Were we right? A re-evaluation of the perceived potential of technology to transform the educational opportunities and outcomes of learners with special educational needs

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Abstract

The focus of this paper is the history of how special needs technology in the UK was developed for people with special educational needs between 1970 and 1999. Despite the proclaimed potential of technology, this context and period has undergone very little historical examination. This paper will draw on interviews with 52 experienced professionals in order to illuminate this history. Analysis will attempt to extend our understanding of the perceived transformative potential of technologies and the factors that influenced the actual transformative potential of technologies. In particular the analysis will focus on three particular kinds of transformations: a transformation of the micro-technology industry; a transformation of teaching practice and a transformation of experience of special educational needs/disability. These three transformations and the potential tensions between them will be illuminated through two themes: 'Entrepreneurialism versus Creativity' and 'Miracle Cure versus Just a Tool'.

Keywords: technology, special educational needs, history, digital divide

Introduction

The focus of this paper is the history of how special needs technology in the UK was developed and used for and by disabled people, particularly those deemed to have 'special educational needs (SEN)'. The particular period of interest in the study reported in this paper is 1970-1999, which was a period of significant transformation in terms of the development of new technologies for disabled people and yet there has been little documentation of the history of the period or of the life-histories of those who practised in the technology and SEN during this time.

The study reported here will make an original contribution to knowledge by undertaking an historical examination of technology use in the field of special education needs that covers a period of thirty years (1970-1999). This examination will draw on the memories and experience of 52 experienced professionals who worked in the field as teachers, developers, advisors or researchers. Analysis of these life-histories will attempt to extend our understanding of the perceived transformative potential of technologies and the factors that influence the actual transformative potential of technologies. In order to place these life-histories in context I will provide an overview of key policy and practice initiatives of the period as well as provide evidence for my argument that there has been a lack of historical research in the field of special needs technology.

Background

The mid to late 70s was a period when aids such as the LightWriter were being developed to enable control and communication.[1] Microcomputers such as RM Machines were also

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[1] Keith Copeland, ed., *Aids for the Severely Handicapped* (London: Sector Publishing Ltd, 1974).

beginning to be introduced into special schools.[2] The 1980's marked the introduction and domination of BBC Microcomputers. This spawned the development of a generation of BBC compatible educational software programmes and specialist technologies such as switches, concept keyboards and communication aids which were introduced into special education contexts.[3] The 1990's marked a period when technologies moved towards mobile devices, virtual reality and the Internet.[4] In terms of technology practice, for children and young people with 'special educational needs' the focus was on using technologies to help develop literacy and numeracy skills; improve cognitive, sensory and motor skills and facilitate communication.[5] In addition, emphasis was placed on using technologies that would facilitate access to the curriculum.[6] These objectives have been constant across the thirty year period in question. For adults with 'SEN', in the 80s and early 90s technologies played an important role in teaching life skills needed to move out into the community and live more independently.[7] In the late 90s, technology use developed to include more social goals such as making friends and community participation.[8] It is against this background that two key strands of policy and practice emerged and developed: 'Entrepreneurialism' and 'Enthusiasm for a Miracle Cure'.

Entrepreneurialism: transforming the micro-technology industry

UK government policy (and hence funding and support) between 1970 and 1999 focused heavily on getting technology into education. It is significant however, that this was not entirely driven by the department responsible for education. For example, it was the Department of Trade and Industry who in 1984, made funds available to place a BBC Microcomputer in every school in the UK. This reflected a desire to promote the UK micro-technology industry.

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[2] Ian Glen, 'Exploring with the Microcomputer', *Special Education: Forward Trends* 10, no 3, (1981): 16-8.

[3] Paul Blenkhorn, 'Microcomputer Software: Using a Touch Sensitive Screen', *British Journal of Special Education* 13, no 4 (1986):161 and Tim Southgate, 'Microcomputer Software: Aids to Communication', *British Journal of Special Education* 12, no 4, (1985): 150.

[4] Cromby, J.J and others, 'Successful Transfer to the Real World of Skills Practised in a Virtual Environment by Students With Learning Disabilities, in *Proceedings of 1st European Conference on Disability, Virtual Reality and Associated Technologies* Maidenhead, UK (1986):103-7; John Hegarty, 'INTERCHANGE - Promoting International Friendship-Links for People With Intellectual Impairment', in *Improving the quality of life for the European Citizen* (Amsterdam: IOS Press, 1998):179-184 and Karen Renblad, 'The Potential For Advanced Technologies to Broaden the Outreach and Social Network of Persons With Mental Retardation: A Literature Study', *Technology and Disability* 10, (1999):175-180.

[5] Mary Hope, 'How can Microcomputers Help? *Special Education: Forward Trends*, 7, no 4 (1980):14-16; David Hawkridge and Tom Vincent, *Learning difficulties and computers: Access to the curriculum* (London: Jessica Kingsley, 1992); and Trevor Watts, 'Microcomputer Software: Screens for Earliest Skills', *British Journal of Special Education* 17, no 2, (1990): 56.

[6] Jill Day, ed., *Access Technology: Making the Right Choice* (Coventry: NCET,1995).

[7] Ann Horsefield, *The Microcomputer as a Teaching Aid for Mentally Handicapped Adults* (Norwich: Hales Hospital, 1987) and Dick Jotham and others, 'Computers and Adults With Learning Difficulties in the NewLink Project. Part 3: Development and Student Progress at Cressy Fields, Alfreton', *Educare* no. 32, (1989): 26-34.

[8] Jane Seale, 'The Role of Supporters in Facilitating Use of Technologies by Adolescents and Adults With Learning Disabilities: A Place for Positive Risk Taking?' *European Journal of Special Education* 29, no 2 (2014): 220-6.

