New Strategies for Digital Inclusion A participatory action research study



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New Strategies for Digital Inclusion | A participatory action research study

Report authors

Chris Hill Andi Stamp Jamie Veitch James Wallbank

Research partners

Access Space Network Community Media Association Community Media Solutions

Research team

Bill Best Steve Buckley Jaqui Devereux Martyn Eggleton Chris Hill Richard Lawrence-Day John Moseley Andi Stamp Jamie Veitch Rob Walker James Wallbank

Report design

Sugarcane

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New and innovative digital tools and strategies are available to businesses (including social enterprises), communities and individuals. Can these emerging and developing technologies and services promote entrepreneurship within deprived communities and disadvantaged groups? How can mobile technologies be used to develop existing businesses and social enterprises and to support new ones? Can web 2.0 and cloud computing technologies be deployed at community level to enhance existing community media enterprises and to start new ones? And what potential do new physical computing technologies, practices and value chains (including design and manufacture, analysis and remanufacture) offer to businesses and social enterprises?

Sheffield Community Network's digital inclusion pilots set out to answer these question through a programme of participatory action research. The pilots aimed to increase understanding and test the potential of the new technologies to support businesses and social enterprise; promote and encourage social entrepreneurship; and provoke and support new business ideas. The pilots conducted action-oriented research, through neighbourhood-based workshop activities, focussing on three areas of new technology:

 Digital Media on the Move Mobile platforms to access, make and share digital media content

- Virtual Enterprise in the Cloud Web 2.0 technologies and cloud computing for social enterprise
- Physical Computing Laboratory

New tools, machines and processes that manifest the digital as physical products

The purpose of each pilot was to work with deprived communities and disadvantaged groups to inspire, innovate, test and demonstrate, acting as a catalyst and a context to identify and engage new and potential micro-enterprises. Each pilot explored questions around: the transformative economic and community development potential of the technologies under investigation; the practical feasibility of their implementation, including factors that either inhibit or encourage effective usage; the sustainability of engagement with such technologies.

The key findings and recommendations of the study are:

The development of 'smart' mobile communication devices and mobile broadband are fundamentally changing the ways in which people access and use the internet. Access to a computer and an internet connection at home or at work is no longer the only measure of digital inclusion.

For a growing number of people with smart mobile devices it is possible not only to access the internet on the move but also to play and to record digital media – text, sound, pictures and moving images. The mobile platform is one of the new opportunities for community media development,¹ engaging a new generation of content makers and broadening the reach of community media.

Digital Media on the Move pilot research focused on the potential of mobile marketing and communications for business, social enterprise and community media. It demonstrated the ease and accessibility of smartphone media content production and distribution in enabling effective growth for businesses and social enterprises, and environmentally sustainable economic development.

The research confirmed that mobile technologies are a large and expanding part of the contemporary digital economy and that their use is vital for businesses and social enterprises if they are to reach their economic potential. But whilst most people running microenterprises had access to smartphones, before our intervention, the majority were unaware of the ease with which the technology they were carrying around could be harnessed to benefit their business.

Social entrepreneurs can benefit from running a *Virtual Enterprise in the Cloud*, saving them time and money and making other people more aware of the organisation they represent. Our work showed how it is possible to integrate the functions of a business into the cloud.

Chapter 1 - Executive Summary

Technically, integration is quite straightforward; however we identified issues of connectivity, affordability, security, trust and scalability that act as preventative barriers to cloud integration. And a strong message came through that, currently, cloud computing is more useable as a tool from the inception of an organisation rather than for an existing organisation to integrate retrospectively.

A number of factors pre-dispose, reinforce and enable potential users to integrate cloud computing. We identify and examine these and make recommendations to enable greater uptake of the cloud technologies which can help reduce the cost of social enterprise; and provide social entrepreneurs with greater flexibility and choice over the information technologies that support sustainable growth.

Physical computing technologies with potential to disrupt existing modes of manufacture are becoming affordable and widely available. At the same time, concerns over economic and environmental impacts are bringing awareness of digital technologies as material objects to the fore.

The Physical Computing Laboratory research pilot tested and demonstrated at neighbourhood level the use of physical computing technologies for social enterprise.

All the technologies investigated appear to show potential for enterprise incubation. They also show signs of having strong potential as a means of engagement and capacity-building.

Digital Media on the Move

Photo by @davelawler, used under Creative Commons License

Authors: Andi Stamp and Jamie Veitch

2.1 Introduction, scope and technology

The Digital Media on the Move research project tested and demonstrated new and innovative digital tools and strategies that can accelerate internet access, support digital inclusion and promote entrepreneurship within deprived communities and disadvantaged groups.

Within this the Digital Media on the Move research project focused on areas where mobile digital technologies (specifically smartphones) offer new opportunities to support digital inclusion and promote entrepreneurship.

2.1.2 Accessibility and availability

Research published in Summer 2013 by UK regulator Ofcom found that the UK has one of the highest penetrations of smartphones of all researched markets, with 51% of adults now owning a smartphone in the first quarter of 2013 (double the proportion of two years previously); and 24% of households now owning a tablet. Three-quarters of mobile phones sold in the UK in the first quarter of 2013 were smartphones.²

U.K. consumers also use laptops, smartphones and "other connected devices" more often to access the internet than other nations, according to the report.

In October 2013 the Internet Advertising Bureau published new figures (IAB multi-device research) predicting that smartphone penetration will reach 75 per cent of the UK population and tablet penetration will hit 50 per cent in 2014. But other research has also demonstrated that people within different "socio-economic status" groups have different access to smartphones. UK smartphone and total mobile phone users, by socioeconomic status, November 2012 (% of respondents in each group):

UK Smartphone and Total Mobile Phone Users, by Socioeconomic Status, Nov 2012

% of respondents in each group



Note: n=1,805 ages 16+

Source: Office of communications (Ofcom) - UK, 'Adults' media use and attitudes report' conducted by Saville Rossiter Base, April 23, 2013

2. The Communications Market 2013, Ofcom, August 2013. Online at http://stakeholders.ofcom.org.uk/market-data-research/market-data/ communications-market-reports/cmr13/uk/ Retrieved: 2 December 2013

2.1.3 Capturing content

Modern smartphones make the process of capturing video and audio content (as well as photos) easy and fast. Smartphone owners will typically carry their phone around with them at all times, as opposed to carrying a camera around less frequently. Android (e.g. Samsung, Sony, HTC, Nokia) and Apple smartphones offer easy User Interfaces to enable recording of video and audio content.

In-built camera / video apps usually offer some creative effects and filters to be applied whilst capturing the content. Most smartphones have very simple audio recorders designed to record "notes" or memos for the user; but many radio presenters use these recorders in the field to record interviews when no other devices are available and as backups: for short pieces they can capture broadcast - ready content.

The quality of cameras and sensors within smartphones continues to increase as a result of intense competition between hardware providers. Phones are predominantly sold on contracts of typically 18-24 months and consumers are strongly encouraged to upgrade their phones at the end of contract periods, to 'lock them in' to a new contract. Smartphone models that were state of the art 2 years ago are positioned, via continued new releases, to be perceived as obsolete (when in reality they are often highly fit for purpose). The net effect of the intense competition in the UK (and worldwide) market is that smartphone users now have access to a device with the capability of capturing very high quality media: HD (high definition) films; and very high resolution images.

Smartphone manufacturers have been keen to demonstrate the quality of the content that consumers can capture with their devices. In 2011 Nokia released a short animation film, billed as "the world's largest stop motion animation set," which was shot on their 'N8' smartphone. To date (November 2013) the film – available at

http://www.youtube.com/watch?v=ieN2vhsITTU - has been watched over 2 million times. Another Nokia film, also shot on a smartphone with the "world's smallest stop motion animation character"

(http://www.youtube.com/watch?v=CD7eagLl5c4) has been viewed over 3 million times.

A video published (on YouTube) by Nokia on 22 October 2013, "Create your own story with Nokia Storyteller," (*http://www.youtube.com/watch?v=uCzjMmNJktc* - designed to market the firm's Lumia 1520 phone with an inbuilt app) has already (27 November) been viewed by over 66,000 people.

2.1.4 Creatives and businesses using smartphones

Smartphones' content capture capabilities are already being widely used by creatives, musicians, artists, businesses and social enterprises. Some are embracing the devices' portability and functionality and using them to create promotional material; music videos; record or film interviews; or to create creative showcases or short films. Examples include:

- Mobile photography awards http://mobilephotoawards.com
- IPhone photo awards *http://www.ippawards.com/?project* = 2013-winners
- The Smartphone film festival and Indiephone http://www.youtube.com/user/indieFone and http://www.indiefone.com - showcase films shot on smartphones
- 7 Superb Short Films Shot With Cellphones http://mashable.com/2011/03/28/films-shot-with-mobilephones/
- Yorkshire singer-songwriter Kelly Mueller (AKA Kell on Urth) created the video for her song "Paper Girl" on a smartphone for a total budget of less than £5. The film http://www.youtube.com/watch?v=TU_jZqI3QZs - has, to

date (2 December 2013), received over 3882 views on YouTube; it has also contributed to the success of Mueller's crowdfunding campaign for her first album (http://www.kickstarter.com/projects/kellonurth/be-a-part-ofkell-on-urths-debut-album

 And bands that have already achieved international success have used smartphones to create videos. Scottish rock band Travis shot the music video for their 2013 single 'Mother' in one day, on an IPhone.³

2.1.5 Journalism in the 21st century - examples of worldwide news in which smartphone footage has been broadcast:

- In September 2013, smartphone footage from the Westgate shopping centre in Kenya, subject to a terrorist attach, was broadcast extensively around the world (e.g. by Sky: http:// news.sky.com/story/1145131/kenya-dramatic-video-showsmoment-of-attack)
- The Arab Spring across North Africa and the Middle East saw an explosion in international news agencies / broadcasters using smartphone footage and 'citizen journalism'.
- Al-Jazeera's citizen media service Share received about 1,000 smartphone videos during the Egyptian uprising against Hosni Mubarak in 2011. Riyadh Minty, its head of social media, told the Guardian newspaper:

"Post Egypt, in places like Libya, Yemen and Syria, citizens posting online have been the primary lens through which people have been able to see what is happening on the ground. Now our main stories are driven by images captured by citizens on the street, it's no longer just a supporting image. In most cases citizens capture the breaking news moments first. The Arab spring was really the tipping point when it all came together." ⁴

- Both opposition activists and pro-government supporters have uploaded footage; but the use by networks and broadcasters of user-generated content – especially in the context of news reports - does involve questions of authenticity, accuracy, verification and ethics.⁵
- But professional news reporters and journalists are also carrying and using smartphones to aid in capturing and disseminating stories. A New York Times managing editor has commented that they are "less intrusive to use in conflict situations" and in November 2012 a Radio 4 documentary on the alleged forced sterilisation of women in Uzbekistan, recorded on a mobile phone, won the Foreign Press Association award for radio. BBC correspondent Natalia Antelava commented "a microphone would put people we interviewed at great risk" and "the mobile phone is so much part of everybody's life now that people just don't seem to be intimidated or pay much attention to it at all. It was much, much easier." ⁶
- Demotix (http://www.demotix.com) publicly launched in January 2009 – is a citizen journalism website and photo agency which aims to connect freelance and citizen journalists with traditional media. It enables ordinary people who capture an event with news values on their phone to sell the footage to media and splits the revenue equally. The site has over 25,000 members in 190+ countries; members can upload content and Demotix relays and sells selected content on to news companies. An image contributed by a Demotix user of Ian Tomlinson, who died on his way home from work after being struck by a police officer during the G20 summit protests, was used on the front page of the Guardian and by other media.
- Newzulu (http://www.newzulu.co.uk) is another, similar platform.

 [&]quot;Travis shoot the video for 'Mother' with the new iphone." Adams, S. Drowned in Sound. http://drownedinsound.com/news/4147000-video-premiere--travis-shoot-the-video-for-mother-with-the-new-iphone Published 14 October 2013; Retrieved 2 December 2013.
Batty, D. Arab spring leads surge in events captured on cameraphones. The Guardian, 29.11.2011 and online at http://www.theguardian. com/world/2011/dec/29/arab-spring-captured-on-cameraphones Retrieved 27.11.2013.

^{5.} Copeland, S. The Arab Spring: A broadcast revolution. Published online at *http://www.theforeignreport.com/2013/05/30/the-arab-spring-a-broadcast-revolution/* on 30.5.2013; retrieved 27.11.2013.

^{6.} Marshall, S. Why a BBC radio reporter has ditched her mic for an iPhone. Published online at *http://www.journalism.co.uk/news/mobile-reporting-why-a-bbc-radio-reporter-has-ditched-her-mic-for-an-iphone/s2/a551285/* on 23rd November 2012; retrieved 2nd December 2013.

2.1.6 Smartphones and local council meetings

Mobile phones are also increasingly being used to film local council meetings. Podnosh's Nick Booth:

"It is often very helpful for local community groups or hyperlocal blogs to be able to record what happens at council meetings. It allows them to capture and share a record of what was agreed - and hold politicians to account in the future. It can also help them celebrate success and show good local government in practice." ⁷

Some UK councils have refused to permit people to film public council meetings; but in June 2013 the Department for Communities and Local Government published new guidance about attending and recording council meetings which explicitly states that (in England) council officers and councillors can be filmed at council meetings.⁸

2.1.7 Smartphone software (apps)

Smartphone users now have a wealth of apps - some free, some paid – available to enable easier (albeit often with limited capability) editing of footage within their device.

- Magisto (iOS and Android, free) is a popular video editor that focuses on ease of use and is "ideal for users without a great deal of technical know-how." The app offers a simplified editing process, in which users can stitch together video clips, add background music, and then add titles. The app incorporates cuts and effects and doesn't offer too much creative control – but this makes it easy to use.
- Lumify (iOS, free and freemium) offers significantly more editing capability, including filters, soundtracks, syncing, titles and the ability to speed up and slow down video.
- Cinefy (iOS) is a video editor that allows the insertion of rudimentary special effects into film clips.

- Viddy (iOS and Android, free) lets users capture short (30 second) video clips, add filters and music, and share them on social networks. SocialCam (iOS and Android) is similar to Viddy though with no limit on the length of clip.
- iMovie (iOS, paid-for) allows users to record video or use existing video and image files and edit them on a timeline or storyboard-based interface. A collection of themes offer transitions and title styles, while a series of audio tracks and sound effects are provided (and users can provide their own soundtracks or record audio.
- Vine (iOS and Android, free) is an app to create 6-second looping videos. Users create stop-motion animated videos by recording a sequence of short clips, which Vine will compile once the six seconds are completed.
- Instagram (iOS and Android) now allows users to create fifteen-second videos and to record multiple clips to create a montage. After recording a video, users can apply a variety of filters.
- Lapse It (iOS and Android, free) is an app for capturing timelapse and stop motion videos. It features a fast render engine up to 1080p (a high definition mode), assorted filters, customizable frame rate, and video trimmer. Users can share directly to YouTube, Facebook, and more.
- StoryMaker (Android, free) allows users to privately craft quality news stories (video and audio) and safely share these through their mobile phones. There is even a competition: the best story or suggestion for improvement wins €1,000.
- As well as StoryMaker, other audio editing apps are available. There are about 250 audio capture apps available on the Google play store; some of these allow in-phone editing.

7. Booth, N. Can I video my local council meetings? Published online at http://podnosh.com/blog/2013/06/14/can-i-video-my-local-council-meetings/ on 14.06.2013; retrieved 27.11.2013.

8. Your council's cabinet: going to its meetings, seeing how it works. https://www.gov.uk/government/publications/your-councils-cabinet-

2.1.8 Other notes on editing

Despite the growing popularity of editing apps (as above), and the efficiency of smartphones as content capture devices, their smaller screen size means that content can often be more easily edited if a PC / laptop (or tablet) is available for users to do the editing. And with editing footage - on whatever platform - being a time-consuming process, it is also critical for anyone considering capturing and creating content via a smartphone to plan what they want to use the content for and therefore what content to capture.

Effective planning makes the post-capture process of editing considerably faster:

"Sure, your smartphone has editing tools built in, but editing a half-hour video on your smartphone is the kind of self-inflicted-torture you should try to avoid. Think about what you're going to film before you press record. What are you going to use this video for?" ⁹

2.2 Partners and participants

2.2.1 Target participants

The mobile research programme was focused on reaching social enterprises, groups and individuals (including from deprived neighbourhoods) that have been connected through Sheffield Community Network (SCN), its partners and the Digital Media Centres (DMCs).

The research programme and workshops were delivered by Andi Stamp and Jamie Veitch who were both social enterprise advisors and business mentors supporting the SCN programme and having up to date working knowledge of the network and the individuals, groups and communities it serves. Three two-day workshops were delivered at two DMCs (Heeley Community Foundation and Sheffield Arts Forge Wavelab) and at a Virtual Community Network (VCN) site (Red Tape Central). They took place during October and November 2013.

2.2.2 Partnership promotion

The delivery of the work followed a schedule of planning, communication and delivery from July to December 2013. The opportunity to participate in the workshops was actively communicated to the target audience, participants and market. There were regular promotions on SCN's e-lists, website and news bulletins in advance of the workshop start dates. In addition from July to October all DMCs were contacted directly by email and phone call (each DMC received a minimum of 3 emails and 2 phone calls during the period).In addition to the DMCs the opportunity was also promoted at Red Tape Central. This was in response to requests from SCN clients who expressed a difficulty in travelling to sites outside the city centre, and there was also interest from Red Tape clients and customers in the mobile marketing and skills development workshops.

The research programme was successful in catalysing potential and connecting energy and activity in emerging areas of social enterprise and the digital economy. This was partly due to promotional efforts being relatively effective in beginning to reach excluded groups and individuals through the DMCs. In addition SCN clients and volunteers from community radio station Sheffield Live also attended the workshops - Sheffield Live volunteers expressed a strong interest in attending once they had direct evidence from peer participants that the workshop was valuable and useful.

The success in connecting with target participants was partly due to overcoming several problems encountered with recruitment. During the promotion of the research programme's workshop opportunities DMC contacts were, understandably, not available to participate in organising recruitment due to holidays over August. There were also difficulties in DMC staff availability as SCN funding support was finishing and DMCs were themselves also occupied with working on developing legacy and continuity strategies.

9. going-to-its-meetings-seeing-how-it-works Department for Communities and Local Government, 14.06.2013 Breuer, K. Musicians: 5 Tips for Shooting Smartphone Videos From the Road. http://diymusician.cdbaby.com/2011/08/musicians-5-tips-forshooting-smartphone-videos-from-the-road/ Published 24 August 2011; retrieved 2 December 2013.

2.2.3. Workshop design

The two-day workshop was designed to enable social entrepreneurs to develop greater awareness and understanding of digital technologies, to develop their analysis of markets and the digital economy and to promote the creation of new social enterprise ideas. Specifically, the workshops were designed to enable participants to acquire skills in using smartphones to produce and market media content.

The focus of the workshops was on key communication and technical skills in production, and key analysis and strategy development for disseminating or marketing their content afterwards. Workshop participants produced their own mobile production and marketing practical work during the workshop. They then researched and planned their own strategies using mobile marketing and production platforms (on their own or in combination with other production and marketing technologies). Android and iPhone smart phones were used for content gathering, and smartphones were made available to workshop participants if they did not have their own.

The scope of two workshop days was designed to enable participants to gather materials in the week between the two Wednesday workshops. The workshop structure was designed in consultation with DMC staff, volunteers and social entrepreneurs. Workshops focused on participatory, action-oriented learning and knowledge sharing using the skills and experiences of the leaders and participants. It created a research base for questions to be asked and answers to be found to key questions in mobiles and the digital economy, such as:

- What new marketing opportunities are emerging due to cheap and easy mobile production and distribution?
- In what ways are accessibility and affordability making mobile a specifically effective marketing tool for business and social enterprise?
- Do specific content capture and editing apps aid users? Or are native user interfaces equally or more effective?

• How easy is it for social enterprises from the SCN target communities to access new mobile opportunities in the digital economy? And what do they need to facilitate their effective use?

