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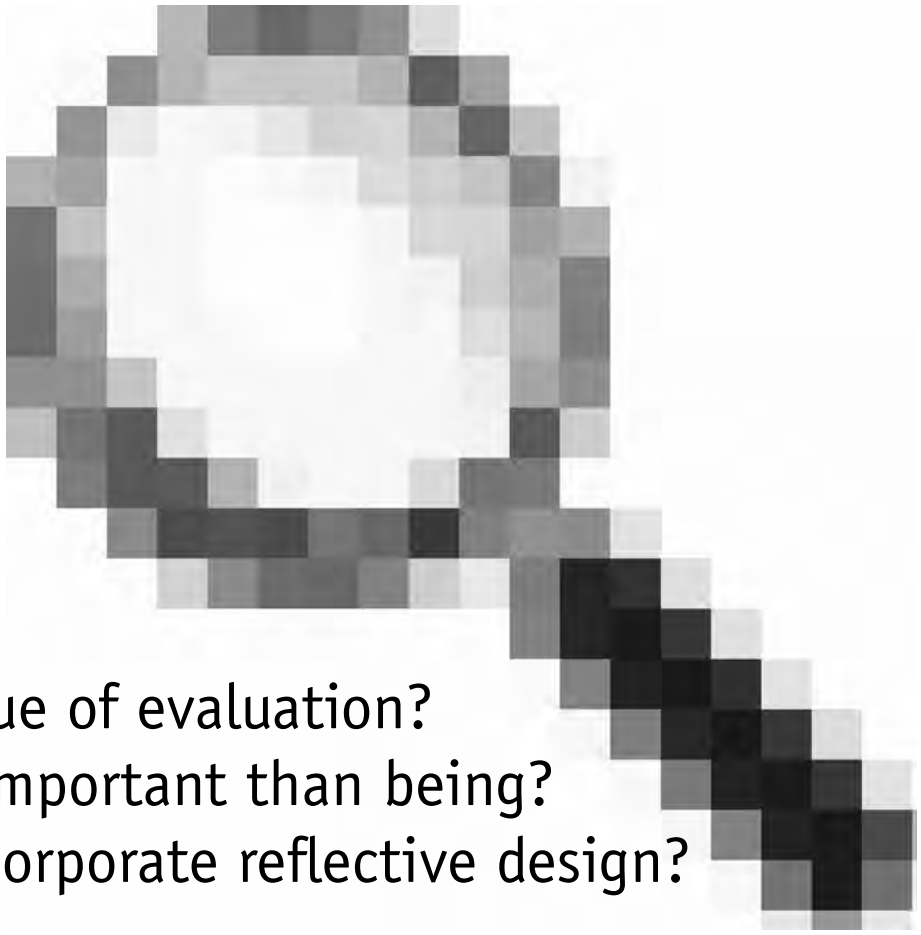
Reflecting on HCI



What is the value of evaluation?
Is doing more important than being?
How can we incorporate reflective design?

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Human–Computer Interaction

Editorial

John Knight

We have a really packed issue for the conference. There are some common themes too. And I have to thank Gilbert Cockton for suggesting some of these and indeed lining up a couple of guest contributors. Unsurprisingly, the common thread is about adding value or more correctly (apparently) adding worth by making a difference to the products and services we work on and by default the people who use them.

Many of the contributors to this issue of *Interfaces* suggest that by reflecting on what we do we can do the best for people. Kirsten Boehner heads up a great article that summarises alternative approaches to design and places reflective design as originally formulated by Donald Schön at its peak. Alan Dix shows how reflecting ideas and concepts in examples is often very difficult but ultimately key to communicating and stress testing them by using metaphors – for example.

Elsewhere Hassenzahl and Roto demonstrate how worth goes beyond utilitarian concepts of quality and go on to tackle the pithy issue of measuring experience. Which neatly leads on to Oulasvirta's article that tracks changes in the way we evaluate the user experience and importantly how we can really make a positive difference to human–computer interaction. Thanks to everyone who contributed to this issue and keep it up!

John Knight is a User-Experience Manager in the mobile communications industry. Before this he was Director of UserLab at Birmingham Institute of Art and Design and has worked as a freelance designer and researcher. John is also chair of IDEC4, which will be at NordiCHI 2008.

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BCS-HCI 2007 21st Annual Conference
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Interfaces welcomes submissions on any HCI-related topic, including articles, opinion pieces, book reviews and conference reports. The deadline for issue 73 is **15 October 2007**. The deadline for issue 74 is 15 January 2008. Electronic versions are preferred: MS Word, RTF, or plain text via email or on CD; but copy will be accepted on paper or fax.

Please send to John Knight, John.Knight@intiuo.com

To receive your own copy of *Interfaces*, join the British HCI Group by filling in the form on page 27 and sending it to the address given. PDFs of *Interfaces* issues 35–71 can be found on the British HCI Group website, www.bcs-hci.org.uk/interfaces.html

With thanks to commissioning editors:
Interfaces Reviews: Shailey Minocha, S.Minocha@open.ac.uk
Photo credits: cover: Peter Bagnall; page 14: left, Rahul Nair; right, Carsten Magerkurth.

This issue's guest columnists

Antti Oulasvirta is a postdoctoral researcher working in the area of human–computer interaction in the Helsinki Institute for Information Technology HIIT. During the academic year 2007–2008 he will be at the UC Berkeley School of Information. He's currently editing a special issue on Mobile HCI for the *International Journal of Human-Computer Studies* with Professor Stephen Brewster.

aoulasvirta@acm.org

Marc Hassenzahl is junior professor in Economic Psychology and HCI at the University of Koblenz-Landau, Germany. His major research interests are usability engineering, user experience, aesthetics, and hedonic versus utilitarian qualities in products. Specifically, he studies affective and motivational aspects of interactive technologies and their effects on satisfaction and inference processes.

hassenzahl@uni-landau.de

Dr. Virpi Roto is a principal scientist at the Nokia Research Center, Finland. She has 15 years of experience in HCI and the usability field. Recently, she has investigated the elements of the user experience and how large companies can integrate user based evaluation methods into development processes.

virpi.roto@nokia.com

Alan Dix is a professor at Lancaster University. He writes the odd book and the odd very odd paper. He regards the reappearance of *Dr Who* as the most important event in revitalising a generation's technological excitement during the 20 years he has worked in HCI. He keeps trying to get this into his research … and may do some day soon.

alan@hcibook.com

Kirsten Boehner is a post-doctoral researcher with the Information Science programme at Cornell University. Her work focuses on the design and evaluation of technology for 'ineffable' experiences. She holds a PhD in Communication with a focus on HCI from Cornell University.

kab18@cornell.edu

Carl DiSalvo is an Assistant Professor in the Department of Literature, Communication, and Culture at the Georgia Institute of Technology. He recently completed a fellowship at the Center for The Arts in Society and Studio for Creative Inquiry at Carnegie Mellon University. He holds a PhD in Design from Carnegie Mellon University.

cdisalvo@andrew.cmu.edu

Mads Bødker is post-doctoral fellow at the Center for Applied ICT, Copenhagen Business School. His research interests include 'users' in open source development practices, critical approaches to HCI, theories about risk and trust in technology as well as socio-cultural perspectives on users in design.

mads@singsign.com

Rogério de Paula is in the Emerging Markets Platforms Group at Intel Corporation Brazil where he conducts ethnographic research into the everyday practices and life of low-income people to help design new technological products. His specialties are in design ethnography. His current work focuses on education and urban areas in Latin America. He holds a PhD in Computer Science from the University of Colorado, Boulder.

rogerio.depaula@intel.com

Contribute to *Interfaces*

Do you disagree with something in *Interfaces*? Would you like more coverage of a certain topic? Have you just completed a great piece of research that you want to share? Have you been to a conference that you can report on? Are you at the end of a project that the rest of the HCI community would like to know more about? Have you read a brilliant book more people should know of? Do you think your department has done great work and the HCI community would be interested in it?

If you would like to contribute to *Interfaces* please contact us by email: john.knight@intiuo.com

The next issue deadline is **15 October 2007**.

Boldly to go

To HCI2007, Lancaster and other exciting new worlds

Tom McEwan

By the time you read this the conference will be but a few weeks, even days away. You've probably already registered, but if not there's still time and here are the reasons why.

Lancaster's finest – Ormerod, Sas, Dix, Ball, plus many others too numerous to mention – have assembled a programme that compares with the best of British HCI conferences, and strives to do more. For its 21st birthday, this conference not only looks mature and has cast away adolescence, it has stopped worrying quite so much about what people tell it that it is and has made up its own mind and acted accordingly.

Some might think that this sounds like an odious step away from user-centredness. Surely the discipline should fit its users' needs? Well, users need knowledge and expertise. To discuss treatment options with a doctor I don't want to have to study medicine for 20 years – I want them to support me to make informed choices. Healthcare has seen a tremendous growth of novel and ever-narrower specialisms, which might seem alien to a previous generation. So it is with HCI. While many of our kind have colonised new and highly agreeable worlds of User Experience, Interaction Design, and wear permutations of words like usability, ambient, mobile and ubiquitous, this conference is unafraid to broadcast loud and clear that it's an **HCI** conference.

Colonisation and empires are dodgy words but if you'll forgive the lapse into Trekkie talk, those are not the only reasons that the adventurous seek out new worlds and boldly go. There is a desire, even a hunger, to seek out new ways of doing things and to share what we have learned with alien life forms such as marketing departments and embedded systems engineers. Afterwards they'll still live their lives much the same as before, yet our engagement with them leaves an imprint on us both.

Thus the conference theme is about opening our mind and our senses to recognise the life-force that is HCI – even when it's not as we have previously known it. Bones practised abstraction as well as medicine. We need that same ability to abstract from the textbooks and the papers of our discipline and see the commonality in other fields. In a lot of cases it comes back to a shared lineage to 50 or 250 or 2000 years ago. Maybe we do share 98.6% of our DNA with customer experience designers, even with the hairdressing end of usability.

What's in a conference?

Well, first, it's what is before a conference that matters. If we are to go on these journeys into strange new worlds then we'd better be prepared! They've been a bit more choosy about tutorials this year – only accepting four full-day and two half-day ones, and have of course selected only the finest. Additionally, delegates for the main conference now get a whopping £60 discount off their tutorials, so there is an added incentive to turn up a day or two early and do some personal development and learning – especially since the hall of residence is only £42 a night.

On the Monday (3rd September), you can choose between John Long & Steve Cummaford's *Managing Iterative Projects More Effectively: Theories, Techniques and Heuristics for HCI Practitioners* and Peter Bagnall's *Using Personas Effectively*. Both of these are full-day tutorials, which cost £220 for non-delegates, £160 for delegates, including lunch and two refreshment breaks.

Long & Cummaford will help the HCI professional avoid being marginalised in professional practice, as project management becomes ever more defined and enforced. HCI people iterate – that's what we do, but that can be misinterpreted as a reluctance to 'be professional and get it right first time'. John and Steve have run many successful tutorials at past conferences and in this one they will help you learn to understand the scope, theory and practice of Iterative Project Management (IPM). You'll learn to use IPM in an HCI context, selecting UCD methods to fit, and exploiting the guidance in IPM. All in all, it will make you a much more effective HCI voice in an interdisciplinary team, and ensure that UCD methods map onto accepted IPM practices.

Peter Bagnall knows about personas and scenarios from working at Alan Cooper's company in Silicon Valley. His consultancy, SurfaceEffect, both offers these techniques professionally and trains others in their use. In Peter's tutorial you will learn what personas are, how to create them, how to use them effectively and to understand why they work and when they fail. In creating and using personas, you will learn how to get the right level of detail – whether from interviews, ethnographic or demographic research, and how to formulate the goals for these personas. You will also learn how to use secondary and negative personas to help avoid two common design pitfalls – elastic users and self-referential design.

On the Tuesday you can either take one of the two full-day tutorials – Cummaford & Long present *Introducing HCI: A Practitioner's Guide*, while Panayiotis Zaphiris & Ulrike Pfeil (from City University's Centre for HCI Design) present *An Introduction to Social Network Analysis* – or you can go to either or both of the half-day tutorials from Syntagm's William Hudson: *Ajax – Usability & Design* in the morning, and *Old Cards, New Tricks* in the afternoon.

Steve and John target those with commercial design experience, but no formal HCI background, wanting to make the most out of attending HCI2007. Doubtless most readers of *Interfaces* will not fit this category, but I'm sure you know a colleague who does. They introduce HCI via a practitioner's guide, which combines a review of the academic discipline of HCI with hands-on discovery of HCI design techniques for application in commercial practice. Practical exercises will identify your specific knowledge requirements and you'll then use these to review the conference programme in order to maximise the value of your conference attendance.

I don't think there's been a tutorial on SNA at British HCI Conferences and Panayiotis & Ulrike have come up with an ideal introduction for researchers and practitioners interested in computer-mediated communication, universal design or

other relevant topics. You will learn the basics of social network analysis, its terminology and background and how to transform communication data to network data. This enables you to apply SNA to HCI analysis, and use standard SNA tools and software to help design an innovative and successful online community.

William Hudson's courses are ever popular and you have the chance to do both. Ajax is everywhere in the consumer and professional computer press, but it's a fair bet that most of you don't know what it is, how it works, how it differs from other web technologies, its strengths and weaknesses in usability terms and how to apply it effectively in design. These are the issues that William will address over the two 90-minute morning sessions. In the afternoon sessions he returns to the topic of his September 2005 *Interactions* piece and gives you hands-on experience of several new techniques in the conduct and analysis of card sorting, in particular using bar codes for data capture and several innovative methods of analysis. Each highly professional session costs £130 (or £120 for conference delegates).

