About : Interaction Design

By Nico Macdonald

Nico Macdonald is a writer and consultant on interaction design, and founder of business technology consultancy Spy. He has been closely involved with numerous professional organisations in the field.

Nico Macdonald

In brief

Also known as graphical user interface design, human-computer interaction design.

Interaction design is the key skill used in creating an interface through which information technology can be manipulated. As products and services are increasingly being created using information technology, interaction design is likely to become the key design skill of this century.

Interaction is the influence of persons or things on each other, encompassing action and communication. In the context of digital and networked products and environments people influence a system to achieve a purpose, and feedback is supplied by the system to the user as to their success, and the new state of the system. Interaction design considers human cognition, context of use, task analysis, user experience and learnability, understanding of functions, error feedback and failure recovery.

The form of traditional products, such as a typewriter, implied something about their function and how they were intended to be used. Information technology products can take almost any form, from a mobile phone to a bank ATM, thus their function in many cases bears a less obvious relation to their form.

Interaction designers craft the resources, for action or

influence, that mediate what happens between people and products. These resources are the elements, constructs and dialogues we see, touch, and hear in our relationships with people, products and environments.

Why it matters to business

As products and services move from being technological breakthroughs that early adopters will use, irrespective of how difficult they are to use by ordinary people, they need to adapt to later adopters, who don’t care about the technology but do want to exploit its benefits.

Later adopters don't want functionality at any price and are more concerned that products are useful, and easy and pleasurable to use. Products need to ‘broadcast’ their value and indispensability to later adopters. Part of this communication can be shaped by good interaction design.

This quality of experience is largely determined by the quality of the interaction design. Users' experience of these products and services will come to dominate their experience of the company producing them, and its brand offering.

No one likes or enjoys using poorly designed things. Poor design, in whatever medium it is experienced, undermines people’s perception of an organisation. From the customer’s point of view, the experience *is* the business.

Interaction design quality will also shape the effectiveness and efficiency of all employees who use information technology in the office, including their partners and collaborators, and this is as true in government and education.

Why it matters to public services

Companies can lose customers, but the citizen can never walk away. The onus is on public services to deliver high quality and easy-to-use services for all citizens.

The complex transactions that will take place between Government and the population will require a high quality of interaction design if they are to be completed effectively and in a satisfying manner.

Government and other public services have a remit to serve a wider audience than business. And while they may require less convincing of the value of online services, those services will need to be even easier to use than a typical service provided by a business. Such services will also have to be delivered in a wider number of contexts, considering that many citizens will be using interactive television, a public kiosk or even a mobile phone as their access point. There will also be a wider range of users, some of whom may be hindered by services designed for the least experienced citizen. (See discussion of novice vs expert in 'Challenges' section.)

Examples

Project: The Macintosh graphical user interface Client: Apple Macintosh Designer: In-house team Year: Early 1980s

Developing on work done at Xerox PARC, what became the MacOS GUI revolutionised our perception of computing by using interface and interaction design effectively. However, there haven't been major innovations in the MacOS GUI since 1984 and subsequent innovations in GUIs have tended to be driven by the web.

Project: Phone user interface Client: Nokia

The Nokia user interface and the quality of its interaction design are cited by many users as the reason they continue to upgrade to Nokia phones, as well as being implicitly acknowledged by its major competitors Ericsson and Motorola. For instance, the design of the predictive text messaging interface makes a complex feature easy to master.

Project: NewtonOS/PalmOS user interface Client: Apple Computer

Apple's Newton interface combined a number of advances in interaction design including an instant-on interface, handwriting recognition support, extensive gesture recognition, drag-and-drop cut-and-paste with a visible clipboard, visible 'electronic ink' when writing, and natural language-based task initiation. Most of these innovations were lost when the Newton project was cancelled by Apple, but some lived on in the PalmOS interface, which was largely based on the NewtonOS interface.

Project: Spotfire

An information mining tool interface originally created at the University of Maryland Human-Computer Interaction Laboratory, and building on research around direct

manipulation and information visualisation, Spotfire is now widely used in industrial research - particularly in pharmaceuticals.

Project: Website Client: Amazon

Amazon is rightly acknowledged as a leader in the use of design for online retailing (though others note that the number of product lines its stores carry have overwhelmed its simplicity). Amazon's strength is in the design of its checkout which supports many modes of purchasing, including the famous '1-Click', and facilitates adding and changing addresses and payment details, gift-wrapping, and setting shipping preferences for orders, all confirmed in an email whose design is more considered than that of almost any other online retailer.

Project: Website Client: Tesco

Tesco was probably the first supermarket chain to develop an effective design strategy for online retailing. The site has many of the qualities of a software application (giving the user immediate feedback on their actions), and has a menu system that is pleasant to use as well as a well-considered procedure for checking out and booking a delivery.

Project: Portable music player/PC-based music player software/online music store Client: Apple Computer Designer: In-house team Year: Early 2000s

Apple’s iPod music player, iTunes software, and iTunes Music Store are individual examples of good interaction design and combine to create a high quality of experience for music listeners, and one that supports their various contexts of use. As well as being a desirable piece of product design the iPod has a simple interface that uses a touch-sensitive ‘wheel’ to facilitate quick scrolling through song listings. When connected to a personal computer its complementary iTunes software is automatically launched

and any new songs automatically synchronised. New songs can be added with one click from any CD inserted in the host PC, and song titles are automatically downloaded from the internet-based CD Database. Songs and albums can also be purchased from within the iTunes software from the iTunes Music Store using an ID that works across all Apple services. Songs can be 'burned' easily to CD or DVD for sharing, or shared with others using Rendezvous, an auto-discovery networking protocol. The interaction design of the iPod/iTunes combination emphasises simplification of complex technology, and effective use of technology to infer a user's intentions from their actions, and keeps in the background tasks about which they don't need to know.

