Welsh Economy Research Unit

Yr Uned Ymchwil i Economi Cymru

Superfast Broadband Business Exploitation Project

Case-study Synthesis Report

April 2020

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European Regional Development Fund

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Summary

This report provides a synthesis of findings from the fifty case studies undertaken for the Superfast Broadband Business Exploitation (SFBE)– Research and Intelligence project. The aim of the report is to draw out themes from the research to inform both policy makers, business representative bodies, businesses and local authorities about the future challenges and opportunities linked to digital technology diffusion.

The main findings of the research can be summarised as follows:

- Despite the onset of a number of enablers, there remains a number of barriers preventing businesses from adopting digital solutions.
- Incremental adoption of digital technologies remains the most commonplace approach taken by the case study businesses.
- Many of the everyday front and back of house business processes can be supported by digital diffusions.
- More transformative approaches are becoming more accessible, though sector and business size variations remain.
- Businesses' digitalisation varies depending on its size, sector, location and skills of its workforce.
- Time and cost efficiencies are the most popularly cited benefits.
- Additional business performance benefits include heightened transparency, increased data security and backup, improvements to customer experience and competitive advantage.
- The labour market also benefits from increased flexibility and access to skill development.
- Advancements in digital technologies enable businesses to relocate outside of urban areas, while extending their access to national and international markets and employees.

The policy recommendations of the case-study findings include:

- Adapt future SME advisory support for digital to focus on targeted sector and locational business needs
- Establish monitoring capability to ensure that future digital threats and opportunities are identified in a timely manner
- Ensure that digital business support is capable of being delivered seamlessly through online and offline mechanisms
- Consider co-learning digital skills as a mechanism that could be implemented through policy action
- Consider how Welsh Government's emerging 'policy mix' of digital programmes and initiatives can best be aligned to meet the needs of business in Wales

1. Introduction

The case-study work programme formed part of the core SFBE Research and Intelligence project's activities undertaken by the Welsh Economy Research Unit (WERU). This strand of research began in late 2016 and supported the research project's objectives to look in-depth at SME adoption and use processes and outcomes. The aim is to use this information to understand the transition underway over time.

The purpose of the case-studies was to provide research and intelligence that could help to inform policy makers, business representative bodies, businesses and local authority stakeholders. To achieve this the research team worked closely with the SFBE Advisory Group (led by Professor Tony Davies) to identify themes and business cases. This synthesis document acts as a final statement of the SFBE case-study research, drawing out key findings and implications for policy practice and SMEs in Wales.

All case-studies were developed through interviews undertaken with business owners / or senior managers. Additional secondary data was drawn from the businesses' website and results of Digital Maturity Survey findings. The case studies were reviewed by the business for approval prior to upload to the website. Results from case-studies also formed part of the annual Digital Maturity Economic Impact Reports.

The case-studies were made available to partners and stakeholders through a number of routes, including presentation to the Advisory Panel and other forums such as the Superfast Broadband Champions (Local Authority) group, and sharing with the Serco / Superfast Business Wales team. All case-studies are available via the SFBE Research and Intelligence project website. The cases (including this synthesis) will form part of the final Project Repository of SFBE research.

The structure of the case-studies synthesis report is as follows. It begins by setting out the aims and objectives of the case -study research activity (Section 2), the research completed (Section 3) and the dissemination approach adopted (Section 4). This is followed by analysis of the main synthesis themes (Section 5). The final section draws together the conclusions and implications for policy and practice (Section 6).

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2. Overview of the case-study approach

The purpose of the case studies was to provide in-depth information on business adoption and use of digital technologies, complementing the findings of the Digital Maturity Survey. Through examining adoption and use processes in detail the cases provide an insight into causality and the challenges faced by SMEs. They were selected to represent the diverse ranges of businesses and digital maturity evident in the Welsh economy. This includes businesses that were in the early stages of broadband adoption and digital technology use, as well as more digitally mature businesses. A broad range of sectors were also selected for the case studies (See Table 1 for full details). Key topics for the case study interviews included:

- What broadband enabled services does the company use?
- How does the business use digital technologies?
- What skills and capabilities does it have in relation to digital?
- How has its use of broadband and skills evolved (for longitudinal cases)?
- What impact does broadband have on sales, employment, innovation and other factors?

Each case study business was interviewed for between 45 to 60 minutes. These recordings were then transcribed per dictum. To help develop and store themes from the data the qualitative data software package NVivo was used.

3. List of reports published

Table 1 presents a list of the case-studies undertaken over the course of the project (including indicative sector and revisit status – yes or no).

