

Working with the community to build affordable internet access in Gellideg – the first project of its kind in the UK





Phase IV Final Project Report & Forward Plan

Prepared by Common Futures for Creative Coop October 2014



Three inter-related factors are at work in deprived communities and impact households where access to telecommunications networks: **affordability**, **financial literacy** and **financial inclusion**;

The situation facing deprived households is compounded by the relative absence of larger form ICT equipment – that is, most are reliant upon mobile phones to access the internet from home and are reluctant to access the internet elsewhere – such that access to affordable ICT hardware is considered invaluable;

Despite their limited means, deprived households recognise the value of internet access and are therefore willing to make a contribution towards associated costs in many instances. And, an opportunity to 'try before you buy' is likely to engage households without prior experience and/ or understanding of the benefits of internet access at home.

It is feasible to apply established mesh networking techniques in deprived settings and, with that, to effect a "DIY, self-build, self-help" ethos through an appropriate programme of knowledge transfer and a core group of local Digital Champions, although specialist input is liable to be required to design and install backbone networks where the requisite skills are lacking at the local level.

The role of Digital Champions is considered paramount to the success of community-led networks in such instances – as is investment in and support for them over the medium to long term if resilience and sustainability are the overarching aims of such projects.

It is imperative that all stakeholders – residents, businesses, RSLs and other public sector bodies – understand what is distinctive about open networks as a movement as well as a technical approach. Without that, open networks may be misconstrued as a direct substitute for established commercial broadband provision, their scope to serve as social capital factories overlooked, and the plethora of added value impacts they can result in lost. Therefore, all concerned should afford any network's 'use case' as much (ideally, more) attention than the core infrastructure project over time.

There are value add skills and employment outcomes for those involved in community-led network initiatives that may be derived from appropriate implementation of our prototype Build Methodology in deprived settings, although these could be more explicitly "designed in" / nurtured in any comparable projects in future.

Prototyping a community-led network in a single location is one thing. Scaling a community-led network is another. Whilst there is real value in adopting multi-stakeholder approach to both, the origins of established community-led networks around the world are in grass-roots enthusiasm and activism – more often than not, founded upon communities who share a technical interest in them. It is, therefore, worthwhile exploring in greater depth how community-led networks are being established in deprived settings elsewhere by, ostensibly, non-technical communities to learn from good practice where it exists before proceeding to scale and, in particular, in the absence of more detailed information concerning demand, technicalities, costings and legal issues.

The potential for a ground-breaking solution to backhaul access for deprived communities to flow from the Digital Merthyr project exists, founded upon sharing economy principles or a collaborative consumption model, and is already impacting the way in which significant stakeholders elsewhere are thinking about their approach to both the digital by default and assisted digital agendas.



Merthyr Valleys Homes (MVH) owns and manages circa 4,300 homes which, taken together, house more than a third of the population living in the Merthyr Valleys area of South Wales.

The area is the most deprived in Wales after Blaenau Gwent, and is challenged at present by an unemployment rate of >10%, together with an average household income of circa $\pounds1,250$ /month.

MVH housing stock is concentrated in the Gellideg and Gurnos housing estates – both of which rank highly in Indices of Multiple Deprivation (IMD) terms, and has a reported benefit claimant rate in excess of 25% - implying an average household income of just £500/month where two people live together.



40% of people living in the MVH managed Gellideg estate currently lacking formal qualifications.

So, whilst housing indicators for the area appear relatively healthy, others linked to education, health, skills, income, employment and enterprise underline the urgent need for community-led regeneration undertaken in partnership with public sector stakeholders. MVH supports broad ranging initiatives at the local level, working in partnership with established community enterprises and its tenants, and identified internet access, digital literacy and digital skills development as an urgent priority for action during 2012-13.

This was, to some extent, in response to the Government's digital by default public services agenda, as direct payments had begun to impact Registered Social Landlords (RSLs) in relation to changes in housing benefit arrangements. But, it also stemmed from a recognition that the digital by default agenda would likely exert a profound effect upon individual Universal Credit applicants – amongst them, many MVH tenants.

A substantial body of evidence suggests that deprived communities are afflicted by digital poverty more broadly – for example, in relation to the takeup of broad-ranging education, financial, energy and healthcare services. There is, then, a growing recognition that areas which lag behind in economic development terms today are liable to fall further behind still in the absence of up to date digital infrastructure and e-skills.

The situation in Merthyr is particularly acute to the extent that an estimated 40% of people living in the MVH managed Gellideg estate currently lack formal qualifications altogether because, by 2015, 90% of jobs are expected to call for e-skills and competencies. Consequently, MVH approached a range of digital infrastructure providers during 2012-13 to assess how best to support its tenants.

Superfast broadband costs the equivalent of 12% of a single benefit dependent person's, monthly income

In 2011, a survey undertaken by Ofcom found that the broadband services offered in Merthyr Tydfil were amongst the worst in the UK, and take-up rates remained stubbornly low at circa 55% of the population, although a reasonable proportion of MVH tenants were thought to benefit from access to smartphone handsets. An exchange upgrade in Merthyr Tydfil has since been implemented as part of the Superfast Cymru programme. However, the minimum monthly charge for line rental and superfast broadband costs £30 per household per month (i.e. similar to existing cable and ADSL provision), which is equivalent to >12% of a single benefit-dependent person's monthly income, and compares with a figure of 1.8% in households where at least one person earns the national average salary in Wales.

The average monthly charge for a symmetrical wireless or satellite broadband connection of 5-15mbps with linked talk package from a commercial provider amounts to £35 per household per month. Moreover, for the most part, those located in the Merthyr Valleys area did not qualify for the Welsh Assembly Government's Broadband Support Scheme at the time. Therefore, commercial broadband access was deemed unaffordable for a significant proportion of MVH residents.

Given tenant access to smartphone hardware, 4G mobile broadband alternatives might have offered some tenants a way forward with, for example, packages costing £15-£20/month for up to 3GB data/month and already operational in Merthyr Tydfil. However, such services are reliant upon contracts that call for healthy credit checks and the costs double for two-person households unless a

dedicated mobile Wi-Fi hot spot device is purchased; they only provide ¼ of the average data reportedly downloaded in a household each month in the Merthyr Valley area at this juncture (i.e. before providers begin serving increasingly data intensive content, mindful of fibre broadband take-up amongst the population at large); and, speeds are restricted to a maximum of 7.5mbps where network coverage permits.

As such, tenants were likely to consume a more narrow range of e-skills and online services if they opted for 4G access via their smartphones, and the range of potential benefits flowing from unfettered access to digital public services and the digital economy more broadly would be limited were this to become the 'internet access route of choice'.

MVH concluded that whilst improved access to digital infrastructure was called for, commercial routes to broadband access were unlikely to result in significant take-up on the grounds of affordability. At the time, MVH didn't want to invest in, then, assume responsibility for managing a dedicated network on tenants' behalf. MVH was also keen to avoid a 'build it and they will come' approach - recognising the need to promote the benefits of digital literacy and support digital skills development at the same time as stewarding any infrastructure project. Accordingly, MVH sought input from the Nominet Trust to help it explore alternative solutions, and subsequently commissioned the Creative Coop to undertake related activities.

THE OPPORTUNITY

A symmetrical network is more equitable, future proof and allows the possibility of creating and publishing content in new formats. Open networks are designed to be symmetrical by default.

We generated a Project Concept Document and proposed a project to research, design and prototype a community-led telecommunications network in Gellideg - drawing upon partners' experience of the community asset ownership agenda and open network movements. Specifically, we recommended an open, hybrid and symmetrical Network be constructed by MVH residents for the following reasons...



THE BENEFITS OF BEING 'OPEN'

Open networks are constructed using open technological protocols (licenses, software, firmware). They allow people to understand how the network is constructed and how it can be replicated. This approach facilitates virility, horizontality and scalability.

The overarching objective was to construct a bottom-up network owned by the community that would allow people to engineer and manage the network for themselves. A Closed Network is, by contrast, built and capitalised by a company. It is underpinned by a conventional business model and the provision of chargeable services. Only members of the company are authorised to scale it, and citizens are not entitled to modify/improve it.



Hybrid networks combine different telecommunication technologies and are widely regarded as the future of telematic networks, since they can be adapted to each specific location and its unique requirements.

The diverse geographical territories as well as the characteristics of the urban topology in Merthyr Tydfil require the mixture of systems in order to mesh different locations. This type of network also provide a more flexible and cost effective solution to scaling open community owned and managed networks.



Symmetrical networks are based on equal data upload and download capacity. The majority of commercially owned and managed networks are asymmetrical. This prevents citizens from uploading and producing content to the same extent to which they can download and consume it.

In an age where internet users expect to publish and share content as much as they consume it, network symmetry is becoming increasingly important. A symmetrical network is more equitable, future proof and allows the possibility of creating and publishing content in new formats. Open networks are designed to be symmetrical by default.

We proposed three open, hybrid and symmetrical network development options for prototyping with residents and key stakeholders, which ranged from a free Local Area Network (LAN) to a low-cost Wide Area Network (WAN) and a more costly WWW enabled infrastructure (post hardware acquisition and installation), and we recommended all three options be implemented so that each phase could be built upon to deliver the next.