Facts and quotes

Facts

According to the New York-based customer experience consultancy Good Experience, $19billion was lost by US companies in online sales during 2000 'as a result of online shopping carts not working or being unusable, poor search, and cluttered homepages'. Source: 'The Dotcom Survival Guide', Creative Good, June 2000, p6

Quotes

'As soon as there are mapping and modes, built-in behaviour, programmability - that's when really interesting things start to happen. How you manage the complex interactions is what I call interaction design.' Bill Verplank, interaction designer, *Blueprint* , August 2001

'An interaction designer should bring the 'same fanatical attention to detail as a car designer brings to a bonnet or a fashion designer to the hang of a seam'. Professor Gillian Crampton Smith, Director, Interaction Design Institute Ivrea, speech given at the Institute's opening.

'An interaction designer [needs] several skill sets. You have to be able to study people and practices in context, interpret your findings, integrate your conclusions into your design project, explain your work to both clients and colleagues, and, finally, continually assess the larger context of your project to make sure you've defined the problem correctly.' Harry Saddler, formerly at Xerox PARC, Apple Computer's Advanced Technology Group and MetaDesign in San Francisco, interview in *Loop*

'Today we are at the silent film stage in interaction design, depending on existing design languages to represent systems to users.' Gillian Crampton Smith 'Humanising Technology: Could do better', *Design Renaissance* , ed Jeremy Myerson, Open Eye, 1994

'Interaction design is a subset of film-making.' Ted Nelson, hypertext pioneer

'Interaction design offers a way out of the problem we have with innovation.' John Thackara, First Perceptron, Doors of Perception, speaking at the opening of the Interaction Design Institute Ivrea, 2000

'Computers and networks are transforming almost every aspect of the world we live in. Interaction design determines the quality of our experience using these systems; it also determines the value of those experiences. In this sense, interaction design is of enormous economic importance.' Gillian Crampton Smith, Director of the Interaction Design Institute Ivrea, at the time of its opening, in press release, 'Interaction Design Institute Ivrea Preview: Plans to produce "super innovators" ', 2000

'Interaction design deals with immaterial processes, and with services that adapt to an individual's needs and preferences. This is a completely new kind of design. Interaction design also reveals the new business models that are needed to deliver these services and experiences.' Statement by John Thackara, First Perceptron, Doors of Perception, 'Why is interaction design important?', written collaboratively with Gillian Crampton Smith's team in Ivrea, 2001

Searching for [a] guiding metaphor is like searching for the correct steam engine to power your airplane, or searching for a good dinosaur on which to ride to work.' Alan Cooper, Chairman and Founder, Cooper Interaction Design, 'The Myth of Metaphor', *Visual Basic Programming Journal,* 1995

website:

www.cooper.com/articles/art_myth_of_metaphor.htm

'Interaction design is the design of things and systems, typically combining computing and telecommunications, to allow a relatively inexpert user to interact efficiently, transparently and pleasurably with the technology.' From a Graduation Ceremony Address, 'The Seven Virtues of the Interaction Designer', given by Professor Gillian Crampton Smith, Director of Interaction Design Institute Ivrea, June 27, 2003

website:

www.interaction-ivrea.it/en/annualevent_speech_gcs

Challenges

Challenges for consumers, businesses, organisation employees, collaborators and people with disabilities.

Technology limitations While technology will always place limits on user experience, the dominant technology for user interaction at present is the web, which has a model for interaction based on pages and 'client-server' communication. This kind of interaction can be disconcerting for users. It most affects consumers on slow internet connections.

Multiple platforms For many online services it is desirable for them to be accessible from a variety of platforms. However, creating interfaces that work effectively across a number of platforms while feeling the same to the user and behaving consistently, is time and resource-consuming for businesses, and increases support and maintenance costs.

Abstracting interaction principles Interaction design is moving to many varied platforms from mobile phones to public kiosks and television screens, while data (enabled by structured markup languages such as XML) is increasingly being separated from presentation. The way in which information is best presented varies between these platforms: from the small, black and white mobile phone screen often viewed in poor light to the large, colour personal computer screen. Modes of interaction also vary: from a small device with a limited number of small buttons, rockers and jogwheels often operated on the move, to a full-size keyboard and mouse. Interaction designers will need to create design solutions based on a high level of abstraction that embodies sets of rules for presentation and interaction that can be adapted to all these platforms and thus minimises required

maintenance. This will also be valuable for the internationalisation and localisation of websites and other products.

Designing for novices and experts As more people use interactive products it becomes a greater challenge for the interface to support all these users. Also, as products become more complex, interaction design needs to support users who are expert in some aspects of an application but novices with respect to others.

Mapping the physical world and the network The network is an enhancement of, not an alternative to, the real world. Interaction designers will need to develop design solutions that support people performing a task that moves from one environment to the other.

Innovating interfaces As products add features, how can the design support existing users in learning about the new features while continuing to work productively and enjoyably? How does innovation in interface design square up to the usability of a familiar interface or of familiar interface conventions?