The scope of the two-day format allowed participants to begin an analysis of markets and the identification of new social enterprise ideas and opportunities, and to develop marketing plans integrating and combining the use of mobile and other technologies.

2.3 Impact of the intervention

2.3.1 Methodology

A specific project research methodology was designed to ensure that the work was delivered and assessed within a framework to enable the identification of key indicators on which to make an analysis and recommendations. The methodology included the design of a baseline study and a questionnaire.

2.3.2 Baseline study and action-oriented investigation

The action-oriented investigation was based on a participatory methodology through workshop-based activities with staff, volunteers and others from the selected DMCs who were involved in research design and implementation. Each DMC partner was asked to provide between six and ten participants.

The emphasis of the workshops was on action-oriented learning and peer group knowledge sharing. Participants were encouraged to identify applications to their existing work, to consider and pursue new concept and ideas, and to explore new enterprise opportunities. They also tested a variety of means to capture content 'on the move' using

smartphones and tablets to edit the content, and to distribute it. These included the native applications included within the user interfaces of most devices, as well as specific apps such as those detailed above in section 2.1.7.

At the beginning of the workshops the researchers conducted a baseline study. The participants involved were 24% female and 76% male, with an age range from 22 to 72, and engaged in a variety of work or studying:



Most (94%) participants described themselves as active in voluntary or community work. They are frequent users of the internet - via smartphones and traditional computers - and they use it for a variety of reasons:



How do you access the internet?

100% 80% 60% 40% 20% 0% Watching TV & Films Social Media/ Networks Email Playing Games Voluntary Work Web for Work/ Looking for News & Business Work

And they were using their smartphones MORE than any other digital device:





But despite their frequent usage of smartphones and of the internet, before the workshops, participants tended to use their smartphones mainly for phone calls and text messages, and to consume rather than create content:

For what purpose do you use the internet?

Information

120%



What do you use your smartphone to do

2.3.3.Questionnaire

Beyond the baseline study, a dedicated questionnaire was also designed to measure

- The impact of the intervention;
- How likely participants were, after the workshops, to create content with their smartphones;
- Their attitudes towards smartphones' benefits to social enterprise and business; community and voluntary work; and their personal development.

2.3.4. Results

The results both in terms of participants' progress and development between each workshop, and their feedback within the survey, were encouraging; with participants rating the workshops as beneficial and the opportunities from the technology – in their neighbourhoods, work, for project and social enterprise development, and for personal development, as positive. Participants had grasped the potential benefits when they attended the first workshop - many brought specific ideas of how they thought video or audio content could benefit their social enterprise, community, business or personal development. Most, however, had limited technical knowledge of how to capture, edit and distribute content,

Participants identified that planning in advance what content to capture made the editing process substantially easier; that editing within the confines of a small screen was limited, difficult, time consuming and achieved poor results in comparison with editing footage on a larger screen; and that web-based platforms made the process of distribution and marketing their content easy.

2.3.5 Apps and editing

We tested a number of apps (see 2.1.7) and found many to be clunky:

- StoryMaker froze on a number of participants' (modern!) smartphones, losing their content
- Lapselt was popular for users wanting to create time-lapse / stop motion content
- Lumify offers great functionality but was difficult to use Magisto was easy to use but limited in functionality

The overall reaction within the workshops to the apps was poor in comparison to either:

- Planning in advance and using smartphones' native user interface (i.e. unskinned camera, video or audio capture) to capture content and then upload it unedited to the web (using web interfaces if necessary to apply basic edits)
- Deciding to create content that would need to be edited, and capturing it within smartphones' user interface but exporting to a larger screened computer (or tablet) to edit. A variety of external editing software (i.e. on computers, not smartphones) was tested, including open source software.

We covered various methods to distribute and market content.

2.3.6. Participants' knowledge (about creating content) before and after the workshops:

Please try to rate your knowledge about creating digital video and audio content



Participants' responses on what they had gained from the workshop included:

- How to storyboard more effectively, increase knowledge in how to tell a factual or fictional story
- The different uses & reasons for using digital smart phones
- How to structure a video
- How to access & use photo & video tools on a tablet
- Marketing, editing
- Understanding of the possibilities of video & how to share it on internet and social media
- Information on how to plan an audio visual package
- Developed a script, planning and mindmapping for a short film
- Laying out "who, what, when, where, how, why"

- Better knowledge of how to structure video content
- Useful to look at digital video footage and talk through the pros and cons of different techniques, including collecting audio content. In terms of technical skills I don't feel I picked up anything new.
- Creating useful, interesting dialogue in interviews and an insight into basic narrative structure for films as well as script building with a group.

2.3.8 How participants can use the knowledge / skills:

Can (or could) you use the knowledge or skills that you learned from the workshop(s)



2.3.9 The "enabling" function of smartphones:



Do you agree or disagree with the following statements

2.3.10 What participants might do next:

Having been on the workshop(s), which of the following might you do more of, in the future, than you did before



2.4 Analysis of the results

2.4.1. Key findings

Overall the experience of participating in the workshops was positive.

The participants could see great benefits from using content creation on smartphones to:

- Benefit their neighbourhood (100% agreed or strongly agreed)
- Help their employment or enterprise prospects (over 90% agreed)
- Help a client group they work with
- Help to grow or setup businesses or social enterprises (over 90% said they can use the knowledge gained on the workshops to do so)

Participants agreed that smartphones make it easy to create content and that they are likely to do more recording and distributing of video and audio content, as a result of attending.

2.4.2 Technical and creative problems and potential of smartphones

We have already above noted that, despite more editing apps being available, in-phone editing is time-consuming and has limitations due to devices' small screens: this widespread understanding was borne out by the experience of the workshop participants. It is preferable to edit content on computers if available. However, the apps listed above DO enable useful field editing – and sharing. But the workshops demonstrated that by planning what content to film or record in advance, participants could significantly reduce editing time.

Two other technical challenges facing the mobile phone filmmaker are picture stability and audio quality. These do not have to be too restrictive if smartphone users plan to take account of them: using objects as makeshift tripods; adding a cheap lavalier microphone to their phone to collect audio.

Mobiles are most effectively used within a mixed platform production path:

- Production: collection on mobile and cameras
- Post production: editing, graphics, sound mixing and dubbing on a computer or edit suite.
- Marketing: distribution via sharing to web and mobile.

2.4.3 Marketing and opportunities for economic development

After creating, collating, and editing content, what next? Again, this depends on the desired use of the material, but a wide variety of options are now available which were explored in depth in the workshops. Video can be posted to platforms such as YouTube and Vimeo. When posting it is important to "tag" films appropriately so that they will appear within relevant searches – there are as many daily searches on YouTube as there are on Google. Similarly, audio content – interviews and music – can be posted onto the online platform soundcloud.com and tagged in the same way as above. These platforms also offer sharing functionality, through a variety of social media – Facebook, Twitter, LinkedIn. They also enable embedding whereby operators of websites can embed a YouTube or Vimeohosted video, or Soundcloud-hosted interview, into their own website by copying and pasting 'embed code'. This provides many advantages for small website owners, including not paying for hosting fees. Platforms also offer privacy settings so that films can be viewable only to people selected by the maker.

Other routes to disseminate content include

- News items with genuine news value broadcasters, local and community TV and radio (BBC, Sky News, Al Jazeera, and other national and international broadcasters have broadcast news stories recorded on mobile phones; Sheffield Live has broadcast interviews recorded on them)
- Dedicated content aggregation or monetisation websites such as the two listed above
- Through apps and citizen journalism websites
- Through hyperlocal or user-generated-content websites
- On forums or websites with a specific user base geographical, e.g. Sheffield Forum; or special-interest based (e.g. climbing films posted onto UKclimbing.com; social enterprise how-to films posted on Pioneers Post or Know-how Non Profit; business interviews and blogs posted to BusinessZone.com
- On Crowdfunding websites in support of a campaign e.g. artists in support of pre-sales of an album; social enterprises seeking to crowdfund an idea

2.4.4 Specific uses for social enterprise

The marketing and dissemination section above already shows a few ways in which social enterprises could make use of content created or captured on smartphones:

- Engaging potential customers by bringing the business to life; showcasing its mission, values, social purpose and outcomes
- Telling a story about a product, selling the product / service
- To generate positive local and national PR through news outlets and also through trade press
- To generate website traffic

• To support crowdfunding efforts

It is clear from the results of the workshop questionnaires that participants can see the value and benefit of mobilecaptured content to their work and community work. The biggest obstacle to doing so does not seem to be access to smartphones - but simply the knowledge of their capabilities - and how easy it is to use them.

2.5 Conclusions

The purpose of this Digital Inclusion Pilot was: "to test and demonstrate at neighbourhood level the use of mobile communication tools to access, make and share digital media content" and "investigate ways in which mobile technologies can be deployed at community level to enhance existing community media enterprises and to start new ones." The research demonstrates that:

- Despite considerable penetration of smartphones into UK markets and widespread internet (and smartphone) use amongst participants, the full capacity and capabilities of smartphones are not often used
- Practical, workshop based experience enables and allows people to experience the benefits of using the content creation and capture capabilities of their phones
- Participants easily recognised these capabilities to be of considerable use in their work, business, social enterprise, life and community and began to grasp the opportunities
- Many content capture and editing apps do not have very user-friendly interfaces and risk confusing or putting off the users. Most users preferred simple interfaces and to edit on a laptop or tablet, including use of web-based platforms, and benefitted from planning their filming in advance to reduce the need for editing
- An inability to use the marketing opportunities of mobile content as a major new and expanding marketing platform will leave social enterprise at a serious disadvantage to other business sectors

2.6 Recommendations

- Businesses and social enterprises should embrace the content creation possibilities of smartphones – to benefit their businesses, and, where appropriate to benefit their neighbourhoods.
- The emerging network of local television providers and existing community radio stations in the UK should encourage and incentivise smartphone-created submissions of video and audio items from the public.
- Colleges and schools should ensure pupils have opportunities to learn and engage with creating content on smartphones.
- Developers need to work harder to create 'in-phone' editing apps that are more user friendly and that do not lock in content to one distribution channel.
- We make further, general recommendations in Chapter 5.