Policy differed greatly between compulsory and post-compulsory education. For the compulsory education sector, the 1980s' was one of the most influential periods in terms of technology policy in the UK.[9] The Government had set up the Microelectronics Programme (MEP) which was managed by the National Council for Educational Technology (NCET). The aim of the MEP was to help local education authorities (LEAs) to set up support services for schools. Whilst the MEP covered all education sectors, its 1981 strategy raised the profile of SEN by explicitly stating that children with physical and learning disabilities should be able to access and use 'new devices' and 'computer programs, which make use of the new technologies'.[10] This led to the creation of a network of four Special Education Microelectronic Resource Centres (SEMERCs) based in Bristol, Manchester, Newcastle, and Redbridge. Their brief was to promote the use of microelectronics in the education of children with learning difficulties across the four nations. The SEMERCs targeted those within the Local Authorities who had some kind of role in the field of technology and special education. Alongside the SEMERC's, a range of advisory or assessment centres with a specific focus on communication aids for children with physical or sensory impairments were created but with different funding models often involving undertaking charitable status (e.g. Cenmach in London, ACE Centres in Oxford and Oldham and the CALL Centre in Scotland).

The policy of the MEP and its enactment through SEMERCs was described by many at the time as letting 'a thousand flowers bloom'; encouraging many developments and initiatives in order to promote progress, but with the expectation that many would fail, and those that survived could not rely on government funding indefinitely- they needed to be entrepreneurial in order to become self-funding.[11] Therefore, funding was withdrawn from the SEMERCs in 1989 and the successor to the MEP, the Microelectronics Education Support Unit (MESU) attempted the preservation of the SEMERCs by encouraging LEAs to fund their continuation.[12] This had varying success, with ultimately only the Manchester SEMERC surviving into the 1990s by morphing into a company that sold software. Peter Fowler, the then Special Needs Co-ordinator for NCET, commented on how the network of practitioners with an interest in technology that was set up and supported by the SEMERCs became fragile, with many technology and special needs co-ordinators going back to the classrooms and resuming their standard responsibilities as teachers.[13] In 1998 NCET was reformed as Becta (British Educational Communications and Technology Agency) which carried on the focus on special needs technology with the maintenance of an Inclusion Team up until its closure in 2011.

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[9] Mary Hope, *Micros for Children With Special Needs* (London: Souvenir Press, 1987) and Chris Stevens, 'Information and Communication Technology, Special Educational Needs and Schools: A Historical Perspective of UK Government Initiatives' in, *ICT and Special Educational Needs: A tool for inclusion* (Maidenhead: Open University Press, 2004), 21-34.

[10] Richard Fothergill and John Anderson, 'Strategy for the MEP', *Programmed Learning and Educational Technology* 18, (1981): 121-9.

[11] Ben Rossie, '30 Years of Technology in Education: BESA Report Advises Government on Lessons Learned'. January 2015. https://www.information-age.com/30-years-technology-education-besa-report-advises-government-lessons-learned-123458887/ (accessed August 19, 2018).

[12] Peter Fowler, '*IT Helps: Information Technology for FE Students With Special Needs* (London: NCET, 1988).

[13] Peter Fowler, 'The Microelectronics Programme- Then and Now,' in. *Into the 1990's: The Present and Future of Microcomputers for People With Learning Difficulties* (Market Drayton: Change Publications, 1991).

Unlike the primary and secondary sector, there was no national programme like the MEP, co-ordinating the use of technologies within further education.[14] In 1986 however, some colleges did establish a national network called the National Federation of Access Centres which aimed to share experiences and provide a more cohesive assessment and provision service. This move, was initially supported with a government grant which provided a pool of equipment which enabled the professional teams to offer assessments as well as training on many different aspects of assistive technology. This funding was short-lived and the Centres eventually had to provide and fund their own equipment. Nevertheless, interestingly, this network still survives today (albeit through a different funding model), whilst the school-based networks have all but collapsed with the withdrawal of government funding.

Enthusiasm for a Miracle Cure: transforming the experience of disability

The developments in technology policy and practice were accompanied in the literature by a narrative that was prevalent across the practice community that heralded special needs technology as a prosthesis that had the potential to provide an emancipatory breakthrough for disabled people:[15]

> "This new technology can emancipate the handicapped and help to open up the horizons of many children whose communication and interaction with the outside world were previously very limited". [16]

> For pupils with significant physical and sensory impairments, IT can provide physical access to the curriculum. This is technology at its most dramatic, liberating the pupil from the physical barriers to learning […] For these pupils, the technology provides independent access to a world of communication and learning that has been closed until now. It is no wonder then that we consider IT in the context of physical access as a lifeline.[17]

> The considerable progress which has taken place in the last few years in the use of microelectronics has provided the long awaited breakthrough. Opportunities for self-directed activities, previously unavailable to people with profound and multiple handicaps, are being created by this equipment.[18]

The dominance and power of this celebratory 'master narrative' produced a range of responses from the special needs technology community. Firstly, a tendency to over-focus on the technological wizardry of the new products being developed to the detriment of disabled people and the practitioners who supported them in using the technology. Secondly, a tendency to expect too much from the technology- hopes of a prosthesis turned into hopes for

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[14] Tom Vincent, *New Technology, Disability and Special Educational Needs* (Coventry: Empathy Ltd, 1989).

[15] Richard Foulds, 'Applications of Microcomputers in the Education of the Physically Disabled Child', *Exceptional Children* 49, no 2, (1982): 155-161; Bernard Chapman, 'Warnock in the Light of New Technology', *Bulletin of the British Psychological Society* 35, (1982): 454-5 and Edward Cain, 'The Challenge of Technology: Educating the Exceptional Child For the World of Tomorrow', *Teaching Exceptional Children* 16, (1984): 239-241.

[16] Southgate, Microcomputer Software, 150.

[17] Day, *Access Technology,* 4.

