

GEOFFREY BOULTON: Good evening everybody and welcome to the Royal Society, my name is Geoffrey Boulton, I chair the Science Advisory Group, and my first responsibility is simply to say welcome, it is good to have you here, we are very pleased to see you, and I look forward to an interesting discussion. These PolicyLabs are regular events; we run about six or seven a year. They are primarily designed to get people who are in relevant and related areas of policy to talk to each other, particularly where sometimes the communication isn't as good as it ought to be, and of course we want to have those who advocate policies, and are interested in particular areas of social and scientific concern and also those who have some responsibility for delivering policy. That is one of the reasons why at the end of the session we have a networking exercise together with a little something to drink and something to eat, which is primarily designed to permit you to make the links that otherwise you might not be able to do.

The society has been involved for a number of years in areas that relate to disability. There is a science technology, mathematics disability group, primarily designed to identify ways in which, particularly students with disability, are supported and enabled better to be able to study with effectively with their peers. It is one of

the domains where the Society has been very active. The purpose of this meeting is a much broader one. Our committee, our science policy advisory group, about a year ago, partially I think in response to the excitement and enthusiasm which had transpired as a consequence of the London Olympics, and the Paralympics in particular. We wondered whether now would be timely to ask questions in a rather different sort of way, we try to do. We spoke with representatives of disability groups, and said, "Where do your priorities lie?" we then circulated a questionnaire to get a broader view of where priorities might lie. And the priorities came out with really two principal issues. Firstly, the principle of access, to be able to access both places and services that sometimes disability inhibits. And secondly, the issue of inclusion, in other words ways in which science and technological developments might be able to address those issues or the barriers that prevent those with certain disabilities from being included readily and easily in the societies of which they are naturally part. So we decided that for this PolicyLab, rather than having a bunch of experts, scientists, technologists, standing up here and telling you what you ought to think, we thought the sensible thing would be to say look these seem to be two of the key priorities for those elements of the disability community

we have talked with, those of access and inclusion, and we would now like you to give us presentations about ways in which you believe those two key issues can be addressed. And what I then hope is in the discussion that will follow; we will get a strong response from the floor, in particular, addressing the question about the extent to which the presentations you have heard do really address in an effective way these two key issues of access and inclusion. So, in a sense we are looking for a user-driven dialogue, rather than, if you like a provider-driven dialogue. So, our purposes then are threefold, first of all to identify priorities in so far as we are able to. To identify how those priorities might be matched with scientific and technical opportunities, and thirdly, to ask the question are there ways in which, if there are serendipitous links, how can we promote those areas that there might be take-up and there are a whole variety of ways in which that might be done. We have four presentations to begin with. Each of them lasting no more than ten minutes, and I will try to be such a nice guy but to be a thoroughly fierce chairman! That is are 45 minutes, that is 40 minutes presentation, followed by 45 minutes of discussion. In principle at 7.30 we break for refreshments and networking, but if the discussion remains animated and creative there is no reason why we shouldn't invade that space. So let's begin,

and if I have got my note about not John Conway to begin with is it is Rohan, you're going to start and I should have a bit of paper telling you what his, indeed I do, telling you what his title is.

In fact he hasn't told us what his title is! So we have to wait until he tells us. So Rohan Slaughter if you would like to come and give us your presentation please.

(APPLAUSE)

ROHAN SLAUGHTER: Thank you very much for having us here, or me here. So I have been asked to talk to you a bit about this report, which I have some paper copies of, thanks to one of the authors who brought them along. So thank you Ross, and thank you Sam also for being here. So this report, Enabling Technology, was put together by Ross and Sam who are, who were, I should say, associates of the Helen Hamlin Centre for Inclusive Design at the Royal College of Art, but the report is branded as a Scope and BT report. I work for Scope, and I work for Beaumont College in Lancaster. Up until fairly recently my title was Head of Technology. The focus of my work, up at Lancaster is with people with low incidence needs. All of our students have complex needs. We are talking about a combination of physical and learning disabilities in most cases. Not all of our students have cerebral palsy, some of them do. Some have other difficulties and disabilities.

Where I'm kind of coming from with this Enabling Technology Report, or where the report is coming from I should say, I will get into the findings later, if I may put this report into context. Scope and BT have been working together for a number of years. This report is part of the second major project that I have been involved with between Scope and BT. The first one was called the Wheeltop, it was about using off the shelf technology, like tablet PCs in place of high-cost communication aids. We're talking about using tablet computers in place of speech output devices of the ilk that Stephen Hawkins uses.

What we did was we thought we were going to focus on that project on the technology, but we wound up really defining a new role for us that we call Assistive Technologist. That is a little different from the Assistive Technologist you might find in some NHS contexts. We are not talking about a clinical rehab engineer here, this is a role which is more a teacher, maybe a little bit of therapist, but is also focused on the technology. So we are looking for people who are people-people first, we are not looking for geeks to fill this role. We worked around mainstream technology as communication aids in the second project to look at environmental control systems. This is technology to open doors, windows, blinds, et cetera. One of the practical elements of the project there

was to use equipment from the smart home or home automation market. Or it is now called the connected home market I think. And use that or make that accessible to the people we were working with. That was fairly successful. In fact the proto-type we built has been incorporated, or the design principles have been incorporated into a commercially available product called SmartHub by a company called Therapy Box. If I come back to this report, when we do these big projects between BT and Scope, we are doing a technology project often based up in the north of the college. Because that is where the majority of our assistive technology provision is based at the moment. But we also have a policy component that is what this was about in this second project.

The report was really intended to be a piece of coproduction, in the sense that a lot of disabled people were consulted with about their interests around what they wanted to be able to achieve, what technology and equipment was difficult for them to use and why, what needed to change about the things that they did like to make them better. So if you have a look at the report you can see how Ross and Sam have engaged, not just the students at Beaumont College, but people from several other contexts, including the Para-Orchestra.

Sam was kind enough to bring some of the proto-types he built for the Para-Orchestra, I will ask him to wave one of them around. So if you can see Sam at the back here. This is a mouse he built, he and Ross built that was intended to plug into a PC and be used in place of a standard pointing device. He has also got a musical scale that is part of what in the report is described as the lins-troment. So basically what Ross and Sam were asked to do is look at the gap between mainstream devices and specialist devices and services. So when this report was in development it was actually called Mind the Gap, but we chose a different name when it was actually published.

Now I think I should probably preface this with being my view rather than Scope's policy position, but inclusive design is not something that can be genuinely practical, in my view. When you are dealing with people with very complex dexterity impairments and learning difficulties. So we could be talking about cognitive delay. You can't necessarily have a mainstream device that is made for everybody that is going to be accessible to literally everybody. That's not necessarily going to be possible.

This gap then, between the devices that have mainstream, devices that are main stream like the iPhone,

which has operating systems built into the hardware. There is a void between that and the very accessible product from the assistive technology industry.

This report is not saying mainstream good, specialist bad. I would like to make that clear. Because we actually use mixtures of equipment from the mainstream market, combined with input devices say from the specialist market. So, for example, we use a Microsoft probe, tablet running specialist software with perhaps specialist eye-gaze interface in order for that to be used as a communication aid.

So when we're working around what a user wants to achieve, we're using person-centered planning. We are starting from what is it that this person wants to achieve and how can we make that a reality.