Table 1 SME case-study businesses

Company name	Broad industrial sector	Revisited
Cloud Genius Ltd	Information and Communication	Y
Method4 Ltd	Information and Communication	Y
Recycle Scooters	Retail, Wholesale and Transport	Y
Menter Berllan Community Enterprise Hub	Business and Professional Services	
Sean Carr Lining Technology	Construction	
NLS Solicitors	Business and Professional Services	Y
DevOpsGroup	Information and Communication	
Bursali Towels	Retail, Wholesale and Transport	Y
D&G Office Interiors Ltd.	Retail, Wholesale and Transport	Y
The Royal Victoria Hotel	Accommodation and Food Services	Y
Rhiannon Cyf	Production	
West Wales Holidays	Accommodation and Food Services	Y
Cefn Cae'r Ferch Farm	Production	
Mango HR	Business and Professional Services	
Zip-Clip Ltd	Production	
Pitton Cross Campsite	Accommodation and Food Services	
Mona Tractors	Retail, Wholesale and Transport	Y
D&S Photographic Services	Business and Professional Services	
AOTV	Information and Communication	
Arad Research	Business and Professional Services	
Celtest	Construction	
Melin Tregwynt	Production	Y
Trail Rides Wales	Retail, Wholesale and Transport	
The White Room at Harlech Pottery	Retail, Wholesale and Transport	Y
Little Inspirations	Business and Professional Services	
Resources for Change (R4C)	Business and Professional Services	
Myddfai Trading Company	Production	
F.P.Hurley & Sons Ltd	Construction	
Diack Ltd	Construction	
Carreg Construction	Construction	
Wynne Construction	Construction	
Hazelwood	Construction	
LH Evans	Construction	
Sophrology	Business and Professional Services	
Bomper Studio	Information and Communication	
Accolade Executive Coaching	Business and Professional Services	

Note: The table includes 36 unique businesses and 11 revisits. Three businesses chose not to publicise their cases.

4. Dissemination

All case study report were disseminated to a range of regional partners and stakeholders, with the intention of informing debate and policy delivery. Table 1 below summarises the main audiences, objectives and dissemination activity undertaken in the project period.

Table 2 SFBE Research and Intelligence Case-Study Dissemination

Audience	Dissemination objectives	Dissemination activities
WG SFBE programme manager	Research is aligned with the SFBE programme, delivering high quality research evidence on business exploitation of SFBE	All case-studies were submitted to Professor Tony Davies, who acted on behalf of the Programme manager, to receive and review the cases.
SFBE Advisory Panel	Regular interaction with the Advisory Panel to review of results.	Case-study themes and business samples were developed with input from Advisory Panel members. All reports were presented to the Advisory Panel prior to publication.
WG Business Wales / SFBE Advisors	WG, via the Advisory Panel Chair agreed format and contribute towards case study topic areas and sector selections. Raise awareness of case-study issues through the Advisory Panel and information provision work of Superfast Business Wales (SERCO).	Case-studies were selected and developed with input from WG and Superfast Business Wales, via the Advisory Panel. Cases were made available on the project website, and contributed to sections of the published Digital Maturity Economic Impact Report. .
Local authorities	Superfast Broadband Champions are aware of the case-study outputs, engaged in their dissemination and contribute to topic development.	Case-studies were disseminated to local authority partners via the Advisory Panel, the project website and Twitter.
Business representative organisations	Organisations are aware of the case-study outputs, engaged in their dissemination, and contributed to topic development.	Case-study reports were disseminated to Business Representative bodies (FSB Wales, IoD Wales, EstNet) via the Advisory Panel and website.
Businesses	Businesses are aware of the case-study outputs, take action on the findings (as appropriate) and contribute to topic development.	Case-study reports were made available to businesses via Business Representative bodies, the project website and various events.
Academic	National / international research partnerships established. High quality academic research outputs	The research team have presented their case-study research and networked with partners at the following national and

Audience	Dissemination objectives	Dissemination activities
	developed around case-study findings.	international conferences: 2019 Regional Studies Association Annual Conference, Santiago de la Compostela, 5th to 7th June (Rural). 2019 Regional Studies Association Annual Winter Conference, London, 14-15th November (LR, CX and DH - Digitalisation and the foundational economy: a digital opportunity or a digital divide?).

Source: Adapted from WERU (2018) Superfast Broadband Business Exploitation Project: Horizon Scanning Plans

5. Synthesis of case-study findings

The case study findings are broken down into three central themes, namely the *antecedents* enabling or restricting the uptake of broadband-enabled technologies; the *varying uses* of digital technologies and their functions for the business; and finally, the range of *outcomes attained* from implementing digital technologies for the business, workers and region.

