Fourth Edition

DESIGNING USER EXPERIENCE

A guide to HCI, UX and interaction design

DAVID BENYON

Designing User Experience

A guide to HCI, UX and Interaction Design

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Dedication

David Benyon, husband, father, grandfather, gardener, philosopher, adventurer, interdisciplinarian, free thinker, conceptual blender, champion of intellectual pursuit. Your guiding hand will be missed at home and around the world.

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For open-access **student resources** specifically written to complement this textbook and support your learning, please visit **www.pearsoned.co.uk/benyon**

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For password-protected online resources tailored to support the use of this textbook in teaching, please visit **www.pearsoned.co.uk/benyon**

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Preface

Designing User Experience is aimed squarely at the next generation of user experience (UX) and interactive system designers. This book presents a comprehensive introduction to the practical issue of creating interactive systems, services and products from a human-centred perspective. It develops the principles and methods of human–computer interaction (HCI) and Interaction Design (ID) to deal with the demands of twenty-first-century computing and the demands for improved user experience (UX). UX and ID are concerned with the design of websites, desktop applications, smartphone apps, ubiquitous computing systems, mobile systems, wearable systems and systems to support cooperation between people. UX and ID are concerned with the development of novel apps, visualizations, auditory displays and responsive environments. HCI is about how to design for these experiences in a human-centred way that takes account of human abilities and preferences and ensures that systems are accessible, usable and acceptable.

This book aims to be the core text for university courses in HCI, ID and UX design. It contains the core material for introductory courses and advanced material and links to other resources for final-year undergraduate and masters-level students and to meet the needs of usability and UX professionals working in industry.

HCI established itself as an important area of study in the early 1980s and by the early 1990s there was a coherent syllabus and several textbooks. In the early 1990s the World Wide Web appeared, opening up website design as a new area. Information architecture and information design emerged as important areas of study and new issues of usability became important in the open and untamed world of the Web. By the late 1990s mobile phones had become a fashion statement for many people; style was as important as function. With colour displays and better screens, mobile phones became increasingly programmable. Interaction designers were needed along with software engineers to create exciting experiences for people. Smartphones, tablet computers and other information appliances made further new demands on software developers. User interfaces became tangible, graspable and immediate and software systems had to be engaging as well as functional. So, came the era of user experience (UX) design. Digital technologies, wireless communications and new sensing devices provided new media for a new generation of artist–designers involving whole installations, new modalities of interaction and wearable computing.

All this has brought us to where we are today: a dynamic mix of ideas, approaches and technologies being used by lots of people doing very different things in different contexts. *Designing UX* aims to focus this emerging discipline by bringing together the best practice and experience from HCI, UX and ID. *Designing User Experience* presents a human-centred approach to interaction and experience design. The strength and tradition of HCI has been in its human-centredness and usability concerns. HCI has evolved methods, guidelines, principles and standards to ensure that systems are easy to use and easy to learn. ID has come from design schools, applying traditional approaches to design that emphasize research, insight and critical reflection. UX has emerged during the internet era to emphasize the enjoyment and engagement of the whole interactive experience.

Practitioners of HCI, website designers, usability experts, user experience designers, software engineers – indeed all those concerned with the design of interactive systems in all their forms – will find much that they recognize in this book. It is concerned with how to design engaging interactions between people and technologies to support the activities that people want to do and the contexts in which they act.

Organization of the book for the 4th edition

The third edition of *Designing User Experience: a comprehensive guide to HCI and interaction design* established itself as the key text for students and professionals of interaction design (ID), user experience (UX) and human–computer interaction (HCI). It has been translated into Chinese, Portuguese and Italian, ensuring it has real international coverage. This new edition aims to bring the material right up to date and to set the agenda for the future.

The change of title to *Designing User Experience: a guide to HCI, UX and interaction design* is intended to reflect the change in emphasis that the discipline has experienced. New techniques have been introduced and there are new contexts for interactivity. Many interactive experiences take place over time and across different media channels. UX encompasses these changes in a way that interaction design or HCI cannot easily do.

The previous edition established a clear structure for presenting the curriculum for HCI, ID and UX. The material was organized into four parts.

- Part I focused on the **essentials** of Designing User Experience.
- Part II covered the key **techniques** for human-centred interaction design that a good designer should master.
- Part III focused on the different **contexts** for interaction design.
- Part IV provided the psychological and sociological **foundations** of the subject.

I reviewed this structure and overall reviewers and students liked it. Some argued that foundations should come first, but providing the essentials first makes the book more accessible. Some argued that the structure of the book should follow the structure of a design project, but interactive systems design projects are so various that there is no one structure that reflects this variety. Others felt that there were too many different techniques and that the book should be more prescriptive.

Taking all these issues on board and looking at the changes that have happened in the subject since the third edition has resulted in this current edition. The four-part structure – essentials, techniques, contexts and foundations – remains. This allows professors and tutors to pick the combination that suits their classes best. Some suggestions are given below. Every chapter has been revised in the light of this rapidly changing subject and all the examples have been updated to reflect changing technologies.

Thus *Designing User Experience* has the following structure.