We absolutely start from the motivation of that individual. Now that work-force us very well in that sometimes we might be having perhaps the long-term goal of having a device which will be used for speech communication, speech output communication. However, the student might want to have a giant iPod, and that is fine, we will start with that. If they want to play music first, great. Perhaps further down the line they want to use it for communication or controlling their environment, particularly when there is positive peer pressure from their



friends.

I think it is worth mentioning that approach that we came up in the earlier project has been scaled considerably now, we are running a couple of pilots within Scope to scale up the provision we have built at Beaumont to other places.

Bringing it back to this report then, there are a number of key conclusions that I want to speak very briefly on. One is adapt the mainstream, so where we can use mainstream technology we will. So if we can adapt a mainstream device to create an enabling device, rather than starting from scratch, then we will. Actually the assistive technology industry is now doing this, much more than they ever did. So many of the communication aids these days are based on a mainstream device. They were previously based on bespoke engineered hardware, part of the reason for the large price difference, and it was also a lot of the reason for the fact that a lot of, until fairly recently, a lot of this type of equipment was very much several generations behind current mainstream equipment. That's because these companies are small, the development cycles are longer and it means the equipment in the hands of disabled people wasn't as good as it potentially could be.

It was, however, highly accessible and did the job it

was intended to. We think using open, flexible technology, perhaps based on open source or certainly extensible technology, gives us a lot of flexibility. Possibly compatibility and certainly security of supply. Tailoring stuff that can be modified is another key point. This we think will minimise the gap between the person and the device if you make it very customisable.

In terms of services the recommendations in this report were to allow the experience to be customised digitally, so a single service could be presented in different ways to different users. So the service itself becomes adaptable, possibly by third parties. Using timed task completion to measure accessibility and other recommendations. That is a little less abstract because it tells you how long it took someone to do something. Considering the experience before and after, so thinking about how the entire delivery of that service is going to occur, making every part of every step of that genuinely accessible. That could mean you substitute for some people how things happen. You might have to go off-line for parts of the service. Including switches is really important. That is something which is often left out. So moving around in a complex interface can be really tricky if you have a single switch to integrate with.

So for me the most important thing in here that I

was really very keen on was the digital affordances or hooks that can be built into systems. If we are presented with the digital affordance and hooks as technologists, we can come along and build a genuinely inclusive interface, rather than having to making do what is available out of the box. That is perhaps a controversial view, people will possibly argue against it that such a device, and any device should be useable by anybody straight out of the box. And that might be OK talking about someone with a visual impairment or hearing impairment, it is much more difficult with a complex disability. Thank you. (APPLAUSE)

GEOFFREY BOULTON: We will run straight on, and questions and discussion will come at the end, I'm sure I'm right this time, it is John Conway who expects to speak. (APPLAUSE)

JOHN CONWAY: Good evening everybody. I'm here wearing several hats, in a sense. I'm a director of the National Association of disability professionals and I have got some colleagues here in the audience, that body represents the disability sector throughout the university and also the national executive, which represents the dyslexic tutors and the university sector. I think I recognised a few names on the membership badges outside. I'm really here because I'm the chairman of the STEM Disability Committee that was referred to in the

opening talk. The STEM Disability Committee draws together representatives from the diversity units in many of the learned societies in science, technology, engineering and maths. We have recently also taken on board medicine, we have the General Medical Council represented there now as well.

The remit of the committee is really to try to encourage young people into STEM degree subjects at university, and then on into STEM careers. Because we're short of people in STEM in employment anyway. The feeling is that what we class as a disabled person still, potentially, is a very intelligent, very able person. There are one or more impairments that may or may not be creating a barrier for them.

I was invited to chair that committee because my day job is I'm the Disability Officer at the Royal Agricultural University, so I spend quite a bit of my time directly working with disabled students trying to understand what their impairment is, how it impacts on their ability to learn at university. And try to come up with solutions for that. At the same time I'm also a full-time academic. So I'm one of those evil people that disability professionals constantly bang on about to give lectures and don't include people. I stand on both sides of the fence. I'm a scientist, a soil scientist, working in an

agricultural university, so my students have got to endure lectures of this kind of format perhaps, they have got to work in a chemistry laboratory and they have got to go out in the field, and I mean literally into the field. Go and see the crops, travel across, so the principles of inclusion and access that Geoffrey referred to are challenging me every day in terms of the academic side of my career, but also in terms of being a Disability Officer. I have had two different briefs for this meeting, one to tell you what we need and the other to challenge you to think of what we need. Somewhere down the middle.

Roughly 25% of my students are disabled. We are officially I think the fifth-highest proportion of disabled students of any HE institution in the country. Fortunately most of them are dyslexic rather than having very complex physical impairments that Rohan was talking about.

When we are talking about somebody with dyslexia it does tend to overlap in a sense with visual and hearing impairment. Not the sense that ears and eyes don't work, but maybe the brain's ability to receive the information coming in visually or in audio is somehow impaired. Nobody really seems to quite understand exactly what causes dyslexia. But I mean what I can tell you, and those of you will know this better than I do here, is issues

around maybe not receiving sight and sound simultaneously, or not receiving sight and sound simultaneously and being able to take notes.

So the kind of technologies I see that we need is to move on from getting somebody a laptop and letting them record the lecture. Because if you record the lecture you have to listen to a whole hour's lecture repeated, haven't you. You want something that converts it into text. So we have this wonderful lady over here, I don't know quite how well she's doing at translating my croaky voice into reality, it looks pretty good to me! But if you are a hearing impaired student, can you hear with you everywhere! Will you come out into the field, will you walk across the potato crop and carry on doing this while I'm talking in the field out to the students?

So my challenge is, can we have an upgrade of voice recognition software which recognises any voice without being trained? I think we all know the name of the one particular programme which is really pretty good if you train it to your own voice. But wouldn't it be nice, sorry I can't see your Christian name sitting there but this lady at the front is taking notes, she's trying to listen to my voice, she could be helped by that, wouldn't it be nice if you sat there seeing all the words appearing as I speak?  
FLOOR: It is helping me to learn by making it physical

writing.

JOHN CONWAY: But if you couldn't hear what I was saying if you could see it appearing and if your combination of hearing and dyslexia and maybe dyspraxia, so you can't write quickly enough, you know, I'm just thinking can we challenge this company that makes this wonderful company that makes this voice recognition software to do that. You don't have to take the lady out into the field and not take your iPhone and see it out there in the field and anywhere else.

There are a number of challenges to the software companies to develop on technology we have already got. To cope with hearing impairment, sight impairment, dyslexia and so on.

In terms of access, going back to trying to get my students across this potato field, where we have got it wedged 30-40cms from the top of the furrow to the top of the potato ridge. There is a lovely array of wheelchair, mobility scooters, quad bike, but can they cope with travelling across that kind of landscape. Yes we have track vehicles that can cross that kind of field, they will leave a trail of destruction and the farmer will be upset, if you step row-to-row there is no damage. How do we develop the technology to give access. We have seen someone wearing an exoskeleton kick the first ball in the World

Cup. That is huge and cumbersome, can it be slimmed down in some way.

Can I really be ridiculous and challenge the medical science, can you grow replacement limbs? I was thinking I was being really stupid saying this sort of thing until I picked up the New Scientist, there is an interview with someone starting off salamander and lizards that can regrow tails and legs and wondering how long before humans can do that?

That is my challenge, in terms of access, do we want to rely on technology and equipment, or could we even start looking at, now I know there is huge ethical problems so I will stop at that point. But certainly in terms of dyslexia and capturing information in a lecture, we could look at computer software to be far more powerful than it currently is.