Designing for immediate use More and more people are using interactive products from games to personal video recorders. Designers need to design more to support non-professional users, people who don't read manuals, and people using products which they wouldn't expect to need a manual to be able to use. This is sometimes referred to as ‘designing to use’.

Designing non-visual interfaces Speech has been touted as the interface of the future for years and is widely used in call centres, while products such as Orange's Wildfire take it to new levels. However voice interfaces only work well where tasks are constrained and uncomplex, and only a small vocabulary is required. Another challenge is users' unfamiliarity with talking to disembodied voices (other than on the telephone).

Input bandwidth and type Computers have traditionally had a lot of bandwidth out (screen, audio) but little in (keyboard, mouse). Computers will become more valuable when they have more of the former (which might include buttons, touch-screens, pens, tablets, and joysticks) and this presents a challenge to interaction designers to represent these new types of input device and the feedback to their inputs from the system. It may be possible for systems to mimic basic senses and for interaction with them to be always at hand. This approach is referred to as pervasive or ubiquitous computing, and presents still greater design challenges.

Interfaces for other cultures Many ideas around which interaction and interface design convention are built are culturally specific, such as the idea of hierarchies and nuclear families. At a lower level, interaction design posits left to right as progress, which wouldn't figure in China or in Arab-speaking countries. As computing and the network spread will it be possible to design universal interfaces that support these kinds of users?

Hardware and software interface development Software interaction design was traditionally done by engineers, then it moved to designers, but is often still separate from hardware design. The most pleasurable products effectively combine hard and soft interfaces. How can we ensure that their development is integrated and complementary?

Better design tools How do we create design tools that support the new challenges, particularly supporting the design of interactions that take place on multiple platforms?

Beyond the desktop At a time when the computer has supplanted the desktop and also become an information access device and repository, the desktop metaphor has lost any vitality it once had. What new metaphors can

conceptual models be built on, and how can techniques such as information visualisation be used to help interface design move forward? And how can users be supported in this transition?

Current trends

Mainstream thinking The 'black box' challenge - The way in which a person understands how they might interact with a mechanical device, such as a typewriter, tends to be implied by its form. Screen-based devices are typically 'black boxes' without the physical mechanics that might indicate how the user might interact with them. This development puts a greater onus on the design of the interface.

This challenge is summed up by Don Norman in *The Design of Everyday Things, MIT Press,* 1998:

'A good interface to a tool has four elements. It should be visible (the user should be able to see its current state), and easy for the user to form a conceptual model. There should be a good mapping between the interface and its functions, and there should be feedback to the user on the result of their actions.'

Affordance - A term first coined by perceptual psychologist J J Gibson and developed by Donald A Norman in a discussion of user interfaces. Describes the actions that a user perceives as being possible with an interface. Gibson notes that 'affordances are properties taken with reference to the observer. They are neither physical nor phenomenal.'

Conceptual models - As people use a product, they create a conceptual model of the way it works which then informs them about what other tasks it might be able to perform, how these other tasks might be executed, and how to recover from failure. Donald A Norman argues that conceptual models are built on the use of established conventions, words to describe actions, and metaphors (see below).

Metaphors - With new products, particularly products that have no obvious predecessor (such as the word processor)

there is a considerable challenge in communicating to users how the product works. Metaphors are one way of helping users learn from their existing experience of interacting in the physical world. Popular metaphors include the desktop (MacOS, Windows), the paper scroll (NewtonOS, PalmOS), office filing (tabs software applications), signage (the web) and architecture (virtual reality spaces).

The problem with metaphors is that users may not all understand the point, and may even take the metaphor too literally and try to use the product for actions for which it wasn't designed.

Context of use - It is recognised that many factors affect where people might want to carry out a task, and the support they will need in carrying it out. For instance most people don't want to do their banking on an interactive television in the living room for reasons related to privacy. Also when they do their banking they need access to bills, statements, cheque books, payment receipts, a calculator and other tools such as a currency converter.

Quality of experience - All the aspects of how people interact with something make up its quality of experience, which is the ultimate measure of the success of the design from the user perspective. These elements include how well they understand how the interface works; the way it feels physically; how they feel about it while they are using it; how well it serves their purposes; the way it fits into the context in which they are using it; and how well it contributes to the quality of their lives. If these experiences are engaging and productive, then people value them.

Research - Established techniques include discovery (establishing existing practice from document reviews, interviews and observation), ethnographic studies, literature reviews, surveys and questionnaires, focus

groups, task analysis, competitor analysis and usability testing, and comparative studies.

Development (or generative research) - Established techniques include characterisation and personas, scenarios and story-telling, sketching, storyboarding, participatory design, (rapid) prototyping (including wireframes and interactive mockups).

Evaluation - Established techniques include expert usability reviews, cognitive walk-throughs, usability testing, rapid prototyping, informal pilot studies, and focus groups.

Inclusive design - When interfaces are designed for people with disabilities (or more generally for universal appeal) the design often works better for people without disabilities as well. For instance, 'predictive texting', best known from its use in Nokia's SMS interface, was originally developed for people with limited motor control in their hands but is now popular with most users.

Changing behaviour - While established conventions for interaction design change at the slow speed of human behaviour, they do change. The most profound change has been the web-/hypertext-driven move from double to single-clicking to initiate a process, which has been largely adopted in the Windows GUI.