I don't have space to talk about 12 diverse workshops that are also on the Monday and the Tuesday (one starting on the Sunday!). They're listed on page 23, and you can find out more on www.hci2007.org. What's in the conference itself? Again I'll point you to the website and the advance programme, but the short answer is 'a lot', and all of it only the best from highly competitive review procedures that only kept the best 25–30%. There are 23 full papers, 31 short papers, 8 student papers, 5 interactive experiences, 2 panels, 3 keynotes and a special guest speaker from industry, 3 other HCI practice presentations, a dinner, a welcome reception, an exhibition, the launch of *Interaction*… and more, much much more.

Be there or be stuck on your own little planet wishing you got out more.

Tom McEwan
t.mcewan@napier.ac.uk

HCI Practice Day (Thursday)

Jared Spool is Keynote Speaker on HCI Practice Day

OK, maybe I do have space to talk about this! HCI Practice Chair, Laura Cowen, has lined up an excellent range of speakers – both of interest to practitioners, but also bringing the more theoretical of us face to face with reality.

Since the last *Interfaces*, Jared Spool has been announced as the keynote speaker for HCI Practice Day. Jared needs little introduction – he is one of the world's most respected authorities on usability, and has been for almost thirty years. He has built a substantial research organisation in User Interface Engineering into the largest research organisation of its kind in the world. He divides his time between mentoring his research team, advising a formidable range of commercial clients, and communicating about usability – through the press and the twenty or so conferences he speaks at each year. It's over five years since Jared spoke at a British HCI Group symposium in London (see *Interfaces* 52 for an interview). His pragmatic views on how to achieve usability and his current popularity as a speaker on Experience Design, make his appearance in Lancaster a timely one.

As well as focusing the more practical peer-reviewed papers into the Thursday, along with a Panel on 'HCI 2.0' led by Laura Cowen and Alan Dix, throughout the day a single thread of sessions connects the following guest speakers from HCI practice:

From IBM, Mark Farmer and Colin Bird will share their experiences with a Hierarchical Task Analysis (HTA) tool, the IBM Task Modeler. They will show how the tool enables the rapid creation, analysis, and communication of a model, providing a valuable and naturally visual tool for information architects. This facilitates the essential processes of design, validation, and modification but also enables an information architect to develop and apply schemes for information classification.

Frequent flyers at British HCI conferences, Tony Renshaw (Leeds Met) and Natalie Webb (Amberlight), bring together their findings and experiences to describe the practical side of eye tracker use, particularly in usability evaluations. This will cover the business case and the technique's benefits and limitations, relaying hints and tips, based on practical experience, to help ensure success with eye tracking.

Also from IBM, Ben Fletcher regularly presents on the role of technology for deaf and deaf-blind people, including at a Royal Society of Medicine event, and on BBC TV's *See Hear*. He has Usher (Type 1), which means that he is profoundly deaf and partially sighted; British Sign Language (BSL) is his first language. Ben is a Senior Inventor and Developer at IBM. He works in the Pervasive & Advanced Messaging Technologies team, developing middleware to enable customers to accomplish end-to-end integration solutions.

This issue's 'View from the Chair' can be found on page 26

Deflections

Embracing technopoetics to make a big difference

Gilbert Cockton

There is no guarantee that well planned and managed research will deliver significant breakthroughs. Although genuinely adventurous research has less chance to 'succeed', we must take more risks: more of the same won't make enough difference.

Bill Gaver's Home Health Horoscope (HHH) presentation at CHI 2007 was really refreshing. A daily horoscope provided poetic interpretations of a previous day's home sensor data. This system output genre was chosen to enable and encourage user appropriation. This hope was met, and the research thus 'succeeded', but the evaluation produced unexpected insights. Problems with sensor power required regular visits to install new batteries, but the hour this took each week provided unexpected opportunities for discussion with the evaluation household. Also, the horoscope genre could irritate ("Don't talk to a tough builder about the inner child"). Further issues arose from existing cultural understandings of horoscopes. Some may argue that this should all have been obvious: batteries run out; people have strong and diverse opinions on horoscopes. But that's not the key point here, which is that Gaver and colleagues tried something very different, including independent production of a documentary as a key evaluation component. They took cultural and methodological risks as well as technological ones, which tend to completely scope IT research endeavours.

HHH is not more of the same, and as such, many will have difficulty assessing it, beyond writing it off. To some, the whole endeavour may seem pointless (who needs home sensing?). To others, its conduct may appear to be negligent (all that money on a documentary about high maintenance horoscope generators?). However, is this really any more pointless and negligent than more of the same? To learn from failure, we have to expose ourselves to the chance of failure. Gaver and his colleagues took different risks to those who pursue accurate robust instructive intelligent home sensor systems. There's irony in the insensitivity of sensing technologists to the (current) limits of instructional text, machine learning, technical reliability and systems design and evaluation. HHH confronted these limitations, echoing Equator's *seamfulness* in mixed reality. Alternatives to technologically utopian overconfidence brought novel discoveries and insights. These support future design and appropriate evaluation of systems that embrace appropriation, co-creation, and evolving user understandings and usages. However, reactions to the horoscopes show that HCI cannot completely ignore technology's materiality.

The literary theorist Jonathan Culler contrasts approaches to literature (and more generally postmodernism's 'texts': films, adverts, buildings, etc.) via a 'too often neglected' distinction between *poetics* and *hermeneutics*. For Leavis, who dominated literary criticism either side of WW2, a work 'should contain within itself the reason why it is so', a poetic stance close to technological determinism. Hermeneutic approaches include phenomenology, and underpin much HCI ethnography. Here 'readers' and their wider social context contain as much, if not more, of 'the reason why a text is so', especially when 'theory' is invited to the analysis.

To make a real difference in HCI, we need to develop much deeper and better-grounded understandings of the middle ground between *technopoetics* and *hermeneutics*. Pure hermeneutics alone cannot locate the differences between Shakespeare and his Sister's songs. Pure technopoetics alone cannot embrace context's impact on usage outcomes. The truth lies somewhere in between, but most existing HCI work gravitates towards pure technopoetics or hermeneutics. This does not simply restate a sociotechnical position, especially one that separates the technical system from a social 'one'. Instead, we must develop understandings of how the social and technical intertwine in narratives to usage outcomes. This involves far more than the simple causal manipulations of formal experiments. Behind each HHH insight lies a narrative web of human and technological factors. Highly complex systems of interacting factors during human–technology interaction process not data, information, media, or knowledge, but *worth*. There are major intellectual challenges in understanding *worth processing*, not least dilemmas over causation, complexity and emergent behaviour.

To learn from failure, we have to expose ourselves to the chance of failure

As designers, our main tools are technopoetic: paraphrasing Leavis, 'what within the technology are the reasons why usage is so'. While we cannot wholly determine interaction and outcomes, design decisions have undeniable influence, as HHH's horoscopes clearly show. Alternative genres are proposed (poems, song lyrics, news articles), yet for these too something 'within the work itself' will shape interpretation and appropriation. There is no escape from the material, any more than the material can escape context. This is HCI's Nature–Nurture controversy, and we have a long intellectual journey ahead of us to unravel worth-processing webs. Succeeding here will really make a difference to our ability to design and evaluate worthwhile systems.

Coombs, H., 1953. *Literature and Criticism,* (p.9 for Leavis quote). Pelican.

Culler, J., 1997. *Literary Theory: A Very Short Introduction*. OUP.

Gaver, W., Sengers, P., Kerridge, T. Kaye, J., & Bowers, J., 2007. Enhancing Ubiquitous Computing with User Interpretation: Field Testing the Home Health Horoscope, *CHI 2007*, 537–546.

Gilbert Cockton
University of Sunderland
gilbert.cockton@sunderland.ac.uk

Gilbert Cockton is Research Chair in HCI and Chair of Interactive Digital Media in the School of Computing and Technology at the University of Sunderland. His research group currently provides usability consultancy and training for the Digital Knowledge Exchange, a HEIF Centre of Knowledge Exchange. Gilbert is also a NESTA fellow, developing worth-centred approaches to interaction design.

Black boxes and white boxes
Where is evaluation heading?

Antti Oulasvirta

Just one week before flying to San Jose for CHI2007, my Thunderbird inbox flashed an email from John Knight, inviting me to write about evaluation for *Interfaces*. This came as somewhat of a surprise, because I regard myself as a novice in this area. I started in an ICT SME during the IT boom of 2000; my task was to evaluate and design web pages. At that time, having passed 101 in interface design and half-a-year of working experience lent enough credibility to be entitled a 'Usability Expert'. The year after, when the IT bubble started to show signs of blowing up, I proceeded to do my PhD studies in an IT institute in Helsinki. During these years, I have been involved in close to twenty evaluations, a number that almost any usability professional outstrips within a year or two. I have a couple of methodological papers on the topic, but they are mostly elaborations of others' ideas. Therefore, to be able to write something that is not trivial, I took it as my responsibility to go and learn from paper presentations at the CHI conference. Most of the relevant papers were to my surprise in *alt.chi* paper sessions. (For those of you who do not follow CHI, *alt.chi* is dedicated to papers that are deemed to be too controversial to be accepted into the official proceedings, but that nevertheless deserve attention. You can read the papers at http://www.viktoria.se/altchi/.)

I begin by sharing a few observations from the presentations I attended. Jennifer Rode from Irvine presented a meta-analysis of evaluation methodology over the past 24 years of CHI. She had three interesting findings: (1) that mean N has been *decreasing* from 1983 to 2006; (2) that qualitative methods are more and more common (maybe explaining the first point?); and (3) that the majority (57%) of test users still consists of university students. In his presentation, Gilbert Cockton from Sunderland argued for 'worth' as an alternative for task-based approaches in evaluation, also proposing a structured 'map' that helps in conceptualising 'worth'. In contrast to Gilbert, Joseph Kaye from Cornell suggested in his talk that the unifying concept for evaluation should be users' experience. Finally, Steve Harrison from Blacksburg examined how three paradigms within HCI have unique views on evaluation. According to him, human factors researchers centre on measuring the coupling of humans and machines, cognitive scientists are interested in the general applicability of findings, and phenomenologists in gathering understanding of 'interaction as a component of a situation'. In almost all presentations I sensed a hint of frustration due to one strong approach, that of experimental psychology, 'hijacking' the field and dictating criteria for appropriate and acceptable evaluation. An implicit suggestion was that more pluralistic approaches should also be approved in the CHI review process.

These talks indicate, to me at least, that our field is divided on some of the most fundamental questions concerning evaluation, such as what it is *for* and what are the driving principles. Maybe the fact that evaluation papers were assigned to – or voluntarily submitted to! – *alt.chi* instead of the 'CHI proper' reflects this. These are not, however, insurmountable problems. I believe that we can get over them, but it involves stopping treating evaluation as a duty that has to be carried out in order to satisfy CHI reviewers, and starting to re-think its role in this constructive discipline. Moreover, being dogmatic and hiding behind 'paradigm wars' is not going to solve anything. Having said this, I don't mean that the level of evaluation is low in CHI. Quite the contrary, many researchers have obviously developed quite ambitious approaches to evaluation and it shows in the quality of the papers. But what is it that distinguishes those getting papers accepted from those who constantly struggle with evaluation?

Let me start from the very beginning, why we do evaluations, what they are *for*. I conceive of HCI as a scientific discipline with *constructive research interest*, to use the terms of the philosopher Jürgen Habermas. In particular, its aim is to contribute to the construction of computers through the study of humans as users. Clinical medicine, architecture, pedagogy, and social politics are examples of other constructive disciplines. What separates constructive disciplines from others is that at the heart of a constructive discipline is a cycle of construction and evaluation where something is created and it is evaluated against some norm. According to Jonathan Grudin, the conundrum of HCI is that to an imaginative person almost *anything* is possible, yet there are hard limitations to the use of technology. This means that our discipline is destined to work on two fronts: construction of the possible and empirical investigation of the impossible.

Within this context, evaluation is work that interweaves the two parts into a whole. The goal is to inform decisions on what to do with a prototype. There are three alternative *consequences* of evaluation: (1) adopt/accept the construction; (2) continue its development (and restart the cycle); (3) drop/reject the construction. In other words, decision-makers, sometimes 'extra-scientific' stakeholders, are the ultimate 'customers' of evaluation. The goal of producing actionable knowledge about the prototype implies that it is a mistake to frame evaluation in terms of 'proving' something or 'validating', as I often hear, because these stances involve a tendency to collect only positive evidence, which obviously does not provide a solid ground for decision-making.

It is important to appreciate the plurality of this field in what comes to the stakeholders of our work. It is for them that evaluation should produce actionable and informative knowledge, and each 'customer' is different. For example, a company executive may be keen to know how ready their product is for market, or how a new product affects their employees' efficiency. A governmental organisation may be more interested in the impact of a computer-driven intervention, a development team in understanding the suitability of a new technical solution for users, and a research community in gathering generalisable information about approaches to design in HCI. The fact that there are many kinds of stakeholders, not only designers and developers, often seems to be forgotten.

One of the key 'customers' is our research community. I tend to second Paul Dourish's paper 'Implications for Design', presented in 2006 at CHI in Montreal. Information technology has become such an important factor that we ought to be able to study it in its own right, regardless of the day-to-day information needs of developers and designers. The 'customers' of *basic research* in HCI – not just in ethnography, which Dourish

discusses – are not developers but everyone who needs to learn and be sensitive to developments and phenomena in the use of technology.

The logical next question is: what form of evaluation report will be informative? I don't believe there are general answers to this. Trying to push evaluation in a direction that informs decision-making has taken me over and over again to the same conclusion: what is essential to understand is *change*. I conceive of evaluation as an intervention where the to-be-evaluated piece of technology is introduced into some material, mental, and social order, a system constructed and upheld by intentional action of a human being. It is the evaluators' task to investigate the causal role that the new technology has in changing this order, be it for better or for worse.