5.1. Antecedents: barriers and enablers

The antecedents refer to the precursors restricting or supporting businesses' ability to adopt digital technologies. The factors influencing the uptake of broadband-enabled digital technologies can be broken down into two subthemes. First, the barriers preventing businesses from adopting or enhancing their digital capabilities. Second, the enablers encouraging and supporting businesses' adoption of broadband-enabled technologies. While there are crossovers between the two subthemes, for clarity these are considered in turn below:

Barriers

While the rollout of superfast broadband across Wales supported many of the case businesses, other businesses discussed the *infrastructure and connectivity* barriers preventing the adoption of superfast broadband. From across the case studies and highlighted in WERU's Horizon Scanning Rural report, a number of businesses in rural areas noted the potential for increased risks through some remaining infrastructure and connectivity barriers. These case studies reveal that some businesses are still facing challenges when accessing robust and affordable broadband connections. In part, this may be the result of a more limited number of connection options and underdeveloped competition between providers:

> "*As the rest of the world is moving on, there are certain parts that are getting left behind. Getting left behind at a very high cost. So, it is costly, and it doesn't work brilliantly. It drops out. It is expensive, because our choices of providers are again far less. You go onto things like MoneySavingExpert and you look at the prices and what's available and then you look at what you get here, and it is very different. We can't get those. So, our options are limited, and our costs are higher*." (Resources for Change)

Nonetheless, these barriers were more commonplace during the early stages of the project, with less businesses having connectivity issues as the project timeline continued. Yet, where these connectivity hurdles exist, businesses can be prevented from fully benefiting from fixed and mobile digital infrastructure, in turn restricting elements of the business and its ability to fulfil customer expectations:

> "*With regards to the poor broadband, we depend very much on the landline and where we are we have zero mobile signal, they are always saying we should get a dongle but we can't do that, and this is also an issue in quite a lot of the holiday cottages; there's no mobile signal, there's no broadband, guests arrive and are unable to communicate with anyone and that's a real problem*." (West Wales Holiday Cottages)

A further prominent barrier was that of *cost*, both in terms of installing superfast broadband infrastructure in areas where it was not currently available, as well as the capital investment required to purchase the hardware, software and subsequent software licenses. Introducing new, and advancing existing, digital innovations often requires a significant upfront and ongoing investment. These costs vary significantly, depending on the extent and function of the digital tools implemented. As one case study business put it:

> *"We are spending upwards of £50,000 because, this year, we've added Field View. This is the site managers' tablets to do all their documentation remotely. Adding that up and probably being conservative, I would say it's close to £50,000, which is, again, a big sum of money and that's an annual renewal that we're paying at different times. Spread over the year, it's nearly £1,000 a week for various licences."* (Wynne Construction)

While digitalisation can involve significant upfront costs, for example when investments in new hardware is required, other important changes such as the adoption of Cloud services and other software is increasingly available on a subscription basis. These ongoing financial commitments were noted by a number of users:

> *"It's keeping up with technology as well, investing heavily and having the unfortunate job of throwing old equipment away when you think they're very good and buying new."* (Zip Clip)

Businesses range from micro businesses of one to ten employees, small businesses of ten to 50, to medium businesses of 50 up to 250 employees. These different businesses have varying capacities and resources when it comes to implementing digital technologies. For smaller businesses these upfront and ongoing costs are not always a feasible option. Alternatively, investment may need to be delayed or implemented over a prolonged period to mitigate the upfront costs.

Moreover, to amend the current approaches and implement digital alternatives or advancements then a *level of ICT expertise* is required for the business and its workers. For the case study businesses this required investment in time, resources and skills. However, not all businesses were equally placed to access these requirements, creating further divisions between businesses. One of these differences is access to ICT and digital skills, with spatial differences being noted. More rural areas highlighted restrictions based on their location when seeking to attract the necessary talent needed to enact changes in the business:

> "*Certainly, for us in this part of the world, it's very, very difficult to find the skills and expertise required and in truth that's probably true outside of any large urban environment and even in some urban environments. You need things that are well implemented, work well and aren't going to break down and that's much, much harder than people think. It's the same as in any industry but it's very easy to sing the praises of technology and the opportunities they provide but just in the way that a good builder is a good builder and bad builder is a bad builder, the same is true of those who provide services within the tech sector."* (Rhiannon Cyf)

A further skill-based hurdle is the differences in knowledge, confidence and access to resources for different segments of the population. In particular, the older generation noted more concerns about replacing existing processes with digital alternatives. These concerns were based on a reduced familiarity with digital technologies and greater concerns about the potential risks surrounding data security:

> *"I have lost a lot of data because of hiccups and problems associated with how computers work when you're working online. It would be very useful to us older people to feel confident that we're secure in what we're doing. It's very important for that, and when I talk with other elderly people that seems central to how they feel things are. The younger people are much savvier, having had computers at school, to be able to do these things without thinking. The older people, we need to think before we do anything."* (White Room Gallery)

Barriers can also exist outside of the businesses' control, with the ability to implement digital solutions being restricted by the digital maturity and resources of businesses along the supply chain. Responding to these barriers, businesses discuss ways of overcoming these hurdles, including providing training and resources to support the digitalisation of businesses along the supply chain:

> *"Yes, because we've had to train our supply chain, we have to train them in the digital technologies so that they can work collaboratively with us, they can use the collaborative software, they can do BIM, they can model in 3D and 4D. We've actually been training them. We run a series of supply-chain workshops where we're training them. They're also then having to invest in digital technologies to be able to use the applications we're using, so there is a cost that's transferable." (Wynne Construction)*

Enablers

Businesses' utilisation of broadband-enabled digital tools is also supported by a number of factors. A prominent theme is that of *changes to industry expectations* based on advancements made by competitors, rising customer expectations and increasing regulatory demand. In certain sectors the rising expectations can relate to regulatory demands. For example, in construction legislation makes proof of compliance with health and safety principles mandatory for businesses and digital tools offer a way to effectively manage and record adherence to these necessary requirements.

