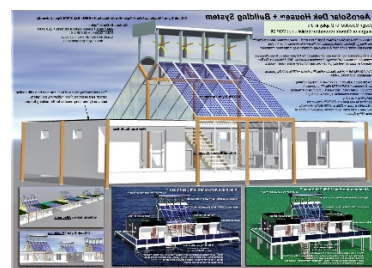
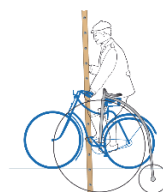
The chapter draws out many lessons for successful creative design and innovation from the iPhone project and the enabling technologies on which it was built. Some of these lessons include: the importance of adapting existing technologies, integrating engineering and industrial design, and satisfying emotional as well as functional needs for successful consumer product innovation.



## Chapter 4 Radical product and building innovations

This chapter covers three case studies of radical innovations. The first examines James Dyson's cyclone vacuum cleaner which disrupted the established appliance industry. The second concerns a 19<sup>th</sup> century innovation, the Rover Safely bicycle, which established the classic bicycle design and facilitated the development of the 20<sup>th</sup> century cycle and motor industries. The third case is of Derek Taylor's radical designs of wind turbines and sustainable buildings which remain as one-offs, prototypes, or concepts.

These cases illustrate some common factors associated with successful innovation, including the innovator's 'constructive discontent' with existing artefacts and having the motivation, knowledge, and skills needed to radically improve them, and their use of different forms of creative thinking, such as adapting existing technologies, transferring ideas between fields, and using analogies. Successful innovation typically involves an iterative design approach requiring the making and testing of many models and prototypes. Also, whether the innovator can overcome barriers to the funding and acceptance of their ideas and collaborates with others for development and innovation. There is a common evolutionary pattern for the successful cyclone cleaner and Rover bicycle; radical innovation followed by incremental improvement and further innovation to maintain commercial competitiveness and continue the innovation's diffusion into use.

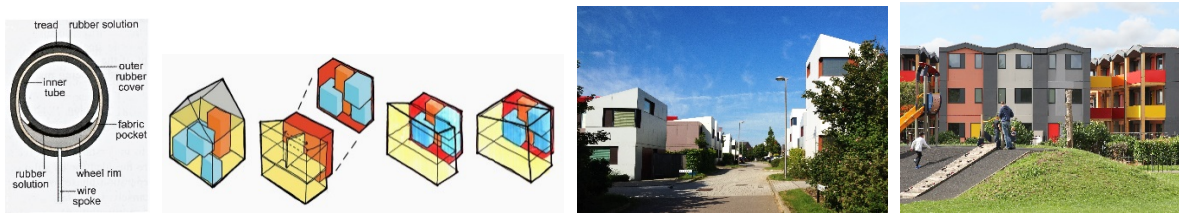


## Chapter 5 Major product and building innovations

This chapter examines two case studies of innovations representing major improvements on previous products or buildings; Dunlop's pneumatic cycle tyre, a highly successful 19<sup>th</sup> Century innovation, and a prefabricated eco-housing system, which even after further development has gained limited adoption.

The Dunlop case study explains why an earlier attempt by Robert Thompson to produce a pneumatic tyre for heavy vehicles was commercially unsuccessful. It then describes Dunlop’s creative process, involving the transfer of ideas and practical experimentation. This led to his second invention of the pneumatic tyre, for cycles, followed by its successful commercialisation after proving its superiority over solid and cushion tyres.

The prefabricated eco-housing project at Oxley Woods, Milton Keynes illustrates many lessons about successful and unsuccessful innovation. These include the role of the economic and environmental context and creative organisations in stimulating building innovation, and creative architectural design responses to the multiple requirements and constraints in a competition brief. It also shows the risks of attempting too many innovations at once and of significant quality problems arising in use from separating concept design from detailed design and construction. The case also shows the importance of associative thinking, prototype development, and continuing improvement for innovative building design.