Part I provides an essential guide to the issues of designing user experience – the main components of the subject, key features of the design process and how these are applied to different types of system. The unifying idea is encapsulated by the acronym PACT: designers should strive to achieve a harmony between the needs of different **p**eople who undertake **a**ctivities in **c**ontexts using **t**echnologies. It is the very large amount of variation in these components that makes designing user experience such a fascinating challenge. A key concept throughout is the idea of 'scenarios'. Scenarios are stories about interactions. They provide an effective representation for reflecting on a design throughout its development. All the material has been updated and new material has

been added to Chapter 4 on cross-channel UX. This chapter reflects a key change in the discipline. UX crosses communication and media channels such as Facebook, Twitter, Whatsapp and so on and people use different devices such as mobile smartphones, computers and public displays to engage with interactive content. HCI and ID focused on single interactions. UX concerns interactions spread over time, different devices and media channels. Chapter 4 also integrates material on service design into the idea of UX. This leaves Chapter 5 to concentrate on usability — traditionally the focus of HCI — and Chapter 6 to focus on the design of good experiences that are aesthetic, pleasurable and fit in with people's values.

Part II pulls together all the main techniques arising from HCI, ID and UX that are used for understanding, designing and evaluating interactive products, services and experiences. Part II presents techniques for understanding the requirements of interactive systems, probing people for ideas, getting people to participate in the design process, card sorting to develop information architectures and investigating similar systems for ideas. Part II includes a chapter on ways of envisioning ideas, prototyping and evaluating design ideas. A more formal approach to conceptual and physical design is included along with a chapter on the key HCI technique of task analysis and a detailed presentation of user interface design in two chapters. One chapter focuses on design of visual interfaces and the other on multimodal interfaces that include sound, touch, augmented and virtual reality and gesture.

Part III considers interaction and experience design in the different contexts that are dominating the subject today. There is a chapter on website design and another on social media. But ID and UX go way beyond displays on a desktop computer. People are using mobile devices and interacting with interactive environments. Accordingly, Part III includes chapters on designing for mobile and ubiquitous computing. There is also a chapter on wearable computing. Collaborative environments and artificial intelligence (AI) are also important emerging contexts for UX, ID and HCI and each has a chapter in this part.

Part IV provides a deep treatment of the psychological foundations of HCI, ID and UX. One chapter deals with memory, attention and human capacities that influence interaction. There is a chapter on understanding human emotion and how this affects interaction. A central chapter on theories of cognition and action brings together the latest ideas on embodied cognition, conceptual blending and how these impact UX. Social interaction is increasingly important to UX and ID and there is a chapter devoted to the key issues from this area. Hearing, haptics (touch) and other ways of perceiving the world are considered alongside the psychology of navigation in Chapter 25. This is fundamental knowledge that the professional should seek to acquire. This part provides material aimed at the specialist student or students studying HCI, UX and ID in psychology or design schools.

Topics in HCI, UX and ID

The organization of the book does have a clear logic to it; however, I do not expect many people will start at the beginning and read the book from cover to cover. Accordingly I have provided a number of routes through the text for different people with different needs (see below). The book also contains a comprehensive index so that people can find their own ways in to areas of interest. I have also provided a list of intermediate-level topics at the beginning of each part. These are shown below in alphabetical order. The topic number indicates which part it appears in. Numbered topic lists appear in the introduction to each part.

Readership

There is a wide range of people involved in the design and development of user experience in the twenty-first century. *Software engineers* are developing new applications for their organizations. They redesign systems to take advantage of developments in technologies and add on extra features to legacy systems. Software engineers working for software companies develop new generic software products or new releases of existing systems. *Systems analysts and designers* work with clients, end-users and other stakeholders to develop solutions to business problems. *Web designers* are increasingly in demand to organize and present content and new functionality for websites. People are developing applications for new media such as interactive television, smart phones, personal digital assistants and other information appliances. *Product designers* are increasingly finding themselves working with interactive features in their products. Many other people with job titles such as *User Experience Designers, Information Architects* and *Interaction Designers* are involved in this rapidly changing business. All these people need education and training, and require ready access to proven methods and techniques of design and evaluation and to the key theoretical concepts.

Just as the range of people involved in the development and deployment of interactive systems is increasing, so is the range of activities. The basic components of design – establishing requirements and developing systems – are common across all these types of interactive products and systems, but detailed activities vary. For example, the analyst–designer working in an office environment would be likely to use traditional requirements generation techniques such as interviewing, whereas the developer of a new smartphone app might use focus groups and 'future workshops'. A website designer would make use of navigation maps, whereas an application developer might produce a prototype in a programming language such as Axure to show to potential users. An evaluation of a mobile phone might focus on aesthetics, style and 'teenage appeal', whereas an evaluation of a shared diary system in a large bank might concentrate on efficiency, time-saving and acceptance issues.

Contexts of interaction are increasingly diverse. Large organizations such as hospitals are introducing smartphones and tablets for consultants and nurses. Universities are introducing purpose-built shared intranet systems to control development of course materials. Oil-rigs have three-dimensional virtual reality training programs and electricity companies are using text messaging to record meter readings. A start-up software company wants to introduce quality and usability control through its software development process and a new media company is developing a Web-based service for its customers. Household environments, on-line communities, mobile computing, offices and remote 'virtual organizations' are just a few of the contexts for twenty-first-century UX design. Most importantly, we are seeing technologies bringing people into contact with people. The design of on-line communities and other services to support the social aspects of life is a move away from the retrieval of information that characterized older systems.