Virtual Enterprise in the Cloud

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Author - Chris Hill

3.1 Introduction, scope and technology

The project sought to evaluate the scope, efficiency, pros and cons of running social enterprise business functions using cloud services. The report examines the scope for development, that is what areas need to be covered and are coverable by cloud computing, a baseline review of products and solutions available, followed by a case study of cloud integration into social enterprises.

To understand the scope needed for the implementation of cloud technology, it is necessary to outline the needs associated with running a social enterprise (SE), a microenterprise or a small to medium enterprise (SME).

And in order to assess whether cloud computing can be used solely to organise and run a social enterprise or business, we need an understanding of the day-to-day organisational and operational functions that must be covered. Although social enterprises may operate with different principles to commercial practices, they will usually have organisational functions similar to a private or public sector body.

So, to set out what is needed for a social enterprise to function, the authors reflected on a 'day in the life' of a social enterprise, based on the day-today functions of Element. This included areas of finance, recruitment, human resources, governance, marketing, product design and execution. Areas essential to functioning included:

- Human resources (HR) & recruitment
- Finance and accounting
- CRM (customer relationship management)
- IT and telecoms
- Marketing
- Governance (registration of the organisation, governing documentations etc.)
- Administration and facilities management (utilities, building maintenance)

The suitability of cloud computing technology platforms as well as an assessment of the feasibility to use cloud computing with social enterprises will be based on their ability to adapt to these areas.

3.1.1 Cloud Overview

The aim of this chapter is to analyse the use and application of digitally inclusive web 2.0 technologies and cloud computing applications for social enterprise. Cloud computing is often a blanket term for the use and application of service led interactions via the internet.

Virtual Enterprises in the Cloud (VEC) hope to utilise online computing technologies and service-led platforms in order to make social enterprises easy to administer and scalable to use. Social enterprises use online applications in order to email clients and service users, documents, share information, forecast sales, control stock, keep books and manage finances. In its most basic form cloud technologies act as 'software-as-a-service' (SAAS) where social entrepreneurs utilise multiple device platforms to access services from a number of points (PC, laptop, smartphone, ereader, tablet) that connect to the internet. Web 2.0 technologies allow social entrepreneurs to create their own economic, social and cultural capital by selfadministering their own social networks, uploading and sharing content, and by collaborating with other people at neighbourhood level. Web 2.0 empowers social entrepreneurs because users are able to express social aims and goals without having the prior technical knowledge to create participatory platforms. The future of social entrepreneurship looks to utilise information technologies at the intersection of Web 2.0 and cloud computing.

3.1.2 Varying Areas of the VEC

Virtualisation is the act of creating a virtual version of a program or process such as computer hardware, operating system (OS), storage or network resources. This works by

moving physical hardware into a cloud format in a way that frees up operating systems to work from software based programmes: taking away the arduous task of maintaining hardware by bringing resources and business functions to the user in a cloud format. This has the potential to prevent social entrepreneurs from heavy upfront financial outlays and can reduce time spent on managing local exchanges and servers.

Virtualisation also seeks to reduce cost spent on procurement of multiple licenses for desktop applications reducing cost. Finally virtualisation seeks to make content and services available anywhere there is internet access, allowing the user access from multiple sites and even the home. Virtualisation is therefore predominant in large organisations. The question however remains, what are the applications of such a flexible system for organisations that are either based from home or within small office spaces and do not require large amounts of sharing?

3.1.3 Aims and Objectives

The aim of the project is to observe the potential of migration from physical and non-cloud servers, giving consideration to:

- The transformative potential of the technologies under investigation
- The practical feasibility of their implementation, including factors that either inhibit or encourage effective usage

3.1.4 Review of some cloud applications

This review does not claim to be an exhaustive list of all available cloud technologies out there as it focuses on the most appealing applications that might help social entrepreneurs.

Google

Its functions include but are not limited to:

Gmail: A webmail client that works on a cloud system. Its advantages include integration with its other services such as Google Docs, 3rd party applications, web hosting, peripheral mobile device integration and developer access. The inclusion of IMAP/POP servers allows integration with CRM and mail management systems such as Capsule, Microsoft Outlook and Thunderbird. Criticism has been levelled as its personal free services are open to marketing algorithms that target keywords for advertising. In addition hacking and data accessibility scandals from the US have caused a large-scale uncertainty over Google's security.

Google Docs: offers a range of word processing, spreadsheet, presentation, database and publishing applications. Features include an online storage facility allowing uploading of any file type across Google users, real-time editing functions allowing collaboration across users, revision history to allow reversion to previous versions, file conversion for use in desktop formats. The advantage of Google is that its nonprescriptive style allows documents to be set up for different reasons. Documents can be used to house everything from HR reports, mailing lists, finance and web-design services. Google Docs also allows a number of different end users the opportunity to collaborate on documents in real time which is particularly useful when trying to convey messages and comments in a number of different geographical locations.

The down side to Google's virtualisation functions is that social enterprises might be resistant to the company's reputation as 'tax avoiders' even though some of its services are offered to not-for-profit organisations such as registered charities. This free provision does not currently extend to social enterprises in the UK which could put off potential users as 'free' equivalent systems and cloud technologies could be utilised instead.

Social entrepreneurs must consider whether the means (i.e. social good being created by using Google cloud technologies) justify the ends. The ubiquity and success of

Google's cloud offer, lies in the ease of use and the fast paced nature of setting up a sharing network that can be easily administered by a number of different users.

Etherpad

Etherpad is an open-source collaboration tool that is powered by Javascript. It operates upon the same principles as Google Docs as it enables users to work on a single project through dialogue and collaboration. Its open-source design also means that its ethos may be more appealing to social entrepreneurs.

Capsule

Capsule is predominantly a CRM cloud client, however its integrable apps function makes it a viable contender for social enterprise cloud management. Its ability to upload files and use storage, as well as maintain project management calendars gives it a great deal of flexibility similar to Google. However at £8 per user per month it is more expensive than its counterparts. It currently offers no discount for not-for-profits or charities. Additionally, integrable clients that modify its functionality (such as finance and accounting apps from freshbooks) do come at an additional cost. Its email drop box allows the user to link POP/IMAP email systems to share across the CRM system, allowing users to keep a track of contact communications and project pipeline; and to create milestones and tasks in order to effectively assign cost to each task. Client management allows comprehensive contact, mail management and CRM functions.

Integrable applications such as Freshbooks, Kashflow and Mailchimp allow the user to manage other areas of the business through their CRM capsule system. This allows business to business (B2B) integration which can be difficult in the cloud computing environment - different organisations using different cloud systems which may not be mutually compatible. Problems however do occur with costs associated with other licenses.

SAP

SAP is the largest and longest established business in the field and is best suited to large organisations such as councils, universities and large enterprises however it has made forays into support for SMEs. Products such as SAP 'Business-One' have been targeted at the market and look to make cloud computing relevant and affordable to smaller organisations. The benefit of SAP is its extensive comprehensibility: SAP includes functions from finance, CRM, HR and recruitment, email, project management and timetabling through to marketing and social media. They offer both hosted and dedicated server options in addition to their cloud systems. SAP although efficient is expensive for the purposes of this study. In preparation for the report a £20,000 figure was quoted for installation, maintenance and license agreements for an SME.

CiviCRM

CiviCRM is specifically designed for the non-profit sector and can be easily manipulated for use in the SE sector. Its most important functionality is a membership management facility which enables social entrepreneurs to engage with existing clientele about their membership renewals on an annual basis. The CRM manages contacts, fundraising, memberships and subscriptions to organisations. Users can raise funds and customise memberships through privileges. Efficiency is built around the ability to configure multiple memberships / members at any one time, and automate subscription payments. This is particularly useful to social enterprises that have memberships that are up for renewal at any one time in the calendar year and those SE organisations who are 'membership' dependent in terms of potential revenues and sales.

Abukai

Abukai allows social entrepreneurs the opportunity to create expense reports through a smartphone platform by taking a screenshot of the expense being claimed which is then electronically receipted to a central claims person who gets

the claim in duplicated form, as a excel spreadsheet, as a PDF file, and as a Word File. This is then emailed to the accountant or financial advisor with a total sum for the expense being claimed. The accountant can then check this against the receipted amount using the numerous documents that are simultaneously created by Abukai. Abukai is available for free for social entrepreneurs who make 12 'personal' claims per annum which could be rationed to track expenses on a monthly basis. The downside to Abukai is that most social enterprises depend upon physical accountancy because funding bodies and regulatory organisations are not yet receptive to cloud receipting and claims.

3.2 Partners and participants

Element

Sheffield-based social enterprise, Element were consulted in order to map the functions critical for operation of a micro business or social enterprise. Functions were delimited by conducting semi-structured discussions with the directors to understand what was needed to set up the business, running key functions such as tracking staff and finance functions as well as understanding key knowledge gaps when establishing the company.

Element itself had successful integrated cloud computing technology into its business systems from the start – it is a cloud integrated organisation. Function such as HR, marketing, comms, admin, project management etc. are all structured using Google Apps and ActiveCollab. Financial functions such as payroll are executed using Payeroo.

Microenterprise A

Microenterprise A has been involved with the development of cultural industries within Sheffield. They are a small organisation with less than 10 employees. They work from one site and are predominantly flat in hierarchical design. Matters such as HR are dealt with either informally or using paper based systems. Functions such as sales, marketing and CRM are done manually (through email or telephone communication) and are generally integrated into other areas.

Microenterprise B

Microenterprise B are a media group working within the city. They are a small organisation working within a managed workspace and therefore are not required to have a comprehensive cloud based system. They have a large mailing list that has renewed membership and operate an inhouse server for email.

Microenterprise C

Microenterprise C describe themselves as a 'mini-enterprise' who work on projects in tandem with a 'regular' job. The enterprise has been created through a mixture of crowd-funding and strong social media interaction with potential customers.

3.3 Impact and Intervention

Methodological considerations

This particular Digital Inclusion Pilot involved in-depth work with three microenterprises as listed above. We sought to understand the functions of the companies, that is what they needed to cover on a daily basis, what their current system entailed including IT and physical paper systems, and what they would be interested in migrating to a cloud set up. This comprised of a mixture of action orientated workshops and focus groups. A deconstructive approach was taken in order to understand the needs of the companies analysed. Asking what a company did, rather than forcing them to fit a framework allowed for an adaptive consultation process. This also sought to capture the aforementioned non-traditional, flat hierarchies developed within the SE sector.

