

State of Technology Conference on Mobile Wireless Technologies for Persons  
with Disabilities – May 11 & 12 2004, Atlanta GA.

## **“We are the music makers”**

Keynote Speech Prof Alan F Newell, MBE, FRSE

It is a great honour to be asked to give this keynote speech, immediately after Greg Vanderheiden, who I have known for 28 years and it is interesting that we both decided to speak on roughly the same topic.

As part of my preparation of the notes for this speech, I re-typed a list of the main points, including the important roundtable discussion with its section about the engaged customer – both of which seemed important to me. Unfortunately my typing skills were not up to the task, and I found that my new programme included a “roundbale” discussion group, but I thought that there could be advantages in this type of discussion. Later on my typing produced the “enraged customer”, which again I felt was a much more appropriate description of many disabled people who had to interact with technology. I thus suggest that, if we want to address the real issues of mobile wireless communication, we should organise a “roundbale of enraged customers”.

This conference has been told that mobile wireless communication has great potential in transmitting gigabytes of data from anywhere to anywhere, no matter how remote, and this can only be a good thing for disabled people. Contemplating some of the predications on the effects of this massive explosion of data, however, I was reminded that medieval monarchs in Europe used to employ a “fool”. The job of the fool was to bring to the monarch’s attention unpalatable facts which no one else was prepared to articulate. I propose to act as “the fool” at this conference. I am sure that mobile wireless will produce greatly increased data which will become available to many people most of the time. Note that I do not use the term “everyone”. This term is often used in discussions of this type, but is inevitable a gross misrepresentation of the situation – “everyone” is usually a reference to about 50% of people in the developed world, most of whom are young and able-bodied.

I want firstly to consider how access to such virtual data compares with a human being’s experience of interacting with the real world. To illustrate this I want you to try and really appreciate what is your full sensation of being here at this moment in time. I want you concentrate on the sensual (in the correct sense of that term) experience of sitting here - sight, sound, smell, taste, touch. Look around. Really listen & feel. What are the important sensations? What can you

see out of the corner of your eye, what sounds can you hear? Consider the many ways you can communicate with others in the rooms. What messages are you sending to them?

Now transport yourselves to the brave new world when mobile wireless technology will enable you partake of this conference from your office or home via your P.C., or even via your mobile phone on your yacht, or walking down the street. What is going to be your interface to this world – how small is the screen? how many pixels are on it? how good is the earphone? how many buttons are there on the keypad? how close is the microphone? How would using a mobile phone to interact with this conference relate to your relationship with the real world here and now, and will your concentration on the virtual world mean that you would be run over or capsized and drown? [This is no idle threat - it is safer to be drunk whilst driving than using a mobile phone, including a hands free one].

Even when it is working well, your mobile wireless interface will have produced very severe tunnel vision, your hearing will be impaired, you will have no feeling in your skin, you will have lost your sense of smell, and you will be very lucky to be able to send the speaker a text message let alone anyone else in the room. No longer can you raise your eyebrows to someone at the other side of the room, or whisper in the ear of your neighbour to arrange an assignation after the talk. A very impoverished experience. If Shakespeare lived today, Hamlet might have said that “there are more things in heaven and earth Horatio than can be accessed via our mobile wireless technology”.

What is the problem? There is an incredible virtual world out there - full of data, radio waves galore, but we are constrained by our ability to transfer that virtual world of radio signal to our internal consciousness. Current mobile wireless technology creates a window on the virtual world which is very much less effective than our interface to the real world, and this situation is unlikely to get very much better in the future. We must live with that realisation, and decide ways in which we can – in the words of the theatre – “suspend our disbelief” and consider how can technology help us to do this.

I liken the current internet to a mountain - it is wild, untamed, unpredictable, amazing, frightening – the view from the top can be magnificent, but it is a great struggle to get there. Mobile wireless will provide us with even more accessible mountains. Will these be - just like real mountains - ugly, inhospitable, dangerous spaces? Imagine having pornography, adverts for Viagra and requests from nephews of Dictators with a spare 15 million dollars sent to you all the time regardless of where you are or what you are doing. Add to this all the

legitimate emails which our friends and colleagues will insist on sending us (The horror of the inbox after a few days absence!).