The rising expectations of customers varies depending on whether the business operates as a business-to-business (B2B) or business-to-customer (B2C) enterprise. In both scenarios, customers are frequently expecting access and use of digital tools, whether it be cloud-based storage and retrieval applications or access to high quality broadband in the tourism and accommodation industry:

> *"The expectation that if a customer comes to stay in the hotel these days they may want to stream a TV programme or whatever and you've got to be able to do that, you've got to live up to that expectation somehow so that gives us a competitive edge to other operators in the area."* (The Royal Victoria Hotel)

While access to financial resources, skills and educational supported acted as a barrier for some businesses, the converse can be said for others. Case study businesses discussed the *benefit of external financial and education support*, helping to overcome the access and implementation hurdles. Support came through Welsh Government programmes such as Superfast Cymru and associated grants, plus the support of telecoms providers.

Support was also provided from a series of sector-based activities to develop digital activities. For example, in the creative industries the Clwster programme can provide research and development support to develop new digital applications. For Bomber Studios this allowed them to develop 3D real-time product configurator.

5.2. Adoption and use of digital technologies

The second core theme relates to the types of broadband-enabled digital technologies businesses are using and the functions they provide for business operations. There were variations across the case study businesses on the extent that broadband-enabled technologies were used to support, or fundamentally alter, the business model. For some businesses, the opportunity to adopt digital technologies have been maximised, replacing traditional processes with digital alternatives:

> *"Probably 95% of business is probably remote, so the digital aspect in that sense is hugely important because, Skype, the internet, we are fixed up with cameras here, and the digital boards and all that kind of stuff. So that's a huge part of our business. Without the digital aspect of it we could not function because we are an international business. So, when we go into a business we use online software that's been built for the business."* (Accolade Business Coaching)

However, at the other end of the spectrum, the need for Internet-related activities can be minimal retaining many of the traditional processes and supplementing them where necessary with incremental digital changes:

> *“Maintaining my website. Most enquiries are by email or Facebook message. A few people phone, but by far the majority communicate electronically. I would say, on average, I answer two or three emails from customers a day, seven days a week. Facebook messages, well, probably about one or two every couple of weeks. I do our website myself, so I upload at least once a week and have a major revamp of the website about four times a year.”* (Trail Rides Wales)

As such, differences also occur in relation to whether the use of technologies lead to gradual changes or innovations in the business or more transformative advancements. More commonly, the case study businesses are implementing incremental adaptions, using digital technologies to support or maximise their existing business operations. These extend across the business model, including internal and external communication, marketing, customer relationship management, human resource management, finance and accounting, purchasing, sales, logistics and marketing.

The information flow diagrams provide further support to the transition that has taken place in our SMEs, with most businesses reporting the use of digital in each of their major business processes. These businesses processes include business management, accounting and finance, marketing, sales and purchases, interactions with suppliers and customers, and delivery. While there are important differences between sectors and services or products, the majority of businesses recognised the transition they were undertaking toward greater digital diffusion. The main areas yet to be fully digitised relate to customer interactions and product delivery. In part, this was because the businesses wanted to retain the personalised and face-to-face interactions, implementing digital solutions to support rather than replace these interpersonal connections.

Internal and external communication are among one of the most cited uses by the case study businesses, whereby employees use digital tools to support the sharing of information, data and appliances within the company. Cloud based storage applications, such as DropBox, OneDrive, Google Drive, File Transfer Protocol and the iCloud are among the most popular applications used by the case study businesses. Using these cloud-based tools, employees and clients are able to store and share files in real time:

> *"Everything is in the cloud. All our emails, all of our work tracking system, all of our HR systems, our accounting systems, everything is in the cloud. It is all accessed by our browser and all of our systems management, remote systems management for clients, all of that infrastructure exists on the internet"* (DevOps Guys)

When exchanging information, a number of text-based, audio and video communication devices are also used. WhatsApp is becoming an increasingly popular free communication tool, allowing for real time interaction between team members. For both internal and external video calls Zoom and Skype for Business were among the most utilised applications, allowing for meetings to take place virtually. These video communication tools allow employees, clients and suppliers to interact remotely. A further broadband-enabled communication tool that supports many of the aspects of the business is that of Cloud telephony. Increasingly businesses replaced traditional landlines with a Cloud-based alternative, namely Voice-over-Internet Protocol (VoIP). The switch provides cost benefits and provides a number of additional features, including transference of calls:

> *"Yesterday we went live with a VoIP telephone system, so again it sounds simple, but the functionality to be able to transfer a call to a mobile phone is now available to us, so coming back to the customer relationships, if someone wants to speak to a salesperson, they've rung their direct line or whatever it is, we can patch it straight through to their mobile."* (D&G Office Interiors)

Other incremental adoptions centre around the back office processes, such as human resource management, accounting and project management tools. Businesses are automating many processes that were previously undertaken manually using broadband-enabled technologies. For example, using a human resource management tool, SAGE, businesses are able to collate employees' time sheets and rotas creating an automated payroll system and digital payslips. Similarly, invoices can be electronically created and disseminated to clients. Again, businesses vary in the extent automation is introduced, with some businesses streamlining existing processes and replacing them with a digitalised alternative:

> *"It's called People HR and basically it's like an online HR system. It stores all the employee data and it also enables you to do recruitment on there, performance, meetings, that kind of thing. Everything can be recorded on there; all the documents, all the compliance stuff. So, when someone starts a job, they have to have proof that they can work in the UK. We have to make sure that all documents are on file, that you've got all their key detail, so there's compliance.."* (Mango HR)

Marketing, promotions and sales, particularly through websites and social media are frequently featured. Almost all businesses included in the sample utilised a website and the vast majority used at least one social media platform. Website use varied from dissemination of information to a sales portal for online sales and purchases. These low-cost digital options support the communication of information, promotions and ongoing interaction with customers:

> *"It's growing, the need of using Twitter, news sharing from the website. We do a lot more use of Twitter, even use of Facebook, LinkedIn. LinkedIn is a great source of making contact with your customer base, particularly overseas."* (Zip Clip)

Businesses are diversifying the social media tools depending on the audience, while Facebook and Instagram are preferred options for B2C interactions, case studies note the benefits of LinkedIn and Twitter for establishing longer term connections within B2B relations. Moreover, the information disseminated through social media varies, with live streaming becoming an increasingly popular tool to share information and interacting with customers in real time.

Incremental digital adoptions also support the everyday operations of businesses. For example, in the service industry, ensuring access to superfast broadband for hotel customers is increasingly become an expected norm. Moreover, other sectors rely on working on sites beyond the business premises. Many of the construction businesses invested in portal tablets to use onsite, allowing workers to collect and relay necessary information away from the office:

> *"There's technicians that go onsite and test material, taking temperatures, checking compaction and densities of the asphalt that's laid. There's an industry app for putting an iPad on a paver that lays asphalt material and that will take all that data without the need for a technician to be on site."* (Celtest)

However, some of the businesses are also adopting more advanced and transformative digital tools, including artificial intelligence (AI) and 3D printing. Linked to the barriers section above, these tools can come with a high price tag and tend to be sector specific. Cloud Genius discussed the cost implications of AI technology, with a £10,000 entry fee plus additional and ongoing subscription fees. Instead, the business selected elements of AI but with more limited functionality as it was the more financially suitable option. More widely, 3D printing is becoming more accessible, helping to support the product development stages of the business:

> *"We utilise, as well, 3D printing, which is great. That's changed things dramatically on making decisions on whether a product is viable or not. When you get a 3D in your hand and you can use it, it's great."* (Zip Clip)

In the construction sector, in-house 3D modelling and design is becoming an industry expectation:

> *"Everything in construction at the moment is BIM, BIM, BIM: "Are you BIM ready? Are you using BIM?"* (Hazelwood Carpentry)

Building information modelling (BIM) is already mandatory for Welsh Government funded projects and quickly becoming a necessity when tendering for work. Using BIM, 3D models can be shared with other team members working on projects simultaneously. The tool allows for the storage and retrieval of information that can be accessed throughout the construction and operation stages of the project and stored for future accountability and transparency:

> *"We've adopted quite a lot of digital technologies. We are now accredited to BIM Level 2. We're now working to our next level of accreditation. That's all about digital construction. It's all about digital drawings and about all the information that sits behind it. It interweaves the whole project."* (Wynne Construction)

Nonetheless, implementing BIM can be difficult for some construction businesses, linked again to the overheads and skills needed for its successful implementation. F.P. Hurley and Sons Ltd estimated that the cost of a one-year subscription to BIM is over £3,000 per annum, with an additional £1,000 for every additional employee using the application. This is following the upfront investment in sufficiently powerful hardware, costing around £2,000 per person for the computer, plus the additional cost of requiring two screens to read the quantity of the data.

5.3. Outcomes

The final theme explores the outcomes businesses, workers and regions achieve after implementing broadband-enabled digital technologies. Given the case studies predominately explored business-related implications the bulk of the benefits will focus on business performance outcomes. However, further implications for workers and spatial outcomes were also highlighted in the case studies and will follow in brief.