[18] Judy Sebba, *The Education of People with Profound and Multiple Handicaps: Resource Materials and Staff Training* (Manchester: Manchester University Press, 1988): 48.

a panacea.[19] Although not writing in the context of SEN or education, disability and technology studies scholars have commented on how views such as these could be seen as symptomatic of techno-centric views both misread the benefits of technology and sought to eradicate or deny the existence of disability. For example, Roulstone writes that such views "misread the benefits of technology and offered misplaced hope as to the potential of technology' themselves.[20] Roulstone also discusses Finkelstein's (a disabled academic and activist) view that 'technology decision-making had to be more fully-shaped by…disabled people aware of the reappraised role of technology'.[21] While Shildrick talks of the tensions of viewing technologies as offering an escape from the disabled body.[22]

Whilst such views might have existed in the SEN and technology community it is important to acknowledge that a counter narrative was offered at the time that attempted to caution against viewing technology as a panacea. This narrative came from teachers, advisors and researchers alike. For example, Heddell wrote that 'Microcomputers can sometimes help; it cannot work miracles'.[23] Hawkridge and Vincent wrote that while computers 'can help learners to overcome their difficulties. They cannot work magic. They are not necessarily the best solution'.[24] The extent to which this counter-narrative gained momentum and endured will form in part a focus of the research in this paper.

Historical research in the field of special needs technology

To date there has been no in-depth systematic historical examination of the field of special needs technology. Some disability scholars would argue that this is because disabled people were and still are marginalised in society and that this 'social death' results in an invisibility in academic research.[25] The limited number of historical reflections that do exist tends to fall into three categories: organisations documenting their history as part of celebrating a particular milestone; practitioners providing some context to their predictions for the future developments of technology and life history work with adults with learning disabilities.

Documenting the history of key organisations in the special needs technology field

In 2008 CALL Scotland celebrated its 25th Anniversary with the publication '25 years of CALL'.[26] This 32 page document charted the major milestones of the centre and placed these within the wider research, practice and policy contexts. In particular it noted how the move away from special schools and the more towards smaller local authorities had 'created a demand for CALL input directly into mainstream settings where specialist expertise was

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[19] Jane Seale, 'Two Perspectives on the Language of Special Needs Computing: Towards a Shared View', *Disability and Society* 13, no 2, (1998): 259-267.

[20] Alan Roulstone, *Disability & Technology: An Interdisciplinary and International Approach* (London: Palgrave Macmillan, 2016): 1.

[21] Ibid., 93.

[22] Magrit Shildrick, *Embodying the Monster* (London: Sage Publications, 2002).

[23] Fred Heddell, *With a Little Help From the Chip* (London: BBC, 1985): 2.

[24] Hawkridge and Vincent, *Learning difficulties and computers,* 21.

[25] Paul Hunt. 'Parasite People', *Cheshire Smile* 18, no 3, (Autumn 1972): 15; Paul Hunt, 'Settling Accounts with the Parasite People', *Disability Challenge* 1, (1981): 37-50 and Vic Finkelstein and Ossie Stuart. 'Developing New Services', in *Beyond Disability: Towards an Enabling Society* (London: Sage Publications, 1996).

[26] An organisation specialising in the assessment and provision of communication aids.

otherwise thin on the ground'.[27] In reflecting on current times, the document reflects some of the cautionary narrative highlighted earlier:

> Progress with communication and learning for children with disabilities can certainly be facilitated by technology but it remains the 'soft technologies' of knowledge, experience and skills - plus a 'sky's the limit' attitude – plus a healthily pragmatic approach to the day to day reality of school life that underpins the ultimate outcomes of intervention with technology.[28]

Communication Matters is a charity set up in 1986 to promote access to and use of communication aids. In 2016, as part of its 30th anniversary celebrations it published '*The History of Communication Matters'*. This short 20 page booklet charted the development of the field of Augmentative and Alternative Communication (AAC) and the place of Communication Matters within this field and it also documented the development of AAC equipment and software, from the mechanical devices such as light boxes and rotary indicators to the 'touch screen revolution' and eye-gaze technology.[29] Whilst both historical documents are valuable they are not comprehensive and reflect the specific perspectives of just one particular stake-holder practitioner in the field- education advisors.

Practitioner reflections

In 1992 Hawkridge and Vincent reflected back on twenty years of policy and practice in order to identify changes that were still needed in the 1990's. 'It often helps to look back before looking forward' they note.[30] They concluded that there has been 'considerable progress since the 1970s, but more remains to be done'.[31] In particular they argued that experience from the past twenty years suggested that more needed to be done to ensure provision of technologies that was led by need, teachers have immediate access to the resources they need and better co-ordination of the networks that disseminate good practice. In 1991 Peter Fowler charted the history of the MEP and the decline of the networks and infrastructure that was created for the special needs technology field. He admitted to feeling frustrated about the future and called for the creation of a 'small, tightly efficient and highly committed national advisory group in this area".[32] Thirteen years later, Fowler's successor, Chris Stevens offered his reflections on UK government initiatives. He was more optimistic than his predecessor but concluded: "There is however, no room for complacency. If history has taught us anything about ICT and Special Educational Needs, then it should be that if we take our eyes off the ball we risk missing the goal".[33] Also in 1991, Janet Larcher, an expert in using technologies to support communication, reflected on her eleven years of experience in the field in order to judge how far the community had come in a decade and the implications for the next decade. She drew on her personal experience to conclude that technologies have potential, but only if we are 'led by the needs of the individuals'.[34] The

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[27] CALL Scotland, *25 Years of CALL.1983-2008* (Edinburgh: CALL Scotland, 2008), 1.

[28] Ibid., 2.

[29] Communication Matters, *The History of Communication Matters* (Norwich: Communication Matters, 2016).

[30] Hawkridge and Vincent, *Learning difficulties and Computers*, 213.