But I love mountains and go there for leisure – the internet is something I put up with and only use when I need to. We need to remember that the “beauty of mountains” was a cultural construct of the Romantics in the 19<sup>th</sup> Century, and it was only after the Romantics re-badged mountains as beautiful sublime places that people learnt to love them. Perhaps this will happen to mobile wireless, but that world will need to be described in a way which is acceptable and accessible to the public not just to technocrats. John Gill commented that “customers are not interested in the technology behind mobile wireless”. We “experts”, however, do tend to describe its benefits in a way which only a graduate student in technology can understand. We need methods for changing the face of this mass of data – most of which is either disgusting or useless or often both - and we need “Romantics” of the virtual world to sell the concept.

We also need to ensure that old and disabled people benefit from the technology, and that we do not repeat the mistakes of the past. That last great technological revolution “Windows” was a great leap backwards as far as blind people were concerned. {Blind people, who had been very efficient workers, were sacked because they could not use the new technology}. It took several years to recover from this situation, which we have heard has been repeated with the introduction of screens on mobile phones.

The use of Power Point within lectures can be very powerful, but it provides yet another visual input for deaf people which may detract from their watching a sign language interpreter or a real time transcription. There are no built in guidelines for making such slides accessible to able-bodied people let alone those with disabilities. It is so easy to create inaccessible, confusing and illegible slides. It is also interesting to note how much support this technology needs, and, even with this support how many problems can arise with this allegedly mature technology during a single conference.

There are many historical examples of where the introduction of technology has not been a major success as far as disabled people are concerned. So, although we have heard many ways in which mobile wireless can support older and disabled people during this conference, we need to look carefully at these amazing possibilities of data provision to people and consider what challenges there are in ensuring that this data does actually support people, especially disabled people, in the activities in which they wish to partake.

There is a real challenge in communicating information, or knowledge, rather than data, to people and between people. The good news for this conference is that rehabilitation engineers have been addressing the problems of people with communication dysfunction – both input and output for many years, and have many successes. The first users of interactive text messaging were deaf people using second hand teletypes and they found it invaluable. Disabled people were the first people to transmit alphanumeric data using reduced keyboards, the first group who used menus to enhance searching via reduced keyboards, and who used speech output seriously. They were the first group who used predictive systems to improve keyboarding. It took mainstream engineering many years to appreciate these good ideas (text messaging was not even deliberately designed into mobile phones – it was a side effect of network management facility). So we have a head start in terms of experience in getting the best out of human interfaces, and we have experience in the design of simple and accessible interfaces. Interfacing effectively to wireless mobile, however, is still a great challenge, and it is an even greater one to ensure that this can be done by older and disabled people.

Human beings exist by being able to filter data they do not need and they can do this very effectively in the real world (the cocktail party effect; scanning a newspaper). People have enormously effective filters for real world data. Huxley claimed that the human mind was mainly an information filter. He also found that LSD suppress these filters so that all sense data seems equally important – but this made normal life impossible. The virtual world currently seems to be operating with a high level electronic LSD. Google is one antedote, for text – but not for sound or pictures, or smell or taste. Also solutions such as Google are fine when you know, more or less, what you are looking for, but they are less useful for browsing [which makes it amusing that browsers are called browsers – it being the one function which they cannot help with]. In this respect, it is salutary to remember that inventions occur because people notice the unexpected - something they had not been searching for. You could argue that finding something you don't want happens all the time with internet searches – but this usually causes immense frustration, and I have never yet had a serendipitous moment on the web.