It is easy to see that there is a practical obstacle to this approach: capturing *all* changes in an intervention is impossible. Any intervention unleashes a 'causal whirlwind' that leaves its marks from the lowest level of physiological responses potentially all the way up to interpersonal and at times even societal levels. Consequently, evaluators have to make choices, and in doing that, they inevitably affect which traces are included and which are excluded in data.

These are not my own ideas. Lately, I've been reading literature concerning the evaluation of social policies, and found an inspiring book, *Realistic Evaluation* by Pawson and Tilley (Sage). Reviewing decades of research in their field, they arrive at the conclusion that evaluators should not be satisfied with reports of outcome measures (e.g., reaction time, user experience scale, cognitive load measure) but should investigate the *mechanisms* that cause these changes. '*Black box evaluation*' should be replaced by '*white box evaluation*', to use terms from software testing. But what does white box evaluation mean in this context? In software testing it means that we are not only capturing performance measures but peeking 'under the hood' in trying to understand how bugs and performance are brought about. One can think in similar fashion also in evaluating prototypes. For example, when our research group developed and has had to evaluate mobile group media systems for large-scale events (mGroup and CoMedia, CHI2006 and CHI2007 respectively), we have striven to understand not only user acceptance or user experience – typical outcome measures – but how these systems are *appropriated* by the users for the purposes of engaging with the event and other spectators. Through appropriation into practices of engaging in the event, we believe, these systems can become acceptable and in a sense usable.

By the same token, I feel that usability engineering methods are guilty of guiding evaluators to black box evaluation – to evaluation that puts excessive weight on outcome measures such as task completion time, number of errors and so forth. Following this path, and consequently lacking principled knowledge about the causalities in the use of their system, I'm afraid that evaluators are forced to conduct an evaluation upon almost any arbitrary change to the system. 'Quick and dirty' usability evaluation may be a disservice rather than discount, as the title of Wayne Gray's CHI panel title suggested in 1995.

The starting point in white box evaluation is to understand that there is no 'theory-free' trial. As I have said, evaluators have to be selective, and the choices reflect preconceptions about the phenomena. It is better to be aware and clear about those choices than to base trials on intuition. John M. Carroll has argued for some time now for a 'psychological design rationale', a structured approach, in design, to consider the psychological ramifications of one's design solution. The better we can explicate our preconceptions as hypotheses, in planning the evaluation, the better the choice of measures and the logic of the trial will be.

In practice, however, it would be quite risky to work with a single hypothesis. What if it turns out that it is not related to anything relevant at all? We rarely have the luxury of knowing in advance *all* causal factors in play in a situation – a sort of closed-system situation that physicists may enjoy in their work. I have therefore often opted to work with a couple of hypotheses and also adopt some 'just-in-case' measures. For example, I typically try to arrange semi-structured interviews and observations, if possible, to be able to spot signals of phenomena that I could not foresee and that are not captured by more narrow measures. Multi-method approaches are important – they allow us to triangulate possible causal mechanisms for an observed change in outcome measures. This leads to choreographing data analysis, visiting sources of data in the pursuit of finding confirmatory and falsifying evidence for pre-trial hypotheses and formulating new ones.

Thus far I have tried to argue for the position that the goal of evaluation is to produce practically valuable, actionable information for the stakeholders of evaluation, and that this information should be about those causal mechanisms, and their effects, in which the to-be-tested system participates. We now arrive at perhaps the most concrete aspect of evaluation discussed thus far: the design of a study.

Evaluators, by their choices in setting up the trial, set up boundary conditions for different phenomena to appear and thus different outcomes of the evaluation. I have had several discussions over the years about suitable users, tasks, materials, user control over the application, instructions, training, incentives, fees, on-line help, duration of trial, and so forth. By this I'm not referring to the trivial observation that it is difficult or impossible to impose experimental control in field studies, but that the design of an evaluation sets boundary conditions to what kinds of phenomena-of-use *can* manifest in principle. One of the most powerful determinants of the success of a trial is the selected user population, as the motivations, skills, and other dispositions are instrumental in finding uses for the system. The use of students as user population is an 'elephant sitting in the corner' in our business. Only in very mature application development, where the change that a prototype inflicts is known, may it be safe to stop continuously rethinking the purpose of evaluation and revert to 'standards' in trial design or outcome measures. Futhermore, as an increasing proportion of new technologies are related to discretionary uses rather than non-discretionary, to use Jonathan Grudin's terms, a key part of present-day evaluation is to understand those motivations and goals that drive the use of a system. It is a fallacy to treat those fundamental mechanisms – needs and motivations – as something that can be 'bracketed' by externally defining them, as assumed in some usability methodologies.

Adding to this problem is the fact that prototypes themselves are incomplete and miss capabilities that real products may have. This problem was raised at CHI2007 in a SIG discussing the role of prototypes in HCI. By definition, a prototype is a 'new type of machine or device that is not yet ready to be made in large numbers and sold' (Collins COBUILD). Prototypes cannot be assumed to attain the breadth and depth of usage and user base that real products do. Unless evaluators

are sensitive to the ramifications of their choices, the prototypes will stay as prototypes.

This point is important but not trivial. Three years ago, Jesper Kjeldskov of Denmark presented the provocative paper entitled 'Is it worth the hassle?' at Mobile HCI 2004 in Glasgow. The crux of the paper was an empirical comparison of laboratory and field usability tests in terms of how many usability problems can be found. The result was that *fewer* errors are captured in the field condition. Although Jesper was wise enough and tried to avoid generalising the finding to *all* field testing, I've had discussions with some practitioners in Finland who have used his paper as a rhetorical 'hammer' to argue for lab testing. In their experiment, the main task was the same in both conditions, to carry out tasks on a mobile interface, the only difference being the fact that in the field condition the users had to walk along a route. My interpretation is that Jesper's paper, and a few others that have replicated it since, mainly show that *walking during usability testing* does not help to produce more errors in task-based usability tests.

I believe that this pragmatic, 'customer-centric', explanation-oriented approach is where evaluation is eventually going. Little by little, evaluators start recognising that top-down evaluation standards are useful only as checklists and that many of the supposed disputes in methodological literature – such as qualitative vs. quantitative, field vs. laboratory, factors vs. actors, tasks vs. experience – are misleading, and sticking to them is often self-handicapping. The scope of evaluative practices is potentially as immense and varied as the scope of technologies that we are dealing with.

To conclude, I want to propose three meta-level questions, in the spirit of Pawson and Tilley, that can work as a checklist when thinking about evaluation. The first two questions are crucial. Together they sum up what in my mind counts as the 'contribution and benefit' sought after in the CHI review process, while the third in my eyes is the fundamental question underlying problems of validity and reliability:

1. Is the evaluation targeted at producing information that is useful from the perspective of the stakeholders' (e.g., research community or company) current or foreseeable choices?
2. Are the results informative in the sense that they describe and explain the causal role of the evaluated prototype in the observed changes in outcome measures?
3. What are the boundary conditions that the trial imposes on the observed phenomena? Are these conditions critically evaluated as limitations and biases to the validity and generalisability of the results?

With hindsight, I regard only a couple of the evaluations I've been involved in as having succeeded. Without exception, the successful ones have been the most expensive ones to conduct. However, good evaluation pays off. By the end of the day – or more likely, by the end of the month – evaluators have not only statistics of outcome measures but also evidence of the mechanisms and contexts of change. This has been, without exception, appreciated by the customers. White box evaluation is also intellectually satisfying as it encourages evaluators to move from intuitions to explicated theories of change and elaborate or reject them in the face of collected evidence.

Reflections on *To Google or not to Google*

I read Alistair Edwards' piece in *Interfaces* 71 [1], on the futility of anonymous reviewing in the age of Google. It struck chords with me. I recall a few years ago a reviewer who, when asked "Was the paper sufficiently anonymised?", responded "No, there is only one person in HCI who has programmed Cobol and does formal methods." Hmm. As Alistair said, you either know the topic and know the person or you don't and it doesn't matter.

Even the most empirically based work is seen through layers of interpretation. Who *is interpreting the material does matter.*

However, I have more fundamental objections to completely anonymous reviewing. The very principle rests on the premise that the content is what matters, not the authorship. I would go with this completely if the papers were printed anonymised, but they are not. The printed (or electronically distributed) material is attributed – and the attribution *matters*.

In some fields, say chemistry, this is not an issue. If the paper says 'substance X was mixed with substance Y and it went green', then this holds, irrespective of who said it, and can be read and reviewed for its content alone. However, HCI by its nature is not so cut and dried. Even the most empirically based work is seen through layers of interpretation. *Who* is interpreting the material does matter.

This cuts both ways. When reviewing for a conference I am often faced with papers that have some methodological flaws, yet still have some value. If the paper is produced by a first year PhD student, then the readers will see that they don't recognise the 'name' and read it with due care. However, imagine that a leader in the field wrote the same paper. Readers may take this as an exemplar of best practice, and perhaps follow the flawed methods themselves. Rather like a golf handicap, the higher your reputation, the higher the standards have to be. On the other hand, if the paper is an 'opinion piece' then it may be acceptable from someone with experience in the field, but not from a newbie.

Putting the boot on the other foot, as Harold Thimbleby has suggested before, reviewers might take more care both in what they accept and in the quality of their critique if their reviews and their names were to be subsequently published.

[1] Why bother with a reference, just Google 'edwards google interfaces'

Name Removed For Anonymity
Email: alan@hcibook.com
url: http://www.hcibook.com/alan/

Being and doing

A perspective on User Experience and its measurement

People own interactive products because they have things to do – making telephone calls, composing and sending emails, writing articles or buying books online. A product's ability to satisfy those *do-goals* with ease is a matter of product usability and utility – quality aspects at the heart of practical and academic Human–Computer Interaction (HCI).

Despite the undisputed importance of usability and utility, one should not forget that people do things for underlying reasons. Calling your spouse while away from home may satisfy completely different needs compared to giving advice to a new business partner. Picked from a Top Ten of psychological needs (Sheldon et al., 2001), the former may satisfy 'relatedness', i.e. a sense of being close and connected to others, whereas the latter may rather satisfy 'influence', to be a person whose advice is sought out and followed. It is a part of our identity, our selves, to strive for the fulfilment of underlying psychological needs. Being related, being influential, being competent, being autonomous – these are all *be-goals*, ways we want to be.

Do-goals, be-goals and the User Experience

One way to approach the concept of User Experience (UX, see Hassenzahl & Tractinsky (2006) for an overview) is to understand it as addressing needs beyond the mere practical level, i.e. doing. In other words, UX differs from traditional usability with respect to its focus on both do-goals and be-goals. Of course, do-goals and be-goals are related. Carver & Scheier (1989) suggested a hierarchy, with do-goals being derived from be-goals and do-goals being in turn instrumental for the accomplishment of the according be-goal. To give an example: being away from home, a need for relatedness might create the wish to talk to one's spouse, which can fortunately be satisfied by a mobile phone. In turn, having made the telephone call not only fulfils this particular do-goal, but also the higher order be-goal of 'being related'.

A model of pragmatic and hedonic quality perceptions

In the context of HCI and UX, Hassenzahl (2003) suggested that interactive products are perceived by their users/owners with regard to their capability to fulfil do-goals (i.e. their pragmatic quality) *and* be-goals (i.e. their hedonic quality). In other words, product attributes related to usability, such as 'easy', 'predictable', or 'clear', signal the potential fulfilment of particular do-goals and linked be-goals, whereas attributes, such as 'cool', 'beautiful', or 'original', signal direct fulfilment of be-goals. Studies (e.g. Hassenzahl et al. 2000; Hassenzahl, 2004) show that people perceive pragmatic and hedonic aspects as independent of each other. Thus, people may perceive products as primarily hedonic (a be-product), primarily pragmatic (a do-product), both or even neither hedonic nor pragmatic. In addition, both aspects are related to the general evaluation of products, although their importance may vary with the situation.

Beauty in products may be viewed as an unnecessary luxury. But imagine using an ugly product every day.

Some implications of the model

The concept of hedonic and pragmatic quality perceptions, which link product attributes to a hierarchical system of do-goals and be-goals, has at least two interesting implications.

As long as hedonic quality attributes are directly related to be-goals, and thus closer to the user's Self, they may be the driver for 'emotional product attachment' (Belk, 1988). Of course, a product can exert a certain amount of functional attachment, if it is the only available product performing a particular do-goal. However, in the case of many products competing for the same do-goals, this type of attachment may not be very pronounced. Take a dishwasher as an example: it certainly performs an important and relevant function (which becomes painfully obvious the moment it breaks down); however, how important is a *particular* dishwasher to its user? We believe that any dishwasher is easily replaced by, for example, a cheaper one given the same expected functional quality. This is primarily because of a lack of emotional attachment to the product itself. With some hedonic quality, emotional attachment to the product or at least the brand may be much stronger.

On the other hand, people suffer from a phenomenon called 'lay functionalism' (Hsee et al., 2003). Lay functionalism is a bias in human choice, which systematically over-emphasises the core function of a product (the do-goal level) and discounts more peripheral attributes (the be-goal level). This effect is mainly driven by justification processes. In general, it seems easier to justify the expenses for something practical compared to something hedonic. This is problematic, since because of this bias, we may end up with a product that felt appropriate at the moment of decision but lacks important experiential, hedonic qualities. Beauty in products, for example, may be viewed as an unnecessary luxury. But imagine using an ugly product every day.

Measuring hedonic quality perceptions

Empirical measurement is at the heart of the self-concept of any practitioner or academic in the field of HCI. It is one of the 'golden rules' of HCI (Gould & Lewis, 1985) and an important part of standard practices (ISO, 1999). Accordingly, any proposed model of UX in general and specific new concepts such as hedonic quality should be quantifiable. Note, however, that there is no such thing as good measurement if an underlying model is non-existent or implausible.