Fringe, new discovery thinking and activities

Research and reflection after launch - 'Designers need to get in touch and stay in touch with the people they are designing for, even after the product ships', Lauralee Alben.

Pen-based input and gesturing - Gestures are movement-based commands, often using a pen, such as 'create a new note' on a personal digital assistant. While this is not a new idea it has yet to reach the mainstream of interaction design. Gesturing was most extensively developed in Apple Computer's Newton MessagePad

products, but the failure of that line set the model back. PalmOS has basic Graffiti pen input as do PocketPC devices and both use gesturing, though in very limited ways. More recently, the concept of mouse-based gesturing has been extended to personal computers, for instance for moving back and forward between Web pages.

'Pick and drop' and 'pick and beam' - as we engage in more connected activities and communications we will need new models for sharing and exchanging files and other digital material. The 'pick and drop' model, pioneered by the Sony Computer Science Laboratories, allows the owner of one handheld computer to pick up a file from their device, using a special pen, and drop it from the pen tip onto the screen of another device. 'Pick and beam' facilitates moving images and other artifacts from a computer desktop onto a real desktop or whiteboard, where they can be spread out or exchanged.

Icons vs text - The role of icons has been questioned from diverse sources. While noting that icons can be used to communicate with people who don't share a written language it is noted that often icons convey little meaning. Interface and systems designer Jef Raskin observes that 'an icon is a symbol equally incomprehensible in all human languages. Whatever language you know, you have to learn the meaning of an icon anew'. (See also the discussion of metaphors above.)

Evaluation - User-centred design company IDEO has developed a technique called bodystorming to flag up unforeseen problems with the use of interactive products by physically acting out real-world scenarios.

Direct manipulation - A way of manipulating information, for instance search results, through direct control of the variables involved. This idea is also related to information visualisation, which supports quick comprehension of data

sets, and feedback about changes in the set resulting from direct manipulation. The term is closely associated with Ben Shneidermann.

Permissive user interfaces - Support for multiple ways of working (when the physical interface or requirements of the task allow it). Professor Harold Thimbleby argues that permissive user interfaces are easier to use. Also referred to as 'equal opportunity interfaces'.

Customisation of interfaces - While there has been much discussion about allowing users to customise their interfaces (originally with Apple's customisable appearances for MacOS and more recently with portals and 'skinnable' applications) some designers debate whether users can be good designers, and how much control they should be given to customise interfaces they use.

GUIs are over - Jef Raskin believes that we have developed an over-reliance on the mouse and icons. 'We really haven't made significant progress interface-wise from the original Mac', he argues. 'In some ways things have retrogressed.' Commenting on WIMP interfaces Jef Raskin notes that 'pull-down menus are slow and hide information that users might want to see. Text editors require too many keyboard movements. And shuttling between a keyboard and a mouse wastes too much time'. 'The Key to User-Friendly Computers?', *Business Week,* 22 January 2003. More generally he believes that 'the GUI starts from a model of how the machine works, while THE [The Humane Environment, an interface whose development he has led] starts from a model of how we work'.

website:

www.businessweek.com

He considers that the limitations of GUI principles are

particularly evident when applied to handheld devices, with their imprecise input techniques. Along with his collaborators he has created 'The Humane Environment', the principles of which are demonstrated in a freely available text editor. According to Raskin one approach, referred to as LEAP, can save four seconds per action in comparison with use of the scroll bar.

Sympathetic computing - Systems that respond to direct biometric input from users. The initial area in which this is being applied is healthcare, but it has the potential to affect how we interact with everyday things. If objects and environments could glean information about a user's state from biometrics they could react accordingly, for instance a car warning a user that they might be drowsy. Interaction design challenges include representing complex, temporal information, allowing users to understand what actions are being taken and why - and, if necessary, how they can override them.

Interaction design as conversation - Interaction designer George Olsen considers that 'print design is about communication, interaction design is about conversation'. Web design consultant Marc Rettig contends that 'when we do interaction design, we are creating the language which people will need to use if they want to converse with a product. This isn't a metaphor, it's really what's going on'.

Design and emotion - Author Donald A Norman argues that as well as the utility and usability of products (including interactive products) designers should consider fun and pleasure, joy and excitement if they want to create products people will love, and that these factors need not be in conflict.

Future trends Network products - Durrell Bishop, a designer at IDEO in London, argues that the form of a product gives it meaning but that this meaning doesn't

have to be conveyed by an iconic form. He contends that physical products also have many layers of communication ('the embodiment of the potential of the thing in the world') that are lost if they are confined to the digital medium. See his networked products piece for the Royal College of Art's 100th anniversary show.

Adaptive interfaces - Interfaces that change according to a user's behaviour in order to better support their work, or help them better understand an application. (This idea is not new, but has not been successfully realised, and is still a future trend.)

User design of interfaces - Systems created by designers, in which users are able to 'programme by example' to customise them for their own ends. This leads on to the idea that people could exchange interfaces or behaviours that they like with others.

Glossary

Early adopters - People who are keen to use a new technology for its functionality, and often despite its poor quality of experience.

Failure recovery - The processes by which a user can move from failure to success in achieving their task.

Feedback - The modes by which a user interface indicates the consequences of a user's action.