Is that my ten minutes up? (APPLAUSE)

GEOFFREY BOULTON: Now again I think I'm right it is Stephen, Stephen Hicks.

STEPHEN HICKS: Thank you very much for the opportunity to talk here, it is a nice change from the type of presentations I often give. It is our work with visually impaired people has been such stimulation, such a stimulating research area for us it is good to talk about how we got where we are. I'm a Research Fellow, I work



primarily in the neuroscience department, with a lot of input from engineering and computer vision and microelectronics in order to produce a useful and socially acceptable device to assist visual impairment. I have been working on this for about three-and-a-half years, it makes an interesting contrast from my previous work which was in Huntington's Disease, where the goal of the work was clear, it was to find some genetic therapy to counter act the effects of HD. But the actual the input from the affected people was minimal. Because everyone knew what the goal was, it was to try to find a cure.

With visual impairment surely the same goal is true, everyone would like to, and presumably everyone would like to get their sight back or prevent it from going in the first place. But visual impairment is different, it is not one thing, it is not directly driven by one particular gene. There are at least a dozen common ways people lose their sight in the UK. There are a number of other ones when you look into the wider population about how you lose your sight. Some are genetically described, but the majority of them are very hard to pin down their real causes. And they manifest themselves in many different ways. So where I began my research was looking at, I guess first of all I was very interested in wearable display, looking at what you can use cameras for and whether we

could primarily as a young scientist, what I could do which would be cool and interesting for us all to do.

I decided to meet people with visual impairment that is where our project has gone, from a hobby into something that was in the press this week as an early technology that we can take into people's homes and potentially start making a real difference. That journey, I think was really only being able to move along so quickly because of the interaction I have had with 70 or 80 or so visually impaired people over the last few years.

I will go through the story of that and tell you about the different types of groups we have met and how it has happened.

I began looking at very simple, a wearable display and trying to illuminate objects for visually impaired people. We got computers to recognise the nature of objects nearby. I thought this was great, visually impaired people need us to find objects in the world and show them where they are. So we started with a project to get a computer to recognise certain characters in a room, set in different high-definition contrasting images and then relay that back to a display.

That was a nice proof of principle, but one of the main problems was it is very, very hard for computers to recognise everything in the world. It is still open question

for researchers and the amount of time it would take for us to develop that would be 20 years down the track.

20 years isn't that long but it is a lot further along than we wanted it to be. So we had a bit of a think, and talked with a number of visually impaired people about what everyone needed, and probably should have done that earlier, but eventually we did do that. We started to realise that the type of questions that people face are diverse, but they also come into some really simple categories, so the main problem that we have discovered for visual impairment is the ability to be read. It is obvious in hindsight, but not what we knew. The second one is detecting faces, particularly expressions and what sort of person is in the room, whether it is someone you know and how do you convey that to someone. And the third one is a bit more classic in terms of white canes and guide dogs, which is being able to get around comfortably without knocking into things unexpectedly and have your confident sensory awareness.

With that in mind we were able to move our research into areas that were practical and by limiting the research space it was something we could get solutions on very quickly. We developed a couple of techniques, ways of detecting the world in front of you and ways of representing that in a simplistic way. Somebody with very

limited sight can detect an obstacle, detect steps and a doorway that is open.

We met then with the Royal Society for a summer science exhibition which kind of pushed our work into the public forum. And that the RNIB caught me out and sat down and said what have you made, is this potential, is this going anywhere. There was a lot of people who come up with engineering solutions for things like visual impairment, they are great but the difference between having something which is a research project and something which can actually go into people's lives is usually a very wide gulf. Partly because they haven't really thought about what the person needs and what they are capable of perceiving.

I guess the third one as well is the cost. We can always have a large cost associated with new technologies. What the RNIB liked about our project is we were using off-the-shelf components which meant the end solution was something that could be cheap. Driven by commercial cameras, commercial display, everything we use is targeted towards a mobile phone. I'm not talking cheap like, well, I'm not talking cheap like a cane, but I'm definitely talking about something that is being driven by a commercial interest in a wider consumer space. Which means that a lot of the component that is we put into our

proto-types now are only in the order of £50-£100, we only need three of those. The potential is we make something that will be affordable. There are other groups who have made visual enhancement technologies that are in the tens of thousands of pounds. That is for a certain number of people that is fine. A guide dog costs somewhere in the order of £50,000 to train throughout its life. So people think that is already, you know, it is within the scope.

That's not really right, you know. There is so many good technologies out there which people can bring in, I think Rohan was talking about this in a way, rather than devices made specifically for a purpose, and you have a maul company and big expense, if you can have bits from emerging technologies and bring them together to get the backing of very large companies who have invested a lot of money into this and want to sell things at cost, basically we string those together with tape and bluetack to make something that will be cheap and able to get into people's hands.

The two main things that I really learned throughout these last few years, the first one, I could have asked people about this as well, is exactly how much sight a registered blind person has? At the beginning it was really only finding out that around about 10% of people

who are registered blind have no light perception. The other 90% have either vision in the centre, tunnel vision which means you usually back night blind and unable to avoid obstacles to the side. Or central visual loss, where you have lost your ability to read and recognise faces. In most cases there is a whole lot of sight that is there to be adapted and augmented. And it makes it more of a pleasant experience for a person because they don't have to think about some of these other ways in which people have approached the problem. There are a lot of systems out there that use sound as a measure of, or method of conveying spatial information to a person.

The two problems with that are, it is really difficult to use sound to see things, you had to translate that yourself. And secondly, it is very often the case that people will use sounds to gain a better understanding of the room around them. So if you take that away, by putting a speaker on here and conveying some information, then you have really taken away a very useful sense and you have to make sure that what you are putting into hearing is going to be at least as useful as what people were using it for before.

Other ones are using touch, a lot of people have made ultra-sonic obstacles avoiders, there is one called an ultra-cane and costs £700 and doesn't do much more than

a standard cane. Finding out people had a great deal of sight was excellent for us.

We started with a chunky LED let set that brought a huge amount of life, very crude, but a lot of participants could see the gaps between the LEDs and why wasn't it clearer? Over the next couple of years we pushed our visual display hire and higher and better resolution until the beginning of the year we worked with commercial device, it was not a Google Glass, but along that line. And found out at least three quarters of the people who were registered blind and came for the testing were able to see just fine. It was that's great, this is becoming an affordable technology, it gives us a lot of scope to start looking at some of these extra questions. So the second and final thing I would like to say is we really needed to find out actually what people want. Because a lot of engineers work in a vacuum, really, they come up with an idea about how they can detect an object or recode the world that will be you useful. You can spend a lot of time dancing around interesting developments, but ones that aren't really geared towards what a person is going to need more.

Once we have done a number of surveys, but where I really found the greatest input is from participants or sometimes patients from the Eye Hospital that we work

with, we spent a long time finding out what their life is like. It is a pleasant way to do science, you don't have to sit and collect vast amounts of quantifiable data, just sitting and talking to people and finding out the challenges they have in life and the work around that they have. You don't have to worry too much about finding items within your own kitchen, so many people have systems for exactly where they will be, or rubber bands around things. So don't worry about the questions that are already solved, find out where the problems lie and focus your efforts on that.

We have had a number of different groups who have helped us, such as the RNIB, and the Eye Hospital at Oxford and local sight loss charities, they have been great for holding informal conversations with people. As a neuroscientist and engineer who won't necessarily have that interaction day-to-day we have been able to get a huge amount of information which we then fed out to other computer visionary sectors so they can focus their efforts. It takes a couple of people to pilot that and get that information out.