Finally, technologies are changing. Software development is moving from top-heavy methodologies based on object-oriented techniques with the Unified Modeling Language (UML) dominant, to agile development methods. Websites often include Java programming and have to interface with databases. Phones run under operating systems such as Android and new network protocols are needed for voice applications through mobile phones and remote control of other devices such as heating controllers. Geographical positioning systems and complete in-car navigational systems have to be seen alongside new concepts in digital entertainment through interactive television and home information centres. Multi-touch surfaces and artificial intelligence are poised to make significant changes to the way we interact with technologies.

So, how do educators and practitioners cross these diverse areas and combinations of people, activities, contexts and technologies? We need to train software engineers to know about and apply principles of usability, web designers to produce creative designs that are accessible to all, and systems analysts to be sympathetic to the situated nature of work. We need product developers who design for the elderly and infirm, engineers who understand people, their capacities and limitations, and creative people who understand the constraints of software engineering. We need information architects, user experience designers and service design professionals to understand the principles of HCI, accessibility and usability. *Designing User Experience* aims to meet the educational and practical needs of this diverse group by providing the variety of perspectives that is necessary.

How to use this book

HCI, UX and the design of interactive systems take place in a wide variety of contexts, by individuals working alone or in design teams of various sizes. The systems or products to be produced vary enormously in size and complexity and utilize a

range of technologies. There is no 'one size fits all' approach that can deal with this variety. In this book and its associated website I provide a variety of perspectives to match the variety inherent in the design of interactive systems. A professional interactive system designer will need to achieve a competence in all the methods and techniques described in this book and will need to understand all the issues and theories that are raised. To achieve this level of competence would take three years of study for an undergraduate student. But not everyone needs to achieve this level, so I have organized the material to make different types of understanding available.

It is an ambitious task to write a complete guide to the design of interactive systems and UX when the area is still evolving. However, I have made an effort to mention all the currently important issues and the further reading at the end of each chapter provides directions on where to go next for more detailed coverage of specific issues. There is also a comprehensive website with student notes, further exercises and tags (keywords) for each chapter subsection to allow for easier searching for additional material.

The pedagogic style adopted by the text ensures that it meets the needs of students and teachers alike. Boxes are used to highlight significant examples of the subject under discussion and to point readers to interesting diversions. Forward and backward references help to show how topics are linked. Case studies that the author has been involved with have been included to illustrate the issues and to provide a rich source of examples for students and teachers.

The book can be used in part or in total on a wide variety of courses, from specialist degrees in Human–Computer Interaction to a minor part of a degree in Software Engineering to specialist modules on Design or Engineering degrees, Psychology, Communication and Media degrees or other programmes where the design of interactive systems and UX is important. Most importantly, this book has been designed with its accompanying website in mind. In the book are the things that I do not expect to change over the next period (up until 2029). The structure should remain stable over this period and the content will remain relevant. All the details that I expect to change are on the website and this will be maintained to ensure it is up to date. Indeed readers are encouraged to email if they find better examples, broken links or out-of-date material. The accompanying website (at **www.pearsoned.co.uk/benyon**) should be considered part of the book.

My colleagues and I have been using this book for several years now and I meet and talk to others who use the book at their universities. The material is highly accessible and flexible. Chapters 1–4, for example, provide the basis of a 200-hour course for first-years and Chapters 1–10 provide a 200-hour course for masters students. Chapters 2, 3, 4 and 10 provide a 16-hour course for on-line financial product developers. To explain how the material can be used, I refer to a first- or second-year undergraduate course of study as 'level 2' material, third-year as 'level 3' and fourth or masters as 'level 4'.

Part I would form the basis of a level 2 course and indeed this is what I teach to our second-year computing students. They study Processing as a prototyping language and I include a number of 'motivational' lectures on current topics in addition to delivering Topics 1.1 to 1.6 and 1.8 to 1.12 (Chapters 1–6) as a series of six two-hour lectures.

Part I material is also suitable for courses on interaction design and as introductory material to a wide variety of level 3 modules. For example, with the materials from Part II it would form a user-centred design module; with more material on psychology from Part IV it would make a level 3 module on human–computer interaction. Chapter 3

and Part II can be used as a course on scenario-based design. Part IV is also suitable at this level where the theoretical background for human–computer interaction is required. In the past I have run an advanced module on navigation (Chapter 25) and cognition (Chapter 23), applied to website design (Chapter 14) and mobile and ubiquitous computing (Chapters 18 and 19). Part II provides a wealth of examples that students can be pointed to that illustrate design issues or to learn specific design techniques as they need them.

Our 'rule of thumb' for a typical course or module unit is 10–15 hours of student time per week. This would be composed as follows and constitutes one 'credit'. Over the period of a year, full-time students study eight 15-credit modules or six 20-credit modules.

Activity	Hours
Primary exposition of material (e.g. lecture)	1–2
Secondary presentation (e.g. seminar)	1–2
Unmoderated, informal student discussions	2
Practical exercises and activities	2
Research and further reading, based on the student notes and further reading suggested	2–3
Revision and assessment	2–4

The following are examples of modules and courses that illustrate how the material in this book could be used. These are just a few of the many variations that are possible.

