

Interactive generative design: A living language?

Sally Beardsley

Interaction designer

Euro-China Exchange:

Technology and Culture of Generative Design Approach

AsiaLink Seminar on Generative Design

The Italian Embassy, Beijing

14 – 16 April 2004

This is the Great Rift Valley in Northern Africa, where we think that man was born. About 1.8 million years ago, an early *hominid* – man’s ancestor – picked up a stone here and fashioned it into an tool, and we have been interacting with technology ever since.

With any piece of technology in hand – be it an axhead or a mobile phone – the challenge facing a user is... how to use it?

The user asks, "What is it? How do I make it work?"

The manufacturer asks, "How do I manufacture it? How do I design it? How do I conceptualise it? What should it do? Who is the user?"

The user begins and ends this scenario, and, in fact, the user is absolutely central to interaction design. How a user will experience a technology – or a building or a city! – depends entirely on the quality of his or her interaction with it.

Interaction design as a profession has been evolving over the last 20 years – and has moved product interface design *away* from engineering. But even today, many companies still think of user interaction as an afterthought, to be tacked on at the end of the product development process.

You can see this in city planning and buildings, too, as well as in products: we’ve all experienced architecture that makes us feel uncomfortable, disoriented, frustrated, demoralised, depersonalised, desolate, or even trapped.

And when we feel uncomfortable with man-made objects, it is a *design* failing – the designer has been too *detached* from the user experience.

The designer, the user and the product (or building) are not separate – they are part of a single, integrated process which is constantly moving backward and forward in time. With interaction design, the starting point – not just the end point – is the user. The designer learns *from experiencing the user* and works *for the experience of the user*. The vehicle of dialogue is the created object, which establishes a constant feedback loop. (Don’t you sometimes find yourself thanking – or cursing – the designers of products or buildings you enjoy, or don’t enjoy?)

In Scandinavia we have a tradition of user-centred design and user participation, where the user of the product is actually part of the design process. We see users as a great source of knowledge, wisdom and inspiration, and we try to treat them with respect, not indifference.

Interaction design is, by nature, multi-disciplinary and team-oriented. In the old days, engineers controlled the interface, but now you will find psychologists, sociologists, philosophers, anthropologists and even artists sitting together with designers and technical people on a project team.

Since the heart of interaction design is the user, this means that designers must develop a keen understanding of what it means to be human – and of the uniqueness of each human being.

One of the essential skills of an interaction designer is empathy.

“Empathy: The power of entering into another’s personality and imaginatively experiencing his experiences: the power of entering into the feeling or spirit of something... and so appreciating it fully. (Greek: *en*, in, *pathos*, feeling)”

The French philosopher Edgar Morin says it well:

**“If you have an understanding of complexity,
you have a sense of solidarity,”**
*“Si vous avez le sens de la complexité,
vous avez le sens de la solidarité”*

The complexity of life in the 21st century requires that *we who are shaping the future* must develop a keen sense of empathy, both for people and for the natural environment.

.....

It sometimes seems that we’re drowning in technology, and the manufacture of material goods is exploding worldwide – certainly nowhere more than here in China! We designers are faced with two extremely important challenges:

- How do we design an interaction with technology which is human-centred and which recognises and *respects* cultural differences?
- How do we design, build and manufacture material objects with intelligence and foresight, so that the human-created world does not destroy the very basis of our existence – the natural world?

I hope that generative design can help us with both these challenges. But at this point, I have more questions than answers!

To try to connect the application of generative design to interaction design, I've been looking at some words which Prof. Soddu uses to describe generative design. For example:

"identifies a genetic code as the idea of artificial worlds"

"unique non-repeatable events"

"the generating idea is identified as a subjective visionary proposal of a possible world."

"code of harmony"

"contains some rules that trace certain forms of behaviour

"not a sequence, not a database" (i.e. not a formula) "but a definition of behaviour patterns."

"the design act changes from forming to transforming"

In addition, from a paper by Professors Soddu and Colabella:

"The myth of the optimization of a product has been debunked.

We cannot identify a given design result as 'necessary' once we have discovered the role of the subjectivity in designers and customers."

And "...rediscover the possibility of linking the object to different human individuals, and to their diversified exigencies"

These thoughts have given me two associations:

One is with human language, which is diversified, individual and generative.

The other is with Howard Gardner's theory of multiple intelligences (or competences), which explains why and how people develop different "strategies" for interacting with the world – also here, a one-size-fits-all "optimisation" is a myth!

Studies in neuroscience have shown us that human perception is an active process, not a passive one: we don't take things in – or even remember things – as fixed blocks of information. Our minds are always in flux, interacting with sensorial input, and we continually re-create our reality, our world.