THE PROJECT

We were subsequently asked by MVH to assemble a team and develop an application for Nominet Trust funding in support of Digital Merthyr – a prototype self-build telecommunications network for a cohort of residents living in Gellideg.

OUR TEAM'S STRENGTHS INCLUDED:

Significant recent experience working with community organisations to develop digital assets Direct experience of developing, managing and scaling the world's largest free open network An up to date knowledge of, access to and ongoing dialogue with civic engineers and open community network pioneers around the world An in-depth appreciation of community asset ownership and community enterprise, as well as direct access to a range of social investors, the Community Shares Unit and the Co-operative Enterprise Hub.

Established relationships with key stakeholders within the UK government and pivotal agencies – including, Nominet Trust and NESTA. Our approach was developed to draw upon community ownership and management expertise, as well as the learning from cutting-edge open network developers from around the world – in particular, through the involvement of Guifi.net



MARC DE'ATH Creative Coop Creative Director of a consortium of creative and technology professionals working exclusively with social enterprises, community

projects, third and public sector organisations. From Community Engagement, Communications to Web Design and Development, Innovation and Research, Marc helps organisations engage and connect people using digital technology and authentic creative communications.



ANNEMARIE NAYLOR

Common Futures Supporting communities to take ownership of just about everything. Annemarie Naylor is Director of Common Futures and Associate Director

(Community Assets) at Locality. Common Futures enables community-led innovation underpinned by technology in relation to the community assets agenda working in partnership with the public, private and third sectors. In the past, Annemarie worked in regional and central government – including, within the Cabinet Office's ICT Futures team. She also established the Asset Transfer Unit (ATU) and helped develop Community Right to Bid provisions within the Localism Act.



VICTOR ONCINS Routek

Developing and implementing telematic projects - specialising in the design, installation and maintenance of wireless telecommunication networks (WiFi). Their solutions can be

integrated into pre-existing networks or used in places without any network infrastructure access, offering solutions with a good cost-benefit ratio. The team consists mainly of engineers from the fields of informatics and telecommunications.



EFRAIN FOGLIA

Mobility Lab interactive media designer currently researching the development of digital networks and the related social and political implications. He is

a member of guifi.net and exo.cat, two self-managed platforms which develop open digital networks.



A successful funding application led to the preparation of a detailed project plan in June 2013 within which we proposed three further phases of activity:-

Phase II – Project Refinement: Co-Production and Prototype Design

Phase III – Practical Prototyping

Phase IV – Reflection & Forward Plan Development

This Final Project Report incorporates the findings from Phase II activities, and summarises the decisions taken by the client at that juncture, so that the learning derived may be shared with an external audience.

It also details the work undertaken and outcomes from Phase III which, together, underpin the recommendations contained here within the Forward Plan section.



We asked MVH to host a co-production week in Gellideg in July 2013 - involving key stakeholders and residents - to refine our understanding of the local context, involve MVH residents in the project, and help us prepare a detailed project design document with technical partners – and this process proved vitally important.



LOCAL CONTEXT

A combination of information solicited during the co-production week, as well as through face-to-face interviews, revealed a more nuanced situation facing MVH residents than may be derived from official statistics about broadband take-up. Specifically, we analysed information from 65 households (including 55 located in 5 'target streets' identified by key stakeholders) – posing questions about their:



Household composition (age/school age children)

INTERVIEW RESULTS



71% of our sample already benefited from home access to the internet.



72% had access to an internet-enabled mobile phone whilst26% via other internet enabled devices



Fixed line 29% Mobile 46% TV bundle 25%



22% reported accessing internet outside the home (4 households reported using the internet at school)



66% of our sample expressed interest in participating in the Digital Merthyr



34% didn't wish to participate in Digital Merthyr at the time.

6/22 households cited already having access to the internet as the reason for not wishing to get involved. (Explanations included: disinterest, lack of understanding / skills / training, and being 'too old')

28% reported children attending the local school living in their household, and a significant proportion were in receipt of state employment benefits at the time.

MOTIVATIONS FOR USING THE INTERNET?

- Job searches
- Household finances
- Banking
- Entertainment,
- Shopping,
- Social networking
- Gaming
- School Homework



Our sample accessed the internet via broad-ranging suppliers and, based upon information supplied the average figure associated with internet spend was estimated at £15/month/household.



74% of sampled households expressed that they did not have access to larger form ICT equipment at home

Notwithstanding the relatively modest sample size, the data was revealing to the extent that it underlined the reliance of the Gellideg community upon mobile phones to access the internet from home. In most cases, residents were confined to high pay-asyou-go or data constrained tariffs which they were often unable to service throughout the course of a typical month – thereby, limiting their access to online services still further. Anecdotally, residents frequently struggled to name their internet supplier, and a significant number of people we talked to were either unaware of internet charges and/or under the impression that the internet was freely available to them – whether bundled with a satellite TV contract or 3G mobile phone package. In addition, a number of people professed to be altogether unaware that their bundled TV contracts would double in cost after only a relatively short introductory period.

We concluded that three inter-related factors were at work in Gellideg and impacting residents where access to telecommunication networks in general was concerned: namely, affordability, financial literacy and financial inclusion – a situation compounded by the relative absence of larger form ICT equipment (74% of sample households), given that the majority of people reported an inability or unwillingness to access the internet elsewhere (78% of sample households), which might otherwise have pointed towards the value of additional investment in assisted digital provision within publicly accessible spaces. Crucially, our headline findings also pointed to the potential for residents to at least contribute towards the ongoing costs associated with internet access – although, we acknowledged that this was liable to differ from one household to the next. Clearly, any such scheme would require careful forward planning and implementation given the levels of financial literacy and financial inclusion encountered.

Nonetheless, we were persuaded that it would be worthwhile MVH and/or the Gellideg Foundation exploring existing telecomms spend in the estate in greater depth before undertaking any detailed business modeling to develop a Forward Plan.

Residents expressed interest in making broadranging use of the internet, and the project team was heartened to secure significant interest amongst residents in participating in the prototyping as a result of Phase II activities. In particular, we were pleased to encounter such a 'can-do' attitude and willingness to get involved amongst women living in Gellideg given the nature of the prototyping project.

Our refined understanding of the local context helped us to hone the Project Aims with residents and, with that, informed all aspects of the Practical Prototyping and Forward Planning phases. However, the co-production exercise proved particularly useful in helping us to develop an appropriate knowledge transfer and build methodology for Digital Merthyr.

THE OVERARCHING AIM OF DIGITAL MERTHYR WAS ORIGINALLY EXPRESSED AS:

"...to test whether it is possible to provide access to know-how and tools to enable communities to design, build, own and manage open, symmetrical, affordable, scalable and sustainable broadband networks – not for private profit but for social benefit - in areas of deprivation and market failure"

| SPECIFIC OBJECTIVES INCLUDED: | |
|-------------------------------|--|
| 0 | To establish the potential for digital infrastructure development by and for the Gellideg community in Merthyr Tydfil |
| 0 | To co-produce and install a hybrid network with MVH and its residents in Gellideg through three phases: LAN, WAN, WWW connectivity |
| 0 | To liaise with public stakeholders to explore the scope for digital service piloting as well as for them to contribute to the provision of digital access for the Gellideg community |
| 0 | To design and implement a framework for measuring the impact of the hybrid network upon digital literacy and skills development, digital public service take-up as well as the digital economy more broadly |
| 0 | To provide organizational and business modelling input to Gellideg network owners/managers and, with that, leave a legacy vehicle and business plan for securing the investment needed to scale the network to involve both the Gellideg and Gurnos estates. |
| | |

These aims and objectives remained pertinent to the Digital Merthyr project following Phase II, but the co-production exercise resulted in our drawing attention to two aspects of the project not provided for in-depth within either the Project Concept Document or Nominet Trust Funding Application in our Project Design Document - namely:-

The practical Animation of the Prototype Network; and



The preparation of a Technical Specification for Scaling the Prototype Network.



During the co-production week, we engaged residents via a practical demonstration of the technology we were proposing to install during Phase III of the Digital Merthyr project to stimulate interest in its potential uses; in particular, we introduced them to low-cost live streaming and video content generation on site.

We also undertook a number of key stakeholder interviews to stimulate discussion about stakeholder use of the prototype network, as well as to assess the extent to which they might be able and/or willing to contribute to the provision of digital access for the Gellideg community. We were very encouraged by the range and extent of stakeholder interest encountered. Accordingly, we incorporated a number of high-level suggestions in the Project Design document which were intended to facilitate further discussion about how the prototype network might be animated in practice – not least, to test its impact and, thereby, contribute to Forward Planning activities.

We had not made explicit provision to co-produce dedicated services with key stakeholders integral to Phase III activities, although we incorporated time for ongoing engagement and the provision of headline advice where those who wished conduct what we have elsewhere terms 'Service Trials' is concerned. As such, MVH and other stakeholders were invited to consider whether to introduce additional aims / activities at this juncture, and the subsequent decision not to afford the network's 'use case' attention equivalent to that invested in the core 'infrastructure project' has undoubtedly impacted the breadth of outcomes we're able to report against our original aims at this juncture, although stakeholder engagement activities proved highly successful in and of themselves.



'We were very encouraged by the range and extent of stakeholder interest encountered...'





Preparation of a Detailed Technical Specification, Business and Investment Plan for Scaling the Prototype Network.