GUI (graphical user interface) - A visually-driven interface between user and computer. Typically associated with the desktop metaphor, including, windows, icons, menus and pointing device (WIMP). Originated in work in the late 1970s and early 1980s on the Star computer at Xerox's Palo Alto Research Center, and commercialised by Apple Computer with the launch of the Macintosh in 1984.

Human cognition - The characteristics of human perception, thought-processes and reactions. Effective interaction design builds on a clear understanding of human cognition.

Interaction - The means by which users input changes to the system and receive feedback from the system.

Interaction design - This process considers human cognition, context of use, task analysis, user experience and learnability, presentation of choices, error feedback and failure recovery.

Platform - The type of device and interface through which interaction takes place, for instance a Windows PC, or a Palm OS-enabled mobile phone.

Quality of experience - See also 'user experience'. The overall experience a target user has when using a product or service to effect a task for which it was intended. This concept was developed by Shelley Evenson and Austin Henderson for an Apple design competition overseen by

Harry Saddler. It was documented by Lauralee Alben in 'Quality of experience: Defining the criteria for effective interaction design', *Interactions,* volume 1113, May - June 1996, pp. 11-15

website:

www.albendesign.com/albenfaris/publications/pub_qofe.shtml

Redundancy - Elements of an interface that convey the same information, usually in different ways, to increase the likelihood of effective communication to the user.

What do I do next : Interaction Design

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FAQs

Business

1 How does interaction design relate to other areas of software and web design? Interaction design overlaps considerably with information design. It is complementary to interface design, and information architecture. Aesthetic design also has an impact on the experience of interaction.

2 As long as users can do what we want them to be able to, does the nature of the interaction matter? If what your product does is unique then probably not - your early adopter audience will just be pleased it works at all. But where you are competing with other similar products the overall experience of using yours will tend to shape users' perception of the product, and your organisation. In most 'mature' products, such as cars, the feeling of interacting with them becomes something users become aware of, even if they can't describe why they like the experience.

3 Should my product just follow the established way in which interaction is done elsewhere? If your product is in a category for which there are established interaction patterns you probably should. However if you have a dedicated base of users who invest a lot of time in using your product you may be able to justify innovating

in this area. Good interaction design can be a product differentiator that is as powerful as a new feature. Presenting a new and better way of doing something can reinvigorate a product and anchor a company brand. This has been demonstrated by Apple Computer since the late 90s when Steve Jobs renewed its emphasis on product and interaction design.

4 Will interaction design be more important in future? Yes. More products will have a digital component which will mean that your design will have to consider more consciously how users will interact with it. And as ground-breaking products, such as next generation mobile phones, now become commonplace, users will judge their purchases and upgrades on the quality of the interactions they have with them.

5 How do I ensure that my designers are creating good interaction design solutions? Ask them to point out what they like about the interaction design of other products. Ask them to describe their design process to ensure they are fully exploring and testing design solutions. Use your own instincts, drawn from your experience of products you like, to judge the quality of their solutions. And when products ship, talk to a few customers (without using leading questions) about their experience of using them.

Government

6 Are there particular issues that we should be considering? As the remit of government is the whole nation (as well as some people abroad) it is very important to delivery design solutions that are universal, or to deliver interfaces appropriate to each user group. The context of use of your audience will also be very varied, including people using public kiosks and interactive television. Extensive testing of interaction design solutions is critical.

Education

7 Are there particular issues that we should be considering? As your audience is likely to be using your product fairly intensively over a long period, you can afford to be more innovative as users will have an incentive to learn to use the tool effectively. You can also expect to get more feedback from them if they find they don't like aspects of the interface. As education tends to be directed, the products you develop will often feel more like software applications than websites.

Top tips

1 Look at the interaction design of products and services you use, including software, mobile phone interfaces, ATMs, and other products with which you interact (including non-digital products): learn from the best and the worst about how interaction design can be done well and badly. Note what your potential users may be familiar with and glean ideas about the way interaction design is moving.

2 When you are discussing interaction design with your designers, try to make sure you can demonstrate things live.

3 When design ideas are being presented to you, make sure you are clear what aspect of what you see is being evaluated.

4 Test ideas for usability with a representative group of users and sit in on the test yourself. You will always be surprised by the flaws that user testing will find in interface designs that you thought worked in an obvious or intuitive way.

5 Try not to let engineering constraints unnecessarily limit the quality of the interaction design that is implemented in your product. Most good interaction does place heavy demands on engineering, but to achieve the best results the engineering team need to be in at the start of the process and have the design approach clearly explained to them. Help them understand that trade-offs they may make in engineering to reduce costs may actually increase them later through the expense of product support.

Reading list

Stu Card, *The Psychology of Human-Computer Interaction,* Lawrence Erlbaum Associates Inc, 1983, ISBN 0898598591

John M Carroll (ed), *Human-computer Interaction in the New Millennium,* Addison Wesley, 2002, ISBN 0201704471

This collection of essays, edited by John Carroll, Director of the Center For Human-Computer Interaction at the Virginia Polytechnic Institute, investigates the critical technical challenges and opportunities that will define HCI work in the future. The essays are grouped into seven sections: Models, Theories and Frameworks; Usability Engineering Methods and Concepts; User Interface Software and Tools; Groupware and Co-operative Activity; Media and Information; Integrating Computation and Real Environments; and HCI and Society. Contributions, many of which were peer-reviewed, come from some of the leading researchers and thinkers in the HCI world. This book addresses new and substantial problems which will be commonplace for most designers in their future careers.