For the concept of hedonic quality, measurement is in principle an easy task (compared to the measurement of more temporally oriented concepts of UX, see below). One must identify a list of underlying psychological needs and link them to product attributes. For instance, Hassenzahl (2004) suggested a collection of 28 semantic differential items measuring

pragmatic quality perceptions (e.g. 'simple – complicated'), hedonic quality stimulation (e.g. 'original – typical'), hedonic quality identification (e.g. 'isolating – integrating') and appeal (e.g. 'good – bad'). The underlying needs for the hedonic quality are a need for novelty and change (growth-oriented) and a need for self-presentation and belonging (socially oriented). The actual list of attributes and underlying needs can be debated and may depend on the product and the context of use. However, any serious measurement instrument must rely on a model that establishes a clear link between product perception and underlying needs.

But good measurement has at least two additional requirements:

- **Select the right level of granularity**. Any list of needs is a good start; however, make sure that people are able to differentiate between related product attributes. Take usability and utility as an example. From an HCI perspective, both can be separated: utility is about whether a product provides important functionality (the what) and usability is about how this functionality is accessed (the how). Nevertheless, for a layperson this distinction may already be irrelevant. If utility equals personal value, one may question the value of any product whose functionality is, in principle, available but, in fact, inaccessible. In the end, the function cannot be performed and from a user's perspective, the reason does not really matter. An expert, however, would find different remedies for a utility versus a usability problem and, thus, for her the distinction makes sense. In other words, a level of granularity in attributes, which makes sense for an expert in interactive products, may not be understood by users. However, any attempt at measurement must take the users' ability to differentiate between product attributes into account and must prove that users are able to distinguish between the different constructs measured.
- **Separate importance from perception**. Importance of hedonic and pragmatic aspects should be a different objective for measurement. Hassenzahl (2003) explicitly separated pragmatic/hedonic quality perceptions from appeal, i.e. the general, overall evaluation of the product. It is assumed that people are able to recognise pragmatic and hedonic attributes because they represent important underlying human needs, but that this does not necessarily imply that those attributes are valued, too. A product may be perceived as 'original', but that does not mean that you 'like' it to be so. In measurement, the importance of aspects can be estimated implicitly by relating attributes to appeal (with, for example, a regression analysis). The higher the relation the more important is the attribute for 'explaining' and predicting appeal. One could also obtain the importance of each attribute by, for example, a simple ranking exercise or more elaborate weight elicitation methods known from research on multi-attribute decisions. The separation of importance from perception has an important implication: it allows for variations in importance from situation to situation. Hassenzahl at al. (2002), for example, showed perceptions of pragmatic quality to be predictive for appeal only in task-oriented situations (as one would expect).

Temporal dimension of UX

In addition to the rather static model of UX attributes and user needs described earlier in this paper, UX also has a temporal dimension, which is interesting and especially challenging from a measurement perspective. Forlizzi & Battarbee (2004), for example, understand 'an experience' as something with a definitive beginning and end. Whatever happens during this 'usage episode' is the user (usage) experience.

Kahneman (1999) distinguished 'instant' and 'remembered' utility. Instant utility is the goodness or badness of a particular moment during an episode, whereas remembered utility is the retrospective, summary assessment of the whole episode. Experience probes taken during the usage episode, such as the question of how one feels at the moment, are an experiential measurement, as opposed to the retrospective question of 'How did you feel during product use?'. Interestingly, Kahneman and colleagues showed that remembered utility is not necessarily the sum of all instant utilities (see Hassenzahl & Sandweg, 2004). (An example for HCI related work, which uses experiential and retrospective measures, is Hassenzahl & Ullrich, in press.)

Both experiential measurement and retrospective episode evaluation are interesting approaches to the measurement of UX, as they serve different purposes. Experiential measurement is able to show how users' (affective) states change over time, while retrospective evaluation reveals what users make of their experience. For example, experienced negative affect because of an encountered critical incident in the midst of product use must not necessarily lead to a negative retrospective product evaluation. Maybe the user did not attribute the negative moment to the product, but to his lack of expertise. Or he simply can't remember the negative moment due to the large number of other, much more positive moments.

The temporal perspective on UX is especially challenging for practical evaluation, because it stresses the importance of spending time with a product to build an appropriate experiential basis for judgments. Any individual is able to judge and even choose among products even if actual experience is limited to only a small number of moments. Nevertheless, the initial judgment may not be confirmed by subsequent experience. Disappointment is a likely consequence. In practice, HCI-oriented product development teams may only rarely extend systematic evaluation to real usage (i.e., beyond product release) because at this point in time the product is on the market and is very difficult to fix. (Web applications, i.e. services,

may be a notable exception.) However, from a UX perspective it seems crucial to monitor product experience throughout the whole product lifecycle and to use these findings at least as a guide for future products.

Implications of hedonic quality for design

The fact that hedonic quality can be measured does not make it a trivial concept from a design perspective. First, designers must strive for a balance between both pragmatic and hedonic aspects. Do-goals must be supported properly by a product; however, without hedonics a user may never become really attached to a product. Second, one must think about ways to design for hedonics. So far, the most prominent strategy is to put something useful in a beautifully designed box. However, hedonics can be more conceptual: for example, designing search functionality that allows for discovery rather than keyword-directed search. Third, when designing, it may be helpful not only to focus on the immediate do-goal to be supported (e.g. 'to make a telephone call'), but also to keep the underlying be-goal in mind (e.g. 'to make a telephone call to feel related to another person'). An example for this approach is the work on technology-mediated intimacy (e.g. Kaye et al., 2005), where intimacy is not treated as yet another form of generic communication, but as something following its own set of rules. Of course, one can experience an intimate telephone call with any available phone. A true UX perspective's objective, however, is to take the underlying needs seriously, and to design technologies that match those needs.

Conclusion

UX has many facets. The present paper summarised our notion of UX as addressing needs beyond the instrumental and ways to measure according concepts. Note, however, that it is not the measurement *per se*, but the underlying model, that is crucial. Models can vary and each may use its own constructs, terms, and approach. Nevertheless, there are some general requirements for an appropriate model of UX (which hold for any other model): it must be plausible, as parsimonious as the complexity of UX allows for, supported by empirical data and generative in the sense that it produces useful insights.

Hedonics as an approach to UX highlights its difference to traditional usability. Its grounding in human needs reminds us of what is important in life. In the end, it is all about value (Cockton, 2004). And only a most puritan perspective may view productivity as a value in itself. Productivity is a means, a do-goal, sometimes important, sometimes not, but always employed with a more basic be-goal in mind. UX seeks to broaden usability by asking not only how people do things, but also why they do them.

To adapt the words of economist Steven Landsburg (1993, p. 44): "Usability wants us to die rich; UX wants us to die happy".

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Obituaries

Professor Brian Shackel, 1927 – 2007

When I heard that Brian Shackel had died on May 9th, 2007, I was saddened on at least three levels. At the personal level, Brian left behind his wife Penny and children Nick, Julian and Francesca – all of whom I remember as much younger (myself included) from my days at Loughborough University in the 1970s. At a professional level, Brian gave me a start in what came to be called usability (Brian was actually one of the first to define this term but that was some years later), and his support never waned throughout my career. At a global level, Brian was one of the true pioneers of human–computer interaction. When he set up a research group at Loughborough in August 1970, he assembled a team of ten young researchers, who shared his enthusiasm for exploring the relationship between people and the new computing technology. HUSAT continued as a focus for excellence for three decades.

His initial seed funding from the university allowed us to spend some time just exploring the possibilities (and deciding to call ourselves HUSAT – HUman Sciences and Advanced Technology) before knuckling down to some serious research. Brian, with his background in classics and a stint at the MRC Research Unit in Cambridge, had founded an industrial research unit at EMI (part of that laboratory still exists today as part of Qinetic), and was determined that HUSAT would do useful research – part funded by the research councils and part by industry. This mix of applied and commercial research is quite common in universities today, but nearly 40 years ago it was revolutionary.

He continued to mix the academic and commercial through building up the department at Loughborough with major undergraduate and postgraduate courses; being Chairman of Council of the Ergonomics Society; Honorary Treasurer of the International Ergonomics Association; helping to establish the journal *Applied Ergonomics* (and being its first editor); and creating IFIP (the International Federation of Information Processing) Technical Committee 13 in Human–Computer Interaction. Under the auspices of IFIP he started the INTERACT series of conferences on human–computer interaction, and these continue as a major focus for human–computer interaction researchers and practitioners to share ideas. TC 13 now gives the Brian Shackel Award to the best paper in the conference.

Brian had enormous (sometimes exhausting) energy and his persistence made him a difficult adversary but a good friend. He was one of the first to see the potential of electronic journals, was an early advocate of standardisation and believed passionately in sharing ideas with colleagues throughout the world. Other international bodies to value and recognise Brian's contribution include the Human Factors Society, who made him Distinguished International Colleague, and SIGCHI (Special Interest Group in Computer Human Interaction), who elected him to the CHI Academy in 2004 for his 'extensive contributions to the study of HCI'.

It was in the field of standardisation where we last met professionally. He was an enthusiastic promoter of the human-centred design standard (ISO 13407), which I helped develop. His tenacity, especially when dealing with a sometimes obstinate government, meant that this standard has now become an integral part of the UK government's approach to developing public websites and information systems.

Brian retired officially in 1992 but he never let this slow him down or dampen his enthusiasm. He also knew how to play the slightly eccentric 'English professor' card when it suited him. I still remember travelling on the train with him from Loughborough to London and being sent on ahead to the dining car to make sure 'the professor got the table with the Oxford Marmalade'. It always worked.

Brian will be sorely missed across the world but his pioneering contribution to usability and human–computer interaction will live on.

Tom Stewart
Joint Managing Director of System Concepts

Dr. Martha Hause, 1960 – 2007

Martha Hause was familiar in these pages as a PhD columnist, but she had many personae: family stalwart and mother to Matthew, choir leader, collage artist, volleyball player, and researcher. She was characterised by sweetness and strength. Martha embodied the spirit of the Open University, where she earned her PhD: hungry to learn, open to ideas, and turning obstacles into opportunities. Her doctoral research into remote collaboration by students on software development projects was typical of her work: rigorous, thoughtful, and thorough. It also involved her in travelling to conferences around the world, creating an international network of colleagues and friends. In recognition of her research ability, she was invited to return to the OU as a post-doc researcher. Although she grew up in Texas, Martha made herself at home in Chippenham, where she became an organiser and facilitator in the local community. Martha had an indomitable spirit. She just got on with doing more than any reasonable person would expect, even when she was faced with crippling illness. She approached things with vigour, enthusiasm, and her heart-warming smile. Martha was a joy: inspiring, kind, and generous. She was so much, and so simply, herself, that people who knew her will remember her vividly.

Prof. Marian Petre
Director of the Centre for Research in Computing,
Royal Society Wolfson Research Merit Award Holder,
Computing Department, Open University

From San Jose to Salzburg

San Jose played host to CHI 2007, and as ever there was almost too much to see. With over 2000 people, several parallel tracks, posters, full papers, demos, a student design competition and a set of workshops and courses there would have been something for everyone. On looking through this year's programme, one of the common themes was mobile and location aware systems, ranging from hardware aspects through to theoretical issues and a one-day workshop was held specifically to discuss related aspects.

Mobile Spatial Interaction Workshop @ CHI 2007

The mobile spatial interaction workshop provided a nice start to CHI, and covered a whole range of topics. A quick look at the workshop overview listed: pointing and gesturing interfaces, geospatial modelling, context-aware systems, pervasive games and mobile augmented reality systems – which in turn brought people together from a range of fields including engineering, design, usability and GIS. A link to the online proceedings is provided at the end of this article.

Mobile Map Interaction for Local News: Johannes Schönig

Handheld Geospatial Augmented Reality Using Urban 3D Models: Gerhard Schall

Some notable work included the Tricorder [1] which is a device designed to work with wireless sensor networks. Not being a Trekkie I am not sure exactly how it compares to its namesake from the said TV series, but the intention is the same. In essence the Tricorder is designed to let people find out about the content of the world around them simply by pointing at objects. It does this by letting people browse the available sensor networks and retrieves relevant information.

Another interesting technical development was the Wiglestick [2], which is designed to aid in social navigation by letting people drop virtual information at real locations around towns and cities. These pieces of information can then be picked up by other visitors to that location if they have the correct access rights.

There was also some work on more theoretical areas, such as my own presentation on mobile phones, sub-culture and presence which talked about some early work from a study of Street Beat – a mobile phone based tour of Berlin. Work by Holleis & Rukzio et al. [3] explored issues relating to privacy and curiosity when people interact with public displays. A quick summary of their work points to people having deep unease about sharing information about themselves, even if this is not particularly private information such as a photograph or music. They also found that more people became more interested in using public displays when a mobile phone is used as the input device when compared to a laptop.

PerGames 2007

Annika Waern from SICS/IPerG with another conference participant

Continuing with the mobile spatial theme, PerGames 2007 was held in Salzburg, Austria and ran in parallel with the ACM Computer Entertainment Conference. Sponsorship was provided by the EU Funded IPerG project, which meant that the conference had more tracks than before and included a set of tutorials on specific aspects of pervasive games. These ranged from one covering patterns in pervasive game play through to how to commercialise the results. Some of the papers may also appear in the *Journal of Virtual Reality and Broadcasting* and the ACM CE magazine.