Throughout the co-production week, we were reminded of the need to distinguish prototyping activities from the work we agreed to undertake during Phase IV: Forward Planning. In particular, we were made acutely aware of the implications that could flow from raising expectations amongst residents in the event that forward plans to maintain and/or scale the network proved wanting or were not progressed for myriad other reasons.

We did, nonetheless, welcome being drawn into discussions about the future of Digital Merthyr in discussion with MVH and other stakeholders whist working on-site. Specifically, we discussed how best to address those legal, financial and technical project dependencies that were liable to colour any effort to scale the prototype network beyond 2013-14, because we felt it important to clarify our intentions concerning legacy planning and business modeling activities at a relatively early stage.

Originally, we'd envisaged inputting high-level thinking around the form that a suitable legacy vehicle might assume, and providing a range of options pertaining to its underlying business model, together with advice where social investment opportunities were concerned.

However, during the co-production week, we were given to understand that MVH and other stakeholders would welcome more detailed proposals 'sooner

rather than later' – i.e. proposals capable of being operationalised to attract the requisite investment and facilitate the scaling of the prototype network to cover both the Gellideg and Gurnos estates apace.

Once again, we had not made explicit provision to prepare detailed proposals for scaling the prototype network beyond the Gellideg prototype, or to undertake the more in-depth business planning activity that would be required. As such, MVH and other interested parties were invited to consider whether this additional activity would be welcome/ helpful during Phase III, since any detailed proposal for scaling the prototype network in a shorter time-frame than originally envisaged would require as much.

We were subsequently asked to scope a research and design exercise in response to MVH's interest in commissioning supplementary activity related to scaling the prototype network. In summary, we recommended MVH seek reliable evidence about demand for any community-led broadband service, input from open network experts to develop detailed technical plans for network expansion, robust costing information and professional legal advice. At the time of writing, this work has still to be undertaken and, as such, our original aims remained largely unchanged in this regard, such that our Forward Plan proposes a number of necessarily high-level options for MVH and Gellideg residents to consider.



We articulated three guiding principles underpinning the Project Concept to inform our early discussions with MVH and key stakeholders –

1. The community ownership and management of assets;

2. Civic engineering & digital network assets; and

3. Open, hybrid & symmetrical networks.

The co-production week uncovered some additional issues in respect of each.



Our work during Phase II pointed towards a number of possible approaches to the community ownership and/or management of the network where legacy design, planning and implementation was concerned.

In short, this is because digital infrastructure assets differ from traditional land and built assets in a number of important respects (*which affect their amenability to 'ownership' and 'investability' in any meaningful sense*), and because a commitment to civic engineering and open networks also points to the scope for less traditional management tactics to be transferred, developed and tested.

Therefore, whilst digital infrastructure and land/built assets both constitute 'capital assets' in broad terms, the former are distinguished by the items listed the the right.

Unsurprisingly, this situation has given rise to digital infrastructure assets being invested in and owned/ managed/maintained in a number of different ways (see: models overleaf).

Moreover, since (3) amounts to the traditional model of corporate ownership and service provision offered by private telecoms providers, and was deemed impractical on the grounds of affordability and financial exclusion in Gellideg, we committed to undertake further investigation of (1) and (2) during Phases III and IV to assess their suitability to underpin any Digital Merthyr legacy.

DIGITAL INFRASTRUCTURE ASSETS

The extent to which they comprise myriad, diverse and dispersed component parts in practical terms;

- The up-front and ongoing costs and permissions associated with their installation and maintenance – in particular, where ducting is installed beneath the ground;
- •

The relative pace of depreciation associated with them – in particular, where they are not installed beneath the ground;



The potential for them to harbour significant residual value over time;

- Traditional investor confidence in them when taken in isolation – so, from the point of view of being amenable to treatment as 'collateral' without associated and/or guaranteed revenue streams;
 - The nature, frequency and pattern of maintenance that they imply; and
 - Their relationship to and reliance upon statutory provisions and corporate services (as compared with, for example, public services, taxation revenues, counterweight assets) for optimum or extended use (i.e. to access the WWW).

MODEL 1

Ethical Internet Service Provider

• Horizontal or Cooperative Ownership, Management & Maintenance(individual ownership and responsibility



The Global Web (L3 etc)

Corporate Backhaul Provider

Owners of the national infrastructure and gate keepers to the 'World Wide Web'. Backhaul providers will charge the Social Enterprise for connectinginto the national infrastructure and world wide web.

Social Enterprise

Connect the Resident's 'private community network' to the World Wide Web, purchasing access from Corporate Backhaul Provider. This is achieved by aggregating Resident telecoms spend and taking contributions from Public Sector Stakeholders – They reinvest any profit back into a digital literacy training for the local community.

Public Sector Stakeholders

Contribute finance into the Social Enterprise for providing hard-to-reach Residents with digital literacy training access to e-services which are hosted on the world wide web (such as job search, healthcare, education etc)

6 **Residents**

To keep costs down they manage their own private community network across the estate on a voluntary basis. To connect it to the World Wwide Web they group everyones telecoms spend and purchase from the Corporate Backhaul Provider via the Social Enterprise with support from Stakeholders.

MODEL 2

Bespoke Internet Service Provider

 Household & Business Internet Connection Contracts
Social Enterprise Ownership of Primary Network Components offering Not-for-Private-Profit Installation, Management and/or Maintenance Services – e.g. Fibre Gar-Den (under development).



The Global Web

Corporate Backhaul Provider

Owners of the national infrastructure and gate keepers to the 'World Wide Web'. Backhaul providers will charge the Social Enterpise for connecting into the national infrastructure and world wide web.

Social Enterprise

Manage the local network and buy access to the world wide web from the Corporate Backhaul Providers to sell onto Residents. This is achieved by aggregating Resident telecoms spend and taking contributions from Public Sector Stakeholders. They reinvest any profit back into a digital literacy training for the local community.

Public Sector Stakeholders

Contribute finance into the Social Enterprise for providing hard-to-reach Residents with digital literacy training and access to e-services which are hosted on the world wide web (such as job search, healthcare, education etc)

Residents

Purchase their access to the world wide web with free Digital Literacy Training from the local Social Enterprise who manage the network as a service at affordabale rate for the community.

MODEL 3

Traditional Internet Service Provider

- Household & Business Internet Connection Contracts
- Household & Business End Stage Infrastructure Hire



The Global Web

Corporate Backhaul Provider

Owners of the national infrastructure and gate keepers to the 'World Wide Web'. Backhaul providers will charge the Corporate National Retailer for connecting into the national infrastructure and world wide web.

Corporate National Retailer

Manage local networks all over the country, aggregates telecoms spend nationally and buys access from the backhaul providers to sell onto residents.

Public Sector Stakeholders

Publish their e-services (such as job search, healthcare , education etc) on the world wide web.

Residents

Forced to purchase their access to the world wide web from the Corporate Retailer to get access to e-services (such as job search, healthcare , education etc). Access to the World Wide Web can cost upto 20% of a Resident's income. The alternative is for resident to go without and become excluded.



CIVIC ENGINEERING & DIGITAL NETWORK ASSETS

During Phase I, we recommended that Digital Merthyr adopt a DIY, self-build and self-help ethos an approach that is proving engaging and effective across many communities in the UK as well as further afield in relation to diverse asset development initiatives. In particular, we said that the development of digital network assets by and for communities is ordinarily underpinned by a form of civic engineering because way leaves, sweat equity, in-kind contributions and community enterprise are required in lieu of risk and development capital to address multiple market failures. We remained committed to this guiding principal following the co-production week, and this was reflected in our detailed 'Build Methodology'. However, we wish to underline, again, here the skills and employment benefits that are apt to flow from such an approach for communities - in marked contrast to traditional broadband infrastructure projects - since it proved of particular interest to key stakeholders we interviewed at the time.

Simply stated, we felt it was essential to take practical steps to facilitate knowledge transfer between our engineers, end users of the network and the eventual owners/managers of any network 'digital assets' integral to our approach. The co-production week highlighted a healthy appetite amongst residents to participate in prototyping, as well as a promising number of individuals benefiting from relevant Science, Technology, Engineering and Mathematics (STEM) skills - rendering them well-placed to serve as Digital Champions and lead the next phase of the project from a local perspective - and it was in a core group of Digital Champions that we subsequently invested significant time, knowledge and new skills during Phase III (in particular, to ensure that we helped install network assets that could be managed and scaled by local champions on a sustainable footing). However, the results of the user survey conducted 6 months into the prototyping phase, together with those outcomes from the project that are detailed

below, attest to the validity of our wider hypothesis concerning the skills and employment outcomes for the Gellideg community as a direct result of the project's emphasis upon civic engineering.

OPEN, HYBRID AND SYMMETRICAL NETWORKS

The 'open' movement has a lengthy and broadranging history – but has gathered serious momentum over the past 35 years in relation to technology: http://en.wikipedia.org/wiki/Open_source There are nowadays a plethora of open source software platforms being developed which include various strains of Linux: http://en.wikipedia.org/wiki/ Open-source_software. You might already have encountered the growing interest in open data - http://www.theodi.org/ - and open government initiatives: http://www.opengovernment.org.uk/. And, you'll almost certainly have picked up on the growing number of open hardware projects that are underway around the world, which include:

The Arduino: www.arduino.cc The Global Village Construction Set: www.opensourceecology.org/ Wiki House: www.wikihouse.cc



Nonetheless, some Gellideg residents and key stakeholders were unfamiliar with the 'open' ethos underpinning our proposed approach to prototyping, based upon the discussions entered into during the co-production week – and, without that, we were concerned that Forward Planning might be limited unhelpfully to an exploration of the second ownership/ management model outlined above during Phase IV. As a result, we incorporated provision in the Build Methodology (below) to address this situation, and ensured that all concerned understood the rationale for 'doing different'. We also made provision for the knowledge transfer and skills development required to scale a truly 'open' approach.