## Chapter 6 Innovative Products and Buildings

This chapter examines two case studies of a product and of buildings that are new and original. The first case provides several lessons about successful creative design and innovation associated with the conception, design, and development of an innovative product – a purpose-designed dog walking bag – and the establishment of a small business to manufacture and sell it. Among these lessons are the significance of the innovator’s background, experience, and interpersonal skills for successful entrepreneurship; the roles of ‘constructive discontent’, direct experience as a user, informal product and market research, and rough prototyping for conceiving and specifying an innovative product for professional design development. The case also highlights the crucial importance of intellectual property protection.

The second case concerns the design of innovative buildings, including a Grade II listed modernist bus station, by an established architect. This case also provides many lessons. They include the influence of the work of admired architects and a strong design philosophy in providing direction to the creative process within the constraints of a brief; the importance of both innovative concepts and design details developed using different forms of modelling to produce successful designs; and the value of working with other creative individuals and teams.



## Chapter 7 Creative product designs

Previous chapters have mainly discussed product and building innovations intended for commercial introduction or construction. This chapter considers examples of creative product designs not all intended for the market, including designs created for educational purposes, where the creators produced what they designed. The chapter includes two case studies. The first concerns the work of a jewellery designer and art teacher, the second concerns the creation by novice Open University design students of graphic images for printing on T-shirts.

The first case shows how a professional designer employs a few preferred ideas, materials, and methods to design contemporary jewellery and other work. Both cases provide examples of products produced either by highly creative thinking within a multi-stage design process or by more straightforward steps of thinking and making from initial idea or brief to final product. The cases also show that, given a starting point for inspiration, a design process, and some design and making skills, students without design experience, including young children, can produce worthwhile creative product designs. The chapter's examples support theories which argue that valuable creative work can be produced by ordinary individuals when provided with the opportunity, a 'grammar' of designing, and some essential knowledge and skills.



## Chapter 8 Guidelines for successful creative design and innovation

This final chapter identifies general patterns associated with the success, or lack of success, in creative design and innovation based on an analysis of the book's examples and case studies. It provides guidelines and lessons for producing successful products, buildings, or innovations in nine areas. 1 The socio-technical and market context (e.g., availability of prior enabling technologies; environmental problems). 2 The characteristics of creative individuals (e.g., early interests; in-depth, domain-specific knowledge, skills, and experience; persistence and collaboration). 3 The motivations to create and innovate (e.g., dissatisfaction with existing artefacts; improving the world). 4 Starting points and inspirations (e.g., a vision for a proposed innovation; admired individuals and artefacts; physical or biological analogies). 5 Effective creative design and innovation processes (e.g., iterative, phased development from initial problem, brief or idea to final artefact; integrated industrial design and engineering). 6 Characteristics of successful products, buildings, and innovations (e.g., unique advantages; satisfy aesthetic, emotional, and functional needs). 7 Intellectual property protection (and the ability to defend IP against infringement). 8 Continuing improvement and innovation (e.g., in response to feedback, competition, and new technologies). 9 Reasons for unsuccessful products, buildings, and innovations (e.g., premature innovation, too many innovative elements, inadequate relative advantages).

## Illustration acknowledgements

### Chapter 1

Design Council Double Diamond model of the design process. The Double Diamond by the Design Council is licensed under a CC BY 4.0 license. [www.designcouncil.org.uk](http://www.designcouncil.org.uk)

Model of the creative innovation process based on Weisberg's case studies and theory of creativity. Diagram by the author developed from Fowles (2004). Fowles, M. (2004) The inception of technological innovation (Lecture). Department of Design and Innovation, The Open University, Milton Keynes, April.

### Chapter 2

The Thames Barrier with the D-shaped gates in closed position. "Thames Barrier 03" by Andy Roberts licensed under CC BY 2.0. ([https://commons.wikimedia.org/wiki/File:Thames\\_Barrier\\_03.jpg](https://commons.wikimedia.org/wiki/File:Thames_Barrier_03.jpg)).

Apple iMac G3 all-in-one personal computer 1998-2003 with its the innovative egg-shaped translucent design marked a break from the grey boxes of previous PCs. "An iMac G3, a personal computer produced by Apple Inc. from 1998 to 2003". Alterations by David Fuchs; original by Rama, licensed under CC BY-SA 4.0. (<https://commons.wikimedia.org/w/index.php?curid=98219515>).