Alan Dix, *Human Computer Interaction,* Prentice Hall, 1998, ISBN 0132398648

Wilbert O Galitz, *The Essential Guide to User Interface Design: An introduction to GUI design principles and techniques,* John Wiley & Sons, 1996, ISBN 0471157554

Clive Grinyer, *Design Secrets: 50 real-life product design projects uncovered,* Rockport, 2001, ISBN 1564966380

Grinyer is a former Director of Design and Innovation at the Design Council, and has considerable experience as a product designer. This book tells the stories of 50 inspirational product design projects, from British Airways

Club Class seat to Apple's iBook, from conception to execution, including the thoughts of the designers and companies involved.

Brenda Laurel (ed), *The Art of Human-computer Interface Design,* Addison-Wesley, 1990, ISBN 0201517973

Although the examples are dated, many of the ideas presented are still relevant. The book is divided into five sections: Creativity and Design, Users and Contexts, Sermons, Technique and Technology, and New Directions. Contributors include Bruce Tognazzini, Jonathan Grudin, Alan Kay, Jean Louis Gassee, Gitta Salomon, and Howard Rheingold.

Aaron Marcus, 'Principles of Effective Visual Communication for Graphic User Interface Design', *Readings in Human-Computer Interaction,* 2nd edition, eds Baecker, Grudin, Buxton, and Greenberg, Morgan Kaufman, 1995.

Jeremy Myerson, *IDEO: Masters of innovation,* Te Neues Publishing Company, 2001, ISBN 3823854852

Bonnie A Nardi (ed), *Context and Consciousness,* MIT Press, 1996, ISBN 0262140586

Donald A Norman, *The Design of Everyday Things,* Basic Books, 2002, ISBN 0465067107

Norman's most celebrated book, this is a sophisticated introduction to human cognition in relation to the design of products and environments. His example of the way door design communicates use (flat panel for pushing, fixed handle for pulling) tends to stick in the mind of most readers.

Jenny Preece, Yvonne Rogers, Helen Sharp, *Interaction Design: Beyond human computer interaction,* John Wiley, 2002, ISBN 0471402494

Written by three senior academics, this book is aimed at undergraduate and masters students studying HCI,

interaction design or web design, and at practitioners. It seeks to go beyond the traditional issues, topics and paradigms that frame HCI to address the next generation of interactive technologies, including mobile and wearable devices. It addresses interaction design theory, practice, and evaluation, and its structure is well-considered, including extensive suggestions for further reading, and a student assignment at the end of each chapter. It is supported by a thoughtful website.

Jef Raskin, *The Humane Interface: New directions for designing interactive systems,* ACM Press, 2000, ISBN 0201379376

Raskin has spent many years arguing why we need to supercede the interface conventions he helped to establish. He believes that people are tired of digital technologies for their own sake and makes a humanist case for more appropriate and hassle-free information technology products. 'An interface is humane if it is responsive to human needs and considerate of human frailties', he contends. He argues that design ideas need to be built on a scientific basis and grounded in cognitive psychology. He proposes a number of innovative and specific interface ideas.

Ben Shneiderman, *Designing the User Interface: Strategies for effective human-computer interaction,* Addison-Wesley, 1998, ISBN 0201694972

In a useful textbook on interaction design, Shneiderman offers practical techniques and guidelines for interface design backed up with discussion of the underlying issues and with empirical results. The author also addresses interaction styles such as direct manipulation for graphical user interfaces, and extensively discusses information visualisation.

Bruce Tognazzini, *'Tog on Interface',* Addison Wesley, 1992, ISBN 0201608421

Terry Winograd (ed), *Bringing Design to Software,* Addison Wesley, 1996, ISBN 201854910

A wide-ranging collection of essays focused on software design but considering the wider context of design in the organisation and in society. Contributors include Gillian Crampton Smith, David Kelley, Donald Schön, Michael Schrage, Donald Norman, and John Rheinfrank and Shelley Evenson.

Jakob Nielsen (ed), *Advances in Human-Computer Interaction,* Volume Five, Intellect Books, 1995, ISBN 1567501966

Further information

Organisations

ACM/SIGCHI The US counterpart to the British HCI Group. Since the early 1980s it has run the annual HCI conference which attracts 2-3,000 attendees, and is responsible for the Designing Interactive Systems conferences.

website:

www.acm.org/sigchi

AIGA Experience Design Group , New York, NY, USA Addresses interaction design as a component of experience design, and is developing experience design theory in the context of professional practice and education, creating a richer understanding of the subject in the business world. Along with *Loop* (which it copublishes with the Center For Design Studies at Virginia Commonwealth University) the AIGA published *Gain,* a journal of design for the network economy, which closed after two issues. In 2004 it re-launched its AIGA Journal as an online publication, and this may in future address interaction design.

website:

www.aiga.org

Association Francophone d'Interaction Homme-Machine French equivalent to the British HCI Group. Co-hosted the HCI2001 conference (Lille).