PRACTICAL ANIMATION OF THE PROTOTYPE NETWORK

During the co-production week, our engineers undertook a technical recce of the Gellideg estate to assess how best to facilitate access to the WWW via MVH's dedicated leased line (provided by Zen).

A FULL ENGINEERS' REPORT WAS APPENDED TO THE PROJECT DESIGN, BUT THE MAP BELOW SUMMARISES

Potential locations for the wireless backbone infrastructure (primary nodes);

Survey data showing residents who expressed an interest in both volunteering and being connected during the prototype; and

Streets that were selected for trials taking the above information into consideration as well as stakeholder recommendations and data held by project partners.

PRIORITY STREETS

- 1. Heol Parc Maen
- 2. Heol Bryn Padell
- 3. Heol Llwyn Gollen
- 4. Heol Scwrfa
- 5. Heol Tai Mawr

*as identified by stakeholders

- Potential Users/Volunteers
- Recommended Primary nodes*
- Houses with line of site to Gellideg Foundation
- Gellideg Foundation
- Super node localtions with potential Users/Volunteers in residence



BUILD METHODOLOGY

We felt from the outset that it would be helpful to develop a formal Build Methodology – capable of being deployed and scaled by Digital Champions, relevant SMEs and local residents with an interest in technology to reduce project costs associated with the prototyping phase; formally engage the community in the design, build and installation of its network; and encourage knowledge transfer and a 'self build, self help' ethos.

The aim was to operationalise those objectives, guiding principles and prototyping options outlined above as well as to inform Forward Planning, and the Build Methodology we developed is provided

below and overlead for interested parties, although we acknowledge that it was refined in the course of being implemented in practice (see: Phase III -Practical Prototyping).

The Build Methodology makes plain the importance of the co-production phase, because until we invested time and energy engaging the community on-site, we lacked a detailed appreciation of the local context and, in particular, its people assets both of which proved paramount in identifying the cohort of Digital Champions and volunteers who would go on to found the Digital Merthyr project at the local level.

STEP 1.

STEP 2.

During the co-production week, Nicholas Giles (MVH, Digital Inclusion Officer) was identified as Digital Merthyr's first "Digital Champion". Locally based, with an education in Computer Science, we believed Nicholas would serve as the ideal candidate to become the local Project Coordinator - both to oversee and drive knowledge transfer within the community during the Prototyping Phase and, potentially, beyond.

As such, our engineers agreed to train Nicholas integral to Phase III activities. The training was to take place during a study trip to Barcelona where he would meet the Guifi.net team, complete an intensive learning programme, and create a manual to support the future development and ongoing maintenance of the Digital Merthyr Network covering the following topics:

The second step of the knowledge

and delivering a series of workshops

level of technical knowledge.

transfer phase would involve designing

aimed at the first core group of 3-5 Digital

Again, there were to be Basic through to

process would involve working to support

Nicholas, who would still be newly trained at this stage, to deliver the programme

Advanced workshops, but this time the

Champions who had demonstrated a basic

I. BASIC

- Principles of Open Networks
- · Basic Theory & History
- · Contemporary Open Networks Movement
- Licensing Issues
- Hardware Considerations

II. INTERMEDIATE

- Installation of Hardware
- Configuration and uses of firmware
- Connections and testing private network
- · Connecting a network to the internet
- Administering the network

III. ADVANCE

- Protocol to resolve problems
- Developing Network Services
- · Proxy servers
- · Hotspot installation and configuration Engage in Open Network global community
- · Scaling the Network

I. BASIC - THEORY

- · What is a Network, Internet
- and an Open Network?
- · What is it for?
- What can I do with an Open Network?
- What is the cost of a Client Node?
- · Responsibility as a member of
- an Open Network?
- · What is Guifi.net
- History
- Current situation of Open Networks
- · Licensing and Equipment
- Difference between Nodes and Super Nodes

II. BASIC - PRACTICE A

- · Where or how can we buy equipment?
- · Installation of nodes in locations
- Configuration: install firmware
- · Testing my own Node
- Connecting a network to the Internet

STEP 3.

Nicholas and his new team were to undertake the final round of volunteer briefings at the local level. Volunteers would be pre-selected from the pool of local residents who expressed an interest in assisting with the practical build project.

This step would also see the recruitment of up to 5 Digital Champions who would assist with the basic installation, documentation as well as resident engagement during the build. This team would bring the number of Digital Champions up to a maximum of 10 to support the build and benefit from knowledge transfer during the prototyping phase.

STEP 4.

Routek would assemble, build and configure Super and Primary nodes between MVH and Gellideg as well as the backbone infrastructure across the estate with the support of the core group of Digital Champions.

STEP 5

Routek would extend the connection from Super and Primary nodes into homes using wireless nodes, hotspots and ethernet cable lwith the support of the extended group lof Digital Champions.

STEP 6

Installation of a local server, network testing and extended service trials.

III. BASIC - PRACTICE B

locally for local residents.

- Use and Admin of the Open Network
- · Protocol to resolve problems
- · Scale the Network yourself



A self-build telecommunications network is, in and of itself, liable to prove limited in its overall impact. That is, connectivity alone – even where it has the potential to facilitate knowledge transfer, underpin skills development, raise digital ambitions and stimulate related business creation – should not be the sole aim of comparable projects. Instead, the purpose of connectivity is to facilitate new / different interactions – in this instance, between residents, residents and MVH, residents and key public sector stakeholders as well as with the wider internet community and economy. Accordingly, during the co-production week, we undertook a series of semi-structured interviews with key stakeholders – including representatives from:

- Merthyr Valley Homes
- The Gellideg Foundation
- Merthyr Tydfil County Borough Council
- Job Centre Plus
 - Coed Y Dderwen Primary School

We also entered into initial correspondence with NHS Wales, Merthyr College and Cyfartha Castle Museum and Art Gallery.



The purpose of the interviews was to undertake a high-level stakeholder mapping exercise to determine:



Organisational aims/objectives in relation to the digital agenda;



Its current provision in respect of digital products/services and the shape and scale of its digital ambitions looking ahead; and



If/how the organisation might contribute to and benefit from involvement in Digital Merthyr during (and, beyond) the prototyping phase.

Ultimately, we were very encouraged by the broadranging interests stakeholders expressed in relation to Digital Merthyr, and looked forward to conversations during Phase III – Practical Prototyping to flesh out what that could look like in practice.



MERTHYR VALLEY HOMES (MVH)

www.mvhomes.org.uk

In addition to its aspirations for residents in relation to Digital Merthyr – as interim client for the work – MVH is keen to transfer services online where it can improve them and/or release associated efficiencies. A prime example of this is its online Report a Repair service: www.mvhomes.org.uk/repair/online.aspx However, its representatives also spoke of a desire to deploy email reminders, e-notifications and advertisements to residents in future. We felt there could also be mileage in exploring a more ambitious approach to smart homes with nearby expert recipients of Innovate UK investment as and when a more comprehensive LAN was installed across the Gellidea estate. We recommended MVH consider whether it might usefully support the implementation of sample service trial ideas we outlined in the Project Design.



MERTHYR TYDFIL COUNCIL

www.merthyr.gov.uk

Our discussion with MT CBC afforded us the opportunity to outline the thinking behind Digital Merthyr, and to understand the Council's keen interest in ensuring the (then) imminent roll-out of superfast broadband services to underpin related knowledge transfer, skills acquisition, job creation and business development by stimulating digital ambition. Representatives were also helpful in soliciting information about practical issues - for example, the power supply for the prototype network – during the co-production week. We agreed that the outcomes of Digital Merthyr could usefully inform the Council's Digital Inclusion Strategy. The Council also indicated that it would explore the potential for it to support the take-up of softer digital skills, prototype legacy and forward planning.



THE GELLIDEG FOUNDATION (GF)

www.gellideg.net

Time and again, those adult Gellideg residents whom we encountered during the co-production week cited the importance of being able to undertake job searches online as a primary motivation for getting involved with Digital Merthyr - in particular, following the introduction of the Government's online service and associated requirements for those in receipt of employmentrelated benefits: https://jobsearch.direct.gov.uk/ Notably, a number of GF staff also reported the increased burden of online Job Searches vis-àvis Gellideg residents and, with that, the growing number of people requesting access to its ICT equipment and internet connection day-to-day despite it being for use 'in-house'. Accordingly, we were introduced to Ceri Jenkins (DWP Partnerships), who agreed to an initial meeting to discuss the project. Unfortunately, the decision not to afford local 'service trials' attention equivalent to the core 'infrastructure project' meant that further related.