As neuroscientist Gerald Edelman says,

"Every perception is an act of creation."

No *brain event* ever happens in the same way twice.

Again, our memory is dynamic, not static!

Similarly, Steven Pinker maintains that children actually *reinvent* language, generation after generation. Each person's use of language is, in effect, unique.

Gerald Edelman tells us that,
“The human brain is the most complicated material object in the known universe. A 3mm sq area of the brain contains 1 billion connections that can combine together in 10x several million ways...

If you start to count all the connections in your own cortical sheet right now, you will finish in about 32 million years.”

We humans have an extraordinary ability to interact with the world, to navigate the multiple layers of meaning with which we live. How successfully we do this depends on our perceptual skills and our experience of any given situation.

We develop operational languages which allow us to “converse” with the physical world. These might be external and communal, like traffic lights; or internal and particular, like rituals for starting the day.

And each brain, each mind, is different. How can we possibly personalise an interface, so that each interaction design is unique to a particular user? The permutations are staggering. I’m not sure we *can* create totally individual interfaces, even with generative design tools.

On the other hand, we must remember that interaction with the world is a kind of language (You’re probably all familiar with Christopher Alexander’s work with Pattern Languages, and these principles are also being applied to product interaction design. See ‘The Interaction Design Patterns Page’:

http://www.pliant.org/personal/Tom_Erickson/InteractionPatterns.html).

We “converse” with the objects of our technology, and the language we use is sometimes shared, and sometimes highly individual.

Think what happens when you pick up your mobile phone. You pick it up with intention, and you silently ask it a question: Any calls? Any messages? It responds when you touch it or talk to it in the correct way. If you want to add a new number to the address book, it “talks” you through the process.

Good interaction design anticipates the user’s wishes at every turn. It makes the object a kind of “partner”, or at least gives it a feeling of familiarity.

Our conversations with any electronic product are partly silent (thoughts directed at the product); partly predictable (menu choices); partly interactive (keying in information); partly tactile (our fingertips “remember” key positions); partly visual, partly aural... there is a very rich world of 2-way communication even in a relatively simple object like a mobile phone.

2-way communication permeates our world – in fact, it’s what makes the world go ‘round. Biologists will tell you that even bacteria appear able to take in information and modify their behaviour appropriately.

Some of the most powerful communication in our own species is not through the spoken word but is purely physical and spontaneous: the tenderness of a hand, a delighted smile, a shocked expression, a flood of silent tears.

Paul Ekman's studies of facial expressions show that there are over 10,000 different muscle combinations in the human face, 3,000 of which are meaningful, and the configurations on the face for emotion – for the seven basic human emotions – are quite universal.

Generative interaction design might incorporate the multiplicity of human communication modes – beyond language and symbols – taking account of our rich sensorial capabilities, as well as our built-in capacity for quickly “scanning” and understanding physical phenomena and relationships.

For instance, we are *born* with the ability to categorise objects – to organise the world into different, separate things. We humans also have an in-born understanding of cause and effect: if you roll a ball behind a screen, a baby will automatically turn its head because it knows the ball will roll out again at the other end. Even for babies, movement is understood to *cause* change, and babies also start out with some knowledge of proportion and distance relationship.

As human beings we have an immense capacity for interacting with the world – our interactive “vocabulary” is endless.

Could generative design recreate the process of *knowledge acquisition* in a developing child, giving us hints for designing interaction with a *developing world* that has become exponentially more complex? In an evolutionary sense, human language *had* to be generative, because the world is constantly changing; perhaps the language of interaction with technology will have to be generative, too.

Returning to Howard Gardner: With the help of generative design, could we possibly evolve styles – or *families* – of interaction, based on the *differences* between human competences or kinds of intelligence?

Howard Gardner, in his studies of child development, observed that children understand and solve problems in categorically different ways, shattering the notion that there is only one kind of intelligence, and that a person is “more” or “less” intelligent. He has distinguished eight different forms of human intelligence, indicating that each person has a particular mix of these competences, and the way we interact with the world is determined by our own unique mix. Could generative design help us to configure an interface particular to the cognitive “style” of a user or a group of users?

These are Gardner's eight "intelligences":

- 1 Verbal-Linguistic
- 2 Logical-Mathematical
- 3 Kinesthetic (movement)
- 4 Visual-Spatial
- 5 Musical
- 6 *Interpersonal* (directed toward other people)
- 7 *Intrapersonal* (directed toward one's self)
- 8 Naturalist

Let's say we need to design your own *personal interaction* with a home entertainment system connected to the Net. If you have a predominantly visual-spatial intelligence, you will want to store and access music clips or films in a very different way to someone who has a predominantly logical-mathematical intelligence. If you have a predominantly musical intelligence, you might want to scan sound clips instead of written lists, which would appeal more to a person with a predominantly verbal-linguistic intelligence.