[31] Ibid., 220.

[32] Fowler, 'The Microelectronics Programme, 9.

[33] Stevens, 'Information and Communication Technology, 33.

[34] Janet Larcher, 'Into the 1990's: How Far Have We Come?' in *Into the 1990's: The Present and Future of Microcomputers for People With Learning Difficulties*. (Market Drayton: Change Publication, 1991), 40.

practitioner reflections reviewed here offer a useful insight into the factors, such as increased focus on individual assessment and support networks, which might influence the potential of 'technology' to reduce the digital divide for people with 'SEN'.

The social history of learning disability

The collective memory of people with learning disabilities forms a particular heritage that is irreplaceable and has the potential to provide an important foundation for future development in education, health and social care practice. Much of the collaborative life-history work between social historians and people with learning disabilities has focused on issues such as the experience of being institutionalized and relationships with parents and others. The results offer powerful insights into issues of oppression, loss and resilience. Technology, however has not heavily featured in this life-story research. In my review of life-story literature I have found just three examples where parents mention briefly how their child has used technology and three examples where people with learning disabilities themselves share their experiences. In '*Witnesses to Change*' three parents briefly mention how their children used computers at college. For example:

> Mark used to go to the technical college in the evening, to a class for physically handicapped people and people with learning difficulties. Then he got on a course in the day, he did joinery and cookery and things like that, he would do a bit on the computers and had two or three days' work experience.[35]

In '*Good Times, Bad Times*' Simone Apsis talked about her passion for computer programming:

> I had a love for maths and decided to learn how to use a computer […] I went on a computer course during one of my summer holidays and loved it. Computer programming was the activity I felt I had control over.[36]

In '*Testimonies of Resistance*', Majorie Chappell and Karen Spencer shared their experiences of using computers. Marjorie said:

> I spend many hours every day at my computers enjoying being able to write and explore the internet in every way possible. Writing has always been my biggest and I like to think my only handicap today. I not only write, but also attend college on one day each week, where I receive a lot of help and encouragement in taking computer courses one after another and gaining certificates. I have been privileged to be invited to give PowerPoint illustrated talks to college staff and at conferences about various disabilities at the Open University.[37]

Given that technologies were hailed as revolutionary tools with the power to transform the lives of people with disabilities, it is surprising that technologies do not feature more frequently or powerfully in the life-histories of people with learning disabilities that are reported in life-story research. There could be a range of reasons for this absence, including a lack of familiarity with technologies on the part of the historians.

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[35] Sheena Rolph and others, eds., *Witnesses to Change: Families, Learning Difficulties and History* (Kidderminster: BILD Publications, 2004), 318.

[36] Dorothy Atkinson, ed., *Good Times, Bad Times: Women with Learning Difficulties Telling Their Stories* (Kidderminster: Bild Publications, 2000), 79.

[37] Duncan Mitchell and others, eds., *Exploring Experiences of Advocacy by People With Learning Disabilities: Testimonies of Resistance* (London: Jessica Kinglsey Publisher, 2006), 36.

Why the need for an historical examination of special needs technology?

Although she was not writing in the context of special needs, in 2001 Light argued that historical examination is needed in order to understand the failure of technologies to reduce the digital divide (where, compared to the majority in society, those in marginalised groups have less access to technology and are less able to benefit, educationally, socially or economically from using technology). She argued that educators should strive to: 'reduce the chance that future scholars will look at current efforts to close the digital divide and ask, with the benefit of their historical distance, "how could they possibly have thought that?"'[38] In this paper I will apply similar questioning to the field of special needs technology- in particular, was the special needs technology community right to believe that technology had great potential for disabled learners?

This question is pertinent, given that we have identified 1970-1999 as a period of great enthusiasm and hope, Despite this powerful narrative, many have argued that there is a long-standing digital divide in which disabled people, particularly those with learning or developmental disabilities, are not accessing technologies to the same degree as non-disabled people[39]. Some practitioner publications from the period offer some suggestions as to the factors that might be contributing to such a digital divide now. For example, Hope pointed to 'anti-technological leanings' of teachers and the needs for training teachers about the potential of technologies.[40] Southgate, Fuller and Poon pointed to the need for funding of training, resources and support.[41] Whilst these suggestions are insightful they were made 'in the moment', at a particular point in time. With the benefit of thirty to fifty years hindsight, would practitioners now conclude something dramatically different?

The study reported here will make an original contribution to knowledge by undertaking an historical examination of technology use in the field of special education needs that covers a period of thirty years (1970-1999). This examination will draw on the memories and experience of 52 experienced professionals who worked in the field as teachers, developers, advisors or researchers. The 52 experienced practitioners in the field of special needs technology were interviewed between November 2015 and February 2017. The criteria for inclusion was that participants had been working in the field of special needs technology between 1970 and 1999 (acknowledging that for many this practice extended beyond 1999) and had occupied one or more of the following roles during their career: worked directly with people with special needs and enabled them to use technology (teacher); conducted and published research in the field of special needs (researcher); commercially

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[38] Jennifer Light, 'Rethinking the Digital Divide', *Harvard Educational Review,* 71, no 4 (2001): 726.

[39] Susan Moisey and Rhonda van de Keere, 'Inclusion and the Internet: Teaching Adults with Developmental Disabilities to Use Information and Communication Technologies', *Developmental Disabilities Bulletin* 35 (2007): 72-102; Jane Seale, *Digital Inclusion: A Research Briefing by the Technology Enhanced Learning Phase of the Teaching and Learning Research Programme* 2009, https://www.webarchive.org.uk/wayback/archive/20100624101759/http://www.tlrp.org/docs/DigitalInclusion.pdf (accessed August 19, 2018); Meryl Alper and Gerard Goggin, 'Digital Technology and Rights in the Lives of Children With Disabilities', *New Media & Society* 19,no 5, (2017): 726-740; Dany Lussier-Desrochers and others, 'Digital Inclusion Trajectory of People with Down Syndrome: A Pilot study', *Advances in Intelligent Systems and Computing* 587, (2018): 510-517.