COED Y DDERWEN, PRIMARY SCHOOL

www.coedydderwen.merthyr.sch.uk online homework platform. However, in the interim, the Welsh Assembly Government had agreed to invest in the roll-out of a new web-based platform right across the country which would be deployed from September 2013, and which we understood was unlikely to lend itself to either a LAN or a WAN set-up in future (thereby, necessitating access to the WWW for primary school pupils). Accordingly, we made alternative suggestions as to how the school might engage in service trials.

Notably, we emphasised that the 'corporate internet' requires people to lease a dedicated line and pay ongoing for broadband access in our discussions with key stakeholders. By contrast, a self-build WAN is advantageous insofar as it holds out the prospect of "owned networking equipment", and can also offer free-to-air essential services. If a selfbuild WWW-enabled network is sought after by a community, then, it is still feasible to talk of "owned networking equipment", based upon community-led initiatives elsewhere.

We also speculated that that could involve sharing an internet connection with either a RSL or public sector provider in the area during the co-production phase, reflecting upon the approach taken to backhaul access by Guifi.net in Barcelona. However, without a backhaul solution built upon sharing economy principles (i.e. collaborative consumption), payment to a corporate intermediary by individual users will always otherwise be required to facilitate WWW access - implying the need to negotiate with established providers and cover associated costs. At the time of the co-production week, we welcomed further discussion with MVH and key stakeholders to explain our rationale for exploring both a WAN and WWW enabled network integral to Digital Merthyr with this borne in mind.

Although we acknowledge recent developments which might afford RSLs new options - http://www. digitalbydefaultnews.co.uk/2014/10/09/housingassociations-deliver-digital-inclusion-thanks-to-bt/ - we continue to believe that those broader aims and objectives of a community-led network project referred to in this report render their pursuit and scaling the better option vis-à-vis digital skills and business development – but that, in and of itself, requires stakeholders to afford the network's use case as much (ideally, more) attention than the core infrastructure project.

jobcentreplus

JOB CENTRE PLUS

www.gov.uk/contact-jobcentre-plus In Time and again, those adult Gellideg residents whom we encountered during the co-production week cited the importance of being able to undertake job searches online as a primary motivation for getting involved with Digital Merthyr – in particular, following the introduction of the Government's online service and associated requirements for those in receipt of employmentrelated benefits: https://jobsearch.direct.gov.uk

Notably, a number of GF staff also reported the increased burden of online Job Searches vis-àvis Gellideg residents and, with that, the growing number of people requesting access to its ICT equipment and internet connection day-to-day despite it being for use 'in-house'.

Accordingly, we were introduced to Ceri Jenkins (DWP Partnerships), who agreed to an initial meeting to discuss the project. Unfortunately, the decision not to afford local 'service trials' attention equivalent to the core 'infrastructure project' meant that further related activity could not be taken forward during Phase III – Practical Prototyping. There is, nonetheless, very clear evidence from the survey of prototype network users undertaken to inform Forward Planning that employment related use of the Digital Merthyr network has added considerable value for the community.

MEASURING IMPACT

Integral to the co-production week, key stakeholders participated in a facilitated workshop to revisit the Project Concept, the overarching aim and those stated objectives – both for Phase III Prototyping and for the future of Digital Merthyr. We commissioned the developers of the Transformational Index (TI) to assist us in this regard.

The TI is a tool that helps organisations to identify their intended social impact and to measure progress in a way that balances a commitment to values with a focus on results. When asked "what does good look like?" many organisations default to numbers and focus on the bottom line. Boxes are ticked and budgets met, but meaningful data on positive impact remains scarce. The TI provides organisations with a quick, easy-to-use way to identify and measure what really matters to them, both quantitatively and qualitatively.

The workshop used the TI to help the group describe how it sought to have an impact (the underlying components of and model for transformation). The facilitators used this as the basis for identifying and prioritising meaningful measures of impact, in discussion with the group.

Subsequently, they provided a summary report of the workshop, including a simple framework for tracking the chosen impact measures, together with further comments or actions. They also prepared an infographic to summarise the measures visually. The Draft Workshop Report was provided in full integral to the Project Design. However, in summary, the group agreed the following purpose and impact statement for Digital Merthyr:

Digital Merthyr starts a positive cycle by mobilising communities with a replicable model of open Wi-Fi which creates new connections and builds bridges in and beyond the community. It makes this a fun experience, so that people stay involved, and empowers them by giving them the equipment and skills to take ownership of the model. This leads to systemic change as digital tools and platforms transform people's access to services, employment opportunities and life choices, reducing poverty and improving quality of life.

MOREOVER, THE FOLLOWING MEASURES WERE IDENTIFIED AS PARTICULARLY IMPORTANT BY THE GROUP:

- Number/examples of new things to do on the estate
- Number of people involved and how
- Cost savings per household and cost savings by service / agency

Extent to which people have had their lives improved by Digital Merthyr

Conclusion – Project refinement activities undertaken during Phase II - through co-production of a Project Design Document with MVH, the Gellideg community and other local stakeholders – were completed in September 2013, and proved invaluable during the subsequent Phase III Practical Prototyping exercise.

After the Co-production and Project Design phase, we undertook to implement the Phase III – Practical Prototyping exercise agreed with MVH through deployment of our Build Methodology.

IN PRACTICE, PHASE III COMPRISED OF THE FOLLOWING ACTIVITIES:

Publicity development and further community engagement to recruit x45 residents and businesses with whom to prototype the network and provide an internet connection – following a period of time for design work and decision-making which resulted in a number of residents withdrawing from the project at the local level, and pointing towards the importance of capitalising upon momentum where any forward activity is concerned;

The design and provision of dedicated training for Nicholas Giles in Barcelona by Guifi.net, the recruitment of x6 Digital Champions and the design and delivery of a focused programme of activity to train Digital Champions in Gellideg about the principles of open networks and how to build them;

Installation by MVH of a 20MB symmetrical commercial line leased from Zen, of which, a proportion was allocated to the Gellideg prototype;

Installation of the backbone network by Routek, Mobility Lab and MVH, and extension of the backbone network with Digital Champions to benefit the full cohort of residents involved in the prototyping exercise;

Discussions with key stakeholders about possible 'use cases' for the prototype network (including, the Local Authority, local GP Jonathan Richards, the Gellideg Foundation, Coed Y Dderwen Primary School, local youth club and church). Knowledge transfer underpinned our Build Methodology and, with it, the bulk of Phase III activities on the part of MVH and local residents. A short film that captures Nicholas's experience of the 'Open Networks Academy' in Barcelona is available online via - http://vimeo.com/80219646, whilst a series of blog posts cover the experience of Digital Champions engaged in the network build: www. digitalmerthyr.org.uk

THE TECHNICAL BUILD

The prototype network we helped residents install proved resilient and was monitored by Routek for a period of nine months, following which, a core group of Digital Champions received training to help them undertake routine trouble-shooting and maintenance activities.

Whilst this continues to work well in the majority of cases, we have recently sought to forge a relationship with representatives of Cardiff Hackspace to reduce the reliance of residents upon Routek and establish the means for forward technical assistance at the local level; at the time of writing, this is envisaged as an in-kind proposition for 2-3 members of Cardiff Hackspace, in return for specialist training for them in network administration from Guifi.net. MVH has already increased the capacity of its connection from Zen so that the network can easily grow three-fold, to provide x200 households with a connection, subject to decisions concerning the Forward Plan.

STAKEHOLDER ENGAGEMENT

All of those stakeholders with whom we discussed the prototype network and possible use cases expressed interest in hosting local services on the LAN we installed with residents.

For example, MVH is keen to automate the payment of rent, the doctor's surgery is exploring the potential to offer anonymous online chats with residents about a range of health issues, and the youth club is interested in teaching younger residents using Mine Craft.

In the absence of dedicated provision within the project budget to support Service Trials, key stakeholders have still to implement their plans in practice.

However, we have recently introduced a server to the LAN that is capable of hosting local services, and we have worked with partners to submit a bid for EU funding which, if successful, would see Digital Merthyr working with 4 open network partners to trial locally hosted services and encourage their cross-pollination to help speed up proliferation.

Notably, the server also affords residents greater control of network usage and access to data - e.g. it can limit access to certain sites, prioritise access to others to improve education and employment experiences online; help Digital Champions diagnose problems more quickly and analyse usage trends more readily.

Conclusion – Project refinement activities undertaken during Phase II - through co-production of a Project Design Document with MVH, the Gellideg community and other local stakeholders – were completed in September 2013, and proved invaluable during the subsequent Phase III Practical Prototyping exercise.



THE OVERARCHING AIM OF DIGITAL MERTHYR WAS ORIGINALLY EXPRESSED AS:

"...to test whether it is possible to provide access to know-how and tools to enable communities to design, build, own and manage open, symmetrical, affordable, scalable and sustainable broadband networks – not for private profit but for social benefit - in areas of deprivation and market failure"

SPECIFIC OBJECTIVES INCLUDED:

- To establish the potential for digital infrastructure development by and for the Gellideg community in Merthyr Tydfil
- To co-produce and install a hybrid network with MVH and its residents in Gellideg through three phases: LAN, WAN, WWW connectivity
- To liaise with public stakeholders to explore the scope for digital service piloting as well as for them to contribute to the provision of digital access for the Gellideg community
- To design and implement a framework for measuring the impact of the hybrid network upon digital literacy and skills development, digital public service take-up as well as the digital economy more broadly
- To provide organizational and business modelling input to Gellideg network owners/managers and, with that, leave a legacy vehicle and business plan for securing the investment needed to scale the network to involve both the Gellideg and Gurnos estates.



