



## Technology for all: towards truly inclusive design

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SCIENTIFIC



TECHNO-  
LOGICAL



HEALTH



SOCIAL

### SUMMARY

How can we make sure that technology is designed to suit all the people who might use it? And how can we build technology that helps users with specific needs, such as People With Disabilities, People With Autism Spectrum Disorder, people with medical conditions such as Obesity, or Alzheimer's Disease and, more generally, marginalised groups in society?

These are some of the questions that keep Professor Lizbeth Goodman at SMARTlab in the UCD College of Engineering and Architecture energised. She and the team in the Inclusive Design Research Centre focus on developing technology tools and innovation methods for real social change. Her work across numerous projects and programmes develops new approaches to designing inclusive technologies that suit the individual user. The research has helped people with severe physical disabilities to communicate and create in new way; it has supported local communities; and it is developing new ways to enable all people to show their strengths.

“1 Size Fits 1! We work on ensuring that creative and assistive technology and innovation tools and methods are personalisable for all users from the start, so that no hacking is necessary to ensure full usability for all, with no extra cost or effort either for the users or their communities.”

### 1 size fits 11 technology for all humans

Most of us interact with technology each day: perhaps with a smartphone, or gadgets to help us around the house, or even devices to let us read books and learn. Now imagine the challenge that someone with Autism, Alzheimer's Disease or a physical disability might face using these technologies. Designing with the widest diversity of users in mind - rather than trying to make one design fit all - can enable everyone to engage equally and confidently with others, and with the world around them.

“Everything we do is about creative technology innovation. We try to figure out how the rapid growth of technology could be truly useful and inclusive,” explains Professor Lizbeth Goodman, Chair of Creative Technology Innovation and Professor of Inclusive Design at the UCD School of Mechanical & Materials Engineering in UCD.

“We don't just invent gadgets and wonder whether someone might use them,” she explains. “Rather, we work on ensuring that technology and innovation is personalised for users from the start, so that the technology doesn't have to be changed to make it suitable, either at the expense of the user or their

community.”

As the founder and Director of SMARTlab, of the Inclusive Design Research Centre of Ireland @ UCD and of The MAGIC Multimedia and Games Innovation Centre, and as a Principal Investigator and Academic Chair of the EU-funded Marie Curie DOCTRID AssistID programme, Professor Goodman works on numerous initiatives to ensure that technology can be used by and for ALL people, of all shapes, sizes, ages, backgrounds, and levels of ability.

### Research for impact

“For SMARTlab and the IDRC team, impact always been a central factor,” explains Professor Goodman. “We focus on the non-standard community groups or community ‘outliers’ such as People with Disabilities, elderly citizens and elders from first nations and aboriginal group, where there are deep veins of knowledge and wisdom that often go untapped.” One of the most immediate impacts of Professor Goodman's projects has been to enable **people with severe physical disabilities to communicate and to create and play music using eye movements.**

These assistive technologies, which the researchers including Professor Mick Donegan of SMARTlab configured using off-the-shelf eye tracking tools customised as input devices, with bespoke GRID tools for communications, have allowed users to express themselves creatively in a manner that would otherwise not be possible. These are life-enhancing tools.



Many thousands of other 'extreme users' are also benefitting from Professor Goodman's work too - the SMARTlab VR First Impact Lab Network and a suite of related projects being set up across Ireland and globally, uses virtual reality (VR) to build **confidence and skills among users with Autism**, a condition thought to affect roughly one in 100 people in Ireland.

"The virtual world gives people a new way to explore and socialise in a safe environment, and to learn and to play games - we can even develop virtual environments to help people learn about work opportunities and to do virtual job interviews" she explains. "In our partner team at Hao2 with Nikki Herbertson et al, roughly 80% of the developers are themselves on the Autistic Spectrum, and some of those developers have gone on to work in the technology industry. That has helped to **change the industry understanding of the skillsets that individuals with Autism can offer.**"

Professor Goodman is also using Virtual Reality to help people with **Alzheimer's Disease** - she and colleagues have developed game-like environments that encourage players to work together. "It's based on competitive gaming and the aim is to not only strengthen brain connections but also build a sense of online community." One of Professor Goodman's current applications of Virtual Reality is to create a **Virtual Obesity Clinic**. Working with UCD Professors Donal O'Shea and Carel Le Roux, and with the Hao2 and HorizonIRs

development teams under the SMARTlab umbrella, she has used virtual reality to explore the barriers to people attending a 'real life' obesity clinic. "We have shown that relatively small things can stand in the way of people getting treatment, such as not knowing where the nearest bus stop is, and whether the person could get to the clinic without stopping to sit down," she explains. Visualisation tools such as virtual worlds enable people to make personal choices safely and then to extend their realm of engagement into the real world.

Technology can also help to **support local communities**, and through SMARTlab Professor Goodman has been **applying this principal in Cahersiveen, Co. Kerry**. "By wiring the streets of Cahersiveen with wifi hubs and sensors, and setting up augmented reality tagging, using SKIGNZ we were able to let visitors see through their smartphones: they can not only see where the preferred cafes are, and where the library is, but they can also find cultural and historic sites, including the INCLUDE lab for local researchers and artists and the new maker space we are setting up there. We have even included a virtual Luke Skywalker above Mount Skellig," she explains. "It allows people to engage with the community and surroundings without necessarily disturbing the natural environment or community. We have run seminars there, bringing in researchers from around the world to the high street of Cahersiveen to honour the place and the people and their spirit of Muinin (Pride)."

The underlying technology is now also being used in Canada in a small town close to the Niagara Falls. SMARTlab is setting up a space where residents can use Virtual Reality to **learn about the environmental consequences of their behaviours and how to protect their surroundings and culture**. "They can see the impact of environmental disruptors and how that will change their area," explains Professor Goodman. "And we now have elders from these native communities working with us, bringing their knowledge about culture and landscape. They are joining the PhD programme, where they feel their values are reflected."



A new cross-cultural China/Ireland virtual world has also been developed for context-specific language learning, including online games and a full 3d Virtual UCD tour: this is ready to roll out as an orientation tool for international



students arriving at UCD.

Professor Goodman has written and edited/co-edited more than 14 books and many peer-reviewed articles, and she has written and presented many **media programmes**. She is also actively raising **awareness of Inclusive Design at European level**, encouraging its integration into research and policy, and she has supervised more than 40 successful PhD researchers, some of whom have gone on to set up their own clusters in a now **broad international network of researchers** seeking to ensure that technology does the right job for everyone, under the SMARTlab INCLUDE banner.

She will be chairing the world's oldest and most prestigious Virtual Worlds conference at UCD 31 October -2 November 2017: IEEE VSMM- Virtual System and Multimedia. Register Now!

## Research References

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