Secondly, we included Element Enterprises as an example to understand how cloud technologies can be successful integrated into a business from start-up.

The new start up perspective

Element used cloud technology from inception therefore transfer from a physical system to a cloud system was not an issue. In regards to email cloud technology is not a user facing problem, that is the user is only affected by server downtime in an exchange based system as the interfaces are on the whole similar. Used from inception the integration of collaborative applications such as Google Docs, calendars and project management software become natural company processes. The issue of integration comes mainly from the introduction of new staff members, those accustomed to using desktop formats such as Word instead of Google Docs. Behavioural modification comes from new staff members following tacit company conventions (going with the flow to get the work done) instead of active behaviour modification techniques.

Workshop 1

This workshop sought to understand the function and governance needs of social enterprises as well as provide a showcase of potential solutions for the participating organisations.

Microenterprise A have a small staff number– so had no need for some of the operating functions of a larger business (therefore no need to consider whether Cloud technology could cover them). It was however identified that the company would require elements such as collaborative document editing, and cloud based image manipulation.

It was decided that the most effective solutions for this company were based in cutting up-time on internal IT systems such as dedicated servers and integration of free or more cost effective online creative packages. For example microenterprise A had a dedicated internal exchange server which required maintenance, repair and management. It was decided that for a small organisation (3 individuals) a hosted email server such as Google Mail would be suitable. Collaborative functions of Google Docs such as real time editing and revision mark ups were seen as useful. Functions such as the ability to download user content were seen as a way of safeguarding against breaches of security and monitoring productivity.

In addition to the reduction of up-time for server and email maintenance, image editing cloud applications such as Pixlr were seen as beneficial and marked for integration.

Microenterprise B, are a small organisation that did not require integration of project management, HR or finance systems. Their main need was highlighted as integrating finance and CRM functions to manage their membership lists. Due to the specialised media needs (streaming web content) specialised functions were needed for management content and was not seen as applicable to cloud solutions.

It was decided that integration should be carried out on a one to one basis.

Outcomes

Microenterprise A agreed that the integration of cloud computing would be of benefit to their organisation – but that they did not want to do so at present. They believed that the integration of cloud technology would require too much down-time for the company and that the cost may have been too high. They were interested in migrating functions over to the cloud in the future and believed that it would be possible to use:

- Google Docs to write collaborative bids within the organisation, and manage functions from maintaining their P&L, cashflow and balance sheet
- Gmail as the provider for email
- Apps such as Pixlr for design

It therefore appeared that some functions could be integrated into business. Other features were either rejected as unnecessary as they did not exist as parts of the company or they were deemed too expensive (Capsule licenses). Microenterprise B agreed that they wanted to integrate their financial systems into a single CRM cloud but were still unsure about the feasibility of this change. The CRM would hope to capture membership data and help the organisation to renew expiring members on an annual basis. They were interested in how this process could be done using existing data that could be transferred from an Excel spreadsheet. It was hoped that this CRM would be interactive and would help Company B to give the members a monthly update about the good work the organisation was carrying out.

The company is still working on the practical feasibility of this idea but were concerned that this change would take up too much down-time and that the data might have to be computed for a third time at a later date.

Microenterprise C found Kickstarter (an online crowdfunding platform) a good way to raise a strong brand presence, provide customers with an engaging 'experiential' purchasing in ways that were feasible and required little uptime once they are up and running.

Workshop 2

This workshop acted as an action-orientated investigation where participants were able to experiment with cloud technologies in a way that might help demonstrate the transformative potential of the applications.

The emphasis was to get the participants to talk about their level of IT proficiency and in what ways computing informs the work that participants do on a daily basis. This conversational approach helped participants to identify their modus operandi and possible ways that this could be improved through peer group knowledge sharing. During this workshop it was clear that many of the participants were more interested in understanding the transformative potential of the cloud computing as a way to

effectively manage a number of start-up businesses. From this discussion it was clear that some participants saw no clear difference between cloud computing applications and Web 2.0 technologies and came to the agreement that 'anything has the potential to be a cloud'. For example, the participants were open about how they use social media platforms to explore new enterprise opportunities although some participants were resistant to using 'Facebook' because they did not trust the terms of use and therefore avoided using it. Other participants saw Facebook as a 'cloud-like' platform that was a useful central portal where people could upload pictures, administer social groups and events, despite other people's concerns about what 'Facebook is doing with this data' or 'how Facebook owns the data I upload there'. One participant in particular was vehemently against the way in which they perceived Facebook had rights over their content.

It was clear that each participant had a different perspective of what cloud technologies could be and in what areas of enterprise that they could be utilised effectively. For example, one participant was mainly interested in how cloud computing could help enable artistic practise through the creation of digital data created on mobile devices. Whereas another participant was still at university and was generally interested in cloud computing as a whole and attended the workshop so that they would be able to put this knowledge to good use once they were reading to start up their potential enterprise that was still at an 'idea' stage.

Workshop 3

Workshop 3 acted as a conclusion for the consultation process. Microenterprise C raised the issue of connectivity to the internet as a problem for setting up new enterprises. This was taken from the perspective of access to hardware and to constant connectivity. The question 'could an individual effectively set up an organisation in the cloud (or indeed in general) without access to a personal computer' seemed to be a key issue for participants. Participants indicated that although managed workspace made it easier they are not open 24 hours making international transactions and operations not possible. Secondly the issue of internet

connectivity became a problem. If the internet connection is unreliable, an organisation can come to a standstill when internet utility is not present. It was suggested that functions such as 'Google Take Out'- a user dump feature safeguarded against this as it allows the user to access content locally.

Trust was again talked about as a perceived barrier to cloud integration. Participants believed that the issue of utility of the cloud over the trustworthy nature of cloud platforms was a more important factor in choosing to integrate a cloud technology.

Collaboration was also discussed. One participant raised the question of how collaborative is collaboration using the cloud. It was posited that when writing large narrative based documents, editing and production becomes impossible and one individual generally takes over the process. Cloud computing was posited to be used for non-narrative based collaboration such as data entry.

Concerns

COST >> TRUST >> COMPATIBILITY

Both microenterprise B and C raised perceived issues of compatibility. Microenterprise C stated that they had had difficulty integrating cloud computing and functions such as bank account access. They stated that integration of PayPal (an online payment client), cloud technology and interface's to suppliers were not adequate and often ended with individuals to reverting to less technically advanced means such as fax. Microenterprise C also noted that the integration of secure keys (peripheral decryption devices for internet banking) has meant that people still have to use non-cloud technology to access their accounts.

Participants had also begun to reflect upon the previous workshops and began to see the potential of cloud computing where there was previously scepticism about handing over data to a third party:

"The notion of cloud service for businesses and the kind of virtual infrastructure where you can stretch and flex storage capacity and bandwidth as you want as the project scales makes sense to me. So does moving away from dedicated servers and lots of hardware. That was in stark contrast to the workshop previously where we sounded the alarm bells about giving over data to a third party." (Dave, volunteer at Digital Media Centre).

One participant then questioned whether paying for cloudbased technologies resulted in a better level of service than if users relied on free services or existing procedures that take place outside of the cloud.

One participant was dissatisfied with the formalities of registering internet banking that slowed down the pace of the enterprise that had grown significantly in the past 6 months. A lack of integration in the supply chain and problems with internet banking integration meant that problems quickly arose and the company had to resort to traditional telecoms.

Microenterprise C had started their 'mini-enterprise' as an extension of a niche-hobby and had utilised online computing technologies to get the business off the ground. In order to get the enterprise into its manufacturing stage the company rolled out a Kickstarter campaign to get the niche-hobby product onto the online market.

Integration of new procedures within an established organisation goes beyond the prescriptive managerial process. When the question 'can a business be transferred from physical to IT services' it goes beyond a question of simple IT processes. For successful integration of new systems, a change in behaviour is necessary. A Total Process Planning model has been suggested¹⁰ to develop changes in institutional processes.

3.4 Analysis of the results

Feasibility

Integration of cloud technology is in a technical sense, straightforward. In the first instance it is easier if a SE (or any organisation) sets out to integrate the cloud into their systems from the outset, creating documents in the cloud,

10. Social Marketing and Public Health: Theory and practice, French, J., Blair-Stevens, C., McVey, D., and Merritt, R., Oxford University Press, 2009

setting up finances online, as companies did not wish to take their servers offline to integrate the systems. Also as a matter of course due to new and innovative funding opportunities such as Kickstarter, newer organisations are already primed to engage with VEC.

The issue however comes from connectivity issues. VEC will only become feasible when everyone has access to a reliable constant internet connection, and has a computer. In regards to physical hardware tablet innovation has made it easier for individuals to connect to the internet, but not necessarily easier to generate text based content (essential for entrepreneurship). New, very low cost technologies such as Raspberry Pi (a small microcomputer running a free, open source operating system designed for education) have been mooted as a possible solution to the problem.

Scalability

Scalability in terms of social enterprise becomes more of an issue of cost than of ease. Due to the fact that servers do not need to be upgraded upon expansion of the business and data and that user accounts can be shared with relative ease, cloud systems (if integrated at the start of a company's development) are relatively simple to administer. Administrators can easily create accounts and share resources with new staff members and share projects across large organisations. The issue of price however becomes prevalent when accounts are charged per user for example a smaller organisation may choose to use a more expensive provider over a cheaper alternative as they require fewer accounts. An organisation must take into consideration the trade-off between money saved through not having to manage and maintain local devices such as personal computers and servers versus cost per license to be placed in the cloud. This becomes more of an issue as more data is housed in an organisation and the number of users increases

The author of this Chapter attended the 2013 VMWare Forum conference in Manchester; it became clear during this event that cloud computing is still in its infancy. Whilst recognising the 'applicationisation' of work and increased mobilities brought about by multi-faceted device platforms a clear useable form of cloud computing has yet been brought into the marketplace. VMWare were clear that cloud computing technologies should 'embrace lack of control' meaning that server and data management should be given over to a third party.