Course/module	Material, chapter numbers
Level 2 Introduction to HCI (15 credits).	
A basic-level course intended to equip computing students with an appreciation of HCI issues and a set of practical skills.	Most of Chapters 1–5 (Topics 1.1–1.6 and 1.8–1.12) plus basic introduction to prototyping.
Level 3 Interaction Design (15 credits).	
A more advanced module aimed at developing the issues concerned with designing useful and engaging interactions. Based around the development of paper prototypes, it encourages students to focus on design issues rather than programming issues.	Quickly revise material in Chapters 1–4, but base the module around Chapters 7–10, 12 and 13 supplemented with chapters from Part III according to the interest of the lecturer and students. The focus here is on scenarios and developing the skills of envisionment, prototyping and the evaluation of ideas.
Level 3 User-centred Design (15 credits).	
A module that provides the basis of a solid method for human centred design for industry. Fits nicely alongside Interaction Design.	This can be based on Chapter 3 using a formal scenario-based design as the design method. The conceptual and physical design described in Chapter 9, based on object-action analysis would supplement this, along with task analysis methods (Chapter 11) and further evaluations (Chapter 10).

Course/module	Material, chapter numbers
Level 4 Advanced Interactive Systems Design Concepts (20 credits).	A masters-level module that looks at advanced and modern interfaces such as wearable and tangible computing. Look at experience design in detail (Chapters 4 and 6), multimodal interaction (Chapter 13), theories of action (Chapter 23), perception and navigation (Chapter 25). Apply to issues of collaborative environments and gestural interaction (Chapter 16) and blended spaces (Chapter 18).
Level 2 Web Design (15 credits).	Part I material supplemented with Chapters 14 and 15. Include evaluation (Chapter 10) and visual interface design (Chapter 12).
Level 3 or 4 Module on Psychological Foundations of Human–Computer Interaction (20 credits).	In-depth coverage of Part IV materials. Examples from Part III with some introductory material from Part I.

Other resources

The text highlights other important resources where appropriate. Here are some pointers to a few general resources. The Usability Professional Association (UPA) is a good place for interested people to look for examples of good practice and links to other resources: **www.upassoc.org**. The American Institute of Graphic Arts (AIGA, **www.aiga.com**) is increasingly involved with interaction and information design. The Association of Computing Machinery (ACM, **http://acm.org**) has an active special interest group in computer–human interaction (SIGCHI) and the British Computer Society also has an excellent group for both academics and professionals (**www.bcs-hci.org.uk**). Both of these have extensive resource libraries and organize many relevant conferences. There are many good websites devoted to aspects of usability, human–computer interaction and interaction design that can be found by following links from the sources on the companion website at **www.pearsoned.co.uk/benyon**. Finally, there are two international standards that deal with usability. They are ISO 9241-11 and 13407. The European resource centre, 'usability net', has details at **www.usabilitynet.org**.

The author

David Benyon is Professor of Human–Computer Systems at Edinburgh Napier University. He began his career as a systems analyst working for a number of 'software houses' and industrial companies. After several years he moved into academia where he developed a more formal understanding of issues of HCI. The first US conference on computer–human interaction took place in the same year that David began an MSc in Computing and Psychology at Warwick University and in 1984 he published his first paper on the subject. Since then he has continued to publish and now has over 150 published papers and 12 books. He obtained his PhD in Intelligent User Interfaces in 1994 when he also co-authored one of the first HCI textbooks, *Human–Computer Interaction* (by Preece, Rogers, Sharp, Benyon, Holland and Carey, published by Addison-Wesley) and *Usability Now!* (1993). He continues to take an active part in the HCI and ID communities, organizing and presenting at conferences including CHI (Computer Human Interaction),

DIS (Designing User Experience), Interact conferences and Interactions (British Computer Society).

During his career David has worked on twenty European-funded research and development and UK-funded research projects and ten knowledge transfer projects. He has supervised twenty-six PhD students, examined forty-three and undertaken a number of consultancy projects. This wide and extensive experience of all manner of HCI, ID and UX puts David in a unique position within the world of UX and interactive systems design. All this experience and knowledge has fed into this book. In the Persona project David worked with Kristina Höök from the Swedish Institute of Computer Science on ideas of navigation of information spaces and on 'social navigation'. He worked with Bang & Olufsen of Denmark on concepts for a Home Information Centre (HIC) and with NCR, UK on personalization of interfaces to self-service machines. He worked with the University of Dundee and others on technologies for older people, with partners across Europe on projects concerned with ideas of presence and with a large consortium of Scottish universities on interacting with wireless sensor networks. He spent four years exploring concepts of 'Companions' – advanced personalized multimodal interfaces to the internet – with Telefonica, France Telecom and others in a large integrated research project and working with a number of Indian Institutes of Technology on gesture-based interaction and multi-touch displays. Most recently he has been working on applications of multi-touch surface computing and augmented reality for tourism applications and interactive dome environments.

Acknowledgements

Publisher's acknowledgements

15, p. 149, Fig. 3 (Olson, G.M. and Olson, J.S. 2000); Table 24.2 after Distance matters, *Human–Computer Interaction*, 15, p. 160, Fig. 8 (Olson, G.M. and Olson, J.S. 2000).