Business Performance

One of the most commonly cited business performance benefits from across the case studies related to cost and time efficiencies. The adoption of digital technologies has allowed the businesses to cut costs elsewhere reduce the amount of time needed to undertake traditional processes undertake tasks in-house that they had previously outsourced to third-parties and reduced the need to travel to submit information. An example of these savings was noted by Celtest, when outlining the time savings generated from adopting electronic tablets to allow site technicians to input data on site. It was estimated that at least two minutes was saved per test report conducted. During 2017, 65,000 test reports were produced, based on these calculations it is estimated that at least 42 hours is saved by week by replacing the manual method with the digital and automated alternative. One additional example is the reduction in download times, allowing processes that might have taken a working day to be vastly reduced:

> *"The time required for uploading has gone from 10 to 24 hours to two to three hours. That allows that computer to do other tasks and then be more efficient."* (AOTV)

Even when the direct savings are hard to calculate the improvements in productivity and efficiency are invaluable for many of the businesses. However, for some businesses these benefits are not instant and can take time to materialise:

> *"If anything, the nominal cost is slightly higher, but in terms of your productivity and efficiency it's a huge boost. Obviously, it takes a while for you to make the most of those, you can't expect to just suddenly go onto superfast and overnight, reap all the benefits. But if you are taking a twelve month view or twenty-four month or three or over five years, it gives you a vast new range of possibilities and it allows you to implement things that you just couldn't have implemented before which are performance-enhancing for the business. I cannot stress how important it is for pretty much any business."* (Rhiannon Cyf)

These benefits also meant that businesses could extend their market reach as well as the radius in which they could attract workers. The additional flexibility attained from removing the need to travel or be positioned locally to clients, allowing for opportunities that would not have been accessible. Time and costs needed to travel for work are also reduced:

> *"Training and supporting our clients via TeamViewer saves on fuel costs, and both team and client travel time. We are also able to run sessions in the evening, which works better for clients in a rural area who do not want to travel on winding and remote roads at night. Typically, our clients live anywhere between four to 20 miles away from the hub. Assuming a mileage rate of £0.45 per mile, that can represent savings, on each round trip, in the range of £3.60 to £18.00, plus the opportunity cost of time lost while driving."* (Menter Berllan)

Increased competitive advantage was noted by businesses as a further benefit of digital improvement across all sectors. One way this was achieved was through improvements to the customer experience. In addition to benefiting the business, the digital adoptions can allow for greater flexibility for the customer, help to boost sales and strengthen the two-way relationships between customers and businesses. In addition, construction businesses implementing BIM outline the competitive advantage provided during the tendering process. The businesses were able to bid for a greater number of public sector contracts, as well as offer a more secure and efficient process of modelling and construction than their competitors. For hospitality and tourism, having access to superfast broadband has become an expectation as opposed to benefit for visitors.

Additionally, the transparency of business operations is improved. This is linked to both adhering to regulatory demands and customer experience. By using digital applications to store and disseminate information, customers can observe that the processes have been completed to a high standard and also helps to identify fair practice:

> *"The company director is currently developing a website that is going to be a transparent tool for clients to log-in and see the ongoing costs of their projects. It will show the value of the project, the amount that's been approved. Clients will be able to approve quotes, which then kick starts the whole process."* (Carreg Construction)

Using the Cloud to store data also helps to secure and backup business and customer data, helping to remove the likelihood of lost files while also reducing the time taken to retrieve the information contained in the files:

> *"All our customer data is online. We do have hard copies, RAID arrays of customers' videos, which are kept offsite. One of the benefits of superfast broadband, I use a system called CrashPlan to back up everything on my Mac, and that costs around £5 a month."* (AOTV)

Together these benefits support the business by improving the likelihood of business growth, extending the market reach and allowing for advancements in the businesses' portfolio.

Labour market

The adoption of broadband-enabled digital tools can also lead to benefits for workers. A commonly cited benefit is the more flexible working environments, particularly when tasks can be completed outside of the workplace. By working remotely workers are able to navigate existing commitments and remove the time and costs associated with commuting to a central premises and meetings. As such, these advancements can help to support a work-life balance:

> *"We're a very family-friendly company and I know that the bosses are very keen that we have that work-life balance. The increased use of broadband enabled digital technologies has allowed us to get more of a work-life balance."* (Hazelwood Carpentry)

Additionally, employees can access online training that can be delivered professionally and efficiently. This allows the workforce to boost their existing skillset while reducing some of the time and costs associated with in-person training. Two-way information channels can also be established, helping to support communication and the development of interpersonal relationships with staff by using digital tools:

> *"When you've got a hundred staff, who are all on different contracts and we're not all in one place, you tend to lose the personal nature of just running one site. So, communication with staff and keeping them informed of developments and opportunities is important*." (Little Inspirations)

Regional

The advancements in online digital technologies also has regional implications. The ability to work remotely allows businesses to locate themselves in one area and maximise the skills, resources and customer base located elsewhere. As a result, businesses discuss the choice of locating themselves in Wales while extending their customer reach internationally:

> *"People love Wales. people in Wales really want to understand the power of their trading as a Welsh person. That's so overlooked, for such a small country, we really have created a landmark in people's awareness in the country that we consider to be just too big to get into. I say to everybody that I speak to in Wales, there's no such thing as a local business. Everything is international, just adopt the digital aspect of potential into your business and you'll become an international business regardless of what you are doing."* (Accolade Executive Business Coaching)

For Accolade Executive Business Coaching digital developments allowed the business to operate almost 95% of its processes online, while maximising on Wales' reputation abroad to help brand and support the marketing of the training business. Similar benefits are also discussed by rural businesses when discussing the decision to relocate from urban areas. While for many businesses it was important to retain the physical proximity of other similar businesses, other online businesses note the connections that can be created and strengthened using online tools.