Furthermore, multi-faceted mobile workspaces require bespoke tailor-made clouds which enable actors to work from a number of different software packages at the drop of a hat. For example, two iPhone/android users could look at the apps that they have downloaded through the app store in terms of which apps they use every day, apps that they use occasionally and apps that they don't use. For social enterprises it might ring true that social entrepreneurs 'bring their own' technologies to the table using their personal computer/office/mobile. Therefore, the 'work/non-work' balance is often blurred as personal and company often become interconnected and entangled with one another.

Cloud computing should also assist productivity by setting in place policies and parameters.

Predisposing factors of potential VEC

The following were identified as factors that pertain to end users' knowledge, attitude, beliefs, values and perceptions of cloud computing and Web 2.0 technologies that facilitate behavioural change.

Positive

Attitudes: people value the enterprising relationships and social good forged through computing technologies.

Knowledge: people are generally aware of cloud computing and web 2.0 technologies. Most entrepreneurs use at least one of these technologies on a day-to-day basis.

Confidence/self-efficacy: end user feels in control of cloud computing and enacts it to maximise social aims and objectives

Negative

Attitudes: cloudcomputing is no better than the existing mode of working that people currently have in place as it would take up too much time and resources to implement.

Knowledge: many social entrepreneurs do not know that cloud computing can be applied to social enterprise so continue to work using other means. Often perceived as something for 'big businesses' who can affort to invest substantial time and resources into a cloud solution.

Confidence/self-efficacy: cloud computing is seen as an ambiguous concept that is talked about in the media that is set to take over the way people do computing so users are afraid that they will be 'left behind' and lose competitive advantage if they do not use these technologies.

Reinforcing factors of potential VEC

The following were identified as factors that are reinforced by rewards to encourage or negate behaviours from others (peers, colleagues, friends) by the end user.

Positive

Utility of cloud computing allows companies to streamline processes and facilitate collaboration

Perception of cost saving may encourage the company to migrate to VEC

Negative

Possibility of compromised security may lead to SMEs/SE not engaging with VEC

Cost benefit may be marginal in real terms and upkeep of cloud might disrupt existing work flow

Enabling factors for potential VEC

The following are factors that are mitigated by skills, resources and environments. These factors can stand as barriers or aid behaviour modification.

Positive

Collaboration is made possible through live editing in the cloud

Free licenses lessen cost of access to software

Up-time on servers reduces cost of IT systems

Negative

Possibility of compromised security may lead to SMEs/SE not engaging with VEC

A company can only achieve transition if agents of change within an organisation (directors, management etc.) are willing to migrate to VEC

24 hour connectivity or lack of hardware may mean that individuals do not feel that they can have constant access to their business

3.5 Conclusions

It appears as though it is indeed possible to integrate the functions of a business into the cloud. Whether this be using dedicated systems and applications such as Capsule or coopting basic applications such as Google Docs to act as a multi-facet system (a spreadsheet can be used to house finances or act as a database for example).

Scalability is an important factor from a general organisational stance. In the instance of company B, the

uptime of internal servers was not seen as an issue at present but an increase of users may cause it to be an issue in the future if the infrastructure is not already included within the system. Cloud technology is therefore more useable as a tool from the inception of an organisation rather than as a retrospective addition.

Outcomes of the workshop pointed to the use of Google Apps as a preferential system of use due to its wide range of ad hoc solutions that are integrable with the core system and its relative ease of set up. However ethical considerations were raised as a problem for some users.

It is hoped that VEC technologies can help reduce the financial cost of SE activity, provide social entrepreneurs with greater flexibility and choice over the information technologies that encourage sustainable regional growth.

3.6 Recommendations

Contingency planning

 If trust in the cloud is still an issue for some organisations a clear contingency plan relating to data and security breaches (or, for example, lost laptops) might put many sceptical minds at ease. Contingency plans might include both practical (how to lock-out systems) and legal advice on what to do if data confidentiality is breached. They should also cover how businesses and social enterprises can be protected if the level of service offered by a cloud computing organisation is below the agreed terms.

Co-creation of services

 Via collaboration with microenterprise and social enterprises the cloud computing industry could co-construct a platform that is adapted to their needs: ALL businesses including social enterprises need to run a certain number of basic functions, but if they could do this through a platform that

- integrates all functions into one place, is affordable from the outset and can grow with them they would be better served. Additionally social enterprises specifically need the ability to demonstrate their impact, and the ability to integrate social impact measurement into a comprehensive platform would provide enormous benefit.
- A cloud platform created by social enterprises would encourage use, dispel notions of distrust and allow a firsthand experience of how the interfaces function. It would help to end distrust between SE and cloud technology, foster understanding and accessibility to cloud technology and finally give SEs a stake in the sector.
- We make further, general recommendations in Chapter 5.

Physical Computing Laboratory

Photo by johnbiehler.com, used under Creative Commons License

Author - James Wallbank

4.1 Introduction, scope and technology

Background

Physical computing technologies with potential to disrupt existing modes of manufacture are becoming affordable and widely available. At the same time, concerns over economic and environmental impacts are bringing awareness of digital technologies as material objects to the fore. In this study the term "physical computing" is used to describe emerging technologies, such as digital fabrication and robotics, and more familiar but often neglected practices, such as computer repair and re-use.

These practices develop high levels of skill which span sectors, connecting creative and digital industries (CDI) with advanced manufacture and engineering (AME). They suggest innovative enterprise models that re-localise design and manufacture, and may have particular potential to engage individuals from communities with an industrial heritage.

The purpose of this research is to work in a community context with people from a wide range of backgrounds (including people from deprived communities and disadvantaged groups) to inspire, innovate, test and demonstrate, acting as a catalyst and a context to identify and engage new and potential micro-enterprises.

It explores questions around:

- The transformative potential of the technologies under investigation
- The practical feasibility of their implementation in a community context, including factors that either inhibit or encourage effective usage
- The sustainability of engagement with such technologies, both for the digital media centre, and for the people and micro-enterprises that use it

This research tests and demonstrates at neighbourhood level the use of physical computing technologies for social enterprise. It will raise awareness of the potential of a range of physical computing practices and value chains (including design and manufacture, analysis and remanufacture) and will engage with new and existing enterprises that already see its potential.

4.1.1 Interpreting These Key Questions In Concrete Terms

Transformative Potential

What impacts can this technology have in terms of who they engage, what people learn, how this may improve employability, and what enterprises are incubated?

Practical Feasibility

What practical barriers to deployment have been encountered? Which technologies are most and least straightforward to deploy?

Community Context

The context in which implementation is relevant is one of ongoing adult learning and informal working, such as exemplified in Digital Media Centres, at Access Space and at The Digital Media Hub.

Sustainability

What income streams can be generated from operating and/or providing access to the technologies? What costs are involved, both for the community context, and for individuals? How can micro-enterprises start to make income from the technology? Are the enterprises incubated have strong potential for sustainability and growth?

To pursue this research Access Space network has:

- Researched and identified key technologies, their costs and potential benefits
- Purchased, commissioned and deployed advanced manufacture and physical computing technologies
- Made these technologies available, with support, to individuals and enterprise startups

4.2 Partners and participants

The programme directly engaged 70 people with the technologies, developing designs, prototypes, products or business ideas. Of these people, 17 (24%) were women, and 53 (76%) were male. Many of these individuals engaged with just one of the technologies – but several also engaged with more than one.

Originally we envisaged delivery of physical computing workshops as group activities in SCN Digital Media Centres. The compressed timescale of the project, and scarcity of physical computing resources in each neighbourhood appears to have made DMC engagement with this methodology problematic - so we concentrated on raising awarenesss across the network, and responding to individual referrals using Access Space's Physical Computing Lab as the venue.

We did not systematically record the routes that individuals took through SCN which led to their enquiry at Access Space – but our impressions suggest that a minority of participation (estimate: 25%) originated from DMC referrals, around 10% from WP4 referrals, and that most individuals were more likely to have heard about Access Space through SCN general publicity (estimate: 30%, or through Access Space's general publicity and established networks (estimate: 35%). Research participants have included:

- Enterprises engaged by SCN WP4
- Pre-start-ups attracted by SCN publicity
- Referrals from DMCs
- Staff and volunteers from DMCs and SCN partner organisations
- Members of the public requesting use of the laser cutter, CNC¹¹ machine or 3D printers for experimentation and prototyping
- "Sheffield Hardware Hackers & Makers" a group of technology enthusiasts focussing their attention on 3D Printing
- Physical Computing Lab artists in residence

Participants in workshop activities, including:

- "Mending Workshop & Digital Embroidery Demo"
- "Inkscape for Laser Cutting" workshops
- "Solder Something" electronics workshops

Equipment Deployed & Considered in This Study

The study initially elected to consider a very wide range of processes and techniques, suggesting a diverse range of enterprise models. As the project progressed, the impact of practical elements of the program became clearer. Due to resource constraints, the project has concentrated activity around the most feasible technologies.

Equipment	Category	Relevant Processes
Laser Cutter	Digital Manufacture	Enables rapid cutting and engraving of an extensive but specific range of sheet materials (6mm x400mm x 600mm).
CNC Router	Digital Manufacture	Enables accurate cutting and routing of wood and composite sheet materials. (20mm x 1200mm x 1200mm).
RepRap 3D Printer	Digital Manufacture	Enables the production of small PLA or ABS ¹² artefacts through an additive deposition process. (200mm x 200mm x 140mm) Portable.
Digital Embroidery Machine	Digital Manufacture	Enables single or multi-coloured embroidering of textiles. (130mm x 200mm) Portable.
Recycled Computers	Remanufacture/ Redeployment	Using FOSS, repair and repurposing of used computers can provide capable workstations, servers and/or control systems for minimal capital cost.
Raspberry Pi	Embedded Electronics	Playing-card sized single-board computer with good audio- visual (AV) capability, equipped with FOSS, provides a low cost, highly portable platform for education, servers and control systems. Can be used as a low-end workstation.
Arduino	Embedded Electronics	Credit-card sized microcontroller with hardware interface facilitates production of sensors, control systems and robotics.