The Garden Quadrangle, St John's College, Oxford in 2009, showing the Belvedere and viewing towers above the student accommodation. "The Garden Quadrangle (1989-93) by MacCormac, Jamieson and Pritchard" by Steve Cadman licensed under CC BY 2.0. ([https://commons.wikimedia.org/wiki/File:St\\_John%27s\\_College\\_Garden\\_Quad.jpg](https://commons.wikimedia.org/wiki/File:St_John%27s_College_Garden_Quad.jpg)).

Claire Norcross's Aikiko lamp for Habitat created by super-scaling plant berries. Courtesy of Claire Norcross and Sainsbury's Supermarkets Ltd.

Paul Smith striped T-shirt, 2023. Photograph by the author.

Barbara Hepworth, Makutu, 1969-70, St Ives. Photograph by the author.

### Chapter 3

Dr Martin Cooper demonstrating a 1973 Motorola DynaTAC prototype in 2007. "Dr. Martin Cooper, the inventor of the cell phone, with DynaTAC prototype from 1973" by Rico Shen licenced under CC BY-SA 3.0. ([https://commons.wikimedia.org/wiki/File:2007Computex\\_e21Forum-MartinCooper.jpg](https://commons.wikimedia.org/wiki/File:2007Computex_e21Forum-MartinCooper.jpg))

Technologies involving government agencies on which the iPod, iPhone and iPad depend (Mazzucato, 2013, p. 109). Courtesy of Mariana Mazzucato. Mazzucato, M. (2013) *The Entrepreneurial State. Debunking public vs. private sector myths*. London: Anthem Press.

iPhone 12 Pro, 2020 showing some of its apps. Photograph by the author.

### Chapter 4

Left: G-Force pink cyclone cleaner, 1986; Centre: blue and red prototype dual cyclone cleaner, 1981; Right: some of the cyclone models used to test their effectiveness in collecting coarse and fine dust. Photograph by the author.

Dyson Gen5detect™ cordless vacuum cleaner with a more powerful motor and battery and a dust detection system, 2023. Courtesy of Dyson.

Ladder analogy used by J.K. Starley to establish the configuration of the Rover Safety (outlined in blue compared with a high-wheel bicycle in grey) to permit optimum use of the rider's muscle power. Courtesy of the Open University.

Concept designs for the AeroSolar Dek House™ + Building System exhibited at COP26. Copyright © 2021 Derek Taylor/Altechnica. Courtesy of Derek Taylor.

### Chapter 5

Dunlop's original pneumatic tyre of 1888. Courtesy of the Open University.

Design for Manufacture sketches from analysis and reconfiguration of spaces in existing homes by rearranging stairs and services to create the Oxley Woods concept. Stairs (orange), bathroom, utility room and WC (blue) in a conventional house (left) compared to the same services in a standard core with different living area forms. Copyright RSHP. Courtesy of RSHP.

A completed street with the Trespa-clad timber panels clad, white for the living and coloured for the service zones. Photograph by the author.

Y:Cube one bed studios designed by RSHP and built for the YMCA using factory-built stackable modules, Mitcham, London, 2015. Copyright RSHP. Courtesy of RSHP.

## Chapter 6

Pet Industry Federation New Business of the Year Award 2021. Courtesy of Debbie Greaves.

The former Milton Keynes Central Bus Station in 2021 with its high-quality grey granite cladding, long after ceasing to operate as a bus station. Photograph by the author.

Rowans Children's Centre (now Family Centre), Fullers Slade, Milton Keynes in 2021. Photograph by the author.

## Chapter 7

Stages in the conception, development and production of a contemporary Perspex neckpiece. Courtesy of Nichola Clarke.

Card designed by Nichola Clarke. Rose' birthday card. Courtesy of Nichola Clarke.

'T-shirt design by Open University U101 Design thinking course student. 'Natural Beauty'. Courtesy of Rhiannon Davies.