A number of interesting demonstrations were also provided. Firstly 'postvinyl' [4] explored the concept of pervasive DJ'ing through two game scenarios. In one scenario players can navigate through the history of vinyl recordings which are represented in audio-visual space. Another game element lets real DJs mix their music with that of a virtual DJ to create an on-stage experience. Meanwhile Digital Situations demonstrated Salzburg Cityball [5], which lets people play baseball, except the pitch was the entire City of Salzburg. Players use their GPS-enabled mobile phones in order to see the locations of other participants and are encouraged to make use

of a range of transport methods. There were also many other demonstrations but for the health conscious 'Jogging Over A Distance' [6] may prove interesting and was devised around some early research which pointed to the fact that most people said they prefer to jog with another person in order to improve their levels of motivation, socialising and fun. As it is not always possible for people to jog together it supports communication between people who are participating over a wide geographical area.

Presence 2007 and the PEACH Summer School

The PEACH team have been somewhat busy this year and have already hosted a range of events including two successful talks during the Edinburgh International Science festival. They are also helping to organise Presence 2007, which is taking place in Barcelona. Not content with that, they are also hard at work putting the finishing touches to the first PEACH Presence Summer School which is taking place in Santorini, Greece, at the start of July. The summer school is designed to provide researchers and practitioners with a chance to hear from some of the leading names in the presence community such as Mel Slater, and to let those taking part receive feedback on their own work. The organisers are said to be very pleased with the number of people attending so the event looks like it will be a success. A full report on the summer school will appear in a future edition of *Interfaces*.

Useful Links

The Pergames website: www.pergames.de
PEACH: www.peachbit.org
IPERG project: www.pervasive-gaming.org
Mobile Spatial Interaction Workshop (includes the proceedings): msi.ftw.at

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Tips for travelling academics: San Jose, Costa Rica

For those of you unfamiliar with geography there are quite a few San Joses (just look on Wikipedia), and for me CHI 2007 was very nearly in San Jose, Costa Rica, thanks to a rather interesting error by my travel agent, the check-in staff and US immigration who all failed to spot the difference. Indeed, like me, everyone assumed I was going to the US, as my ticket was for 'San Jose', and I had specifically asked for a flight to the Californian version. I was also flying via Newark, New Jersey, and prior to leaving I had been issued with a US immigration form which was only for those staying in the US and not in transit. However, as I found out on taking the next part of my flight to San Jose my travel agent had accidentally booked me on a flight to Costa Rica, which left about 20 minutes before the one to California and was from about two gates away. Although the mistake was rather costly, I managed to make it to CHI in California; my luggage, however, enjoyed a relaxing few days in Costa Rica. The moral of the story is to make sure that your travel agent prints the country as well as the city on any air tickets or proposed itineraries; mine, for whatever reason, does not. For those of you interested in the usability of these tickets the only difference between the two destinations was a couple of codes consisting of a handful of letters and numbers, which unless you have managed to memorise the entire flight schedule from Continental Airlines are not much use for identifying which country you are actually flying to.

Rod McCall is a research scientist within the Collaborative Virtual and Augmented Environments Group at Fraunhofer FIT in Sankt Augustin, Germany. He previously held an ERCIM Fellowship at Fraunhofer and CRP-Gabriel Lippmann, Luxembourg. His research areas interests include virtual and mixed reality environments, pervasive games and collaborative systems.
Email: rod.mccall@fit.fraunhofer.de

Why examples are hard, and what to do about it

Examples are important to generate ideas, to test ideas and to communicate ideas, but often we end up talking in generalisations, or read texts that never seem to move from the abstract to the concrete. For the reader and receiver of communication, examples are easy – so why are they so hard to produce?

In this article I'll look at why examples are important, why they are not used, why they are hard to produce … and how to make them easier!

Examples and abstractions

I'm a mathematician, so I love very abstract ideas. The beauty and power of abstraction is both fascinating in itself and intensely practical. I only know of two ways to generalise: through abstraction and through analogy, and even to generalise through analogy requires some level of abstraction in order to understand which features are critical to the analogy.

However, equally important are concrete examples, both real examples from our experience and 'made up' examples from our imagination. These examples themselves may be 'concrete' in a fairly abstract space, such as $2 \times 3 = 3 \times 2$ as an example of commutativity, or may be very solid, such as 'the day I went to Bognor Regis'.

Concrete examples work together with abstractions and theories:

examples **motivate** theories – The real or imagined scenario may exemplify some problem we wish to solve and hence creates the reason why we want to understand a domain better.

examples **inspire** theories – Seeing something in a particular situation may spark those 'why' questions that lead to more abstract investigation.

examples **fuel** theories – Seeing that something is true in several situations suggests that it may be true in general; that is examples are the basis for *induction*.

examples **test** theories – Having, through induction or through reasoning, come up with an abstract idea, we can see whether this holds in different situations. In mathematical terms, abstract arguments are good at universals – showing that something is always true, whereas examples are good at existentials – showing that there is at least one situation in which it is true!

examples **communicate** theories – When we read an abstract description it may be hard to make sense of what the writer means. The example effectively allows us to see each concept in a context.

examples **ground** theories – Perhaps worse than not understanding, we may *think* we understand each other, but in fact the meanings we each connect to concepts may be completely different. Examples serve to ground more abstract discussion, ensuring that our different interpretations at least agree somewhere!

Academics and examples

For years I've wondered why, given the obvious importance of concrete examples, academics are so bad at using them. Textbooks can be pretty bad, but articles and academic monographs are even worse. Strangely, this seems to be more common in the social sciences and humanities than in the sciences or even mathematics.

There are several reasons for this:

(a) **too much understanding** – Writers may simply understand their material so well that they don't realise that the concepts and terms that have become familiar to them are difficult for others, or are simply not the terms others would use.

(b) **too little understanding** – The writer may have a vague idea, but not really understand it clearly enough to be able to make it concrete. This is often an important precursor to deeper understanding, although in this case the attempt to formulate examples can be one of the ways to solidify and deepen understanding.

(c) **fear of misunderstanding** – Examples may over-simplify. When giving an example we often choose a central case, for example; a poster-paint red, not deep crimson, as an example of red. This may mislead a listener into believing it is only the central category, or only the simple case, that we are trying to communicate.

(d) **defence from understanding** – If you stick with vague abstractions, it is hard for anyone to challenge your ideas, but as soon as you give an example, it is easy for someone to say you are wrong.

(e) **rhetoric of incomprehensibility** – By using abstract, hard to understand language a fairly ordinary statement may sound impressive. And if readers do not understand something they often think the ideas must be clever and difficult, not just that the writer is poor at communicating. That is, readers can confuse (a) for (b)!

(f) **being academic** – Researchers may feel that because the product of their work is often abstract theory or concepts, the way they reach this and reason about it must also be abstract. In these circumstances, using examples may appear to be an un-academic way of thinking.

(g) **sounding academic** – For similar reasons, even if the writer has thought about a problem domain concretely themselves, they may choose to write about it purely abstractly, for fear of sounding un-academic, or lightweight. Sadly, this appears to be the 'right' thing to do in terms of academic success: when experimenters submitted the same paper to academic journals in either plain or obscure English, the obscure versions obtained better reviews.

(h) **writing to genre** – In several disciplines the standard way of writing has fossilised into an abstract form of writing. This is the case in mathematical

proofs, where all the small examples and counter-examples that formed part of the mathematician's creative process are apparently forgotten in the abstract proof. This seems to be part of a cult of minimalism. For different reasons, in parts of the social sciences obscurantism in writing seems to have become the accepted style. Here it appears more that the nuanced complexity of early thinkers in the field has been emulated in form, but not substance, by later writers.

Note that some of these are weaknesses in communication by strong academics (a & c), some failures of weak academics (b) or misguided academics (f & g), and some deceptions of Machiavellian academics (d & e). In practice it is often the first of these that lead to disciplinary patterns of obscurantism (h), but for the most part we see a mixture of many of these reasons.

Interestingly, Newton apparently wrote his *Principia* in geometric terms, rather than the emerging calculus, partly to make it difficult to understand except by those who had sufficient knowledge of the subject. This is not for any of the above reasons, but more a Gnostic-style *writing for the elite* (and by using the work 'Gnostic' I'm aware I am doing the same and sending some readers scurrying for a dictionary!). Arguably the obscurantism of some disciplines is related to this, and certainly part of the rhetoric of abstraction is saying "I can write like this, I am part of the intellectual elite".

Examples are hard

In all the reasons (a – h), the writer is at best poor at communicating, and at worst deliberately misleading. While there are no excuses for the latter, there is in fact a good reason for the former: creating examples is hard.

When an abstract concept or theory arises through induction then the examples come first and so these examples are easy. However, in other cases you really do need to generate or find examples.

Even when the concepts come through induction you may wish to find other examples of the general concept as well as those that drove you to formulate them. For example, in Coleridge's *The Rime of the Ancient Mariner* are the lines 'the furrow followed free'; having read these, you realise that the common first letter gives a sort of inverse rhyme and decide to call this 'alliteration' … it seems obvious to you that alliteration will be a good poetic technique and you try to think back over other poems to recall further examples in addition to the line from the *Ancient Mariner* that started your quest.

If the concepts came through a process of abstract reasoning, then even if you had examples of some of the concepts and theories that started your thinking, you may not have any for the end point of that reasoning. This is often particularly difficult for negative reasoning – 'a place name that begins with A but does *not* end with A'; and pretty hard for conjunctive reasoning – 'a poem that uses alliteration *and* rhyming within a line'.

Furthermore, the concepts may simply have 'come into your mind'. This may be through some more subconscious process of induction or 'reasoning', but if so you are not explicitly aware of the underlying instances that drove the process. For example, poems usually use alliteration within lines and end, or near end, sounds in rhyming. What about a poem where the beginnings of lines sound the same? Let's call this an emhyr (pronounced em-here) … can you think of an example?

The problem in all these cases is that we have a concept and want to either:

(a) generate an example *ex nihilo*, or

(b) recall an example from memory that matches the concept.

It is clear that (a) is difficult, to somehow generate an example of something from the abstract description. In the case of the poetry you would have to create a poem. However, (b) sounds easier. Indeed, this is precisely the annoyance in books or articles that remain abstractly 'in the clouds'. Why not simply give us an example you've seen?, I always think. In fact, even this is not as easy as it sounds.

To understand this we need to think about the way our brains code memories through associations. When I think of 'group theory' all sorts of associations spring to mind, the texture and colours of the first books in which I read about it; Galois, who formalised the area and solved problems outstanding since the Greeks, but died, at nineteen, in a duel; the axioms of the theory (and a few examples!), of course; and Open University presenters with fish-tail ties and flared trousers.

Now, for you, 'group theory' may not mean much. If so, and I explained it to you (which sadly would take longer than explaining alliteration), you would find it hard to think of examples of it, not just because it is mathematical, but because when you have seen real examples (e.g. the manipulations of a Rubik's cube), you will not have thought (consciously or subconsciously) "ah that's connected with group theory". With no associations between your new concept and the old memories, you cannot recall them.

So it is no wonder that we find it hard to recall old examples for new concepts, and perhaps remarkable that we ever manage this at all! In fact the process for recalling old memories for new concepts appears to go something like:

1. You start off *generating* semi-concrete examples of the concept
2. These examples are then available to be matched by *similarity* to past memories (our brains are good at this!)
3. After a while, suddenly an old memory comes to mind (which is a good candidate example, as it is similar to the generated example)
4. You check to see whether it actually matches the concept
5. If it does … hey presto – got it!
6. If it doesn't ... repeat the process starting with new generated examples (step 1) or more retrieved examples (step 3)

Notice how this, in effect, retrieves using analogy, the more

primitive (as in 'older' and more basic) way to generalise.

But also note how this retrieval of past examples, which seemed like the easier process, actually requires that you first generate examples … the difficult process!

Finding examples: transformation and semi-abstractions

As in so many areas, once you understand that examples are difficult, and furthermore why they are difficult, you can start to conceive strategies to make them easier.

Step 6 above says – if the retrieved example doesn't match the concept then repeat the process. In fact, this elides an important step that we may make instead:

6a. if the old example doesn't match the new concept, try to alter it

Finding an example of a concept is not a simple accept/reject decision, but if we find something that is almost right we adapt it.

We may often follow steps 1–6 and 6a unconsciously. However, when we find it difficult to think of examples, we can adopt the process more explicitly. Given that step 1 is the hardest, why not skip it – think of *any* concrete example, analyse why it isn't an example of the concept you are after, and then alter it until it is.

Note that even this process of altering examples normally has starting points that are in some sense roughly in the right area. In the boxed 'emhyr' example I started with a poem, not a mathematical equation. It would be harder to transform $E=mc^2$ into an emhyr! However, when things get really tough this can be a good way of generating novel/different examples; indeed, one of the creativity techniques I suggest is the use of completely random analogies.

So normally there is at least some level of generation of an example, followed by transformation; we have not managed to skip step 1 entirely! However, instead of having to get an example of an abstraction exactly, we are now simply trying to generate examples that are vaguely in the right area: easier for recall (e.g. any poem) and easier for generation.

More 'pure' generation of an example may come through a process of semi-abstracted examples. That is, examples that have concrete elements, but where other parts are still vague or completely unspecified. These can then successively be made more concrete, or may simply suggest or cue a full concrete example.

In the case of the emhyr, we might start with a couplet:

> Looking o'er the troubled sea
> Looming into the greying clouds

or a set of line start sounds and metre only:

> Looking *dumpty dumpty doo*
> Listening *dau dee do da dim*
> Listing gently *dau dau day*
> Looming *didle doble dan*

In the first case we would need to add more lines to make a fuller example, but the couplet alone might be enough to remind us of something. Similarly we might try to complete the line ends in the second example, or simply find that this process of thinking of start sounds reminds us of a poem we have heard before.

In a more analytic domain such as mathematics, we can have similar partially concrete examples: if we were interested in a property of two numbers we might consider what it would be like if the first number was 2. However, these semi-abstractions may also be more descriptive, but using concepts that are well understood. For example, if we have a new property about numbers in general, we may consider what this would be like for even numbers, or positive numbers.