Phases II and III demonstrated the feasibility of our original hypothesis vis-à-vis the design and build of an open, symmetrical and affordable broadband network by and for the Gellideg community in Merthyr Tydfil. Our Build Methodology proved resilient, our efforts to transfer knowledge to a core team of Digital Champions has resulted in the creation of a legacy team confident in its ability to maintain and extend the network, and those volunteers involved in the prototyping project report overwhelmingly positive outcomes from network usage (see: below) - such that all of them would like the network to remain active, and are prepared to recommend it to other residents (where, previously, low levels of digital literacy and confidence surrounding their ability to engage with the project to render its peer-to-peer design dynamic a significant challenge). There remain some issues where transitioning specialist technical support for Digital Champions from Routek to a local provider is concerned but, on balance, we are encouraged by the scope for that to emerge from a closer working relationship with the Cardiff Hackspace - and, with the prospect of added value for all concerned over time. We would also wish to acknowledge the continued interest, involvement and support from MVH's ICT team here, as it has doubtless contributed much-needed enthusiasm for the project in-house as well as continuity between project team visits to the site over an extended period.

Phases II and III also enabled us to explore the scope for digital service piloting with key local stakeholders, and although we feel the decision not to afford practical service trials attention equivalent to the core infrastructure project seriously impacted progress toward this in practice, we have endeavoured to lay the foundations for related activity in future in the course of implementing the project. Overall, we are encouraged by the breadth and depth of stakeholder buy-in to the project's future – in particular, from the point of view of their openness to contributing to the costs of providing a backhaul solution for any extended network in future (see: below), but also insofar as the manifest benefits flowing from the prototyping project for residents might yet impact a forward plan we were led to understand had been ruled out during the project's early days (namely, to the extent that MVH might yet consider developing the network in-house where next steps are concerned).

Having decided not to make further use of the Transformational Index as a tool for evaluation in relation to the prototyping project, we worked with MVH to conduct a survey and semi-structured interviews with a sample of residents involved in the prototype during Spring/Summer 2014.

THE EXERCISE WAS INTENDED TO SOLICIT QUANTITATIVE AS WELL AS QUALITATIVE DATA TO HELP US:

- compare user experience of involvement in the project with our own;
- better understand the impact of the project in relation to our original aims and objectives (given its experimental nature); and
- inform forward planning albeit in relation to a very modest sample size and in outline terms.

The survey results, which comprises data collected from 25/42 prototype households, are provided in full at Appendix A – but, to summarise:

39% benefited from an internet connection at home before the prototype

40% reported having purchased additional hardware since the project began

70% (i) benefited from an internet-enabled device at home before the prototype project, as compared with **90%** (ii) afterwards,

60% (i) claimed their ICT skills had improved as a result of the prototype project, and **65%** (ii) claimed to have learned or benefited from the project in some other respect

60% expressed their motivation to join the project as financial (often, in relation to undertaking job searches), **15%** by helping the community, **15%** as a direct result of encouragement from Digital Champions, and **7%** by its 'novelty'

100% would recommend the network to others on the basis of price, quality of connection, sense of community; their 'wish list' re local service trials in future included: local Job Search, Education and Health Care functions.

10% hadn't used the internet before and still don't but perceive a benefit from the project to the extent that it has enabled other family members to get online reported knowing other residents keen to join the network if it is extended. The data we solicited from interviews with residents is captured in these companion infographics so that stakeholders can access the project in the form of 'user voices', but as with the survey results, we are incredibly heartened by the benefits expressed, which align well with our suppositions and those aims/objectives we refined during the co-production phase working with the community.

Considered in the round, we feel the feedback from Digital Champions and network users bodes well for the project in the longer term and, in particular, we wish to highlight the impact of our emphasis upon civic engineering, knowledge transfer, skills development and employment opportunities from the outset given its importance in project design terms.





Tina lives with her son and friend and has benefited greatly from being connected to Digital Merthyr. The main benefit is that both Tina and her son are in receipt of Job Seeker's allowance and use the connection to complete job searches. In the past, she struggled to meet Job Centre requirements.

Terry lives with his partner and they previously had a broadband connection with the Post Office. He has been very pleased with the connection as he was previously struggling to pay his bills. He has cancelled his land line contract and is now benefiting from a saving of £25/ month. He uses the internet for general use but is currently considering setting up his own custom t-shirt printing business, which would be run primarily over the Digital Merthyr connection. His skills have improved since the connection was installed and he's considering attending computer lessons at the Gellideg Foundation.



Rachel lives with her partner and their children - they previously had no connection to the internet. Now, the children use the internet to complete homework, and Rachel is able to undertake job searches more readily. Her IT skills have also improved since the project started and she'd recommend the service to everyone!





Kinga lives with her son. Since connecting to Digital Merthyr she has cancelled her connection to BT and now relies on the Digital Merthyr connection. She was motivated to get involved with the project due to the savings she would make but has been pleasantly surprised with the quality of service, and has acquired a PC to make the most of other savings available online in the interim.

David lives with his partner and four children. They previously had a connection to the internet and he rated his IT skills as "good" when the project began. He was motivated to get involved by virtue of the connection being free at the outset, but would be prepared to pay a fee of the project was to continue.



Susanna lives with her partner, father and two children. Upon joining the project, she cancelled her connection and now relies on Digital Merthyr. She uses the internet for general use as well as to take care of her finances. The kids use the connection for educational purposes and communicating with family through Skype. Since being connected the whole family has improved their IT skills and now feel more comfortable with the concept of going on line for both financial benefit and recreation.

Chris lives with his mother whom he also cares for every day - he previously had no connection to the Internet. His quality of life has improved - he doesn't have much time to leave the house as he is his mother's main carer – and, in particular, the Internet affords him the opportunity to compare prices online so that, when he does get a chance to shop, he can secure the best deal and knows exactly how much he is going to spend. He would like to encounter additional local health services online to help him and his mother.



Helen lives with her son and previously had a broadband connection. They use a number of devices, including: PC, Tablet and mobile Phone to get online. She uses the Internet mainly for social media and Shopping and would rate her IT skills as "average". She was motivated to get involved in the project due to the price and the school benefits. But, she hasn't acquired any new equipment since joining the network. Helen also uses the Internet for company and to chat with friends.

Natalie lives with her daughter and previously had no connection to the Internet. She mainly accesses the internet via tablet and her daughter has also started using the connection. Her skills have improved a bit since joining the project - her daughter's skills have improved massively. She says several family members would love to get connected.





Youth Music Workshop - young people aged 8+ use this facility for its practice and tutorial sessions. They previously had no connection to the internet and Digital Merthyr has helped massively, as they now can download sheet music and lyrics whenever required. They were motivated to get involved due to the catering company recommending them to the Digital Merthyr Team. They've since purchased IPads and a printer for the music room and the functionality of the music room has improved both in skills and operation with the young people making use of the internet to download lyrics as well as to look up tutorial videos. They think that additional educational services would be very useful. **David** lives at home with his son and previously had no connection to the Internet. His IT skills have improved since being involved and he now uses the net to buy cheap car parts so that he can save some money.

He has also acquired one of lan's refurbished PC's so that he can get online, and his son uses this to complete job searches. They would previously go to the foundation to use the Internet but now find it easier that they can do it in the home. They would recommend the service to people they know and would also be prepared to pay monthly if it meant that the service would continue.

Paul runs the local church services. People who make use of the connection at both the church and the church flat ranges from ages 20-60 and say it has greatly benefited the operations of the church. He was motivated to get involved as he believed that the project would benefit the community. He says of several people who come in to make use of the connection that their skills have improved. He was unaware that such projects existed and has been pleasantly surprised with the speed of the connection as it has been faster than his previous, commercial, connection. He will be recommending the project to people as he believes it is an economical way of using the Internet and promotes community engagement. He'd like to see some charitable organisations represented on the local network and maybe advertised on the splash page that we are working on setting up.



Samantha lives with her three daughters and didn't previously have access to broadband at home. She did have minimal access through her mobile phone, and she rated her IT skills as good before the project had started. Her motivation for joining the project was financial reason although she also wanted her children to have access to help with homework. Having access has allowed her to explore more things online - including competitive prices for goods – and has also enabled her to connect with friends and family. She'd like to see some school services put onto the LAN so that the kids can make use of more educational resources. Samantha has also sold items on E-Bay since getting connected which has helped her financial position and would recommend the service to all of her friends.

Ňx

Cyfartha Catering is a company which, prior to being connected, had no broadband connection on-site; they where running the business through emails exchanged via a mobile phone. They had a PC but couldn't use for it business purposes as they couldn't afford an Internet connection. Now, with the connection to Digital Merthyr, they are able to keep up to date with orders coming through and respond to customers quicker and in a more professional manner. They have also purchased a new printer since being connected so that they can keep up to date with their paper work. They'd recommend the network to other businesses and households as the installation was quick and efficient and they have experienced no major issues since being connected.