[40] Hope, 'How can Microcomputers help?' 15.

[41] Tim Southgate., Prue Fuller, and Patrick Poon, 'Microcomputers at Ormerod School', *Special Education: Forward Trends* 10, no 3, (1983): 33.

designed, developed and distributed special needs technology (developer); supported the practice of others in the field, by providing advice, information, training or user assessments (advisor).

In each interview, I began by establishing a potted history or time-line of the participants' career in the field, their motivations for entering the field and their proudest or happiest memories. Participants were also invited to share any artefacts that reflected their time in the field. Shared artefacts included books, photographs, video clips, scrap-books, product brochures and old pieces of technology. I then sought participant views on the expectations of the community regarding the potential value of technologies for people with special educational needs and whether that potential had been met as well as opinions regarding the factors that influenced the use of special needs technology within the community.

Analysis of these life-histories will attempt to extend our understanding of the perceived transformative potential of technologies and the factors that influence the actual transformative potential of technologies[42]. In particular the analysis will focus on three particular kinds of transformations: a transformation of the UK micro-technology industry; a transformation of teaching practice and a transformation of experience of SEN/disability. These three transformations and the potential tensions between them will be illuminated through two themes I will call: 'Entrepreneurialism versus Creativity' and 'Miracle Cure' versus 'Just a Tool'.

Entrepreneurialism versus Creativity

As I have outlined at the beginning of this article, the key focus for politicians and civil servants was on transforming and expanding the micro-technology industry through entrepreneurialism. Indeed some of my interviewees talked about how they were supported by government agencies or local businesses to develop new products, set up companies and sell the products them to the special needs market. For example, Nick Pronger (a former teacher) and Rob Boyes (a programmer), who started a very popular but short-lived special needs technology called 'Brilliant Computing' in 1983/4, told me the story of how they started out a few years before and the role that organisations such as the Manpower Services Commission played in supporting their entrepreneurialism:

> And so, to cut a long story short, BBC computers came along and we were really interested-'oh wow, what could we do with this technology?' But we could get no interest or support within the educational system at that time and so I got really annoyed and said 'well I'm going to chuck in my job and use my last pay cheque to buy a BBC computer and I'm going to teach myself computing'. Which I did in 1981/1982. And lo and behold, no sooner had I packed my job in then, through Active, I was put in contact with a workshop in Shipley who had woodworkers who wanted to do useful things. And they said could they actually make specialist wooden toys like the ones I had been using in school. And we had all the designs. And they said oh we have actually got funding from 'job creation' or something at that time

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[42] The analysis presented in the following sections is drawn from data from all 52 participants. In the interests of space, just selected quotes will be presented that best reflect the issues being discussed and represent a spread across the different generations and roles. When presenting quotes from participants I will identify them with a code that indicates their surname and role (e.g. Hegarty-Researcher).

'community programmes'. There was money knocking about- we were in an EEC Directive 2 area or directive 3 area, so there was money knocking about for employment. So they said, well we could employ you as a manager to develop this. You could actually bring us the designs and go and market the stuff that our workshop produces. So we started doing that and then Rod came along and said he wanted to do some woodwork. In chatting with him it turned out that he had a data processing degree- he knew far more about computing than anybody else in the building. I subverted him and said well how about you doing some computer programming.

Bob Dyke, an advisor talked to me about how local business people in the area where he taught who had an interest in technology and engineering formed a 'Computer Club' and would help one another with their design and development ideas:

Back at school I was running out of ideas on progressions of things. I wanted to develop a switch, where you had to use it twice, or perhaps three time, or four times; or press the switch at the same time the teacher pressed their switch; or even better press your switch at the same time your fellow pupil pressed their switch. I wondered if it might be possible to put my Tandy computer between the switches and the toys. But I couldn't. I could think of no way of doing it, because in those days these simple computers didn't have USB ports. So I mentioned the problem at North-west Computer Club and a guy called John Hughes who ran a company called Pyramid Micros in Warrington said: "Oh I think I could build an interface box, driven by the computer. [I think it was off the cassette port]. I'm sure the cassette port has got some kind of output that we can use. I'll come back to you with that". A couple of weeks later, he came into the club with a plastic box with a couple of jack plugs in it and showed me how you could plug a jack plug into one-side of the box and the toy into the other side of the box. He loaded his little home-made programme into the computer off a cassette recorder [laughs- those were the days] and Lo! John could make me press the switch three times or four times to get the toy to work. I thought "weyhey this is progress!" So imagine me taking Johns box into school. That became the toy interface box- still sold by Inclusive Technology at Oldham- although not made by John Hughes anymore.

My analysis suggests however that whilst all relevant stakeholders appeared to be committed to increasing the use of technology within education and special education, motivations underpinning this commitment differed however. If politicians and policy-makers wanted transformation of the micro-technology industry; for education practitioners, the focus was on transforming and expanding teaching practice through creativity.

Creativity: A focus on transforming and expanding teaching practice

Many of my interviewees suggested that 1970-1999 was a 'halcyon period' in the history of special needs technology which has now gone.[43] Alongside this, the period was considered a positive exciting period, during which, practitioners felt like they were on an upwards journey; what one participant called the 'ascendant years' in terms of developments and achievements:[44]

It is a depressing thing, but I suspect that funding being how it is, that we have almost been through the golden age and that it is now going to be something that possibly won't be so well used-which would be incredibly sad.[45]

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[43] Hegarty-Researcher.
[44] Abbott-Researcher.
[45] Gray-Advisor.