Text

Box 1.1 adapted from *Things That Make Us Smart: Defending Human Attributes in the Age of the Machine*, Perseus Books (Donald Norman 1993) Copyright © 1993 by Donald Norman, Reprinted by permission of Perseus Books, an imprint of the Perseus Books Group; Box 5.1 from *Compiled by advocates of universal design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, Gregg Vanderheiden, © Centre for Universal Design, College of Design, North Carolina State University; Extract on page 129 adapted from Digital ground: fixity, flow and engagement with context, *Archis*, 5 (special 'flow' issue, Oct/Nov) (McCullough, M. 2002), with permission from the author; Interview 6.1 adapted from on-line interview, http://infodesign.com.au/uxpod/ludicdesign, with permission from William G. Gaver; Box 7.5 from Ethical Conduct for Research Involving Humans, 2010, http://www.pre.ethics.gc.ca/pdf/eng/tcps2/TCPS_2_FINAL_Web.pdf. All rights reserved. Reproduced with the permission of the Canadian Institutes of Health Research, 2017; Box 7.6 from Grounding blue-sky research: how can ethnography help?, *Interactions*, 4(3), pp. 58–63 (Rogers, Y. and Bellotti, V. 1997); Box 10.1 from Oli Mival; Extract on page 330 from Tangible Media Group, http://tangible.media.mit.edu/projects/Tangible_Bits; Extract on page 361 from David Benyon; Box 14.4 from www.uie.com/articles/; Extracts on pages 478–80 from Activity based serendipitous recommendations with the Magitti mobile leisure guide. *Proceedings of the Twenty-sixth Annual SIGCHI Conference on Human Factors in Computing Systems*, 5–10 April, Florence, Italy, pp. 1157–1166 (Bellotti, V., Begole, B., Chi, E.H., et al. 2008) © 2008 ACM, Inc., reprinted by permission, http://doi.acm.org/10.1145/1357054.1357237, the research and development behind the Magitti system was sponsored by Dai Nippon Printing Co. Ltd. 'Media Technology Research Center' and 'Corporate R & D Division'; Box on page 543 from Is affective computing an oxymoron?, *International Journal of Human–Computer Studies*, 59 (1–2), p. 69 (Hollnagel, E.), copyright 2003, reprinted with permission from Elsevier.

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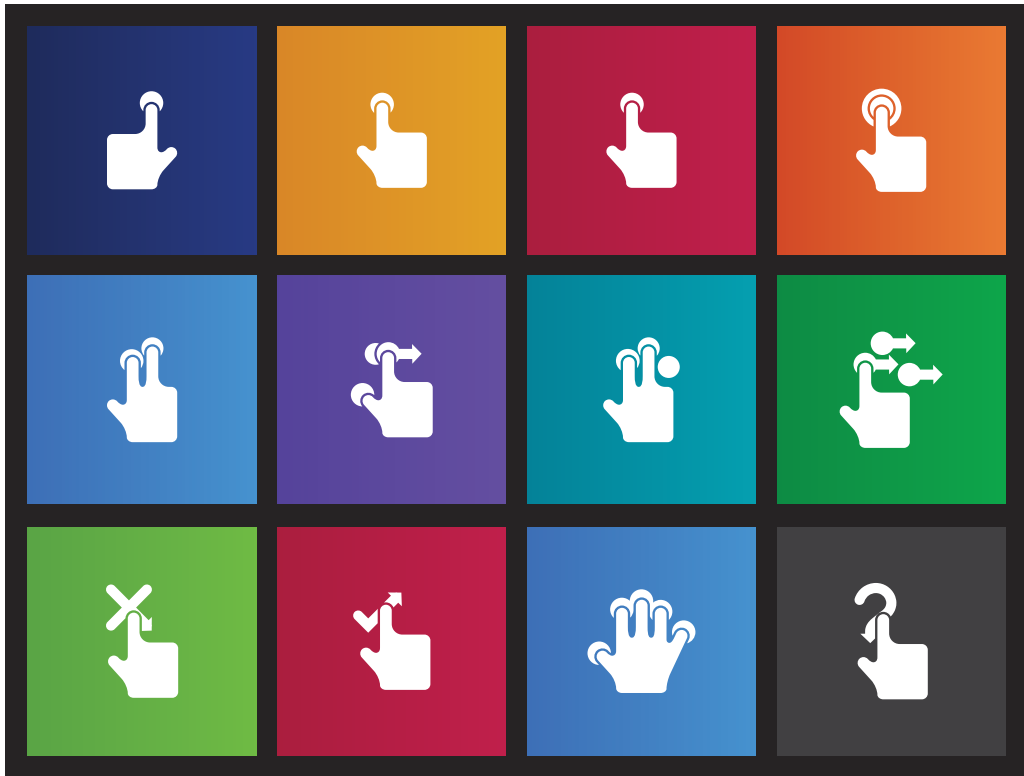
Part I

The essentials of designing user experience

Introduction to Part I

User experience (UX) encompasses all the feelings, thoughts, sensations and actions of engaging in some activity. Think of the UX of having a meal at a restaurant, going shopping or travelling to work. The UX of driving to work and being stuck in traffic or packed onto a commuter train may not be too good, compared with the UX of walking through a park.

In this book we are concerned with designing the interactive products and services that contribute to delivering a good UX and with providing designers with the knowledge and skills to deliver good user experiences. For example, a designer might be asked to develop an app for a tablet that the waiters use to take customers' orders in a restaurant. They might develop the restaurant's website. They might be responsible for designing promotional messages and photos to put on the restaurant's social media pages. The designers that this book is aimed at are unlikely to be in charge of choosing the cutlery, the tablecloths or the glassware for the restaurant. They are unlikely to advise on the lighting and interior design of the restaurant. They are not going to advise on the food or how it is presented. Hopefully, though, the designers that this book is aimed at will talk to the interior designer, the lighting designer and the chefs to ensure that the design of both the interactive components and the services provided contribute to an overall restaurant UX.