The generative design idea of "uniqueness" would recognise and make use of these cognitive differences in the way we see the world.

How would generative interaction design affect the client-designer relationship – already complicated because designing interaction with technology requires many steps, *starting* with user studies and *ending* with user studies. This is a very time-consuming process, which companies often want to cut short for short-term economic reasons. (Long-term, a product is always most successful when it's easy to use).

If individual interfaces can be generated, this raises the problem of user evaluation – there would have to be some kind of general testing to make sure that the "species" worked well, even if the "individual" was a unique variation.

The generative interaction designer will be a visionary, capable of imagining (with the project team) the "idea" of the interaction; the client will need to articulate what he wants the product to offer, and the ways in which he wants the customer to succeed; the generated interfaces will need to be tested; the client will need to have a deep understanding of the whole process – so the designer will also need to be a teacher!

And because any interaction is composed of a series of events, always dynamic and often unpredictable, there will need to be a new methodology for evaluating the viability of generated interaction designs. As we move into the use of sensorial recognition technologies – using our senses to interact – this process will become increasingly complex.

.....

Finally, I'd like to share with you my own personal wish for the practitioners of design, generative or otherwise.

As our human experience becomes more and more mediated by technology, and as our *traditional* creative territory is overtaken by computer intelligence, we will need to be acutely aware of what constitutes a human being, a human life, a human experience – in order to design spaces in which the 'human' can evolve, along with the 'technological'.

Now, for this question – what it means to be human – I've started with the *biology* of being human, and I've found wonderful inspiration in the work of the neurologist Antonio Damasio, author of *The Feeling of What Happens*.

Of course, what lies at the very root of our humanity is consciousness – not in the sense of *wakefulness*, which all creatures share, but in the sense of *being aware*...

...and specifically, being *aware* that we are aware.

Damasio, one of the world's leading experts in the physiology of emotions, believes that consciousness arose in evolution in order to help the organism cope with environmental challenges not predicted in its basic design.

Imagination – the ability to foresee, to plan, to envision, to create, to dream – is linked, *through consciousness*, to the basic, unconscious functions of the organism – those functions which maintain steady internal states, or *homeostasis*.

About 90% of what we do every day is carried out by a kind of automatic, unconscious system which is concerned with pure survival.

As the world becomes more and more automated, with electronic devices and software programs replacing much of our customary mental activity, and leaving our minds free for... something else... we may find that our "conscious self," which arose in evolution in order to help the organism cope with unpredictable environmental challenges, is now required for...something new.

Antonio Damasio writes that civilisation is the main consequence of consciousness. He says that...

"To some extent, in a variety of imperfect ways, individually and collectively, we have the means to guide creativity and, in so doing, improve human existence rather than worsen it. This is not easy to achieve; there are no blueprints to follow; the successes may be small; failure is likely.

And yet, if creativity is directed successfully, even modestly, we will allow consciousness, once again, to fulfil its homeostatic, regulating role over existence. Knowing will help being."

Damasio explains:

“At its simplest and most basic level, consciousness lets us recognize an irresistible urge to stay alive and develop a concern for the self. At its most complex and elaborate level, consciousness helps us develop a concern for other selves and improve the art of life.”

Is it too much of an extrapolation to suggest that consciousness *as a species* is essential at this point in human history for the maintenance of a stable state within the species and, in fact, the global society and ecosystem itself? And that it is still *human* – not computer – *creativity* that is the key to success?

Let's hope that, as an extension of human creativity, generative design can help us *understand* and *interact* with the dauntingly complex world we are now creating. To do this successfully, generative design must reflect not only the *structure* of human life, but also the *strategy* of human life. It must enrich that absolutely *vital* part of human consciousness that is ... imagination.

References:

Damasio, Antonio, *The Feeling of What Happens: Body, Emotion and the Making of Consciousness* (London: Vintage Books, 2000)

Edelman, Gerald M., *Bright Air, Brilliant Fire* (New York: Basic Books, 1992)

Gardner, Howard, *Frames of Mind* (New York: Basic Books, 1993)

Gopnik, A., Meltzoff, A. N., and Kuhl, P.K., *The Scientist in the Crib: What Early Learning Tells Us About the Mind* (New York: HarperCollins, 2001)

Pinker, Steven, *The Language Instinct* (New York: William Morrow and Company, Inc, 1994)

Articles:

On Paul Ekman: Malcolm Gladwell, "The Naked Face," in *The New Yorker*, 05.08.2002

On Edgar Morin: (my interpretation from the French), UNESCO Round Table: Dialogue among Civilizations, United Nations, New York, 05.09.2000