Requirements

Acquisition and functional deployment of the machines and technologies presented significant challenges and made practical demands on facilities and staff assigned to operate the equipment. In use, very high levels of skill and knowhow will assure better results with all of these technologies. In general, the highest level of skill is required when designing and prototyping new products and in setting up production processes. Lower levels of skill are required in repeating the production of an item - but even the least demanding production processes suggested by these technologies requires skilled operatives. There is a significant level of knowhow required, without which products cannot be created. None of the technologies under consideration can meaningfully be deployed by technological beginners. Note that there are contexts and supplementary technologies which have proven essential to deploy these technologies successfully, including workspaces, work surfaces, storage areas, lighting, hand tools, electronics test gear and so on, which should not be overlooked.

Technology	Physical Resources Required	Indicative Facilaties Required	Indicative Equipment Budget	Skills & Knowledge Required
Laser Cutter	Machine purchase, suitable space for deployment, external fume extraction vent, fume extractor, control system PC, proprietary driver software. Workstation for generating design data. Space for storing & handling materials & products.	Moderate	c. £6500	2D Design software. Laser control software. Laser operation. Laser maintenance & safety induction.
CNC Router	Machine purchase, suitable space for deployment, dust extractor, pipes & hood, control system PC. Workstation for generating design data. Substantial space for storing & handling materials & products.	High	c. £8500	2D Design software. CNC control software. CNC operation. CNC maintenance & safety induction.

RepRap 3D Printer	Machine kit purchase, kit assembly (requires several days) worksurface for deployment, control system PC. Workstation for generating design data. Raw materials supply (PLA or ABS feedstock) to correct specifications.	Low	c. £550	3D Design & Reprap Control Software. G-code. Electronics, Familiarity with Reprap operation & maintenance.
Digital Embroidery Machine	Machine purchase, worksurface for deployment, control system PC. Workstation for generating design data. Scanner desirable.	Low	c. £900	2D Design. Embroidery machine control software. Familiarity with Embroidery machine operation & maintenance.
Recycled Computers	Electrical & electronics hand tools. Electrical safety systems. Workstation for running hardware tests, downloading & producing bootable installation media. LAN & internet connection. Suitable spaces for reception, triage, testing, recommissioning, storage & recycling, taking account of physical & data security.	High	c. £500	Diagnostic expertise. Analysis & repair knowhow, including BIOS menus. Knowledge of analysis / testing software. FOSS Installation & configuration knowhow. For innovative repurposing, knowledge of programming, networking, system administration may be key for many deployments.
Raspberry Pi	Equipment purchase. SD Card. Cables, charger. Workstation for downloading install media and initial setup. Keyboard, mouse etc. desirable. LAN & internet connection desirable. Additional electronic components or devices & tools may be usefu.l	Low	c. £150	FOSS download & installation knowhow. Knowledge of programming & system administration key for many deployments.
Arduino	Equipment purchase. Workstation for software development, interfacing with board (typically via USB). LAN & internet connection desirable. Additional electronic components or devices & tools may be useful.		c.LOV50	FOSS download & installation knowhow. Knowledge of programming & electronics essential for effective deployment.

4.3 Impact of the intervention

- The single most dynamic success of this project has been the emergence of digital manufacturing employer Pimoroni. Paul Beech, Pimoroni's director, prototyped his first product with Access Space's laser cutter. That product, the Pibow a rainbow-coloured plastic case for the Raspberry Pi, sold 3500 units in the first week after its launch online. In his first year of trading Pimoroni turned over around £700,000.
- Amplifier manufacturer TinAmps has grown incrementally, is demonstrably sustainable, and shows potential for longer term growth. Its director, Phil Shankland, used Access Space's laser cutter to accelerate production of a key component of the "TinAmp" amplifier which he was making by hand. He aims to mass-produce and mass-market what has been a small-scale, crafted product. To do so he's curretly applying or CE certification for a TinAmp with a built-in rechargable battery.
- Habibu Zziwa has set up a craft business, Shukran Crafts, producing decorative home products created by CNC machining recycled scrap wood. He purchased a CNC machine identical to the one deployed at Access Space, and now employs himself. The location and business model of his new enterprise appear to be informed by enterprise support sessions at Access Space.
- Several project participants in pre-start phase have successfully brought prototypes to market, but have yet to scale up to the point where their enterprise is an operating entity that employs them. These show strong potential for incremental growth. Notable amongst these is the author of this report, who sold £10,000 worth of prototypes via crowdfunding, enabling investment in laser cutting capacity.

In this project we have yet to see enterprises emerge which employ more than 10 people, and the scaling we have considered is incremental. Larger scale, highly capitalised and/or established enterprises, which may have capacity for sudden growth, are outside the scope of this study. However, it is worth noting the added significance of microenterprises that engage with technologies that have strong potential for continuing, incremental growth, compared with that of enterprises which are centred on equipment and processes which have less scaling potential. It should also be noted that tiny, specialist projects which engage with advanced technologies at a very high level of skill may have almost no scaling potential, but nevertheless have strategic significance beyond their direct potential for growth, perhaps facilitating products or processes that are exploited by other local enterprises.

4.4 Analysis of the Results

4.4.1 Engagement Potential

If an objective of deploying technologies is to engage local people in capacity-building, pre-start enterprise activities, the degree of interest exhibited in the technologies may be of interest.

Some of the technologies prompted high levels of enquiries – others proved to be of less immediate interest. Reasons for high levels of interest in Laser Cutting, 3D Printing and Computer Re-Use may be quite different.

- **3D Printing** has been heavily represented in the media over the last couple of years.
- Laser Cutting is heavily represented online, particularly in forums associated with maker culture. It may also be appealing because it is one of the most accessible digital manufacture technologies.
- **Computer Reuse** is an established activity at Access Space, and has immediate money-saving appeal. It is appealing to computer enthusiasts and technological tinkerers.

Technology	Level of Interest Expressed (1-3)	Level of Prior Kowledge Required (1-5)	Actual Level of Engagement (Number of People)
Laser Cutter	(3) High	(3) Moderate	(43) Very High
CNC Router	(1) Low	(4) High	(5) Moderate
3D Printer	(3) High	(5) Very High	(13) High
Digital Embroidery Machine	(1) Low	(4) High	(5) Moderate
Computer Reuse	(3) High	(4) High	(18 High
Raspberry Pi/Arduino	(2) Moderate	(5) Very High	(16) High

4.4.2 Capacity-Building Potential

High levels of skill required to get started with a technology may reduce engagement potential, and may reduce potential for scaling, requiring enterprise founders to train employees over an extended period. However, the high levels of skill required by advanced technologies can serve a positive purpose in building the capacity of people that are interested to engage with them.

Technology	Skills Developed
Laser Cutter	2D design, 3D design, prototyping, engineering, geometry, mathematics, materials science
CNC Router	2D Design, CNC tooling & operations, prototyping, engineering, geometry, mathematics, materials science
RepRap 3D Printer	3D Design, OpenSCAD, G-code, Electronics, Arduino, electronic engineering
Digital Embroidery Machine	Scanning, Pixel Art, 2D design, embroidery, textiles, materials handling, materials science
Recycled Computers	Perception & communication skills, analysis, diagnostic logic, introductory level electrical and electronic engineering, computer hardware
Rapberry Pi/Arduino	Programming, Linux Operating System, Python, electronic engineering, control systems

This study suggests that 3D Printing is a particular example of this. It's a highly complex and fiddly technology, that requires a wide range of skills to master. Yet its current popularity in the media attracts more people than might be expected, and while its enterprise potential may currently be low, its potential to build skills and capabilities may be high.

4.4.3 Scaling Potentials

Scaling is a concern when enterprises are incubated. A particular technology may hamper or facilitate larger scale production through several mechanisms.

- Operator Skill A technology which requires a high level of operator skill (as distinct from design skill) may be more challenging to deploy quickly at scale. Technologies which require high level operator skill may tend to be smaller, slower-growing enterprises, which recruit highly skilled new staff only incrementally. In some cases, the key may be the first employee – who frees up the enterprise founder to pursue their expansion plans.
- Production Speed A technology with a slow production speed may be limited to producing fewer, higher-value items. While this doesn't necessarily suggest lower scaling potential, the practicalities of financing, maintaining and housing multiple machines to increase production capacity may slow down growth.
- Value of Products This can be seen as an emergent property, driven by the logic of other factors. In general, it seems to us that technologies which produce lower cost products have more potential to grow quickly into enterprises which employ multiple people.
- **Regulation** Enterprises which manufacture products which include electronics may be delayed by the requirement to acquire European Conformity (CE) marks. As well as delay, the cost associated with CE compliance is around £6000

4.4.4 Examples of Scaling Potentials

Very High Scaling Potential: Laser Cutter

Once designs are finalised and laser speed and power is optimised, additional objects can be created quickly and easily by an operator with only a low to intermediate level of skill. Dependent on their complexity, objects in the 1cm30cm range may be produced in a matter of minutes. Operator skill need only be orientated around machine operation – there's no need for high level IT or design skills. Production capacity can quickly be scaled-up – one operator can tend several machines. Laser cutters are thus particularly adept at creating relatively low value products (under £10) in large quantities, as well as complex, bespoke items of higher value. Potential to damage the machine itself is present but manageable.

Moderate Scaling Potential: CNC Router

Even with finalised designs, router bits, cutting speed, and feed rates determined, loading the machine and attending to the cutting job requires continuous, dedicated attention and skill. Production speed is generally slow(for example, components to create a piece of furniture may take hours to produce) and materials costs may be high, so enterprises operating CNC machines are likely to work on small numbers of higher value items. Furniture-making is a good example – bespoke items are likely to command a price of many hundreds of pounds.Scaling will require founders to train operators to a moderately high level of skill. There is significant potential to accidentally damage the machine or the items in production during operation.

Moderate Scaling Potential: Digital Embroidery Machine

Our experience of engagement with this technology suggests that digital embroidery shows most potential to create unique, high value products. While embroidering standardised logos or badges to new textile products adds a small amount of value, more value is added when creating items with a high level of artistic or design content. Items tend to take many hours to create. There seems to be significant potential in customising or "upcycling" high quality second-hand clothing. Enterprises operating these machines will only be able to scale with highly skilled, apprenticed employees, able to make crafting and design decisions during the manufacture process.