There is a whole load of other aspects to the story I could tell but that is an introduction to where I'm at.

(APPLAUSE) .

GEOFFREY BOULTON: Thank you very much, Claire, Claire



Mookerjee will end the presentations.

CLAIRE MOOKERJEE: Thank you, I have to say I feel like the imposter amongst the experts here, I'm an urban designer and I'm from the Future Cities Catapult, we are a new organisation that has been set up by the Government to look at cities, but not just the built environment, not just the products and services and the new technologies in them but look at it in its entirety. There are things that we are really concerned about, in our urbanising world. 70% of us will live in cities in 20 years. Looking at children, people with visual impairment, all those kinds of related issues that we think are central for building cities fit for the future. And so one of our first projects is called Cities Unlocked that is what I'm here today to talk about. It is collaboration with Microsoft and Guide Dogs for the Blind. And we came together to address the problem, which is that 180,000 visual impairment people don't leave their home at all, for fear of how difficult their journey might be. In the future by 2050 apparently the number of visually impaired people in the UK will double the number it is at the moment. So a big problem and a problem which technology definitely has a role in solving.

One of the reasons we were set up is the Smart Cities Agenda, you may have come across this, that technology-enabled cities will solve all our problems, it is

problematic and driven by technology providers. We kind of think that citizens, people, need to drive that agenda and look at how to develop the right kind of technologies and the rights kinds of ways.

In a way Microsoft, Guide Dogs, us, this third sector publicly-funded and big multinational coming together to tackle a problem is an interesting and quite unique one.

We all have very different capabilities and Microsoft are obviously good at developing tech, and Guide Dogs have brought a really wide range of users with a vast array of sight capability as well as different lifestyles and life choices.

They have done that and we have kind of brought to the table a number of expertise around the complex way that cities are made and how you need multicollaborative partners for a new infrastructure. The idea is we need to look at the way that visually impaired people navigate from one place to another and how can we enable them to do that in new ways. We are doing that through a pilot project from Reading to London, looking at a journey door-to-door, how sounds, specifically, could be used in an augmented way to help people navigate through that space. Related to that we have also commissioned a number of pieces of research, which look specifically at a kind of human-centered design approach? We are working

with fantastic design researchers, Ross at the back has already had a name check from Helen Hamlin, and Arup Forsyth, who are futurists and engineer who is build a City, who helped us create a horizon scan of insights about what is already being done out there and best practice. We're also working with a kind of future studio called Super Flux, who looks at what the visually impaired community would like the city to be. What kind of sensory and exciting things might they get from a journey, it is not just about being enabled to go from place to place but also building on their other sensory experiences and cities. We are trying to bring together lots of different types of research and bring this to Microsoft and engage other smaller companies into thinking about how can we build cities that answer some of these questions.

So in terms of collaborative innovation there is, I think, a lot to learn from this sort of process. We have engaged with Tesco's, Network Rail, First Great Western, Reading Borough Council, because in order to trial this pilot we need all of their buy-in, and this kind of very human problem inspires, I think, the kind of behaviours you need in professionals to go that extra mile. Collaboration isn't easy and it is often people outside of their 9-5 job doing that extra two hours that make this happen. That is what we have been so excited and

surprised by is how this whole project has really come to life because it speaks to people and there is a sense of injustice that we are not building the right kinds of cities for enormous amounts of people.

So our outputs are at the moment a bunch of research, which will be publicly available and downloadable and we hope it will help other people in their professional lives trying to solve some of these challenges. I did bring some videos of some design research insights with me. These are from Ross. The design researchers if you don't know, they are product designers and urban designers and people who know what the insights designers need collecting this research and communicating it, hopefully in an easy way to understand so that more people working in the built environment and on cities can really experience.

(Film is played)

NEW SPEAKER: Well eventually the member of staff did turn up and we got as far as the entrance and he said I can't help you any further and has left me here, so I now need to call on a member of the public to help me to the number 23 because. Excuse me, excuse me? Excuse me? Do you know the number 23 because stop is by any chance? For Oxford Street? Not to worry, thank you so much, don't worry. Yes I'm sure, thank you so much. Oh,

thank you so much.

(Film ends)

CLAIRE MOOKERJEE: So I'm sure you are all familiar, those of you that work in the sector with these kinds of changes, I think it is important these stories get out to people who aren't in the sector who work in other professions that need to really understand the detail of the challenges both physical and emotional that people face.

(APPLAUSE)

GEOFFREY BOULTON: Now to a large extent it is over to you, but before we do that perhaps I could simply reflect on what's been said and try to categorise it, at least for me. I'm a scientist who doesn't work in this domain, though actually I can think of things that I do that might well be applicable. I think we have had a series of rather interesting themes.

One of them was the theme that was introduced by Rohan, and that is putting hooks on mainstream technologies and asking the question, can we adapt them to specific disability needs. The great advantage of that is that those technologies are technologies that inevitably are reduced in price, so the costs are likely to be rather small. Then if you go to the other end there is thinking out of the box part. John asked the question could we possibly generate speech-to-text which could, which wouldn't need

training to a particular voice, but could simply pick up any voice and to generate text from it. Now I think, I'm in the sound business, and I think that's a complicated and difficult problem, but let me give you an example of thinking out of the box. I work on the Antarctic ice sheet. I send sound signals to the bottom of the Antarctic ice sheet and I make pictures, I make sound pictures. The immediate thing that came to my mind is why can't we make sound pictures? Why can't we emit sound in a particular frequency in little boxes that are somehow on our person and why can't we then utilise software to create pictures in the way that we do. We look through 2,000ms of ice and produce highly detailed pictures of what the bottom of the ice sheet looks like. Of course others do things not too dissimilar. The problem with those sorts of thoughts is they require a lot of research, they are a long way from application. The initial results are likely to lead to devices which are very complex and extremely expensive. And so there is a spectrum there between the ones where there are probably easy wins, provided there are enough people who are applying themselves to application in the disability community. As long as there are companies that are creating mainstream devices that are willing to see their devices and the software accompanying them used in that fashion.

Then Claire asked the question, well, what about the living structures within which disabled people in the future are likely to be? My question immediately is it is easy to think like that if you are in China where a new multimillion-person city arises every I don't know two or three years, where something like 80, 90, possibly 100% of the building stock is new. We tend to live in old cities with old core which are pretty inflexible and adopted to a very well defined set of behaviours that are pretty intensive.

And then I think the other issue that was raised, I think very clearly indeed by Stephen was actually we need input from the relevant disability communities. The question is how do we ensure that input is applied in, I think, those three areas. The things that could be done on a short time frame and relatively inexpensive. The ambitious things unlikely to be developed except over relatively long-term frames and the extraordinarily difficult ones about how do we create the living spaces of the future which are sensitive to these sorts of demands and requirements.

That is my take, as an almost complete amateur in this domain. Having said that it is over to you, what I hope we will do is both address big generic issues, but also highly specific ones and let's see if at the end of our

discussion we can sum things up in way that gives a pattern of things of priorities that ought to be addressed to those who are in a position to be able to influence how they are achieved.

So we have a microphone at the back. Who would like to kick off? This is where there is usually a terrible silence! For a couple of minutes.