I think in the late 70's, early 80's and into the 90's we were in a different era because everything was so new, there was a step-wise change in terms of what you could do with technology and everybody was excited.[46]

So the whole period of late 80's to late 90's was a period of great excitement, looking back and a period of great expansion. It felt like it was ever upwards.[47]

And there was a feeling of progress. I agree with you that nobody quite knew where we would end up, but I also feel that nobody had any doubt that it would be a good journey. We had such good support from the authorities and the technologists that we felt that it was a good journey to go on, a safe journey.[48]

Whilst the participants identified a whole host of factors that they perceived had helped or hindered the development of special needs practice within this 'golden age' such as funding, networking and support, one recurring theme throughout, was the importance of creativity:

I counted myself very lucky to have been involved in the work that I was, and to work with such an interesting range of people. It was a very creative era.[49]

But as far as looking back over my entire career is concerned- that team in those early years was very powerful. It was very powerful, very creative.[50]

Creativity Stories

This identified creativity manifested itself in many ways across the practitioner community. My interviewees shared with me, stories of creative teaching practice such as introducing technologies to students and staff in the context of play and having fun; and problem-solving solutions to technological and practice problems. For example, Janet Larcher, an advisor who started in the field in the 1980's, told me a story of an FE college lecturer called Tony Jones who together with a group of young adults invented a vocabulary called LLL (Language Learning and Living) using a technology based communication system called MinSpeak.

It reflected the humour of that sort of age group […] Wednesday for some reason was a knot- so every Wednesday he would come on with a knot in his tie. Bra became Zebra. He used a lot of ingenuity. It was clever teaching and those young people did quite well.

Kathryn Stowell a teacher, described how her school developed their own sensory room:

The whole school loved it [the sensory room] and we ended up actually- we had the sensory room which we developed alongside the curriculum and then we ended up developing the whole corridor going to the sensory room with sensory and interactive items. We had a premises manager that was quite good at making things so we had all sorts of thing, like key boxes that you could get from IKEA, we had switches and all sorts of sounds of different things that were interactive along the corridor. And then we decided to make a cupboard in our hall- where the students had play times and break times- into a dark room. So we had fluorescent glowing things. The idea was that they had a space that was around learning and

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[46] Poon-Developer.

[47] Abbott-Researcher.

[48] Head-Developer.

[49] Firminger-Teacher.

[50] Fowler-Advisor.

curriculum. But they also had a space that was around relaxation and fun and integrating it across the school.

My interviewees also shared examples of creativity that focused on making or adapting technology such as amateur programming of the BBC; 'hacking' into and adapting existing equipment such as switches and inventing new technologies such as the concept keyboard:

> I can remember writing and adapting programmes. There was a user port on the BBC where you put the Concept Keyboard, but other things could go in the user port as well. There was this box with coins on- and I made a programme where basically you could add up coins. So we got really involved and spend a heck of a lot of time on it.[51]

> We made little input output boxes for £10 a time where you had 8 inputs and 8 outputs so you could actually plug in 8 switches…It also meant that we could have 8 children with a single switch controlling something-playing games for the first time ever, interacting with each other. We were lucky in that one of the special schools had a deputy head who was an ex carpenter and he made some beautiful switches- polished wood, really too good (laughs) but that was the way he worked.[52]

The 'makers'

Whereas the transformation of the microtechnology industry was about making money- for many teachers, the transformation of practice was about sharing products and ideas for free. Two very different motives, spawned from the same breeding ground. Drawing on current discourse, one participant likened the creative activity of 'hacking and bodging' to 'the maker movement' and therefore the teachers and others who developed or adapted their own software and hardware as 'makers'.[53] The 'maker movement' is an extremely popular non-educational phenomenon that has emerged in the last five or so years and is defined by Halverson and Sheridan as "the growing number of people who are engaged in the creative production of artefacts in their daily lives and who find physical and digital forums to share their processes and products with others". [54] They note that this can be applied to education in that learning can be conceptualised as 'making'- the construction of understanding- in Papertian terms.[55] Some participants in this study were familiar with Papert, LOGO and the Turtle and others were actively engaged in encouraging their students to learn to programme by copying code from popular computing magazines. However, overall, the participants' reference to creativity through various forms of 'making' was more about viewing *teaching as making* rather learning as making (where teaching is understood in a broad sense, extending beyond teachers and classrooms). For those who worked with children this may have been influenced partly by the 'do-it-yourself' culture in special schools:

> In special ed. there has always been this culture of making stuff- out of cardboard- doing your own teaching resources and not buying in photo-copiable textbooks because they are not

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[51] Whittaker-Teacher.
[52] Kitchen-Teacher.
[53] Blamires-Researcher.
[54] Erica Halverson and Kimberley Sheridan, 'The Maker Movement in Education', *Harvard Educational Review* 84, no 4 (2014):496.
[55] Seymour Papert, *Mindstorms: Children, Computers, and Powerful Ideas* (Brighton: The Harvester Press Ltd: Brighton, 1980).

going to work. So you've got to make your own resources, cutting up photos. To me there has always been that sort of DIY culture in special education.[56]

Halverson and Sheridan highlight what they call the 'democratizing nature' of the maker movement through the sharing of the products of 'making'.[57] Interestingly, an example of shared software and one huge success of the special education field, which the participants frequently referred to was an initiative called 'BlueFile' software, in which teachers wrote their own programmes and then made them freely available for sharing. This was, in many ways, as Fluck argues, a forerunner to open educational resources.[58] The field, perhaps, was ahead of its time. Many of the participants (teachers and advisors) spoke fondly and with pride of the 'Bluefile' software, with one, speaking of how they aspired to get their programmes accepted into the 'Bluefile' portfolio.[59]

Halverson and Sheridan define 'makerspaces' as "communities of practice" constructed in a physical place set aside for a group of people to use as a core part of their practice" and in my interviews there were plenty examples of 'makerspaces' where practitioners joined like-minded others to share making experiences and skills.[60] These included SEMERC sponsored network meetings, Teacher Centres and local computing clubs.