UX designers should aim to design interactive systems and services that are enjoyable to use, that do useful things and that enhance the lives of the people who use them. As UX designers we want our interactive systems to be accessible, usable and engaging. In order to achieve this we believe that the design of such systems should be human-centred. That is, designers need to put people rather than technology at the centre of their design process. Unfortunately, in the past, interactive systems, services and products have not always had a good record of considering the people who use them. Many systems have been designed by programmers who use computers every working day. Many designers are young males. Many designers have been playing computer games for years. This means that they enjoy different experiences than the users of their systems will. They may not realize just how difficult and obscure some of their designs can be to people who have not had these experiences, and what a poor UX results.

In the days of the web, smartphones, tablet devices and technologies embedded in the environment, issues of usability and UX are critical to e-commerce. Before the immediacy of e-commerce, UX problems were discovered only after purchase. If you bought a nice-looking smart TV and brought it home only to find it was difficult to use, you could not take it back. The shop would say that it delivered its functions; all you had to do was to learn how to operate it properly. On the web, customers look at UX first. If the system or service is hard to use, or if they do not understand it, if it does not look nice or makes them angry, they will go somewhere else to make their purchase. People are learning that interactive systems and services do not have to be hard to use. People are expecting to have a good UX.

This first part of the book provides a guide to the essence of the human-centred design of UX. Chapter 1 focuses on the main elements of UX. It considers the nature of design, the features of interactive systems and what it means to be human-centred. The chapter provides a brief history of human–computer interaction (HCI) and interaction design, and a glimpse of the future, before focusing on why good UX is important. Chapter 2 introduces the key components of interaction – people, activities, contexts and

technologies (PACT). This proves to be an insightful construct not just for understanding the breadth of interaction design but also for designing for a good UX. The chapter describes and illustrates a first UX design method: PACT analysis.

Alongside this view we need to consider the products and services we are designing: what they will do, how they will do it and what information content they will manipulate. In Chapter 3 we look at the processes involved in designing UX. We see why the evaluation of ideas is central to the process if we are going to be focused on people: 'being human-centred'. The requirements for products, early designs and prototypes of systems all need to be evaluated to ensure that they meet the needs of the people who will use them. People will make use of different technologies in many different contexts, to undertake different activities. The chapter introduces key abstractions for helping designers in their tasks: personas and scenarios. We give examples of personas and offer practical advice on how they can be developed and used. A design method is introduced, based on scenarios as the key unifying construct, that can be followed to deliver good interactive systems and services.

In Chapter 4 we look at the design of services in the context of the modern world. In this world most people are carrying smartphones around with them and most people use the web. The concerns of designing interactive products have to be augmented with the concerns of designing interactive services. Services are the essential background. Think of a service such as Airbnb or Uber. These put customers directly in touch with suppliers. Uber will allow me to call a driver when I need a lift. Airbnb will allow me to find somewhere to stay in another town. It is sometimes said that Uber is the largest taxi company but has no cars and Airbnb is the largest hotel chain but has no hotels. On other occasions you may want a product such as new suit or some new shoes. Rather than wandering the high street shops, many people will now make use of the Internet, comparison websites, social media, TV, radio and a host of other service channels to help them towards finally getting their product. UX designers need to design for these new service ecologies.

In Chapter 5 we look at principles of design: how to ensure systems are accessible, usable and acceptable. Usability is an important contributor to UX. As interactive systems become increasingly embedded in society, they stop being a luxury. Accessibility is about ensuring that the benefits of interaction design are available to all. Another key concept that has long been the central focus of human–computer interaction is usability. Chapter 5 provides a detailed consideration of usability and acceptability. Finally the chapter provides some high-level design guidelines that will help designers ensure that designs are accessible and usable.

When people use the devices and services we have designed, what do they feel? Do they have a sense of satisfaction, enjoyment and engagement? Chapter 6 looks at these issues and at aesthetics and designing for pleasure. This chapter provides the UX designer with the essential background that will enable them to create great experiences for people. Once again this serves to illustrate the wide scope of UX design.

After studying Part I you should understand the essential features of designing user experience. In particular:

- What UX design is
- Who is involved
- What is involved
- How to develop systems and services that are human-centred
- Principles of UX to ensure systems are usable and engaging.

Case studies

Chapter 3 introduces the 'companions' case study. Chapter 4 introduces the 'commuting to work by bus' case study.

Teaching and learning

With some supplementary material showing examples, following up on the web links and further reading and doing some assessed exercises, the material in this part would make an ideal introductory course on human–computer interaction, UX or interaction design. The list of topics covered in this part is shown below. Each topic could take 10–15 hours of study to reach a good general level of understanding, or 3–5 hours for a basic appreciation of the issues. Of course, each topic could be the subject of extensive and in-depth study.