So to do this for real, let's take the idea of an *emhyr*, a poem that alliterates it's initial sounds of lines. Start with any poem, say the most widely known in the English language*:

> I wandered lonely as a cloud
> That floats on high o'er vales and hills,
> When all at once I saw a crowd,
> A host of golden daffodils

Let's try to alter this so that the first words match. 'I' looks like a difficult word to alliterate on (although perhaps 'I wandered' would alliterate with 'Iowa'!), so we can change the word order:

> Lonely I wandered like a cloud
> Floating high o'er hills and vales,
> Lo, when all at once I saw
> Flowing golden daffodils

I've preserved the ABAB pattern from the original and deliberately made it not rhyme (although unintentionally added additional assonance between the 'Lo…' sounds and the 'Flow…' sounds). This may not be good poetry, but it may serve at least as an example to talk about, and furthermore act as a cue and remind you of a real poem that does this.

Actually I think one of the discipline genre issues in writing about poetry is that made-up examples like this are inevitably bad poetry (and worse when bowdlerising good poetry!), not least because an effective example will have the features you are trying to show and nothing else, whereas one of the aspects of good poetry is precisely that multiple poetic mechanisms (word sound, imagery, rhythm) work together. In mathematics trivial examples are more acceptable.

**Daffodils*, William Wordsworth, 1804

or even … http://www.golakes.co.uk/wordsworthrap/

Working in the space between

We initially started with a dichotomy between abstraction and concrete examples. However, the process of semi-abstraction reminds us that in fact all our mental images are somewhat like this. When you recall a face, it is not every line and feature you recall, but parts and general aspects; indeed our very perceptual systems have already done a level of abstraction. Perhaps it is only when we externalise these, whether in action or in communication, that we start to make them truly concrete, but even then our words themselves are highly abstracted (e.g. the word 'poem' or even 'cloud' covers so many things).

In mathematics, the most concrete things are themselves abstractions (e.g. numbers), and through the process of naming and axiomatising, more and more complex theoretical constructs become in some sense 'concrete', but this simply mirrors the 'normal' process of day-to-day language. The flow between more and less concrete examples is fairly fluid and often we do not need fully elaborated concrete examples to get inspiration for where to go next.

Similar levels of inspiration and reasoning can happen in this in-between space of semi-abstracted examples in other domains. For example, as I thought about the semi-abstracted emhyrs, it became obvious that the technique (if it works at all) would be most effective in simple patterns, perhaps three lines starting with 'lo…' words, or three lines starting with 'fl…' words.

Challenge! Write an emhyr about HCI and mail it to alan@hcibook.com. I'll post the best on www.alandix.com/blog and at the HCI conference in Lancaster.

Experiencing design
Sweetness in standards

Sam Horodezky

It is not uncommon to hear from the cubicles of an everyday office a litany of stinging epithets directed towards Microsoft Windows. If only those tortured souls realised how lucky they are. Windows is not perfect, but the personal computer market has enjoyed a luxury unheard of in the mobile device space: a *de facto* user interface standard. Mobile device consumers are forced to use an unsavoury patchwork of user interfaces. The mobile marketplace offers little continuity across different phone models and carriers, and no consistency in user experience even on applications within the same device (the browser is the most notorious example). And the problem appears to be getting worse, since there are more and more entrants to the mobile market and an increasing assortment of features being pushed into the software.

How has it come to this? A brief history lesson is in order. Everyone knows that Apple, as a PC maker, decided to own the software and hardware together. And everyone also knows that IBM ceded control of the operating system and user interface to Microsoft. The mobile device marketplace steered clear of IBM's approach: for pragmatic and strategic reasons, manufacturers decided that the software layer was too important to give up to another party. Therefore phone manufacturers developed their unique user interfaces. Over time the phone manufacturers came to see the quality of the user interface as a strategic advantage for their brand, and became even more resistant to giving up control.

Users need to be able to pick a user interface platform and stick with it as they move from device to device.

The carriers *also* concluded that the user interface was a strategic advantage. The carriers come from a position of great strength, since in most places in the world they are the business entity that actually sells the phone hardware to the end customer. What has ensued is a pitched battle between the phone manufacturers, who insist that the UI is central to their brand, and the carriers, who insist the same. With all these players claiming ownership of the UI, many flavours of different software enter and persist in the market.

Consumers have tolerated this state of affairs because they are largely insensitive to the user interface at the point of sale. Instead they pay much more attention to battery life, price, form factor, screen size, and quality of wireless service. This fact is illustrated by the unprecedented success in the United States of the RAZR, a phone with a unique sleek design but a ghastly user interface.

To return to the despondent Windows user, most PC users have access to a vast catalogue of non-Microsoft-created software, all of which is roughly consistent in its basic UI characteristics. Microsoft Windows has been around so long that even advanced features like drag-and-drop and keyboard-only access are requirements of any commercial-grade software. Every Microsoft application can rely on the user having a CTRL key, ALT key, ESC key, and many others. The result is a large ecosystem of Windows-compliant software created by thirteen-year-olds in their garages and giant conglomerates alike; there is a corresponding raft of hardware components to flutter the heart of the most niche market consumer. This is a market economy in its fullest glory. If Windows is weak as a user interface solution, it has still spawned a wide and varied universe as a platform.

In stark contrast, although mobile phones have only around 20 buttons, only around 15 of them are standard (including 0-9, # and *). The rest freely vary by model and carrier. The current state of affairs has to change: too much money is being left on the table.

In the developed world, revenue based on voice usage is on the decline. As a result, carriers in North America, Europe, and Asia have invested heavily in infrastructure to drive the adoption of data, known colloquially as '3G data'. The expectation is that a bigger slice of carriers' revenue will be based on data usage. European carriers like Orange and Vodafone have invested considerably into data-intensive services like Videotelephony, Push To Talk, and Radio Streaming. However, in each case, the carriers have already retreated or are in the process of retreating from these strategies. Any quotidian blogger already *knows* what people want to do: they want to browse, email, and IM. If current web trends are any signal, mapping applications, picture sharing, social networking, and video clip watching are also rising in popularity. The vehicles that will feed data uptake are already clear, but the means to harness them on the mobile device are still absent. The applications are already on the phone: just no one wants to use them!

Standardisation will address this critical problem. Users need to be able to pick a user interface platform and stick with it as they move from device to device. Developers of software for devices also need to be able to pick user interface platforms that have a long life. When companies write a browser client or an IM application, they need to be able to rely on a fixed set of screen sizes, buttons, and operating systems. Because the current marketplace is so fragmented, it is extremely difficult to write a third party application that integrates properly with a large number of devices.

The movement to standardisation is already afoot. Nokia continues to hold strong market share with a standardised set of UI solutions requiring fixed screen sizes and buttons. Windows Mobile is now gaining significant traction; it also requires a standard set of input and output hardware. Palm, Motorola, and LG have released devices carrying the Windows solution. For at least some devices, these high-profile and high-volume manufacturers have decided to give up their 'strategic interest' in UI development.

It is not yet clear where all the standards will come from and what they will be. Apple, Google, or Sony Ericsson may all yet have something to say on the matter. But consolidation on the UI front is coming, and even if an inferior solution wins, we will all be the better for it.

Sam Horodezky is Senior Manager of Human Factors at QUALCOMM Inc. His specialty is user interface theory and design for button-based mobile devices. Despite being an early adopter of the Macintosh, he uses Windows because he finds it more expedient to be carried by the tide than to risk drowning while swimming against it.

The increasing value of reflection
A discussion of reflective HCI

"As a technology designer, what do you do if technology is not the solution?"

While designing collaborative electronic environments for nomadic teachers in Sweden, Sinna Lindquist began to doubt the role of technology and her role as a designer. She found the proposed computationally intensive designs to be somewhat excessive, possibly even futile, in the face of the teachers' more urgent needs [12]. Although technically possible, the technology was contextually inappropriate. Furthermore, the most interesting, but off-point, information disclosed by the teachers had nothing to do with the original design brief and had to be cast aside. Lindquist's experience is symptomatic of a broad conundrum for HCI practitioners and researchers: how do we account for conflicting or even contested perspectives, needs and agendas within the design and study of technological products, services and mediated experiences?

The kind of reflective questioning that Lindquist engaged in is crucial for today's technology-saturated environments and the field of HCI research. Whereas computer technology was once relegated to structured domains such as the office and was readily identifiable ("it's that big black box over there"), today's computational artifacts infiltrate the natural landscape, body, home, and city in less visible and defined manners. Beyond the expanded context of use there is also an extension of the role of technology: giving computers responsibility to facilitate and foster an ever-increasing range of personal and communal experiences such as helping us express emotions, develop intimacy, and even connect spiritually. The growing prevalence of and power afforded to technology in our everyday lives begs for a critical understanding of the current and future place of technology. Particularly, there is a need for a means of accounting for our roles as HCI researchers in shaping and assessing these technologies and the accompanying experiences they bring.

We propose that a practice of reflective HCI provides the means to address this technological flux and the social, political and ethical challenges that confront HCI researchers and practitioners today. Through a reflective stance, HCI practitioners open up what is considered worth designing for and expand the range of methods and attendant theories for designing and assessing systems. A practice of reflective HCI raises awareness of, and at times challenges, assumptions and agendas that are driving the field of HCI but may be hidden or taken for granted. More broadly then, a reflective stance in HCI promotes thinking critically about HCI as a field, and importantly, applying the insights that result from such critical thinking to the design and assessment of computational systems.

In this essay, we sketch an outline of reflective HCI by tracing the growing value and application of reflection in action. Through this discussion, we demonstrate how a reflective stance contributes to and advances HCI research by broadening the possible field of inquiry and effect.

Reflection on design and use

Reflection as a critical practice during the design process, and reflection on the eventual impact of a particular design, are perhaps the most familiar applications of reflection to the HCI community. Reflection on the design of systems and their eventual use, for instance, is a core value of computer-supported cooperative work (CSCW) and participatory design [e.g. 2, 8, 10, 19]. In these domains, researchers and practitioners look not simply at the point of contact between the user and machine, but at the surrounding politics of design, bringing users and designers together in questioning the political and cultural assumptions of technology.

More recently, with the focus in HCI moving beyond the domain of work as the primary site of interest, researchers and practitioners have argued again for the importance of reflection [6, 14]. The importance of reflection is today championed not only by researchers whose goal is to expose the politics of design, but also by researchers seeking to improve the practical utility of their designs. Mankoff [13], for example, describes how web site design for the general population can be improved by reflecting on hidden biases and assumptions that systematically exclude use by people with disabilities. In addition to reflecting on the design and use of systems at the level of the single design case, reflection is also a critical component for HCI as a field of study. As Dourish argued [6], the field of HCI can be advanced through research that is not directed solely at iteratively improving or informing the next round of design. Instead the particularities of a system design or use can lead us to broader reflections about the design space in general. Dourish draws on Suchman's qualification [20] that ethnography seeks to draw out, respect, and amplify local practices rather than solely represent them for the purpose of design.

There is also movement within HCI to reflect on the myriad of methods and theories at play across design cases [5,6,16]. HCI as a field continues to grow by absorbing practices from other disciplines as diverse as cognitive science, anthropology, and art. This diversity provides a prime opportunity for reflection about the original design and use of these theories or methods, how cultural or social assumptions might be built into them, and how certain methods may be adapted in their appropriation. However, although the potential for such reflection exists, the act of such reflection is rarely discussed. For example, in a recent analysis of the uptake of cultural probes in HCI, the authors [4] highlighted how many attributes of the original cultural probes methodology were simply left behind and others were modified, and there was little or no discussion about the possible implications of this selective appropriation.

The reflective stance described thus far has focused on the foundations and spread of reflection on the design and use of systems as a valued activity in HCI. In the following sections, we will explore how this reflective stance is being extended in new directions: from reflection *on* a system and its use to reflection *through* the system and *through* its use. In the first case, we explore reflection as the outcome of a design process, and in the second, reflection as the objective of a designed system.

Reflection through design

One familiar way of conceptualising reflection through design is the reflection-in-action approach described by Donald

Schön in *The Reflective Practitioner* [15]. Schön's descriptions of designers reflecting on and responding to the back talk of the environment continue to be influential to the field of design and design research. In this conceptualisation, the designer is positioned as an improviser dynamically moulding the design brief to the situation at hand. Central to reflection through design is the notion that critical thought concerning the assumptions behind any design process or product, particularly reconsidering prior design decisions and foundational beliefs, has the potential to lead to valuable insights and meaningful inventions of and with computational technologies.

Relatively recent activities, most notably the practices of critical design, have taken this notion of reflection-in-action and advanced it into contemporary contexts and problems, particularly in regards to the design of computational products and services and computationally mediated experiences. The phrase critical design was coined by Anthony Dunne and Fiona Raby [7] at the Royal College of Art in the mid-1990s to set apart a distinctive kind of design practice. According to Dunne and Raby, critical design is about designing products to ask questions, rather than provide solutions; it is about using design to discover and raise issues in society and culture, particularly in relation to design, and to demonstrate those issues rather than resolving them. This conceptualisation of reflection through design is perhaps less familiar to HCI practitioners. Whereas with Schön's reflection-in-action, reflection is a technique for advancing new and better solutions, for Dunne and Raby reflection is a technique for asking new questions. Whereas with Schön the designer is an improviser, with Dunne and Raby the designer is a provocateur.