One of the principles for the Maker Movement is defined as 'Giving' where 'there are few things more selfless and satisfying than giving away something you have made".[61] The self-lessness of making within the field of special needs and technology is exemplified in one story told by a participant:

> He was such a good guy and he was just churning out simple software by the yard and turning it over to us. And if we said: "Oh well, this doesn't work so well, not sure about putting this in the BlueFile at this stage- could you make sure that it doesn't fall over when you do this and could you just make that a bit more obvious?" - "Oh yes- no trouble". Then another cassette would be on its way with the problems put right.[62]

Although 'Bluefile' software had died out by the mid to late 90's, this commitment to democratisation and sharing has been continued by three of my interviewees who have set up personal websites to share the online resources they have created in more recent times.[63] Whilst the 'making' movement within special needs education clearly had an impact on practice, given the complexity of new technologies such as eye-gaze, robots and brain-computer-interfaces, it is unlikely that many practitioners will be able to 'hack and bodge' these technologies in the way they did in the past. The challenge for the new generation may therefore be to find new ways of being creative. But whether these new ways will emerge without a policy-driven push similar to the 'thousand flowers bloom' initiative remains to be seen. Particularly, as many of my interviewees felt that the current focus on performativity

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[56] Evans-Teacher.

[57] Halverson and Sheridan, 'The Maker Movement in Education', 497.

[58] Andrew Fluck, 'Government Sponsored Open Source software For School Education', in *Proceedings of the IFIP 18th World Computer Congress - TC3/TC9 1st Conference on the History of Computing in Education*, 22-27 August 2004, Toulouse, France, (2004): 27-45.

[59] Kitchen-Teacher.

[60] Halverson and Sheridan, 'The maker movement in education', 496.

[61] Mark Hatch, *The Maker Movement Manifesto* (New York: McGraw-Hill, 2014):1.

[62] Dyke-Advisor.

[63] http://www.oneswitch.org.uk/ http://www.ianbean.co.uk/ http://www.doorwayonline.org.uk/

within schools and the associated 'lack of freedom' that teachers are perceived to have does is not conducive to encouraging creativity:

> There was that opportunity for people to be creative, because it was an area where we were all learning. There wasn't- this is how you must do it- it was well- none of us are sure. I think that went on into the 90s as well.[64]

> So we had the luxury of spending a lot of time. I certainly don't have that these days. It's probably another reason why people don't 'make' anymore.[65]

> When I started in school, I was given a reasonable amount of time for this project and had encouragement…We did have more freedom…Also, we were not under this pressure. If we wanted the kids to try something for half the afternoon or a whole afternoon we could do it.[66]

'Miracle Cure' Versus 'Just a Tool'

My analysis reveals tensions in the practitioner narratives regarding the potential of technology in the field of SEN. Some viewed technology as a catalyst to transform the experience of disability; others saw it as a catalyst to transform educational practice.

Perceptions of technology as a panacea: a catalyst for transforming disability

From the interviews I conducted with practitioners reflecting back on the period, a more nuanced 'master narrative' to that of the time, emerges. Participants raised many points regarding the unrealistic expectations that both practitioners and parents had of special needs technologies, due to their potential of being 'over-hyped':

> I feel that it's not the fault of the technology, I think it is the fault of our perceptions about technology. There are still unrealistic expectations of it. It is still seen as an end, rather than a means to an end. And I think that is the challenge that we have, to constantly manage people's expectations of it.[67]

> I think because it was probably over-hyped or over-promised in the first place and the delivery and the years after the 90's didn't match expectations- but now technology is catching up with those expectations again.[68]

> I think there was a risk then and this still exists without a doubt that imagines that technology on its own is the solution to the problem. This happened a lot then.[69]

Others felt that there will always more that technology could achieve:

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[64] Stewart-Teacher.
[65] Brough-Teacher.
[66] Bates-Developer.
[67] Reeves-Advisor.
[68] Brown-Researcher.
[69] Crick-Developer.

I don't think we will ever be there, because technology is constantly changing and our expectations of what technology can do is constantly changing, I don't think we will ever be there.[70]

I think the technology is here to stay isn't it. But I don't think we should ever say that it has reached its potential for people, certainly not for people with physical disabilities, no way. We are a long, long way from that. I don't think we ever should think that technology has reached its potential I think you always have to be looking at how things could be better. [71]

Others went further and directly challenged the 'panacea' metaphor:

One of the problems caused by the arrival of technology in schools, was that it was regarded as being a panacea by people. It is like a doctor giving out a pill- oh you have a got a problem take this. It was and it did seem magical, but actually one of the obstacles to success could be in my view, too much of a focus on the device and not the needs of the person in context.[72]

So it was a fear that we have to use this technology, because we know it benefits, but we also had to be aware of its immense dangers. It can a produce a panacea which is actually nonsensical.[73]

People think that it is going to be a magic cure; that is going to relieve them of lots of work. Nightmare![74]

Perceptions of technology as a tool: a catalyst for transforming practice

One aspect of this challenging of the notion of a metaphor was the proffering of an alternative metaphor- that of technology as a tool:

If you imagine that it is just a tool, it is just like a spanner, or a wrench, it will do what you tell it to do. It is not threatening.[75]

I have always said that technology is a tool. It is not the be all and end all. It is the way that you use it. It is the tool for getting through to people and what people want and talking to people.[76]

This distancing from constructions of technology as a panacea could be argued to reflect a rejection of the rehabilitation or medical view of disability where technologies offer fixes for the deficits of disabled people.[77] Alternatively, adopting the preferred metaphor of 'tool' could be saying more about the participants views of education than their views of disability; where the notion of 'tool' perhaps reflects the creative culture of the halcyon days, where 'makers' needed tools to create the environments needed for technology enhanced inclusion. In other words, tools for transforming practice:

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[70] Bean-Teacher.