FLOOR: Hello, I have a hearing loss and without the speech-to-text I would be absolutely at a loss to know what on earth was going on this evening. I'm one of the founders of STAGETEXT which provides this service and we provide captioning in theatre where we take a script and output the script at the same time as the actors speak, so I can actually hear the actors on stage beautifully. One thing that I could empathise with in the presentations was in Claire's video where I saw something of the attitude and lack of awareness of the public to disability. I think this is an issue which is a major problem that we have a Government which passes a DDA legislation which is completely ineffective, it all depends on "reasonable adjustment" that very often, in our experience, in our work in the arts sector has been that people say we can't offer you reasonable adjustment because we can't afford it.

What we also found in terms of attitude was years



ago when we first started doing our work in the theatre, we had some feedback and we had a feedback from some hearing people who said, this captioning was completely distracting and why do these people have to come to the theatre. (Laughter) This was the attitude. Now today it is completely changed. We don't get feedback like that anymore, because hearing people also find the captions very useful, not all the time, just every now and then when they miss something, or American visitors when they are listening to Shakespeare, something like that! So I think your comments about trying to utilise technology which is already available and can be used for maximum amount of usage is tremendously exciting. I would like to understand if you could give a comment on how do you think we can create better awareness in the public generally that disability isn't about "them", it is about all of us and as we all get older you have failing eyesight, failing hearing, failing legs and arms, whatever. I'm just wondering if this is not a critical point to start?

GEOFFREY BOULTON: Thank you very much, the great thing about chairman is you don't have to answer the question. I will take the question to those sitting in front and those to the side. A key question is how do we stimulate a sense that these are "our" problems and not "their" problems we have to address. Let's have some

answers.

JOHN CONWAY: I think actually you answered your own question, didn't you? You said hearing people find the captions useful at times. I think it is getting the message out that the sort of things that can be done to help people with an impairment are actually things that help everybody. That's the message isn't it? The policy I have driven at our university is all our lecture notes go on-line in advance, because it is taken as a reasonable adjustment for dyslexic people. Now of course all the students benefit from this, and we got to the stage where it is not the dyslexic students who are demanding lecture notes in advance, it is all the students going berserk if they are missing. They have seen the benefit of this which was originally actually in a sense it was a selfish adjustment because it saved having to print them out and hand them out individually in the right colour, font and size to individuals. Now we have a policy that benefits all students and it is seen as an essential part of the university system. So I think yes extrapolate that, if everybody can appreciate the benefits of these things then...

ROHAN SLAUGHTER: I would agree with what John's just said, last week I was invited to speak at a TV accessibility conference at Dundee University, it was organised

between the computing department there and the BBC R&D team, there was a huge discussion about the value, the pound value of the meta-data that is associated with subtitling on television programmes. Because in that subtitling you have got something that you can pass through a software system to give you all sorts of information about the programme. And if you also add into that not just the subtitling of the spoken stuff but audio description of the programme, then you get an even richer data set that can be used for archiving the programme, particularly useful for things like searching later, this is what the meta-data is for, especially for services like iPlayer and the on demand stuff. So yeah, I would agree if you do that right, you do the subtitling right, you do the audio description right you have added a whole load of value there for everybody.

GEOFFREY BOULTON: Perhaps as a complete amateur I could make a couple of comments. I have just finished reading 844-pages of Stephen Pinker's recent book entitled something about our better angels. He argues over the last 1,000 years or more, we have seen a progressive decrease in the violence that an individual can expect to have visited upon them, on average. There are obviously bumps. Secondly he argues that there has been what he calls a civilising process over the last couple of

centuries or more, where partially or completely excluded groups have become included. Without wishing to offend everyone, it starts with the rich and the poor and then women, and then gays and then animals and it seems to me that a concern for disability is part of that sort of spectrum. In a sense it is a very optimistic take and if it too were true, don't forget over the last 30, 40, 50 years in this country we have seen strong advocates, starting with Roy Jenkins when Home Secretary, for the if you like the extension of the rights agenda to many, many more categories, and on the whole that has been a positive step. So that's the optimistic bit.

The other question back to both you and others here, isn't that something we should talk about in schools to a greater degree, who are we? And we are a rather diverse group of people and shouldn't it be part of the understanding of growing children are subject to.

CLAIRE MOOKERJEE: Just to add to that, I also think it is about categorisations. In Denmark you know there are no issues around people in wheelchairs moving about, that is because they put people in wheelchairs, people with buggy, people with bicycle, which basically covers everyone in the same category, therefore they design with that in mind.

I think when you kind of create marginal groups, by

categorising them in a particular way you kind of, yeah, you push them out slightly.

GEOFFREY BOULTON: Maybe something we should have done, or I should have done is please say who you are.

FLOOR: My name is Susan Woolfe, I'm with St Martin in the Fields Disability Awareness Task Group trying to increase inclusion throughout the Anglican Church. It seems to me as a person with a hidden disability myself, several hidden disabilities, including sound trigger-epileptic seizures, that there has to be a will and willingness doesn't seem to be there in so many organisations. I hear people talking at meetings, visually impaired people saying the new buses after all the work they have done, the new Boris buses, don't have you know the hold bars that you hang on to they aren't a contrasting enough colour for people to see them. And so they can't see them. And why couldn't they just have done it in the first place after all the talk and years of talks.

When I, for example, say in a shop could you please turn your music down I can't shop there, the customers like it and they won't, and I have to go through the whole reasonable adjustment argument and so forth, it is unpleasant. Instead of just turn it down and see that actually customers maybe don't like it blasting and their sales would go up. And the effect of the public health

when I tried to speak with someone at a local PCT about the massive noise and the effect on the public health of blood pressure and so forth, she said if you have a medical problem you should speak to your GP.

How do you increase the willingness?

GEOFFREY BOULTON: Claire do you want to comment on that, how do we engineer the environment and the attitudes that go with it that permit problems like that to be addressed?

CLAIRE MOOKERJEE: Yeah, I mean it is a kind of deficit in empathy really, if somebody is standing in front of you and like you just described, I mean I think people, I think stories and people really understanding the challenges that other people face and the effect that it has on how they should conduct themselves professionally and consider things professionally is one way. I also think that there needs to be a reversal about thinking about accessibility up front in policy and planning documents, there is a tendency for it to come at the end of the process, rather than at the beginning. I think the Olympic Park is held up as a really extremely successful thing in terms of accessibility because of that, and the people who really spearheaded that they are at the start that have process. I think that document is quite an interesting one to look at in terms of how they approached accessibility in

the built environment. Like you said that was a blank canvass and it is much easier than retro fitting.

GEOFFREY BOULTON: You said this is what ought to happen, how do we make it happen, what things could and should be done in order to move this agenda forward?

ROHAN SLAUGHTER: I'm just thinking if you want to think about the social end of this, if you like, or the bit about changing attitude, Scope is running a campaign right now that is trying to use humour as a way of making people think again. It is called End the Awkward. I don't know if you have seen it if you look at Scope's website you will see the campaign. Scope exists to bring about social change within our society to address what we're talking about here, by is disablism, basically. That is society perhaps not understanding that in the social model of disability that it is, disability is created by the environment and the attitudes around people rather than issue, and if you like that person has. This reversal of that attitude is a long process to achieve and, yes, I would say it is probably getting better, but not universally better. Disability hate crime is still a problem. I know our own students have experienced that. I have spoken to and even seen some of these things happen. We have got a long way to go. And yes, education is definitely a part of it, but so are things like the End the Awkward campaign.