British HCI Group A special interest group of the British Computer Society which approaches interaction design from academic and research perspectives on human factors and usability. It publishes 'Usability News' and runs an annual HCI conference.

website:

www.bcs-hci.org.uk

Human Factors and Ergonomics Society Established around 50 years ago, and based in California. Exists to 'promote the discovery and exchange of knowledge concerning the characteristics of human beings that are applicable to the design of systems and devices of all kinds' and advocates the 'systematic use of such knowledge to achieve compatibility in the design of interactive systems of people, machines, and environments to ensure their effectiveness, safety, and ease of performance'.

website:

www.hfes.org

Human Interface Society - Japan [website in Japanese only] Co-hosts of Interact 2001.

website:

www.his.gr.jp

International Federation for Information Processing A non-governmental, non-profit umbrella organisation for national societies working in the field of information processing, established in 1960 under the auspices of UNESCO.

website:

www.ifip.or.at

User Interface Engineering - Bradford, MA A research and training firm specialising in product usability issues, fronted by Jared Spool. UIE's research on user behaviour is very thorough and often contradicts received wisdom and common sense. They also run the User Interface

series of conferences which pioneered the discussion of usability in the web design world.

website:

www.uie.org.com

Research centres

University College London Interaction Centre
Advanced research centre in human-computer interaction at University College London

website:

www.uclic.ucl.ac.uk

PARC (Palo Alto Research Center) Formerly Xerox PARC, and headed by John Seely Brown; now an incorporated a subsidiary of Xerox Corporation. Led the development of the graphical user interface. Conducts inter-disciplinary research in physical, computational, and social sciences. Current focuses include digital documents.

website:

www.park.com

Microsoft Research Headed by George Robertson, based in Redmond, WA, USA and Cambridge, UK. Focuses include voice-based systems.

website:

research.microsoft.com

IBM Research Has a number of research centres looking at aspects of interaction design including, Almaden Research Center User Systems Ergonomics (USER) and Human-Computer Interaction. There are a number of other human-computer interface projects.

website:

www.ibm.com

Royal College of Art - Interaction Design Research
Related to the Interaction Design (formerly Computer-Related Design) course founded by Gillian Crampton Smith.

website:

www.crd.rca.ac.uk

Interaction Design Institute Ivrea Research
Currently researching wearable computing and connected appliances. On 12-13 November 2003 the Institute convened a 'Symposium on Foundations of Interaction Design', to discuss the theoretical foundations of interaction design. Invited participants included Donald A. Norman, Bill Moggridge, and Thomas Moran from the IBM Almaden Research Center. The papers presented there can be found at

www.interaction-ivrea.it/en/news/education/2003-04/symposium/index.asp

website:

www.interaction-ivrea.it

Sun Microsystems Research Currently researching user interfaces that interact with large complex systems, speech technology, and accessibility.

website:

research.sun.com

News sites

InfoDesign Edited by Peter Bogaards, InfoDesign is a meta-review of writing and events around interaction

design, information architecture, usability, navigation, and user experience.

website:

www.informationdesign.org

Usability News - An online publication for anyone interested in or working in the field of usability. Also covers interaction design.

website:

www.usabilitynews.com

Boxes and Arrows? An online journal focusing on information architecture but encompassing interaction design. It takes a 'community of practice' approach, with peer-written articles, and is 'dedicated to discussing, improving and promoting the work of this community, through the sharing of exemplary technique, innovation and informed opinion'. US-based, but with contributors from outside the US.

website:

www.boxesandarrows.com

Web magazines

Loop: AIGA Journal of Interaction Design Education Formerly edited by Steve Hoskins and Roy McKelvey and jointly published by the AIGA and Virginia Commonwealth University. Writing and resources relating to teaching and student projects.

website:

loop.aiga.org

Educational links

Art Center Media Design Program - Pasadena, CA
Taught by Brenda Laurel among others.

website:

www.artcenter.edu

BA (Hons) Interaction Design - Ravensbourne College of Art, UK

website:

www.rave.ac.uk

Human-Computer Interaction Institute - Carnegie Mellon University, Pittsburgh, PA

website:

www.cmu.edu

Master of Design in Interaction Design - Carnegie Mellon University, Pittsburgh, PA website:

www.cmu.edu

Center For Design Studies - Virginia Commonwealth University, Richmond, VA

website:

www.vcu.edu

Centre for Human Computer Interaction Design , City University, London

website:

www-hcid.soi.city.ac.uk

MSc in Human-Centred Systems - School of Informatics, City University, London

website:

www.soi.city.ac.uk/pgcourses/hcs

Interaction Design Institute - Ivrea, Italy Founded in 2000, with initial funding from Olivetti and Italia Telecom, to bring research and teaching in interaction design closer to industry. Gillian Crampton Smith is the first director. Its Explorers Club of advisers is a catalogue of the great and the good in interaction design.

website:

www.interaction-ivrea.it

Interactive Institute - Stockholm, Sweden Seeks to 'create new modes of human and social interaction through innovative use of digital media'.

website:

www.interactiveinstitute.se

Interactive Media Design - University of Dundee

website:

www.dundee.ac.uk

MA Design for Interaction - University of Westminster, London

website:

www.wmin.ac.uk

Interactive Telecommunications Program - Tisch School of the Arts, New York University, New York, NY

website:

www.itp.nyu.edu

Royal College of Art Interaction Design (formerly

Computer-Related Design) Founded by Gillian Crampton Smith, now headed by Irene McAra-McWilliam.

website:

www.crd.rac.ac.uk

Human-Computer Interaction - Stanford Interactivity Lab course Led by Professor Terry Winograd.

website:

www.hci.stanford.edu

The Illinois Institute of Technology - Institute of Design Directed by Patrick Whitney, offers post-graduate study that covers interaction design.