Tania lives with her husband and three children and previously benefited from a broadband connection. The household uses the internet on various devices including Games Console, Tablet, laptop and mobile phones, and she would rate her IT skills as "moderate". The family uses the internet for a variety of reasons, including: social media, shopping, and educational purposes. They were motivated to get involved in the project as Tania's husband thought it was a great project and would benefit the community. Although she does not believe her IT Skills have improved since being connected she would recommend the service to people, as it is cost effective and reliable. The household has cancelled its commercial connection and now solely uses the Digital Merthyr network. She knows people who would be interested in joining the project but they live in a different area.

Diane lives on her own and previously had no connection to the internet. Diane had no IT skills and had never used the Internet before. She was motivated to get involved to support her neighbours by connecting to the project. Although she has no real equipment and has not purchased any since being connected, she has used the connection on her mobile and has used Google, which she finds very useful. She would recommend the network to other people, as she believes it has been very helpful and reliable. She has some family on the estate that she believes would benefit from the connection.

Allyson lives with her husband and previously had no connection to the internet. Although she has no interest in using the internet, she was keen to get involved in the project so that her gran-children could make use of the service. This has since encouraged her to use the internet on occasions when her grand children visit her





Linda lives at home on her own and had no previous connection to the internet. She has no equipment that she can use and has no previous IT skills. She hasn't acquired any new equipment since being connected and has not attempted to use the connection. She said that she thought about trying, and that's why she agreed to the connection, but the whole thought of it was too daunting for her.

John lives with his daughter and previously had no connection to the internet. He now uses his phone to connect to the internet for browsing and to engage with social media. He was motivated to get involved in the project because it promised a free connection. John would recommend the network to other people as it has been very reliable; he has used it but doesn't feel his IT skills have improved since the project began.



Peggy lives on her own and previously had no connection to the Internet. She has not used the connection herself and doesn't intend to – so, she hasn't acquired any new equipment. But, her grandchildren regularly visit and they love the connection, as they have tablets that they can use to connect. Although she does not use the connection herself, she would definitely recommend the network to other people.

Colette lives with her two children and previously had no connection to the Internet. She has devices such as games consoles tablets and laptops at home. Before the project, she was already quite proficient in using a computer but feels as if her skills have definitely improved as she now has an idea of how networks work. She uses the Internet for various reasons including banking, email and social networking and she got involved in the project for the connection and to try and support the community. The household has used the site for a variety of reasons, including: money saving advice; insurance comparison, social media and job searches and they've found the connection very useful. She would like to see more healthcare and job related services over the network and would definitely recommend the network to other people.



Stanly lives with his partner and previously had no connection to the Internet. He owned a mobile phone that he could use to access the web and hasn't purchased any new equipment. He was motivated to get involved in the project due to the cost. Since being connected he believes that their IT skills have improved, and Stanly now feels more confident online. Since being connected, Stanly has made use of online shopping as well as using Google to look things up when required. He would recommend the network to other people as it makes life in general easier.



Liam lives with his partner and sister and previously had a broadband connection. They use many devices to access the network including an IPad, Laptop, Playstation and phone. They rated their IT skills as "good" prior to the project starting. They used their home broadband before the project started for general purposes, including: social media, browsing and shopping. Although Liam's skills have not improved since being connected, they would recommend the service as it offers the same quality as a commercial supplier, save at a much lower cost. Overall, they were very happy with the service and would be very pleased if the project was to continue.



Hannah lives with her two children and previously had no connection to the internet. She rated her IT skills as "good" before the project started and owns devices such as phone and Tablet. She has since bought equipment online - including a laptop. She has become reliant upon the connection as the children use it for school and homework purposes and she can't afford to pay for a commercial line. She would like to see some services put onto the network that would increase the awareness of the school and healthcare. She has friends on the estate that are interested in joining up to the network if it where to expand.



IAN WRIGHT

Digital Champion (above right) lan lives in Gellideg with his wife and two children. He previously had a connection to the internet with Sky, but has cancelled that to improve the household's financial position, and now relies on Digital Merthyr. He has several devices that he uses to connect to the internet at home, and both he and his partner complete their job searches there - making life a lot easier for them than it is for many other residents.

Ian has been very active with the project since it began, and has helped to manage the network in a volunteer role. He was motivated to get involved because he saw the potential to benefit the community and received training from Guifi.net in Gellideg, although he has previous experience working with computer hardware. Ian now holds the estates network phone so that residents can call him if something goes wrong because he is on hand to provide them with advice and support if needed. He reports his computer skills have 'massively improved' such that he now has a good understanding of mesh networking and networks in general. lan and his wife would recommend the service to everyone and lan is now contemplating setting up his own business based on the estate so that residents can pay him to connect them to Digital Merthyr network. Ian would also like to supply residents with refurbished PC's at low cost.

So, the Team introduced him to Eco Communities – a social enterprise operating in South London and connected him with a local enterprise support agency to develop a business plan and establish the feasibility of becoming self-employed. The Project Team designed a support programme with Eco Communities to offer lan in his first year.

At the time of writing, stakeholders are reluctant to support lan where business incubation and the PC refurbishment angle is concerned, because they would prefer he establish a network installation and maintenance business, but discussions are ongoing and his case points towards the added value of projects like Digital Merthyr that are premised upon a core commitment to knowledge transfer and civic engineering.

We have learned, over the course of the project, that communities are apt to move more quickly (better – in a more 'agile' manner) than their institutional counterparts. In practice, this resulted in our having to undertake additional community engagement activities but it has also, ultimately, precluded our undertaking the more detailed work we proposed to facilitate in-depth business modeling.



The Digital Merthyr prototyping project has, then, ably tested and demonstrated that it is possible to provide access to know-how and tools to enable communities to design, build and manage open, symmetrical, affordable, scalable and sustainable broadband networks.

However, it also set out to explore the potential for the community to own and operate such a network at scale – not for private profit but for social benefit – in an area of deprivation and market failure.

Therefore, at the outset, we committed to provide MVH with headline input surrounding organizational and business modelling for prospective Gellideg network owners/managers and, with that, to leave a legacy in the form of an outline forward plan to help them secure the investment needed to scale the network to benefit both the Gellideg and Gurnos estates.

We have commented elsewhere in this report upon the impact of the decision taken by MVH not to invest in a more detailed programme of work to support legacy planning following Phase II activities. That is, we recommended MVH seek reliable evidence about demand for any community-led broadband service, input from open network experts to develop detailed technical plans for network expansion, robust costing information as well as professional legal advice before proceeding to support any move to scale our prototype. At the time of writing, this work has still to be undertaken and, as such, our Forward Plan proposes a number of necessarily high-level options for MVH to consider in future as well as drawing upon ongoing discussions with MVH and key stakeholders.

Nonetheless, stakeholder buy-in to replicating and/or scaling the network to reap the benefits of channel switch and economic development associated with the same points toward extension of the network as being both sensible and, to all intents and purposes, the likely outcome of the prototyping project.

That is, at the time of writing, we understand MVH plans to support the development of 2 additional micro-networks in other locations over the months ahead, and that Gellideg's Digital Champion, Ian Wright, may be employed on the basis of a six months contract to implement the proposal at the same time as business planning to support any future enterprise he might establish is undertaken in earnest. This is, of course, welcome news – and reflects continued stakeholder support following our prototyping project in Gellideg.

MVH AND OTHER LOCAL STAKEHOLDERS MIGHT ALSO WANT TO UNDERSTAND:

- opportunities and challenges facing its residents where accessing telecomms hardware/software/services is concerned;
- the ability/propensity of residents to switch to alternative service providers;
- the ability/propensity of residents to engage with a self-build project were it to be taken to scale;
- the prevalence and location of residents benefiting from and/or interested in acquiring ICT skills (basic/intermediary/advanced); and
- the prevalence and location of residents who would welcome support to pursue related employment and/or establish related start-up enterprises.

because, without this information, it isn't possible to compare the opportunities and challenges associated with extension of the network with either commercial broadband offers (including, BT's recently announced programme to work with RSLs in this regard) or, indeed, the option of 'doing nothing' in future.

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WE WOULD, HOWEVER, SUGGEST THAT MVH CONSIDERS CAREFULLY:

How to maintain the network and momentum gained in Gellideg;

2 The pros and cons associated with nurturing local Digital Champions where new micronetworks are to be established and, with them, if/how to develop a broader training programme to benefit MVH residents in the round based upon the Open Networks Academy model and Build Methodology prototyped in Gellideg OR some other approach deployed by mesh network proponents elsewhere as in the case of the Open Tech Institute, Commotion and Red Hook Wifi in the United States;

Whether establishing modest mesh networks in disparate locations represents the best way forward if the aim is to ensure the overall resilience and sustainability of any resultant network connecting a greater number of households OR whether there are merits in first seeking to grow and consolidate the Gellideg network such that it can organically extend to neighbouring estates;

Whether opportunities to exploit economies of scale or pursue alternative courses of action in relation to the provision of either backhaul access OR hardware underpinning and/or associated with the network may be impacted by the proposed plan;

5 What impact proposals are liable to have for network hardware ownership, management and maintenance going forward – whether by design or inadvertently – recognising that the intention at the outset was to nurture a thoroughgoing community-led option in this regard.

Finally, we would wish to emphasise that unless MVH also acts to address those learning points contained within this report vis-à-vis the value in affording network 'use cases' equivalent (ideally, more) attention than the core infrastructure development effort, any moves to extend the mesh network prototyped in Gellideg will only serve to replicate the situation there. That is, whilst there are clearly many real/perceived benefits to residents of improved access to the internet brought about by tackling the affordability issue in an innovative manner, we believe many more positive outcomes could flow from a greater emphasis upon those local services developed for and/or offered via any mesh network in Merthyr Tydfil in future.