FLOOR: Thank you, I'm Nigel Lewis, I'm the CEO Disabilitynet, and we are a pan disability charity helping disabled people with technology. Picking up on the point that there needs to be a social revolution in how people approach and look at disability, not just disability but age-related disability, we have heard a lot about visual impairment, but the largest group is about cognitive, learning, dementia and Alzheimer's, but the thing is part of the problem is too many of us are saying the same things but we are disjointed. We do it, Scope does great job, and we have the RNIB and a million and one charities and organisations all sending out similar but disjointed messages. Until we all get our act together, I don't think we're going to change the attitude within society. Because we send a confused message and we make too many get out of jail free cards for everybody.

GEOFFREY BOULTON: Perhaps I should then ask you to answer your own implied question, what should be done? What could be done?

FLOOR: I think part of the reason why I think it is disjointed is because we're all focused on our own little niche piece and we have to park some of that parochial, this is my only piece of the puzzle and invest more in actually joining it together and being willing to join and kind of create, the thing I always equate it to is the global,



you know, the environmental global warming, you know. Everybody got their act together and if you asked most people what does global warming mean, most people will give you roughly the same answer. If you ask people what does access, accessibility, inclusion, et cetera mean, we will all get different answers, different slants. Even about in the presentations we heard about what does accessibility mean, meaning the health market versus the assistive technology market et cetera. We have to join it up somehow and create a way of bringing the global warming argument to this agenda.

That is my opinion.

GEOFFREY BOULTON: I have an interesting example, I have been involved recently in commenting on a major submission for a really very large commercial, industrial development in the Midlands of England. It has had, of course, the usual consultants' reports on this. And you can see where they are going almost from page 1. The dominant determinacy, economic growth that is the dominant determinant, period. All the other issues of noise, pollution, disturbances of habitat and the like are all of them, they are all there listed, largely I suspect because that is what they have been told one should do, but if you ask the question, do they seriously address those issues, in a robust and intellectually coherent way,

my answer would be no they don't. It is as if somehow the issues we have been talking are at the end of the day are not taken terribly seriously. They do not stack up against overriding issues of cost and economic growth. And my question in a sense to all of you, are there ways in which we can somehow make those issues which are environmental issues of crucial importance that have been mentioned to mandates, is there any way we can make them be taken seriously, the gentleman in the corner and then two voices down here.

FLOOR: I'm Andy, a disability adviser and LGBT manager for a university. I'm picking up a couple of things. We actually are very proud to make inclusion high on the agenda. My question to the panel and to everyone else is do they have awareness of the Time to Change campaign, we are sponsoring that, as mental health can affect people with a range of disabilities, and I have several myself, I compensate really, really well. The thing I wanted to pick up on particularly, regarding Dragon, which is the package I'm assuming John was referring to, it can actually be trained if the student has a very specific accent. I have noticed over the five, six years now that some accents pick up better than others. But what I want to know is what other people's perspective of mental health and co-morbidity of other disabilities.

JOHN CONWAY: I'm not an expert in using Dragon, I find it difficult to train it to my croaky voice, despite I'm one of the original voices it learned from many, many years ago. I don't know to be honest, I don't know how good it is. It is something I always want to use, and I always install the latest version and have a play and then I go back to fiddling on the keyboard. I'm not the best person to ask about its capabilities.

GEOFFREY BOULTON: Would anyone else like to chip in response?

JOHN CONWAY: Are there any users of Dragon here.

STEPHEN HICKS: I would say in terms of voice recognition, Google is doing fantastic job of trying to bring it into the mobile markets, if you can continue to use that type of technology then that's something which becomes, you have a huge amount of clout and processing to take on lots of different voices, whether it can be fast enough for real time speech is a different thing.

GEOFFREY BOULTON: There are three hands down.

FLOOR: OK just to respond to Dragon live subtitling, it is not quite accurate yes, it is chaos, watch the BBC News and laugh at some of the misspelt words. So bear that in mind. It is not there just yet. My name is Merfyn, I'm also a co-founder of STAGETEXT and a deaf advocate working in the NHS and social care. One of the interesting things I

have noticed here is that when we talk about user-led, I always tend to find that we're behind you as professionals rather than in front of you in advocating any issues about disabilities in the wider world. Partly, I think, because we have been deprived of the opportunity for better education that you have had, better opportunities for management skills that you have had. All these things are still in place where we can't achieve certain status in order to champion disability issues. Especially with Government, my experience is as a user I'm quite frustrated in finding there are some great access officers in the frontline, combating disability issues but getting frustrated when they start talking up in the hierarchies in the system, usually about 20 people above. They are the people that are killing the efforts of good workers who are trying to campaign on disability issues. Earlier on we talked about attitude and I think that is one of the key words we have to hold on to, how can we achieve raising better awareness concerning everybody's attitude, because it is all about money, which comes into the equation. But also about ignorance, how can we overcome their ignorance to understand that what we are trying to do here is to make society more universal in its application, because they are not letting that happen.

The Olympic events was a disaster for me in that

they wouldn't put speech-to-text, but they did but BSL sign language interpreters, that demonstrates ignorance that all deaf people are BSL sign language users, that isn't the case. That is because there was a conflict of interest in the Olympic party in making decisions about how to make access available. Obviously that conflict of interest didn't matter with able bodied peers. But also disabled people's organisations are also having a conflict in interest in how they represent disabled people. Politics comes into play here and obviously what you are talking about here is technology. What I like to have is ownership, it would be great to have voice recognition that I can have it on my mobile and go anywhere and say I'm sorry I can't catch you, put my app on and you can speak to it and I can understand it, empowerment. But it is not there yet. But the money is. But the will is lacking, I don't think we have found somebody who can work with us. Google, they have get a vested interest in wanting to do Google Glass, but actually it is for able bodied, they haven't talked to us and said what do you want can we talk to you and do that. They will look at the market with hearing people, not with deaf people, that is very interesting. My thoughts.

GEOFFREY BOULTON: Would everyone like to cap that comment, and add to it.

CLAIRE MOOKERJEE: I would like to say the Microsoft

project I'm working on was completely led by a blind employee at Microsoft and supported by a deaf employee across in America. Our bosses throughout have known a great deal more than we have. But I'm sure that the exception not the rule.

FLOOR: The people you are talking about we need to hear them rather than the back door.

FLOOR: I am Ross Aitkin some of my work has been referenced today. I guess I wanted to talk about the lever that we have got, because I don't often get to talk I talk a lot about design and technology and people and I'm not often in a policy environment. I feel like the big policy lever we have got is the DDA, now the Equality Act and reasonable adjustment and the stipulations in there. I guess, because I feel like the awareness is definitely going to help and the more people making design decisions understand the needs of the people who those decisions are going to affect is going to make things better but it will only go so far, because of exactly this point that this gentleman made earlier about the access officer at some point and someone 20 people higher and the access officer knows what will help people and they can't persuade the person above they have to do it. Especially talking about infrastructure that Claire is working on, it is expensive and the DDA is not helping us that much. The question I guess

is to the policy people, is there a better way, is there a better instrument that we could have? What is the alternative is there an alternative, should we just live with it?