Topic 1.1	Overview of UX	Chapter 1
Topic 1.2	Characteristics of people	Section 2.2
Topic 1.3	Activities, contexts and technologies	Sections 2.3–2.5
Topic 1.4	Doing a PACT analysis	Sections 2.1, 2.6
Topic 1.5	The design process	Section 3.1
Topic 1.6	Personas	Section 3.2
Topic 1.7	Scenarios	Sections 3.3–3.4
Topic 1.8	Accessibility	Sections 5.1–5.2
Topic 1.9	Usability and acceptability	Sections 5.3–5.4
Topic 1.10	UX design principles	Section 5.5
Topic 1.11	Experience	Section 6.1
Topic 1.12	Engagement	Section 6.2
Topic 1.13	Designing for pleasure	Section 6.3
Topic 1.14	Aesthetics	Section 6.4
Topic 1.15	Service design	Chapter 4
Topic 1.16	User experience	Chapter 6

Chapter 1
An introduction to user experience

Contents

Aims

UX is concerned with developing high-quality interactive systems, products and services that fit with people and their ways of living. Computing and communication devices are embedded in all sorts of everyday devices such as washing machines and televisions, ticket machines and jewellry. No self-respecting exhibition, museum or library is without its interactive component. We carry and wear technologies that are far more powerful than the computers of just a few years ago. There are websites, online communities, apps for mobile phones and tablets, and all manner of other interactive devices and services that need developing. UX is about all of this.

In this chapter we explore the width and breadth of UX. After studying this chapter you should be able to:

- Understand the concepts underlying UX
- Understand why being human-centred is important in UX design
- Understand the historical background to the subject
- Understand the skills and knowledge that the UX designer needs to draw upon.

1.1   The variety of UX

UX is concerned with many different types of interactive service and product. It is about designing web services that will run on a computer at work. It is about designing apps, games, interactive products such as home control systems, digital cameras and applications for tablet devices such as the iPad. It is about designing whole environments, such as new retail spaces, in which phones, tablets, laptop computers, digital projectors and other devices and services communicate with each other and through which people interact. It is about designing user experience, products and services for the home, for work or to support communities.

Here are some examples of influential interactive products, services and systems.

Example 1: The iPhone

In 2007 Apple Inc. changed the face of mobile technologies when it introduced the iPhone (Figure 1.1). The iPhone was beautifully made and had a carefully crafted, purpose-designed interface to make use of the finger as the input device. It had a revolutionary touch-sensitive screen that allowed for multi-touch input. This facilitated new interaction techniques such as pinching an image and drawing it in to make it smaller, or pinching and moving the fingers out to make an image larger. Many mobile devices and larger screen systems have now adopted this technology, but the iPhone started it.
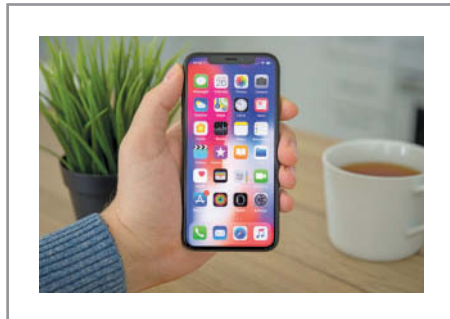
Figure 1.1 The iPhone

The iPhone included sensors that could register how the phone was being held and whether it was vertical, horizontal or sloping. This allowed for other novel interaction methods. For example, the display would automatically adjust from portrait style to landscape. In 2008 the App Store was launched, turning the iPhone into an open platform for developers to design and produce their own software, creating an entire new industry of app development. Combined with the iTunes delivery service, this turned the iPhone into a versatile, multimedia device with hundreds of thousands of applications, from sophisticated games to trivial pieces of entertainment to useful information applications. This created new experiences and new services for a new set of customers that have now spread to many other devices running the Android operating system (from Google) or Windows (from Microsoft). The iPhone includes a speech recognition system called Siri that allows people to call or text their friends, enter appointments in a calendar or search the web just by speaking into the phone. Google Now and Microsoft Cortana perform similar functions.

Example 2: Nest Home control

A 'smart thermostat' to control central heating in people's houses was developed by Nest in 2014. The device has an elegant appearance (Figure 1.2). It has a simple user interface for

setting the temperature, rotating a dial on the outside of the device. It communicates through a proprietary communications protocol called Heat Link with the boiler to turn it on and off. It is also linked to the home's wi-fi system. It comes with an app for the user's smartphone and tablet so that the temperature can be changed from locations remote from the home. In 2015 Nest was acquired by Google and now there is a variety of other devices such as smoke alarms, lights and cameras that can be linked to the same system.
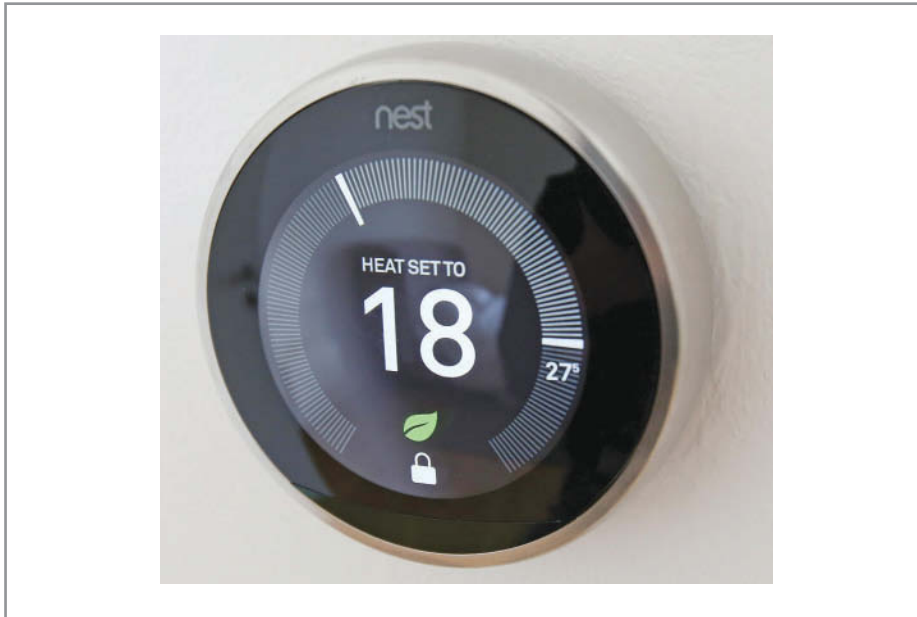
Figure 1.2 The Nest thermostat