2. INCREASING BACKHAUL PROVISION

From the outset, the prototype network we helped residents build in Gellideg represented a front-end solution that already works well from a technical perspective for an estimated 150,000 users internationally; the largest amongst them, our project partners, Guifi.net in Barcelona. Indeed, there are healthy community-led mesh networks in operation right around the world as 'proof of concept' and, as such, we sought primarily to devise and test a mesh network Build Methodology appropriate to a deprived and overwhelmingly non-technical community in the UK.

Every community-led network of which we're aware adopts a different approach to the provision of backhaul access to the WWW – where they seek to do so at all (for example, not in the case of the Athens Wireless Metropolitan Network) – and we are encouraged by the very positive outcomes of the solution identified for Gellideg, working with MVH and Zen, which is borne out by the recent decision taken by MVH to increase the bandwidth available in this important regard.

Looking ahead, the backhaul solution deployed in Gellideg will need to be revisited as and when a decision is taken to scale the prototype network and/or replicate it elsewhere; not least, to the extent that the ability to rely upon a backbone network supported by a line of sight connection and/or relays from MVH premises may be more or less difficult in different locations. Recent discussions with MVH and other key stakeholders have, however, pointed to a more significant break-through for our prototype project. That is, at the outset, we proposed to test stakeholder support for our Model 1 - Financial Market Failure Model (see: above - P17), which implied financial support from one or more key stakeholders to make backhaul available in perpetuity for any community-led network that grew to scale. Having engaged senior MVH, Merthyr Tydfil County Borough Council (MTCBC) and education service representatives in discussions about the same, we believe that this most ground-breaking of models vis-à-vis possible backhaul solutions could well be realised in practice over coming months on the basis of contemporary sharing economy or 'collaborative consumption' principles.

In short, MTCBC has expressed its in principle support for opening up public infrastructure to share broadband connectivity - not only with MVH residents but with residents of Merthyr Tydfil more broadly. Meanwhile education service representatives are discussing whether it may be feasible (in addition or instead) to open up the public sector network to which schools are connected in the area. Each school currently benefits from a 100MB symmetrical line and upwards of 50% of such connections could be shared with communities in keeping with established policies for primary and secondary schools to help those for whom connectivity remains unaffordable; crucially, scaling bandwith thereafter represents extremely good value for money for the public sector in relation to both the efficiencies and social impact to be gained from this collaborative consumption approach.

Already, the schools in Merthyr Tydfil have confirmed that they do not require permission from DfES because MTCBC owns its own fibre. However, at present, the latter option remains under development whilst security implications are considered in greater depth, and the potential to create a dedicated social enterprise to scale the network is considered by all concerned. Nonetheless, Digital Merthyr could well serve as a test-bed for sharing schools' backhaul access to the WWW to benefit deprived or disenfranchised communities in a practical setting in future.

As this aspect of the forward plan makes plain, we started out with a shared view that access to broadband is imperative but must be cheaper than the commercial offer and oriented towards the agenda of local service providers if scaling our approach is to be deemed worthwhile and appropriate, and we have ended up in a position such that a multi-stakeholder approach to developing broadband solutions for a deprived community – a bona fide public/social partnership - could yet be established. It remains to be seen if/how that approach will extend to the provision of affordable ICT hardware, training and skills development as well as local service trials founded upon this firm basis for a future extended infrastructure project. It does, nonetheless, lend strength to advocacy for so-called 'Muni Networks' in the United States and Europe; see, for example, http://www.muninetworks.org and reflect a very positive outcome for the overall project at this juncture.

MAINTENANCE, SUPPORT & LEGACY VEHICLE OPTION(S)

We sought from the outset to explore the potential for the Gellideg community to own and operate its own network as well as to oversee efforts to scale the same on a social enterprise footing both because MVH made plain its unwillingness to own, manage and maintain any resultant network during our early conversations with them, and because we believe in the added value that flows from community owned and managed assets more broadly (in particular, where a guintessentially organic approach to infrastructure development one that has been tried and tested elsewhere over a number of years - ordinarily calls for a bottomup rather than a top-down approach to forward maintenance, support and extension if best practice is to be taken into consideration in any future evolution of the Digital Merthyr project).

Accordingly, appropriate options were reflected in our Models 1 and 2 (see: P17-19) and shared with MVH for discussion in Autumn 2013. We've already stated that the additional work needed to develop a detailed business plan for any such social enterprise has still to be undertaken at the time of writing. However, we have made plain in the course of discussions our firm belief that it would almost certainly need to offer network installation, maintenance AND ICT hardware refurbishment/sales as well as related training in order to render it viable based upon the expert advice solicited from social entrepreneurs well-versed in this area of activity during the project.

We've also alluded to proposals which would result in the establishment of a further 2 micro networks elsewhere rather than organic scaling of the Gellideg prototype network in the first instance, as well as MVH's preference for a more limited network install/maintenance offer where any future enterprise that might be established by Gellideg's Digital Champion, lan Wright, is concerned. We understand that MVH is now re-considering whether it couldn't in fact fulfill the role of "network anchor" in-house and, for example, apply a one-off charge to its residents for a year to cover core infrastructure and initial install costs; obtain a license from Zen to re-sell broadband access; and/or apply a charge ongoing to its residents for ongoing backhaul access. Until such time as MVH and other key stakeholders determine their preferred approach to extending the mesh network and increasing access to backhaul provision, or the Gellideg community 'steps up to the plate' and takes a lead in and of itself (as the network design permits them to do), we are unable to make firm recommendations as to the most appropriate form of legacy vehicle for the prototype project; that is, as ever, 'legal form(s) should follow function' in the first instance.

However, as we remain committed to those principles which have guided the prototype project from the outset, we feel strongly that an appropriate way forward needs to be brokered so as not to lose the good will and momentum secured to date and/ or compromise the potential for significant social and economic impact to flow from evolution of the project in future taking into account good practice from elsewhere.

Accordingly, we recommend MVH either reconsiders its relationship with / support for lan Wright's proposal to undertake the feasibility and business planning work required to attract investment into a dedicated social enterprise OR explores the potential to work with others and establish a dedicated multi-stakeholder or 'open' coop at this juncture.

Notably, both options are considered preferable on the part of the project team in comparison with any MVH-led vehicle/initiative, to the extent that they would be more readily capable of engaging residents of Merthyr Tydfil in the round (potentially, beyond the scope of MVH's Memorandum and Articles of Association), benefiting from broader public sector backhaul provision as bandwidth intensive services increase (together with associated economies of scale qua costs), and attracting social investment to develop their impact over time. Clearly, this is a matter for the client to consider, but we would be very happy to expand upon this topic further in due course once plans are firmer at the local level. The prototype network we helped residents build in Gellideg represented a front-end solution that already works well from a technical perspective for an estimated 150,000 users internationally.

There are healthy community-led mesh networks in operation right around the world as 'proof of concept' and, as such, we sought primarily to devise and test a mesh network Build Methodology appropriate to a deprived and overwhelmingly non-technical community in the UK. We successfully delivered against the range of aims and objectives we co-produced with the community and key stakeholders - although, with hindsight, we'd like to have done more in relation to prototyping local services to demonstrate the prototype network's added value at the same time as supporting the core infrastructure project. But, in particular, we are heartened by the feedback from the network developers and users themselves - Gellideg's emergent 'civic engineers'.

Looking ahead, we've made headline recommendations concerned with extending the mesh network in Gellideg (and beyond), increasing access to backhaul provision as well as maintenance, support and legacy vehicle development to underpin any scaling initiative.

We're encouraged by enquiries from nearby RSLs about replicating the project and, in particular, their interest in iterating the Digital Merthyr model insofar as they've expressed interest in exploring the scope to open up access to lamp posts to power and structure associated backbone networks; elsewhere, such a willingness to innovate is generally limited to stakeholders in more affluent areas that recognize the importance attaching to infrastructure development capable of facilitating Internet of Things related trials – as per Cambridge - and we already perceive very real and significant scope to add value to RSL tenants where this can be operationalized in practice following national conversations with organisations including the NHF and HACT.

We've also referred here to the scope for a cuttingedge approach to the collaborative consumption or sharing of internet connectivity in the context of public/social partnerships to expedite solutions and/ or overcome the challenges associated with the growing need for assisted digital provision in deprived communities and households. Notably, we've been approached by a London Borough and County Council in England already to pursue this approach further.

Above all, the Digital Merthyr prototyping project sought to empower the residents of Gellideg to help themselves – faced with a seemingly insurmountable challenge which continues to impact the community as technological advancements impact it at break-neck pace.

As such, we wish to thank them for their support, input and can-do attitude throughout. The project was designed with them in mind, for them to shape and to benefit from long after the project team departs – albeit, from the outset, we were conscious of our pioneering together. There is now genuine international interest from other community-led network proponents in approaches which combine established mesh networking techniques with (more than tech) missions and, to that end, we hope that the efforts of Gellideg residents in Digital Merthyr will continue to underpin a 'ripple effect' elsewhere in future, in recognition of the courage to 'do different' that local residents, MVH and other key stakeholders have exhibited from the very outset.