6. Conclusion and implications for policy

The findings are divided into three key themes. First, the antecedents enabling or restricting businesses' adoption of digital technologies. The barriers relate primarily to costs, infrastructure availability, and access to skilled employees. The enablers pinpoint the variations based on industry and customers' expectations, as well as accessing financial support and training. Second, the digital tools being employed and the functions they provide in the business. Most businesses included in the sample undertook incremental adoptions, updating their front and back of house businesses processes with a variety of digital tools. However, increasingly more advanced and transformative digital tools are being adopted. Finally, the outcomes show how implementing broadband-enabled technologies for the businesses, workers can benefit the regional economy more widely. The business performance benefits stem from reductions in time and overheads needed to perform everyday practices, improvements in the customer experience, increased functionality, heightened transparency and improvements to data security. Benefits are also available to workers, including enhanced flexibility and more readily available training. The advancements also meant that businesses could relocate their operations and benefit from national and international markets, skills and resources. Together, the themes identify the changes brought by employing digital alternatives and outlines the ways that businesses have predominately benefited from these developments.

Yet, the adoption of digital technologies does not provide catchall uses and implications for all case studies. A number of overarching differences also emerge across the case study businesses. While some businesses were developing high levels of digital maturity others are retaining largely offline and traditional business models. In part this is dependent on the size, sector and location of the business. Smaller businesses face greater barriers in terms of implementing digital solutions, largely due to the upfront costs in capital and time. Nonetheless, when these businesses invest heavily in digital tools the outcomes can be stark, transforming the business model and providing opportunities that a business of its size would not otherwise be access.

The sector is also an important factor. The uses of digital technologies and the available outcomes vary from sector to sector. In IT and many other business and professional services businesses digitalisation has been long established, with advancements in digital tools augmenting existing online processes. For construction and production, industry standards are pushing for digital developments, encouraging businesses to adapt and respond to customer and regulatory demands. In contrast, other sectors such as retail and hospitality are less digitally mature, retaining an emphasis on traditional and offline processes while selecting digital tools that support these traditional processes. The urban-rural differences also emerge from the case studies, with digital developments providing both opportunities and restrictions for rural business.

Given these findings a number of policy implications emerge[1]:

1. Adapt future SME advisory support for digital to focus on targeted sector and locational business needs

The case study findings suggest that there may be a need to consider whether the current 'blanket approach' to SME digital adoption is appropriate in Wales. These findings and that of the wider research highlight important differences in levels of digital maturity, as well as connectivity challenges. This implies that any future business advisory support may need to be more targeted at particular sectors and policy agendas. Examples here might include developing specific digital business support for the foundational economy sector, or particular rural sectors. In developing such support greater specialism may be required in advisory staffing.

2. Establish monitoring capability to ensure that future digital threats and opportunities are identified in a timely manner

The case studies also highlight the transitionary nature of digitalisation in the Welsh economy. In particular, the repeat case studies show that developments were occurring over time, with businesses predominately becoming more digital and looking for ways to overcome any pre-existing implementation hurdles. This highlights the need for policy in Wales to focus on understanding and examining the future trends and signals. This may help to ensure that policy adapts and helps to ensure that Wales is able to respond accordingly. While a technology focus to such capacity will be important, examining how wider political, social, environmental, health factors might shape future digital policy will be important.

[1] These should be read in conjunction with the recommendations provided in the Horizon Scanning Synthesis).

3. Ensure that digital business support is capable of being delivered seamlessly through online and offline mechanisms

While the case studies were undertaken prior to the outbreak of coronavirus and the greater moves towards working from home and online service provision, they did reveal that businesses were making growing use of online services across their business processes. Many businesses, however, reported continued importance of face-to-face interactions in their sectors (See for example the Recycle Scooters case). Looking to the future when the coronavirus pandemic's impacts ease, it will be important that greater consideration is given to developing business support channels, with greater attention given to a 'blended' service model, whereby the online, digital support provision is strengthened and capable of providing a similarly high quality service, relative to face-to-face workshops. This will help to not only support operational resilience of SMEs, but also in the policy process itself.