The problem with many technologists is that they often make the mistake of assuming that anything which requires physics is inherently difficult and anything which requires knowledge of human behaviour is trivial. In the 60s the phrase “flying to the moon” implied something was impossible, whereas, at that time, “experts” claimed that the outstanding problems of speech recognition would be solved in 2 years time and that there would be enormous markets in 5 years time. This same prediction has been made for speech recognition technology

approximately every five years since then. It was last made yesterday at this conference ! You will also recall Bob William's call for "transparent, easy to use interfaces for disable people". This is particularly ironic considering most interfaces to mobile wireless devices provide significant challenges even to those people, who are at the peak of their intellectual and physical abilities, whose only impairment is being over 25 years of age. We need substantially less data and possibly an order of magnitude reduction in functionality in many of our communication and information technology systems at ensure that the majority of people, including older and disabled people, are going to be able to use them effectively.

The problems of interfacing with real people is only partially a physics problem – it is mainly a problem of really understanding how human beings work. It is actually a hard problem and needs an interdisciplinary approach. But many in the engineering community will perceive such projects, which do not depend on hard physics, to be either trivial or not very important. So don't expect much support if you embark of this field of endeavour.

In addition, this might seem to be boring, but it is important to work towards providing practical solutions to real problems, which do not actually require magic. John Hockenberry talked about the people who persisted in offering him "Jet Packs" as solutions to his problems - complex, high tech devices which were not only unrealistic, but did not solve the problems he actually had. A colleague of mine who is blind was discussing the latest research into navigation – some very exotic technology, and made the comment "I can find the hotel from the railway station that is not a problem, but I cannot find my way back from the hotel restaurant to my bedroom". Almost no one was investigating that problem, possibly because the engineers did not realise it was a problem or they did not have a realistic solution. Also the problem was perceived as "trivial" because, unlike wide area navigation systems, it did not seem to require hard physics.

It is also really important to be radical - a number of things I have worked on were considered to be entirely misplaced when I began. I suppose if I have learned any lessons in my life it is perseverance in the face of odds.

In the late 1960s, and early 1970s, the whole of the Augmentative and Alternative Communication (AAC) field was attacked on the basis that technological devices may discourage non-speaking people from learning to talk. Some Speech and Language Therapists were even sacked because they were not concentrating on improving the speech of their clients. That battle was finally won, and it was proven that natural speech would increase with the use of AAC devices. But even after that change, the work in Dundee in the 1980s, on

prediction, re-usable conversation and story telling within devices for non-speaking people, was criticised by many prominent Speech and Language Therapists. It was five years before these therapists realised the advantages of reusable conversation. Now versions of this technology appear in most communication aids in one form or another. [Our most recent work at Dundee is examining how we can introduce humour into AAC devices for children].

Being radical and going against received truth can be exhilarating, and fulfilling in the long term, but it not likely to endear you to the funding agencies. Also , when funding is tight it is the radical ideas which are sidelined. I thus implore the RERCs to ensure that they shield their youngest and brightest researchers from the need continually to justify what they are doing to external agencies. Do not expect to be applauded for your early attempts, but, if your work is sufficiently radical, it may make a real change to our interaction with the virtual world.

So what are my messages to you. A real challenge for mobile wireless is to *reduce* the data which is transmitted to the user and to find ways in which such information can be *filtered* and *presented* to the human being in an effective and efficient way, without further disabling their interaction with the real world. The vital issue is the interface.

Experience would imply that main-stream designers do not have the background, expertise, and in many cases interest in including the needs of disabled people in their design philosophy. We, who focus our design efforts on disabled people, are, I believe, more likely to make a more significant impact on human interface design for everyone that those who focus simply on the requirements of able bodied people. Remember, it was a consideration of the needs of disabled people which produced the cassette tape recorder, the typewriter, the fountain pen and the ball point pen.

There is a great future for our work, and as a prelude to this future I offer you words written by Arthur O'shaughnessy in the late 19<sup>th</sup> century

We are the music makers  
We are the dreamers of dreams.  
Wandering by lone sea-breakers  
World losers and world forsakers  
On whom the pale moon gleams.  
We are the movers and shakers  
Of the world for ever, it seems.