website:

www.id.iit.edu

Human-Computer Interaction Lab - University of Maryland Founded by Ben Shneiderman.

website:

www.cs.umd.edu/hcil

Industrial Design and Multimedia - University of the Arts, Philadelphia.

website:

www.uarts.edu

Mailing lists

ACM SIGCHI CHI-WEB A high-level discussion about web design. Posters are divided equally between academia, research and industry.

website:

www.sigchi.org

ASIS SIGIA-L An information architecture list run by the US-based library sciences body which also addresses interaction design. Posters are more industry oriented.

website:

www.asis.org

Interaction Designers A discussion list. One resource from a group that 'promotes awareness of the discipline and craft to businesses, academics, and consumers to create high standards for interaction design'. It was founded in 2003 in the US.

website:

www.interactiondesigners.com

Discussion forum

CHI Place An informal adjunct to the CHI conferences, CHI Place began life as a project for CHI 2002. User registration is required.

website:

www.chiplace.org

Magazines and journals

ACM interactions Edited by Steven Pemberton, interactions is a bi-monthly magazine for designers of interactive products. Established in the early 1990s the writing is more learned than most writing on the subject, but is also quite accessible. It is available to members of ACM SIGCHI, and on subscription.

DMI Journal Published by the Design Management Institute. Covers interaction design indirectly in its

discussion about digital branding.

website:

www.dmi.org

Annual events

ACM SIGCHI Computer-Human Interaction conferences (Vienna, 24-29 April 2004)

Usually in April, attended by 1,500-2000 people, takes place outside the US every four years. Peer-reviewed paper submissions, plenaries, panels, tutorials and informal special interest group. Also attempts to bring industry into the CHI world through its sponsorship of a Development Consortium. Future locations: Portland, Oregon (2005).

website:

www.chi2004.org

Designing Interactive Systems 2004 (18-21 July 2004, Cambridge, MA, US) Biennial conference under the wings of SIGCHI, attempting to bring design, human factors and engineering closer together. Peer-reviewed submissions, panels, keynotes and tutorials along with an exhibition and interactive design award, and professional publication of proceedings.

website:

www.sigchi.org/DIS2004

AIGA Experience Design Group Annual Advance for Design Summits Informal forum for up to 100 people working in and around interaction design. Focus is on presentations followed by discussion, along with workshops. Summits take place in the US.

IBM Make IT Easy 2004 Conference A formerly private event, the 'Make IT Easy' event series has gone public as IBM has placed more emphasis on ease of use. Events will take place across the US during 2004, aimed at anyone who is 'interested in ease of use or involved in

human-computer interaction including technologists, system architects, influencers, human factors specialists, product developers, visual and industrial designers and market planners'.

website:

www.ibm.com/easy

HCI 2004 (6-10 September 2004, Leeds, UK) The 18th British HCI Group Annual Conference. Peer-reviewed papers, plenaries and tutorials.

website:

www.bcs-hci.org.uk/hci2004

HFES Annual Meeting (20-24 September 2004, New Orleans, LA, US)

website:

www.hfes.org/meetings/2004menu.html

Doors of Perception The biennial outing for John Thackara and Kristi van Riet, formerly of the Netherlands Design Institute, exploring the forefront of new thinking on design and innovation. Doors of Perception gathers around a thousand people from across Europe and the US for three days of programmed talks and panels, some of which it can be hard to relate back to the theme of the event. The next Doors of Perception conference is likely to take place in late 2004. A regional conference was held in Bangalore, India, in December 2003 (

www.doorseast.com

).

website:

www.doorsofperception.com

Interact 2005 (12-16 September 2005, Rome, Italy) The theme of the tenth IFIP TC.13 International Conference on Human-Computer Interaction is 'Communicating naturally through computers'. The conference will highlight to both the academic and industrial world the importance of the human-computer interaction, and address recent breakthroughs in applications.

website:

www.interact2005.org

Designing for User Experiences (5-7 June 2003, San Francisco, US) A conference on interactive digital design organised by ACM SIGCHI and SIGGRAPH, and AIGA. The conference is focused on the presentation of peer-reviewed case studies, which are publicly available from the Experience Design Case Study Archive (

www.aiga.org/dux2003_cs

). Began life as the CHI|AIGA Experience Design FORUM at CHI2002. The next conference is likely to be in San Francisco, in the summer of 2005.

website:

www.dux2003.org

HCI International 2005, 11th international conference on Human-Computer Interaction (22-27 July 2005, Las Vegas, NV, US) An international forum for the dissemination and exchange of scientific information on theoretical, generic, and applied areas of HCI, usability, internationalisation, virtual reality, universal access and cognitive ergonomics.

website:

www.hc1-international.org

User Interface conferences Programmed and hosted by User Interface Engineering, conferences typically take place once or twice a year on the US east or west coast. UIE also programmes smaller workshops.

website:

www.uiconf.com

HITS: Humans Interaction Technology Strategy (16-17 October 2003, Chicago, US) A conference on interaction design and business strategy, with many high profile speakers from the design world. A follow-up conference is likely to take place.

website:

www.id.iit.edu/events/hits/

2AD: The second international conference on Appliance Design (11-13 May 2004, Bristol, UK) An inter-disciplinary forum focused on appliance design for industries including broadcasting, entertainment, computing and telecommunications. 3AD will be held in 2005.

website:

www.appliancedesign.org/2ad

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