4. Consider co-learning digital skills as a mechanism that could be implemented through policy action.

Here the case studies note how sectoral supply chains can aid the adoption of digital technologies. Important generational differences are identified with the younger population tending to be more confident and experienced in using digital tools, compared to the older generation. These older groups would benefit from bespoke training, tailored to meet their specific needs, including a focus on data security. Additionally, businesses may benefit from the sharing of good practice and different approaches for overcoming these hurdles. For example, a number of case study businesses overcome the differences in the workforce's capabilities by pairing up more digitally savvy employees with those needing more support to adapt. These small-scale changes can help to support the transition toward greater digitalisation.

5. Consider how Welsh Government's emerging 'policy mix' of digital programmes and initiatives can best be aligned to meet the needs of business in Wales

The case studies highlight that businesses have multiple challenges with respect to digital, including adapting their business model to digitisation, but also their staffing, and preferences and ability to access public services (digital and non-digital). The Welsh Government Brown Review[2] sets out a policy agenda to develop and support a broad range of digital activities across Wales (and via its partners). This has the potential to create new forms of support for business, but also add to the complexity of the policy mix for digital business in Wales, and will call for better integration of policy measures, including linkages between business support, innovation and skills initiatives. This will help to ensure that the digital policy mix promotes good practices and knowledge flow across Welsh Government department and institutional boundaries.

[2] https://gov.wales/review-digital-innovation-final-report

Annex

Table 3 SME case-study details

Company name	Broad industrial sector	Size	Registered office local authority	Location
Cloud Genius Ltd	Information and Communication	Micro	Carmarthenshire	Rural
Method4 Ltd	Information and Communication	Small	Cardiff	Urban
Recycle Scooters	Retail, Wholesale and Transport	Micro	Rhondda Cynon Taf	Urban
Menter Berllan	Business and Professional Services	Micro	Powys	Rural
Sean Carr Lining Technology	Construction	Small	Conwy	Urban
NLS Solicitors	Business and Professional Services	Small	Cardiff	Urban
DevOpsGroup	Information and Communication	Medium	Cardiff	Urban
Bursali Towels	Retail, Wholesale and Transport	Micro	Rhondda Cynon Taf	Urban
D&G Office Interiors Ltd.	Retail, Wholesale and Transport	Small	Cardiff	Urban
The Royal Victoria Hotel	Accommodation and Food Services	Medium	Gwynedd	Rural
Rhiannon Cyf	Production	Small	Ceredigion	Rural
West Wales Holidays	Accommodation and Food Services	Micro	Ceredigion	Rural
Cefn Cae'r Ferch Farm	Production	Micro	Gwynedd	Rural
Mango HR	Business and Professional Services	Micro	Monmouthshire	Urban
Zip-Clip Ltd	Production	Small	Powys	Rural
Pitton Cross Campsite	Accommodation and Food Services	Micro	Swansea	Rural
Mona Tractors	Retail, Wholesale and Transport	Small	Gwynedd	Rural
D&S Photographic Services	Business and Professional Services	Micro	Wrexham	Rural
AOTV	Information and Communication	Micro	Cardiff	Urban
Arad Research	Business and Professional Services	Micro	Cardiff	Urban
Celtest	Construction	Medium	Gwynedd	Rural
Melin Tregwynt	Production	Small	Pembrokeshire	Rural
Trail Rides Wales	Retail, Wholesale and Transport	Micro	Ceredigion	Rural
The White Room at Harlech Pottery	Retail, Wholesale and Transport	Micro	Gwynedd	Rural
Little Inspirations	Business and Professional Services	Medium	Rhondda Cynon Taf	Urban
Resources for Change (R4C)	Business and Professional Services	Micro	Powys	Rural
Myddfai Trading Company	Production	Micro	Carmarthenshire	Rural
F.P.Hurley & Sons Ltd	Construction	Medium	Bridgend	Urban
Diack Ltd	Construction	Small	Caerphilly	Urban
Carreg Construction	Construction	Small	Pembrokeshire	Urban
Wynne Construction	Construction	Small	Denbighshire	Rural
Hazelwood	Construction	Small	Rhondda Cynon Taf	Urban
LH Evans	Construction	Medium	Cardiff	Urban
Sophrology	Business and Professional Services	Micro	Conwy	Rural
Bomper Studio	Information and Communication	Small	Caerphilly	Urban
Accolade Executive Coaching	Business and Professional Services	Micro	Bridgend	Urban

Note 1: Size definition: Micro 0-9 full-time equivalent employees (FTEs); Small 10-49 FTEs; Medium 50 to 249 employees.
Note 2: Location definition uses the 2011 Census rural-urban classification of OAs for England and Wales, Scotland and Northern Ireland.
https://www.ons.gov.uk/methodology/geography/geographicalproducts/ruralurbanclassifications/2011ruralurbanclassification (last accessed 19/02/2020)

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http://www.cardiff.ac.uk/superfast-broadband-project/digital-maturity-survey
https://www.linkedin.com/company/welsh-economy-research-unit/
https://twitter.com/CUWERU

Cronfa Datblygu Rhanbarthol Ewrop
European Regional Development Fund