GEOFFREY BOULTON: Again, there is an important question asked there, would anyone like to respond to that. Perhaps I can have a go. It is easy for me because this is not my domain I can say what I like, hopefully you will forgive me. There are issues like this throughout society whereby there are strongly those who are at the point where a policy really impinges on individuals, understanding very well where it is not working and understand where he very well where it ought to work. I think the lesson from those domains is somehow to articulate as clearly as possible and with as simple and direct a voice as possible, going back to the question the gentleman over here asked earlier, articulate that into the public domain in ways that are the rest of our Fellow citizens find sympathetic. That's not easy. I mean the clever trick of course is not to alienate them. But actually to get them on side. Once you move in that direction, then I think that there are sufficient numbers of bodies which are prepared to pick up major issues and to address them in a very firm way, articulate them in the public domain and the key thing is to get them on to the Governmental

agenda in a way that makes some sort of sense.

Now I think if you look back over the last 30, 40, 50, 100 years, these things take time. In a sense it is only when communities begin to organise themselves in effective ways that really the timescale is shortened. So I think it is about organisation, it is about coherence of message, it is about strong articulation, it is about bringing allies on board. Those are almost clichés. But actually I think you know they are one that is we recognise from recent experience work. There was gentleman I think, was there another gentleman down here who had his hand up.

FLOOR: I don't know I was just going to respond from a couple of points earlier. One was John it is interesting that you talk about switching on Dragon and finding that it's basically not good enough yet. Hearing that I think the ultimate benefit, if you start using Dragon, the people who benefit most sounds like they will be your students not you. So perhaps it is not just a better speech recognition package that we need, maybe we need one where your students can do the training and you don't have to, because if they are going to benefit they will probably have to put in the leg work doing the training. So maybe it is just a way of reworking the way we interact with these bits of software to actually get the most out of them.



The other thing I was, thinking, when we were talking about schools, I really, having worked with Ross over the last two years and met a lot of people with different disabilities and seen a lot of the kinds of awkwardness and the way people don't know how to interact with a disabled person often, I think if we have, I mean I don't know if this still happens in schools, but I did RE, religious education and then SE, social education, but why don't we have disability education, that is what I would like to see given an equal status, I would hope.

JOHN CONWAY: Yes, this discussion on Dragon has gone all over the place. What I originally said or tried to say was that it is a very good piece of software if you train it to your own voice and then it recognises you, the more you use it the more you correct its mistakes the better it gets, on your individual voice. The challenge I'm throwing out which is massive is you don't need to train it. That Dragon is sufficiently aware of the variety of accents and male and female voices and young and old voices and all the rest of it that it can recognise words no matter how they are pronounced. That is a massive challenge. But what I want it to be able to do if they can achieve that. You sit there and you record all of us, accurately. Puts this poor lady out of a job, but that is a portable device, but wherever you are you have this software on your mobile

phone, wherever it may be and you can listen to anybody speaking. That, I think would be quite valuable. It is still in terms of students giving you word for word what the lecturer has said, in the same way as an audio recording does, but because it is in text, they can edit it and delete out bits and so on, they can work with it and use it.

Whereas if you go to an audio recording you have just got an hour's tape or whatever it is, I mean there is another piece of software which I don't know if I should name or not, Audio Note Taker, it records in block, you can colour them and delete them out, it is not just an hour's voice. But to see it going into text and being able to work with it would be really quite useful.

The alternative is all my colleagues have to train dragon to their own voice, record their lectures themselves and then hand over the text equivalent, which is just not going to happen for quite some time is it. But if Dragon or the equivalent by somebody else, it could be the power of Google and once you start thinking about the what do you call it the citizen science, this idea of everybody being involved, if Google could be hearing hundreds of thousands of voices and distilling out whatever is common in a word, maybe that is a way forward.

FLOOR: David Willets...I'm Sally Daunt, a dyslexia and

study skills support tutor in higher education. David Willets' recent pronouncement on the disabled students allowance is particularly targeting the non-medical helpers lower than band 4, that is people like note takers. And I was at a meeting at the Department of Business Innovation and Skills recently, representing higher education institutions like yourself that have more than 25% and more students in receipt of DSA. The civil servant who was running that meeting asked us what we thought about note takers? And I made exactly the point that John's made in that it is all very well to give students a recording device, but they still have to take notes, and if they are dyslexic and they can't take notes they are stymied and it takes, you know, there is so much time and there is no substitute at the moment for a real live note-taker.

The Department of Business Innovation and Skills is looking to using technology instead of live people because it is cheaper. But the technology isn't there. We need to get that across to the Department of BIS. Until Dragon is great.

JOHN CONWAY: Don't get me started on David hill Willets at the moment.

GEOFFREY BOULTON: It is possible for technology in a hubbub to hear individual voices and understand them,

because we do it all the time. Those who have got effective audio systems. The way the neural system works is key to decoding all this noise. In my domain, which is seismology, generating sounds, getting responses from deep within the earth and making pictures from it, then what's been happening over the years that we have this relationship which is called signal and noise relationship and what has been happening is that progressively more and more of the same things that we recorded 20, 30 years ago are now signal and less and less is noise, why? Because we are getting cleverer at disentangling everything. The way increasingly we are doing that is utilising systems which are neural systems, my view is it is going to happen. It will happen, and a lot of it will be in the software, our capacity to disentangle information, but the problem in a sense is that you need, as the gentleman at the back said, the voice of those who need these things so that it becomes clear and secondly you need a voice going in both to the scientific community and also into the commercial community that will exploit that science, a statement to the effect first of all this matters and secondly there is a market there. And I think this is one of those domains again where we need somehow to identify where real priorities lie and then to find pathways whereby pressure can be applied. The gentleman over here.

FLOOR: Hi, my name is Tom I work for a company called Employability, we are a disabled organisation which helps graduates and students into employment into things like the tech industry and stuff. My viewpoint comes from working with the likes of Google. I would say in terms of going back to the whole speech recognition thing, I wouldn't say it is necessarily as far as away as you might think it is. Because big data is what all these things like Facebook and Twitter all deal with these sort of things. If you think about how when you type into something into a search bar how it has to recognise all the different variations and how people type this in and get an accurate as a result, that is not too dissimilar an engineering problem to how people speaks. It is more about getting the will into getting these companies to actually do it. Addressing the gentleman at the back there who said about these companies and how you need to get the policy forward, a lot of these companies are engineer-led and so you have to almost tailor your arguments to them in an engineering fashion. They still think in very much an engineering fashion. The other thing I was going to say, if I forget, was that, I have forgotten it.

GEOFFREY BOULTON: Don't worry it happens to all of us. Time is moving on, in principle we ought to be moving next door and having something to eat and drink and an

opportunity to talk to each other more intimately. Before we do that, what I would rather like to do is to get some sense from this group where priorities really lie? We have dealt with, in very broad terms, hearing and visual impairment, the approach to technology from Rohan about the utilisation of mainstream technologies and how one might go about doing that and also the broader environment of the evolving City, but looking at those two areas of impairment, have those who have spoken from here, have they effectively articulated what you think the priorities to be?

FLOOR: Thanks I think it is an interesting question, my name is Nicola Martin from the National Association of Disability Practitioners, but I think taking that impairment specific focus is actually too narrow, I'm going to slightly contradict myself. I work very closely with Simon Baron Cohen and my colleague Joanna with students with autism, and technology is a fantastic innovation for people with autism to help them organise their world and minimise their anxiety I think we have to be broader than impairment-specific focus and think about addressing barriers which are experienced by disabled people, tabling barriers and that point that good practice for disabled people is good practice for everything else.

GEOFFREY BOULTON: Going back to the point of the

gentleman at the back that the input from those who need support is the crucial part of it.

FLOOR: The emancipatory research principles have to underpin everything. I'm not making the assumption that disabled people have visible impairments, there are disabled people in this room, I'm one of them and you can't tell by looking at them.