Critical design exaggerates the reflective practice described by Schön through two primary tactics. First, these emerging practices make the reflective aspects of the design process explicit and bring them to the forefront of the product. That is, the reflection that is often 'backstage' to the design process becomes overtly embodied and referenced in the material manifestation of the designed artifact or system. For example, in Jofish Kaye's Intimate Objects projects [11] the quandary of how to evaluate private personal communications media is made explicit to participants through the unconventional survey mechanisms, such as asking provocative or difficult to answer questions. Second, these practices extend the reflection beyond the design process and the poetics of the artifact to include the socio-technical system that the artifact or system is embedded in. This is evident in The Double Deck Desk designed by Bill Gaver, Andrew Boucher, Sarah Pennington, and Brendan Walker [9], which brings into relief the issues and experiences of the contemporary white-collar workforce.

An important aspect of the agenda of critical design, as expressed by Dunne and Raby, is the desire to employ these tactics not for shock value or for the sake of difference, but to advance the field. As envisioned and practiced by Dunne and Raby, critical design is located within a product design programme and agenda. It assumes and situates design as the mode of critique, emphasising aesthetics (in admittedly a broad sense of aesthetics to include the aesthetics of use in addition to visual appearance). The goal of critical design is to simultaneously broaden the scope of lived experience through design, as well as to broaden the scope of design by extending it to uncommon lived experiences. Likewise, reflection through design in the context of reflective HCI locates the mode of critique in technology. Thus the goal of reflection through design is to broaden the scope of our experience with technology by *inventing* and *developing* prototypes of new applications, modes of interacting with, and contexts of use for, computational technology.

Reflection through design in the context of HCI serves to produce a kind of embodied evidence of the assumptions and practices implicit in the design process and the resulting products. This evidence, in the form of a system, an artifact or even simply a proposal, becomes an object of consideration, that is, of reflection, for those who view it. In this sense, the reflective object begs reflection in the audience. In this way, reflection through design gives way to a discussion of reflection through use – extending Schön's notion of the reflective practitioner to the prospect of a reflective user.

Reflection through use

Whereas the activity of reflecting through design is primarily geared at provoking designers to rethink the design space, the activity of reflecting through use draws users into this critical analysis and questioning of the existing design space and the products that fill it. This is perhaps the newest growth area for reflection in HCI and has been coined as 'reflective design' [18]. There is a history of designing tools to facilitate reflection by the user on different problem spaces (e.g. decision support systems) and there is a history in participatory design of engaging users in reflecting on the design of a particular system. What we mean by systems that provoke reflection through use, however, are systems that are intentionally designed so that through using the system the user is compelled to reflect on its use, design, and implications.

The Influencing Machine by Sengers et al. [17] is an example of a design for provoking reflection by users. The system consists of a mailbox into which users feed emotionally evocative postcards. Based on how these cards are 'read' by the system, different images and sounds are projected into the room that in turn are 'read' by the users. Originally the system was intended more as a kind of critical design artifact as described above – as a way of pushing the limits of affective computing and the perceived capability of capturing emotional valence into code. However, as people began to play with the system, the designers found the users' questions and interpretations set a slightly modified agenda. In particular, users were asking whether or not they were influencing the system in its emotional display or whether the system was trying to influence them and their emotional reaction. Ultimately the designers hoped users would use this question of influence as a springboard toward pondering what it would mean in the first place for a machine to 'have' emotions and what it would mean for a machine to affect them emotionally.

Questioning the line of autonomy between user and system is also the objective of the DELCA project from the University of Copenhagen [3]. DELCA stands for Disembodied Location-

specific Conversational Agents, and consists of an audio voice (and occasionally a small accompanying image) that rides the users' network to offer various commentaries and assistance from a range of platforms such as the PDA, mobile phone, or computer. The DELCAs are designed as auditory ghosts in contrast to the very visual, and proposed autonomy of, existing computerised conversational agents. The DELCA named HALT (a play on HAL9000) is designed primarily to stimulate reflection by users on issues of networking security and surveillance. In other words, as a computer-based entity, the DELCA encourages questioning of its computerised nature: its role, design, and the overall computer environment.

In both of these examples of reflective design, the intention is for users to question the parameters of the design space – in the first case in terms of affective computing, and in the second in terms of ubiquitous computing. Both projects also employ similar strategies for provoking reflection – such as the use of ambiguity in the representation in order to signal to users their role in the interpretive process. Reflective design in general shares many of the same strategies as the practice of critical design discussed above – strategies such as ambiguity, defamiliarisation, exaggeration, translucency, incongruity, and humour. The strategies of critical design must be used with a degree of care, however, in a reflective design object, as the goal is to draw users into the questioning process, as opposed to alienating them by making designs preachy or obtuse. In this way, reflective design – or the goal of promoting reflection through use – sits somewhere in between critical design and participatory design. All three of these areas of reflection, whether on the design and use of systems, through the design of a system, or through the use of a system, demonstrate the spread of reflection as a critical pillar in advancing HCI as a field.

Advancing reflection

The call for disclosing the reflective process as part of the design story was one of the themes in the most recent Reflective HCI workshop [16]. Participants noted how although there is recognition of the value of reflection for the design process and for assessing a designed system in use, there is less of a shared value in disclosing this reflective process in mainstream HCI publications. For example, people may discuss informally how the different procedures of institutional review boards or funding agencies might influence what research gets done and how, but there is rarely room for such a discussion in the publication of a journal or conference article. There is also little documentation of the work that happens throughout the course of a project such as the inevitable trade-offs that are made when the design and evaluation process do not occur according to plan. What is desired instead in a journal article is a clean narrative of objectives, design, evaluation and results. The discussion focuses on what happened, but much of the interesting information, such as why certain methods were chosen over others, is given much less space for questioning. With a reflective stance, however, the messiness of this ancillary information [12] is valued as much as the eventual design.

Beyond adopting a reflective stance we believe that reflective HCI as a distinctive practice should be established and promoted as a standard element within the expansive register of HCI research and education. Regardless of whether reflective HCI remains on the margins of the field, it is a productive component of HCI discourse, contributing to the intellectual as well as material standing and trajectory of the field. The challenge at hand is to discover ways to support reflective HCI within existing structures and to advance reflective HCI through pedagogical forums.

One way to support reflective HCI within existing structures is to establish it as a category within conference and journal publications. Like all categorisation, this would serve to situate the scholarship in relation to other HCI research practices, as well as in relation to a body of external discourses with which it intersects. It would also serve the important function of building a coherent collection of related works to be referenced and extended upon. It is important to note, however, that establishing reflective HCI as a category within conference and journal publications is not reifying the practice of reflective HCI. Just as 'design' is a category that accepts a plurality of methods, techniques, subjects, and outcomes, so too should the category of reflective HCI. Whether or not there is a need for distinctions between reflective assessment, reflection through design, or prompting reflection in use, is unknown and will depend on the future course of reflective HCI as a larger endeavour.

With all forms of research and scholarship, ideas and practices are advanced through education as well as publication. As reflective HCI continues to be articulated and expressed within the academic context, what is needed to further the effort are exemplars of the teaching and learning of reflective HCI. Of course, education and publications reinforce and extend one another: as we publish more our resources for teaching expand, and as we teach more we, and our students, discover the opportunities for substantive research. While the reflective stance is accepted and common in traditional arts-based design education and discourse, it is not so in engineering and computer science education and discourse. This is significant because it is these pedagogies and practices that have, historically, shaped the field of HCI design. As Rick Alterman noted in his contribution to the 2006 Reflective HCI workshop at CHI [1], one challenge to teaching reflective HCI is the entrenched cultures of computer science and humanities departments – both of these cultures often view the other with suspicion. What is needed is an increased effort to integrate these cultures, not to 'dilute' either, but to strengthen both by developing hybrid practices, reflective HCI being key among them.

Conclusion

Although it may be tempting to suggest that critical analysis and practical design are separate domains of practice, at root both involve reflection on the situation and the implications of intervention. Anyone who examines the complexity of an environment before (and after) introducing a new system is reflecting on the design and use of technology. What we would argue is happening with the activity of reflection in HCI, however, is that its value and visibility as an explicitly reflective stance is increasing both in terms of improving practical designs and in terms of advancing the field itself.

In this essay we have explored the foundations of a reflective HCI that began with critical assessment of the assumptions and trade-offs underlying the design process and the evolving implications of use. We suggest that the importance of this critical reflective stance has become even more essential as technology proliferates into ever more intimate and in some cases invisible applications. We have also identified how the practice of reflection on design and use can be extended across individual design cases in order to advance the theories

and methods of HCI as a field. Although all design involves reflection, this reflective practice is not always seen as valid or worthy of documentation and discussion. As such, it is rarely disclosed in formal publications. As the value of reflection increases in HCI we see such contributions as becoming more valued. Finally, we presented two new directions where reflection is shaping new practices in HCI. The first is reflection through design, exemplified by work such as critical design, and the second is reflection through use, exemplified by reflective design. The former uses built systems as a way to critique, question, and in some cases transform the design space. The latter holds these same objectives but also strives to include users in this questioning process.

In summary, reflective HCI is a principled way of critically and productively engaging in all HCI practices whether this is the development of theory, the implementation of a system, or the critique of applications. Through underscoring the value of reflection and its role in HCI, we believe the efficacy of our future designs increases and the potential growth for our field expands. Reflective HCI is not a contrarian position, but rather an approach that advances research and opens the space of possibilities for design activities and informed analysis.

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Interfaces Reviews

We have two interesting books reviewed in this edition.

In the first review, Peter Wright (Sheffield Hallam University) presents his views on the second revised 2007 edition of the book *Interaction Design: Beyond human–computer interaction* by Sharp, Rogers and Preece. James Woudhuysen of DeMontfort University has reviewed the book *Total interaction: theory and practice of a new paradigm for the design disciplines* and raised some interesting thoughts on interaction design and the failure of post-modernism. This second book edited by Gerhard M. Buurman is a compilation of essays by experts engaged in aesthetic disciplines and product design.

On behalf of *Interfaces*, I would like to convey our thanks to both the reviewers, Peter Wright and James Woudhuysen, for sharing their insights on the two books with us.

I hope you enjoy the reviews. Please contact me if you want to review a book, or have come across a book that you think should be reviewed, or if you have published a book yourself recently. I very much look forward to your contributions, views and ideas. Many thanks.

Shailey Minocha
S.Minocha@open.ac.uk

Interaction Design: Beyond human–computer interaction

H. Sharp, Y. Rogers and J. Preece

John Wiley and & Sons Ltd
2nd revised edition
January 2007

The first thing to strike you about the new edition of *Interaction Design* is that it is much thicker than the first edition and the second thing is the abundance of colour plates distributed throughout its pages.

On looking at the contents page, the chapter and section titles look familiar, making navigation easy, but some interesting restructuring has gone on. In particular, the topics of 'Interfaces and Interactions', 'Data Gathering', and 'Data Analysis', which previously had been sections within chapters, have now become chapters in their own right. In addition, the 'Affective Aspects' chapter and 'Evaluation' chapters have been expanded.

The new 'Interfaces and Interactions' chapter now takes a more leisurely tour of WIMP and GUI interfaces, form-filling and so on, and gets down to some detail on icon design with colour examples from Mac OS X. There is an historical slant on this topic, which will give students a sense of what's been achieved, but the colour plates and descriptions of advanced interfaces will give them a real sense of an up-to-date and alive book. The perennial problem of terminology – paradigms, types, styles, genres, or whatever these things should be called, is once again tackled gallantly.

The 'Affective Aspects' chapter deals with issues ranging from expressive interfaces, through users' emotional responses and anthropomorphism, to issues of persuasive technologies. It includes illustrations of virtual pets, avatars and intelligent agents that give it a contemporary feel. It also has a new section on the theories of emotion, affect and experience that are beginning to emerge. One of the issues noticeable by its absence (but this is common to HCI text books more generally, so its hardly a fair criticism) is a consideration of ethical and political issues of social computing and ubicomp technologies. Internet fraud, identity theft, pornography on the web, data trails and the surveillance society, are perhaps hard subjects to deal with, but there is a need for some critical reflection on these issues in the context of the human-centred design of emerging digital technologies.

I value the fact that separate chapters are now devoted to 'Data Gathering', and 'Data Analysis', and that these are separated from both evaluation and requirements. I think this is a great step forward. User research is an integral part of human-centred design, but it has its foundations outside of HCI, and it is a complex area that requires careful and critical attention. The relative value of qualitative and quantitative methods, the difference between *design* research and *psychological* or *social* research for example, are topics that students need to appreciate. The new edition provides a critical perspective on such issues, but also manages to provide detailed help with procedural issues (e.g. how to run an interview, what kind of questionnaire responses to elicit and why, etc.). There are lots of examples and activities that teachers can draw upon to help students to design and run a user-research project.

The 'Data Analysis' chapter provides a useful introduction to principles of both quantitative and qualitative analysis without getting bogged down in detail. Simple but essential distinctions between mean, modes and medians and the idea of means and deviations are conveyed in a commonsense way. The value of graphical visualisations is also demonstrated. Qualitative data analysis is explained simply, and different approaches are highlighted and contrasted. Data coding is illustrated with real-world HCI examples that give it immediate relevance. Various approaches to structuring a qualitative analysis are offered. These include Distributed Cognition and Activity Theory, which provide a link back into HCI theory. Grounded Theory Analysis is also included here. This is a central approach to qualitative data analysis, and it is good to see it explained so well. But for me, it sits strangely alongside Distributed Cognition and Activity Theory.

Like other sections throughout the book, the evaluation section has been extended and improved by the addition of more case studies including the evaluation of cell phones for use by different world markets, the evaluation of affective aspects of interaction, and the evaluation of ambient displays with multiple modes of interaction. The usability testing section provides a detailed description of both lab-based and field testing with many illustrative examples. There is even a box about the thorny question of how many users?

Overall the book is an excellent textbook with a modern feel and an engaging style. Together with the updated

web site, it provides an excellent textbook for those HCI teachers interested in teaching HCI as an interdisciplinary but strongly user-centred discipline.