[71] Fuller-Advisor.

[72] Donegan-Advisor.

[73] Fowler-Advisor

[74] Davidson-Advisor.

[75] Fluck-Advisor.

[76] Aspinall-Teacher.

[77] Alan Roulstone*, Enabling Technology: Disabled People, Work & New Technology* (Oxford: Taylor & Francis; 1998); Roulstone, *Disability & Technology.*

Without new technologies we would never have had inclusion. It would have just been impossible. In those early days the only technologies for anyone to communicate in writing were the heavy Brother type-writers with huge wooden or metal guards across them. And then of course as the technology improved and the keyboards got lighter they were more user-friendly and the children could have them in the class-room and carry them home and between classes.[78]

I have seen paradigm shifts that have been caused by people with PMLD having their interests, needs and lifestyles captured and then routinely shared with everybody in their circle and actually they make a major shift towards being better understood and included and therefore being able to advance in terms of their skills, their communication and their life choices and that is just using the equivalent of PowerPoint and a bit of online capability.[79]

Some practitioners were not convinced that technology had successfully transformed practice yet:

I think, for myself, my expectation and hope for technology has always been to change practice. I don't think practice has changed…What is happening in schools now is different to what happened in the 80's. Some of that is due to technology, not necessarily AT, but I think the enablers and the barriers are much the same.[80]

Until systems change radically, I don't see that happening my lifetime, there are always going to be barriers around technology applications.[81]

So it is a journey, it is a little way there, but there is still a long, long way to go I think.[82]

I think there is still enormous scope for improvement and I think there are still schools where there are tremendous opportunities to use IT to help children move forward that aren't grasped.[83]

But I think sometimes that we should reflect back- that actually what we are doing, is not good enough yet and we are trying to do stuff that is good enough.[84]

1970-1999 marked an era of expansion in both the micro-technology industry and in teaching practice in relation to the use of technology with those who had 'SEN'. For government, the funding available to support the expansion of the micro-technology industry within education was limited. For practitioners, however, their expectations regarding what micro-technology could achieve appears unlimited. There is always more that can be done. Such a position may serve as a breeding ground for new creative practices, as practitioners strive to develop something that is 'good enough' to use Martin Littler's words. Equally, such a position may serve as a demotivating factor, causing practitioners to lose hope and give up. If technology has not successfully transformed practice in the last thirty years, can it really do so in the future?

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[78] Tingle-Advisor.
[79] Minnion-Researcher.
[80] Galloway-Teacher.
[81] Waller-Advisor.
[82] Stowell-Teacher.
[83] Dyson-Advisor.
[84] Littler-Developer.

Conclusion

Roulstone argued that 'technologies represent the wider constructions, zeitgeist and social imagination as much as they represent tangible artefacts'.[85] The analysis presented here suggests that special needs technologies came to represent the spirit of the age of the 70s 80s and 90s through the entrepreneurial and creative practices that it inspired. In many senses, the golden age of special needs technology as described by my interviewees had all the ingredients for a 'big bang' in terms of an expansion of practice: the funding: the technology, time and freedom. So why then, is there still a digital divide for disabled learners? There could be many reasons, including the persistence of the 'social death; that Hunt referred to when highlighting how disabled people are pushed out of sight in both life and research.[86] Goggin argued that one element that a disability-adequate theory of digital inequality needs to incorporate is the recognition that disability involves new aspects of literacy, education and user support.[87] I would argue that this study has illuminated that an adequate theory of digital inequality, in the context of SEN, needs to incorporate realistic narratives regarding the potential of technologies to transform life and educational opportunities for disable people and look at the influence of practices enacted by policy makers and related organisations and personnel, where creativity is valued and encouraged to flourish.

This paper is the first of its kind to conduct an in-depth historical examination of the special needs technology field in the UK between 1970 and 1999. The analysis suggests that if new emerging technologies such as eye-gaze technologies, robots and brain computer interfaces are to meet their potential,[88] the special needs technology community needs to heed the argument made by Light and learn from the past in order to understand what factors might influence and hinder successful or effective use of these new technologies and therefore what is required to remove the digital divide that disabled people.[89] Whilst the study has filled in an important gap in knowledge and has the potential to inform digital divide debates, it does have limitations which suggest a need for follow-up work including a need to capture the memories of people with SEN themselves, so that disabled peoples voices are not ignored in preference for the experts voice (see Seale et al. in press).[90]

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[85] Roulstone, *Disability & Technology*, 4.

[86] Hunt, 'Settling Accounts', 37-50.

[87] Gerard Goggin, 'Disability & Digital Inequalities: Rethinking Digital Divides with Disability Theory', in *Theorizing Digital Divides* (London: Routledge, 2018): 63-74.

[88] P Encarnação and others, 'Using Assistive Robots to Promote Inclusive Education', *Disability and Rehabilitation: Assistive Technology* 12, no 4, (2017): 352-372; Patrik Rytterström, Maria Borgestig and Helena Hemmingsson, 'Teachers' Experiences of Using Eye Gaze-Controlled Computers for Pupils With Severe Motor Impairments and Without Speech', *European Journal of Special Needs Education* 31, no 4, (2016): 506-19; S.R Sreeja S.R. and others, 'BCI Augmented text entry mechanism for people with special needs'. *Lecture Notes in Computer Science* Volume 10127 (2017): 81-93.

[89] Light, 'Rethinking the digital divide', 726.

[90] Jane Seale, Ajay Choksi and Karen Spencer, ''I've been a whizz-kid since I've been at college': Giving voice to the collective memories of adults with learning disabilities about the role that technology has played in their lives, *Disability Studies Quarterly*.