High Scaling Potential: Raspberry Pi & Arduino

Considered together, these two technologies are very low cost digital equipment - a computer and a hardware controller respectively. They both have high educational potential, and require very high levels of skill to deploy effectively or to incorporate into innovative designs. Unlike advanced manufacturing technologies, which create products, Raspberry Pi and Arduino are likely to be parts of products, so scaling must be considered with this in mind. Markets for the Raspberry Pi and Arduino themselves are well served, but there is significant potential in scaling enterprises which supply associated products and educational materials. This market is specialist, but is large and growing. More than a million Arduinos and two million Raspberry Pis have already been distributed.

Low Scaling Potential: RepRap 3D Printer

Production speed with this technology is slow(for example, a plastic item as large as a matchbox may take 20-30 minutes to produce),, and the sole potential for accelerating it is to run multiple machines in parallel. Designers require a high level of expertise to create the digital data that defines objects. Operators require a high level of experience to tend the machines and ensure successful reproduction. While the machines are mobile and convenient, and have huge potential as an educational tool, the objects that the machines we tested produce are small, of only intermediate precision, and are created from plastics with only an intermediate level of resilience. It is likely that this technology will develop significantly in coming years, but currently deployment of this technology as a production tool is only practical in specialist cases.

Low Scaling Potential: Computer Repair & Re-Use

Several project participants expressed an interest in setting up computer repair and re-use enterprises – and have developed high levels of skill in diagnosis and repair. While these may create sustainable sole trader enterprises, they may have low scaling potential – principally because of the extremely high levels of skill and experience required to consistently repair computers within a given timescale. A further limit to the potential of these enterprises is the low value of new PCs – with a new, high specification laptop or desktop available for under £300, there is only so much that a customer is prepared to pay to fix an old one. Highly specialist data recovery services may break through this limit, but fall outside the scope of this study, as does high volume computer recycling, which produces recovered raw materials, not working systems.

4.5 Conclusions

All the technologies investigated appear to show potential for enterprise incubation. In the immediate future (2014-15) the strongest potential for enterprise incubation appears to be presented by Laser Cutting, which presents no major barriers to scaling up, and by businesses based around embedded electronics – particularly those associated with Raspberry Pi, which has a high level of popularity.

CNC and Digital Embroidery technologies have a slower production rate, and enterprises based on these technologies will be likely to thrive by producing a relatively a small number of necessarily high value products. Their growth potential will be slowed by their requirement for highly skilled machine operators.

3D Printing is an interesting case. Its production time is very slow, and the level of operator skill required to produce suggests that growth in this area will be very slow. There may be enterprise opportunities for designing and selling the machines themselves, but this study did not come across a

single, clear example of an economically viable product created by this technology. The future of 3D Printing may be similar to the current status of the inkjet printer. While they may be virtually ubiquitous, the only enterprise potential is in selling the machines and associated consumables – very few enterprises operate an inkjet printer to create a saleable product.

Computer Repair and Re-Use shows enterprise potential only as a very small scale activity. The time and level of skill required to successfully repair, redeploy and maintain machines gives only marginal opportunity for profit. There are other reasons why this activity may be of interest.

As well as the enterprise potentials discussed above, all of the technologies under consideration show signs of having strong potential as means of engagement and capacitybuilding. When considering this, the level of skill required may be seen, not as an impediment to business growth, but as an enhancement to learning potential. Both 3D Printers and Computer Repair and Re-Use appear to have particularly strong potential for engagement and capacity-building – they both appear to attract participation, and both develop high levels of skill.

Glossary

ABS: Acrylonitrile Butadiene Styrene. A type of plastic. **CNC:** Computer Numerical Control.

FOSS: Free and Open Source Software. Typically distributed under the General Public License, this software is free from restrictions regarding its modification and redistribution, and is usually, though not necessarily, available gratis.

G-code: a numerical control programming language, used to instruct machine tools.

OpenSCAD: free open source software for creating solid 3D CAD objects.

PLA: Polylactic Acid. A type of plastic. The type in use in this study is made from potato starch.

4.6 Recommendations

- Both new and existing micro-, social- and other enterprises would benefit enormously from aninventory of where they can access new physical computing technology (PCT).
- Business support agencies, as well as Local Enterprise Partnerships and local authorities, should map the provision of local PCT – and signpost how it can be accessed.
- Businesses could benefit from knowledge of where and how they can create and test, and then refine prototypes.
- Additionally, some of the technology tested which has Medium scaling potential but involves high skilled work (eg Digital Embroidery machines) should be considered in the context of skills and employment development.
- We make further, general recommendations in Chapter 5.

Summary and General Recommendations

5.1 Summary of results

All three digital inclusion pilots (Digital Media on the Move, or DMM; Virtual Enterprise in the Cloud, or VEC; and Physical Computing Laboratory, or PCL) took place during a 6 month period in 2013, in Sheffield. All the pilots put actionoriented learning and research at the centre of their programme. Given the brevity of the programme and the limited amount of researchers' time, this made sense in order to maximise the learning.

The pilots all, initially, attempted to make use of the network of Digital Media Centres within Sheffield, located within some of the cities most deprived neighbourhoods, with a view to seeking DMC assistance in promoting workshops to individuals, social enterprises and businesses at a neighbourhood level.

The nature of the technology under investigation also led to divergences. Smartphones have comprehensive 'market penetration' (see figures within chapter 2). Even in deprived neighbourhoods they are a technology with which most people have some experience or at least awareness. People are also used to consuming media – films, music, visual and audio entertainment, advertising and other media content is widespread.

Testing and researching smartphones is easy due to their widespread use, low cost, and their portability (even though, as seen in chapter 2, most people were not aware of how to use them to create content).

Virtual Enterprise in the Cloud tested software designed to run on most internet browsers, so again, this makes the technology easily accessible. However, those without access to a computer (or tablet) of their own may be excluded. Most of the DMCs, however, as well as locations such as Red Tape Central, Sheffield Live, The Sheffield College, universities, and other enterprise incubation centres offer access to computer hardware and workstations, giving potential and emerging business and social enterprise startups the use of IT equipment. By comparison the technology tested in the Physical Computing Lab pilot is far less widely available or accessible (with the exception of the Raspberry Pi, available online for c. £30). Testing and researching the technology is complicated by the expense and size of CNC and digital embroidery machines, laser cutters, and 3D printers.

A commonality between the VEC and DMM technology is the limitations of screen size: we found that smartphones are excellent content capture and dissemination devices but are less able for editing; similarly while they provide internet accessibility, operating cloud based accountancy or CRM software (for example) is usually much easier on a larger screen.

Each Digital Inclusion Pilot worked with a differing number of participants too. About 70 people were involved with the PCL – through open-access participation at Access Space. DMM involved participants signing up to two in depth workshop sessions one week apart; it involved 25 participants. VEC involved working in depth with three microenterprises.

All three strands of the research demonstrated that social enterprises, businesses and individuals can use emergent technologies to:

- Help increase market share and achieve sustainable incomes
- Create and develop community and individual capacity
- Benefit deprived and disadvantaged communities and neighbourhoods

The relative ease of access to the technologies tested can be summarised as follows:

- 1. Digital Media on the Move
- 2. Virtual Enterprise in the Cloud
- 3. Physical Computer Lab

All three strands of the research have demonstrated that, beyond accessibility, many other factors can prevent uptake of the technologies or can mitigate against them being used to their full potential - whether for social enterprise, business growth and development, or for community capacity building. Common barriers to uptake include: awareness, understanding and education. All can be dealt with relatively easily.

5.2 General recommendations

We've made specific recommendations within each chapter, but also recommend the following in order that more social enterprises and businesses can benefit from the application of emerging technologies:

Policymakers

- Government should identify opportunities for wider research and dissemination of good practice in the uses of mobile technologies, cloud technology and physical computing for developing businesses and social enterprises. This could be conducted through the Technology Strategy Board, which the Government is currently using to run a technology competition (with £8m funding available) which aims to test and showcase the use of technology to create footfall for high streets and town centres. A similar funding competition could assist in the wider testing and uptake of all of the technologies tested in this report.
- Local Enterprise Partnerships, local authorities, as well as Enterprise Zones, need to consider that access to and effective utilisation of digital opportunities is vital for business growth - including technologies such as cloud computing and digital media content sharing. They should also map and signpost access to physical computing technology that businesses and entrepreneurs can use to test and refine prototypes.

Business and enterprise support sector

• Support organisations should provide information and guidance about the enterprise potential that these technologies offer, and provide support to businesses, social enterprises and social entrepreneurs in levering the abilities of their smartphones, accessing cloud technology and mapping the availability of new physical computing hardware that emergent businesses can use. They should also create 'matchmaking' services (which themselves could be cloud based) to assist new businesses and social enterprises in accessing learning from existing businesses that are already using these technologies.

Education sector

- Educational organisations should better equip students with the knowledge of how to create compelling video and audio content as an enterprise skill; and with software as a service as part of the IT curriculum.
- Physical technologies that demonstrate both scaleability and accessibility (e.g. laser cutters, Raspberry Pi, Arduino), should be used by educational organisations to demonstrate business applications of technology. They could also develop student skills in digital embroidery as a route to highly skilled employment.
- Educational organisations could adapt the SCN workshop model of concentrated skills and knowledge, for further use and application to meet a range of different needs and situations e.g. a 1 to 3 hours workshop could be developed for conferences, festivals and "one off" special events.
 A longer workshop (one week or more) could be designed to allow for more time to comprehend and assimilate technical knowledge and combine with creative skills, potentially as a module withing a broader educational framework.

Businesses and entrepreneurs

- Individuals and start-up social enterprises and businesses should use the full capacity of their smartphones and consider video or audio content creation and distribution as a key part of their marketing strategy.
- Start-up business should consider the implementation of cloud computing at as early a stage as possible in their business development and plans for risk mitigation.
- Entrepreneurs should consider examples of how other businesses have used mobile content, cloud, and physical computing technology to benefit their business - and learn from this experience.
- New and early stage businesses should make use of the opportunity to digitally prototype, test, market research and refine their physical products by using the services of Physical Computing Labs.