Reviewed by

Peter Wright
Professor of Human-Centred Design
Art and Design Research Centre
Cultural, Communications and Computing Research Institute
Sheffield Hallam University

Total Interaction: Theory and practice of a new paradigm for the design disciplines

Gerhard M. Buurman (editor)

Birkhauser, Verlag AG
November 2005

In his foreword, Professor Gerhard M Buurman, who runs the interaction design programme at the University of Applied Sciences and Arts, Zurich, says that this book aims to provide a comprehensive definition of the concept of interaction design, and, also, to 'define our solutions'.

Buurman goes on to attack the position on interaction design that, he says, is 'commonly found in the English-speaking countries' as 'confusing'. He argues that Anglo-Saxon interaction design focuses on control of the steps involved in computer use. Conversely, the 'European tradition' focuses on the design-aesthetic dimensions of the problem.

Over 367 pages, a few misspellings are forgivable (e.g. Lev Manovich's otherwise excellent essay on Flash refers to *Lora Craft* on page 73). But this book also displays a sloppy attitude to words, back-up arguments, footnotes and the visual representation of the thematic links between different chapters.

The translators have battled hard to create clarity but have been thwarted by obscurantist, post-modern thought and language. Links to the real world of commercial design are scarce, and instead fierce, brief and elusive assertions are made against adversaries, many of whom are not even named. Footnotes often quote sources from the 1990s, on issues around which there have naturally been important developments since that time. The diagrams setting out the place of each chapter in the whole book are almost unreadable.

For all these faults, the book does contain some genuine nuggets of brilliance. At least Buurman notes that the famed porosity that now exists between different design disciplines means that 'out of our own insecurity, we forge creative yet (mostly) arbitrary links from one subject or branch of science to another'. He is right about the arbitrariness and relativism that now prevails in design, and even in the sciences. And though I might cavil at his insistence that interactivity must be entertaining, it is about 'intelligent, situation-adapted interrelations between systems and users'. Finally, the maxim that form should follow function certainly applies to interaction design, as Buurman says.

In the opening chapter, Michael Friedewald, project director at Karlsruhe's Fraunhofer Institute, also combines brilliance with some highly questionable assertions. He gives a wonderful history of the contributions of Vannevar Bush, Doug Engelbart and Alan Kay to HCI, showing in particular the debt owed by Kay to Marshall McLuhan and Seymour Papert (well, we all have problems).

However, Friedewald is dismissive not just of technological determinism, but also unnamed 'social' determinists, who, he says, are guilty of reducing technology and society 'to a linear system with fixed cause and effect'. Rather, Friedewald insists that we see science and technology 'as a culture with its own rationale of individual development'.

It is left to Kiel aesthetics professor Norbert M Schmitz to show what that means. Echoing the French post-modern sociologist Pierre Bourdieu, Schmitz holds that design is a form of 'symbolic capital'. It is never only about being better and more beautiful, but – 'above all' – about being different and new.

So design is not about progress but rather about difference: it emerged not with the industrial revolution and the development of a division of labour, as one might imagine, but with 'modern science, an independent system of art, capitalism and many other fields of instrumentally rational action in the Early Middle Ages in the cultural centers of Flanders and Italy'. It also emerged 'far back into an era predating the beginnings of modern industrial culture'. And interaction design? It 'can be understood as the expression of a qualitatively new and specific communicative relationship in a post-industrial society'. Thus, much less than industrial design, it is 'less and less tied to location and material costs'.

There we have it. Once one lives in a post-industrial society, there is really no need to think about all the time that is today spent at work developing new kinds of human–computer interaction, or the money equivalent of that time. Instead, all that is solid melts into air. As Buurman says in his own essay,

> The new media-based information and transaction systems enable participatory structures, since they dissolve or minimize the traditional relationships between producer and consumer, author and reader, designer and user. If we are all able to acquire, understand and use these new technologies, there is great potential for creating societies that consist solely of authors, designers, producers and other artistically creative individuals.

In 'Visual perception and virtual worlds', Bern University Professor Bernd Kersten has much more to offer. First, he presents a wonderful illustration of coloured cogwheel-like forms, which fairly make your eyes go loopy. He then gives an excellent treatment of cognition in general, and the role of colour and of the face in particular. Like music specialist Daniel Hug's later chapter on the enormous power of sound in interaction design, Kersten's chapter is recommended.

In this book, the later chapters on special *technologies* associated with interfaces – simulations, chemical reactions, a kind of joystick, and educational robots – are, characteristically, the most impenetrable to this reader. That confirms that, sadly, *Total Interaction* fails in its stated ambition.

For me this is little surprise. Why? Because post-modernism, its language and its innumeracy cannot be comprehensive, any more than it can define real solutions – about interaction design

or anything else. Post-modernism *disaggregates* enquiry. It ridicules the idea of progress. But let Lev Manovich, a professor at San Diego university, put it his way:

> I am not advocating a revival of modernism. It goes without saying that we don't want to simply replay Mondrian and Klee on our computer screens. The task of the new generation is to integrate the two key aesthetic paradigms of the 20th century: (1) belief in science and rationality, emphasis on efficiency and basic forms, idealism and the heroic spirit of modernism; and (2) skepticism, interest in 'marginality' and 'complexity', deconstructive strategies, baroque opaqueness and the excesses of postmodernism (1960s–). At this point all the features of the second paradigm have become tired clichés. Therefore a partial return to modernism is not a bad first step, as long as it is just a first step toward developing new aesthetics for the new age.

I might not go even the limited distance that Manovich goes, here, in defending modernism. I also think, and am sure Manovich thinks, that interaction design must mean more than just aesthetics. But it is about time that everyone, from the artistic academy onward, took Manovich's words seriously, and sounded the death knell of post-modernism.

Reviewed by

James Woudhuysen
Professor of Forecasting and Innovation
De Montfort University
Leicester

www.woudhuysen.com

View from the Chair

Is technology helping?

Russell Beale

I have been wondering if technology is helping us, or not. A colleague recently told me that using email during the day equates to about a 10 point reduction in IQ, because of the interruption and change of focus and reduced concentration time – and whilst I can't find the source to back this up, it wouldn't surprise me. Now, whether it's actually true for a younger generation, more used to technological multi-tasking, is another issue, but it's certainly an indication that technology causes problems as well as solving them.

It has its successes: for example, I am in love with my Sky+ box – the ability to record programmes easily onto the hard disk, to have them listed onscreen and play them back whenever I like – has given me a lot of time back. I can have a full weekend away, then watch some key programmes when I get back late on Sunday. I can pause live TV and deal with some urgent email, or a phone or Skype™ call, and then resume it later, having missed nothing. And it works because it's easy to use. Now, I liked the Tivo® system, which was much the same but also learned your viewing preferences and would choose to record programmes it thought you might like. Much more a success in the US than here, I think it failed on marketing and investment grounds, not on those of functionality. But this is not about the triumph of the well marketed and funded over the potentially better technologies: the point is that a very useful system has found its way into my house, and I like it, and it helps me manage my time.

But everywhere there are examples of technology making our lives more complex. My mobile phone now does everything you could possibly wish – except make phone calls reliably. I have had a mobile phone since the bricks first made an appearance, and one needed to carry a rucksack just so I could move the phone around easily – if I dropped it into my trouser pockets they either fell down, or crippled me if I tried to sit. I like mobile phones, or at least, the freedom to work from wherever you happen to be – but being able to actually make a call is a prerequisite. I had a conference call on Friday, and my phone crashed and rebooted four times during the call. Harold Thimbleby makes the point that technologies move so fast that companies never get to second or third generations in which problems are ironed out – the market has moved on and they offer another new one, with a new set of problems that users will be exposed to.

My mobile phone now does everything you could possibly wish – except make phone calls reliably.

But I think the real problem runs somewhat deeper. Technology makes it easy for me to check train times from my sofa, or book flights to conferences – and yet in the old days, I'd ask a travel agent to do it and actually spend less time doing it myself. In our department, we have a system by which we bid for travel and conference funds from a resourcing committee, who vote on our applications. The problem is, it tends to disintegrate into a competition to find the cheapest travel deal, or else someone on the voting committee pipes up with "well, I found that flight 36p cheaper at www.ivenotgotalife.com" rather than assessing the actual merit of the conference. It seems that technology has allowed us all to do more – but also it is now expected that we will also do more ourselves, and so it has probably added to our loads. Someone once asked me what one thing would improve the quality of my life, and I gave an okay, but not insightful, response. But now I have the answer – someone to delegate many of the tasks that technology has foisted onto me to. Now that would be lovely.

Russell Beale leads the Advanced Interaction Group in the School of Computer Science at the University of Birmingham. His research focus is on using intelligence to support user interaction. Before returning full time to academia and research in 2003, he co-founded, ran, or worked for various internet-related companies.

Russell Beale
R.Beale@cs.bham.ac.uk
Advanced Interaction Group, University of Birmingham

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Chair Janet Read

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IFIP Liaison Phil Gray

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Regional Liaison Daniel Cunliffe

Events Sub-group

Chair Anxo Cejeiro Roibás

Conference Planning Fintan Culwin

European Conference Liaison & Planning vacant

HCI2007 Chairs Tom Ormerod & Corina Sas

HCI2006 Chair Nick Bryan-Kinns

Meetings Officers Colin Venters
Fausto J Sainz Salces (SR)

British HCI Group committee members (alphabetical listing)

Jesmond Allen • tel 01179 020301 • mob 09731 731757 • jesmond@jesmondo.co.uk

Russell Beale • University of Birmingham • tel 0121 414 3729 • fax 0121 414 4281 • R.Beale@cs.bham.ac.uk

Ian Benest • University of York • tel 01904 432736 • fax 01904 432767 • ian.benest@cs.york.ac.uk

Gerred Blyth • Amberlight Ltd • tel 0870 7399900 • gerred@amber-light.co.uk

Nick Bryan-Kinns • Queen Mary University • tel 020 7882 7845 • nickbk@dcs.qmul.ac.uk

Catriona Campbell • Foviance • tel 0207 843 6700 • fax 0207 843 6701
catriona@theusabilitycompany.com

Jarinee Chattratichart • Kingston University • J.Chattratichart@kingston.ac.uk

Gilbert Cockton • University of Sunderland • tel 0191 515 3394 • fax 0191 515 2781
Gilbert.Cockton@sunderland.ac.uk

Fintan Culwin • South Bank University • tel 020 7815 7434 • fax 020 7815 7499 • fintan@sbu.ac.uk

Daniel Cunliffe • University of Glamorgan • tel 01443 483694 • fax 01443 482715 • djcunlif@glam.ac.uk

Andy Dearden • Sheffield Hallam University • tel 0114 225 2916 • fax 0114 225 3161
a.m.dearden@shu.ac.uk

Alan Dix • Lancaster University • tel 07887 743446 • fax 01524 510492 • alan@hcibook.com

Jonathan Earthy • Lloyd's Register • tel 020 7423 1422 • fax 020 7423 2304 • jonathan.earthy@lr.org

Dave England • Liverpool John Moores University • tel 0151 231 2271 • fax 0151 207 4594
d.england@livjm.ac.uk

Phil Gray • University of Glasgow • pdg@dcs.gla.ac.uk

Kate Ho • University of Edinburgh • tel 0131 650 4412 • K.L.Ho@sms.ed.ac.uk

Joanna Bawa • editor@usabilitynews.com

John Knight • John.Knight@intiuo.com

Rod McCall • Fraunhofer FIT • rodmc@acm.org

Tom McEwan • Napier University • tel 0131 455 2793 • fax 0131 455 2727 • t.mcewan@napier.ac.uk

Barbara McManus • University of Central Lancashire • tel 01772 893288 • fax 01772 892913
bmcmanus@uclan.ac.uk

Dianne Murray • tel 0208 943 3784 • fax 0208 943 3377 • dianne@soi.city.ac.uk

Amir M Naghsh • Sheffield Hallam University • tel 0114 225 3195 • A.Naghsh@shu.ac.uk

Dale Richards • QinetiQ Ltd, FST • tel 01252 393896 • fax 01252 392720 • drichards@qinetiq.com

Janet Read • University of Central Lancashire • 01772 893285 • jcread@uclan.ac.uk

Anxo Cejeiro Roibás • University of Brighton • tel 01273 642458 • fax 01273 642405
a.c.roibas@bton.ac.uk

Fausto J. Sainz Salces • Liverpool John Moores University • tel 0151 231 2082 • fax 0151207 4594
cmsfsain@livjm.ac.uk

Andy Smith • Thames Valley University • tel 01753 697565 • fax 01753 697750 • andy.smith@tvu.ac.uk

Colin Venters • University of Manchester • tel 0161 275 1384 • c.venters@ncess.ac.uk

Robert Ward • r.d.ward@hud.ac.uk

Peter Wild • University of Cambridge • pw308@cam.ac.uk

Adrian Williamson • Graham Technology plc • tel 0141 533 4000
Adrian.Williamson@GrahamTechnology.com

William Wong • Middlesex University • tel 0208 411 5000 • fax 0208 411 5215 • w.wong@mdx.ac.uk

KEY
Bold entries indicate members of the Chairs and Officers Group
SR: student representative

Interfaces magazine

Editor John Knight
Reviews Editor Shailey Minocha
Production Editor Fiona Dix

Editor Interacting with Computers

Dianne Murray

BCS Contacts

Rachel Browning, Rachel.Browning@hq.bcs.org.uk
+44(0) 1793 417416

The British Computer Society
First Floor, Block D, North Star House
North Star Avenue, Swindon, UK, SN2 1FA

Tel: +44(0) 1793 417417
Fax: +44(0) 1793 480270
Email: hci@bcs.org.uk

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