Device ecologies

UX is often experienced through an *ecology* of devices rather than on a single device. An ecology is where a number of different organisms (or devices in this case) work together to create an environment. UX is increasingly concerned with interactions that involve a number of different devices: a device ecology. For example, I was sitting in a café with my wife the other day. She was connected to wi-fi and found a picture she wanted me to see, so she sent it using the Airdrop function to my iPhone. Just one example of a typical interaction in a miniature device ecology – two iPhones and a wi-fi connection – that provides a good UX. The Nest system described in Example 2 supports an ecology for smart homes. Other good examples of device ecologies include running technology such as that shown in Figure 1.3.

However, other ecologies could include an Apple watch, a digital projector and people using personal computers (PCs) made by someone other than Apple and smartphones running the Android operating system. In these cases, creating a successful ecology where all the devices can communicate and share content can be surprisingly difficult, causing frustration and anger. These circumstances lead to a poor UX.

Figure 1.3 Sony's PS Vita works with the PS4 to create a device ecology.

FURTHER THOUGHTS

Figure 1.4 Burberry store

Example 3: Burberry

Burberry is an up-market brand of clothing manufacturer and retailer. Its flagship store in Regent Street, London (Figure 1.4) provides an enriched and interactive experience for customers; 'blurring the digital and physical worlds'. Technology has been integrated throughout the architecture of the building including wireless communications, stereo speakers, large display screens and interactive products. Customers can watch fashion shows and interact with brand content. Radio-frequency identification (RFID) is woven into some clothing and accessories, triggering bespoke user experiences that can be consumed on in-store screens or on the customer's smartphone or tablet. There are mirrors that can turn instantly into screens so that customers can see what they would look like in a particular garment without trying it on. Alternatively, they can try on a physical garment and see it in different colours. Digital signage displays content in key areas, and staff with iPad apps can provide purchase history and customer preferences to enable a personalized shopping experience.

Example 4: i Robo-Q domestic toy robot

The i Robo-Q domestic toy robot is an example of new children's toys that are increasingly available (Figure 1.5). Toys use all manner of new technologies to enhance the experiences of children at play. They use robotics, voice input and output, and a variety of sensors to provide novel and engaging interactions.

Example 5: Facebook

Facebook (Figure 1.6) is a highly popular website that allows people to keep in contact with their friends. Known as social networking sites, or social media, there are many similar systems around. Facebook is the most popular, with more than 1 billion users worldwide. Facebook is increasingly becoming a significant platform for a wide variety of activities, allowing people to add applications (apps) in a similar way to the Apple and Android platforms. People can store and share digital photos, write notes to each other and get regular updates about what their

Figure 1.5 i Robo-Q domestic toy robot

Figure 1.6 Facebook

friends are doing. Other examples of social media include web services for dating, connecting mothers with other mothers, knitting enthusiasts, crossword solvers or just about any activity or hobby you can think of.

Summary

These five examples of interactive systems and services capture many of the features that the UX designer has to work with. The UX designer needs to understand the possibilities that exist for new forms of interaction, with fixed devices or mobiles, for people on their own or for connecting people to each other through text messages or through animation and video. It is a fascinating area to work in.

Challenge 1.1

Find five interactive products or services that you use – perhaps a coffee machine, a particular smartphone app, a theme park, a TV service such as Sky or Virgin, a computer game such as Grand Theft Auto and a web service such as The Huffington Post. *Write down what it is that you like about each of them and what it is that you do not like. Think about the whole experience and not just the functions. Think about the content that each provides. Is it what you want? Is it fun to use?*

If possible, find a friend or colleague with whom to discuss the issues. Criticism and design are social activities that are best done with others. What do you agree on? What do you disagree about? Why?

1.2 The concerns of UX

UX design covers a wide range of activities. Sometimes designers will be working on both the hardware and the software for a system, in which case the term 'product design' seems to be most appropriate to describe what they are doing. Sometimes the designer will be producing a piece of software to run on a computer, on a programmable device or over the internet. In these cases the terms 'system design' or 'designing user experience' seem more appropriate. Sometimes the designer will be working on providing a connected group of facilities that is available over a number of devices, in which case service design is most appropriate. We switch between these expressions accordingly. However, in all these cases the key concerns of the UX designer may be summed up as:

- *Design.* What is design and how should you do it?
- *Technologies.* These are the interactive systems, products, devices and components themselves. The UX designer needs to know about technologies.
- *People.* The UX designer needs to consider who will use the systems and services and whose lives they would like to make better through their designs.
- *Activities and contexts.* UX is about what people want to do, about their goals, feelings and achievements. UX needs to consider the contexts within which those activities take place.

Design

What is design? It's where you stand with a foot in two worlds – the world of technology and the world of people and human purposes – and you try to bring the two together.

Mitch Kapor in Winograd (1996), p. 1