GEOFFREY BOULTON: Can I ask another question to illicit a final response, is there anything that has particularly annoyed individuals, statements that have been made that really you find annoying, or has the tendency of the conversation been sensible?

FLOOR: Hello, my name is Deepa from STAGETEXT co-ordinating the access tonight. I have a love-hate relationship with the Equality Act, because the Equality Act allows flexibility, finding the best solution, in America they have the American disability act which forces people to provide access. But it is providing the most basic level of access, which is really a way of avoiding being sued, so it is not always the best solution to the problem, so it is here we're, the Equality Act is a little bit weak still, but for example for me and the STAGETEXT equipment we bought from America 13, 14 years ago, it is still the same over there, we have progressed, improved, made adjustments to the equipment to make it better. So it is a very strange

situation so we have achieved a lot so far and the attitudes are changing. Everyone is trying to make things better, women have got to be more equal to men, but it is up to all of us to kind of get on with it and be thick skinned about it but it is giving the power say for men giving the power to women to make them more equal, it is more us to kind of do the same thing with disability.

GEOFFREY BOULTON: Would anyone, let me ask the panel, are there any final comments you would like to make?

ROHAN SLAUGHTER: Standards are helpful, or can be helpful, but I would try to view them as a minimum bar, because can you create a website that is standard accessible, but not accessible. So I think the American approach you are absolutely right there. If you think about the subtitling stuff we discussed earlier, it is much further advanced here in the UK than it is in the states, and that's not so much about the laws, that is about particularly what the BBC has done, to drive that forward, and there is interesting stuff happening there, I think, around not so much the law that is requiring this stuff to happen, but the standards that has been set by service like iPlayer which is subtitled, you know if the states there is no law to require web original content to be subtitled but it is, but they have to do it to broadcast material. So with Netflix and Amazon



producing their own programmes they don't legally have to produce the subtitling, but they are often choose to because of the meta-data stuff. It is interesting, most of these problems I think are logistical and about money rather than about the technology.

JOHN CONWAY: I think I might go back to that gentleman's comment earlier and perhaps put in a slightly different way, to what extent what we call reasonable adjustments or assistive technology can it be sold to a wider market. The first time I came across Dragon, was not through a disability-related issue, it was a medical conference which just happened to be hosted in our university, and these were top surgeons and there was a guy selling Dragon and the little recording thing. To the surgeons, because they could dictate their own notes on a voice activated device in the operating theatre and have it transcribed by Dragon rather than have his secretary make head nor tail of what he was trying to say. So I mean there's a commercial application of Dragon, totally outside of the disability world. I may be wrong but I think sign language originated in the Lancashire cotton mills because it was so noisy nobody could speak. So they invented a, I can't do any sign language but they invented a way of doing signs.

FLOOR: Lipreading rather than sign language.

JOHN CONWAY: That was born out of a necessity, that wasn't actually a disability. The mind-mapping software we use, which we have networked across all computers in the university is not one of the ones that is most recommended under the DSA, but it does mind-mapping and a whole variety of things that are supposedly a good way for some dyslexic people to work. It is actually a business piece of software which was designed for brain storming and it is actually project management software, if you dig into it. So I'm just wondering do we make these things, do we sell some of these things to the companies to develop or do a wider audience, so that there is a commercial push for them? And when it comes to wheelchair access, I don't want to offend too many of the ladies in the room, but many of you have pushed kids around in pushchairs and prams why isn't the entire female population in the country leaping up and down demanding wheelchair access for pushchairs and the disabled people just happen to get it as a bonus, I keep saying this at our university. If we put a lift in, 99.99% of its use will be the catering staff taking food to the dining room upstairs. There might be the occasional wheelchair user that might use it. Can we go in this direction possibly. Commercialise some of these things.

GEOFFREY BOULTON: On that theme, I'm a grandfather

and pushing my little grandson around is much, much easier than it was to push my daughters around 25 years ago. Things really have changed. But we need more.

STEPHEN HICKS: Just two quick points, to the gentleman at the back in terms of getting out in the front of science and leading it, I could definitely see your point. A lot of researchers get into researching and wanting to explore interesting areas, but we will come across areas that need research incidentally, and science, in many respects is led by funding, or either getting a lot of money going into defence because that is where scientists can do work. We are generally funded by the MRC or research councils, and if you want to make a difference in that people will follow an area that's demarcated, a mice big grant there for particular things. EPRC are doing orientated grants, I don't know who leads the direction for those, but that is something to look into, if you want to help set the agenda for research and are not in the field of doing research yourself, being able to put input into the direction for those funding councils would be one way to do that.

The other point I was going to make a bit earlier on about assistive technology was when I was giving a talk at RNIB and approached the idea of making glasses for visually impaired people one of the directors said it doesn't really matter what you do, just make them look good.

Make them desirable. Because there are a lot of technologies which will get you to a stage but you know they are clunky, but if you get a nice designer behind them people will pick them up and a lot of follow-on community, other uses that people will find for these technologies will follow as well. I think it has to be, the general population wouldn't be satisfied wearing something which didn't look great, there is no reason you have to cut that process either.

GEOFFREY BOULTON: Perhaps I can comment from the point of view of rather basic science, many of the problems we have been talking about in relation to sight or hearing they are absolutely common to a whole area of science, the gentleman over here talked about big data, the search for the Higgs boson, much of the work that is now looking at extremely large data sets, they are all trying to do the same thing and are looking for solutions to exactly the problem of trying to create a picture from a limited visual input, optical input, or discriminating between sounds. We're just simply looking for patterns in complex data sets, because of course that's the information that our sensory apparatus acquires. So what is absolutely crucial is not to think of this area of work as simply being the application a well tried and tested scientific approach, there are, now, almost daily coming

on stream new fundamental approaches to the way we take complex data sets and create patterns from them. It is crucially important that the science that is done in this domain, designed for application is well connected to rather basic science that is looking at high energy physics that the big bang and so on. There is a really important issue there that not only must the science be connected to those who have real experience and the problems that arise, it has to have its feet, if you like, in basic science that is now emerging. Just let me to pull together what I think have been three very high-level issues that have come from this discussion, I think the first one is that changing attitudes is crucial. I think someone said how do we persuade our fellow citizen it is us not them. How do we, and of course if we are able to do that, then you change the answer to the question, can we afford it? Because the more people feel that we as a society implicated in these issues, then the more likely it is we will respond by saying, yes of course we can afford it, because it is our problem and not the problem of some disadvantaged minority.

The second very high level issue is how does the community represented here in part, how does it speak with an effective voice in a very political domain. An effective voice that first of all persuades our fellow citizens

that these issues are important but taking it forward to influence politicians.

The third one is a vital issue that everyone has brought up, or almost everyone and that is it is a question of ownership and empowerment. Really it is absolutely vital that the community of those who feel these issues on a day-to-day basis somehow has got to be involved in a fundamental way with those who are attempting to look for solutions. It seems to me those are the key high-level issues and of course we have identified a series of others. One of the things that we will hope to do as a consequence of this meeting is try to make some sort of coherent summary on what we might then want to do which is to suggest how one might be able to take it further or if it is possible to take it further through other routes.

So thank you all very much for coming, thank you very much to our speakers, thank you for being here and those of you who have asked questions and contributed to the debate. Outside in principle there should be some food and drink waiting for us, let's have some and talk to each other, thank you very much indeed. (APPLAUSE)