



Welsh Economy
Research Unit

Yr Uned Ymchwil
i Economi Cymru

Superfast Broadband Business Exploitation Programme: Research
and Intelligence

End of Project Report

7th December 2020



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This report was written by Dylan Henderson, Calvin Jones, Max Munday, Laura Norris, Laura Reynolds, Annette Roberts, Neil Roche and Chen Xu. Results of all project research can be found at <http://www.cardiff.ac.uk/superfast-broadband-project>

1. Introduction

This report sets out findings from Cardiff Business School's examination of the economic impacts associated with business use of superfast broadband in Wales. It draws on evidence from a five-year period of research – 2016 to 2020, including annual Digital Maturity Surveys of Small and Medium Enterprises (SMEs), analysis of economic impacts, case studies of business adoption and use of digital technologies, and horizon scanning of economic, social and technological trends. The research formed part of the Welsh Government's Superfast Broadband Business Exploitation (SFBE) project, part-funded by the European Regional Development Fund (ERDF).

Digital technologies and their use by business have been identified as one of the factors that may help SMEs to improve their productivity. This issue is particularly important to Wales and its sub regions as regional productivity is highly uneven, and reflected in low Gross Value Added per worker, relative to other parts of the UK. The research by Cardiff Business School points to the potential benefits to SMEs from the adoption of superfast broadband and associated digital technologies in areas such as turnover, profitability, innovation and employment growth. This evidence demonstrates how broadband can lever productivity gains, and act as a component of economic convergence processes.

This report aims to provide a summary of the main findings from the research, including:

- Pointing to diffusion of digital technology use by SMEs and the consequent economic impacts on the Welsh economy.
- Illustrating the spatial, firm size and sector dimensions of SME digitalisation in Wales.
- Highlighting future trends and issues facing the ongoing digitalisation of the Welsh economy.
- Draw out implications for research and future policy, including the influence of the coronavirus pandemic in the later period of the research.

Results of all research activities, including Digital Maturity Surveys, case studies and horizon scanning research can be found at <http://www.cardiff.ac.uk/superfast-broadband-project>

2. Overview of the research project

The SFBE project was a five-year programme of research examining digital transformation of SMEs in the Welsh economy. It sought to address the limited evidence base on SME adoption of digital technologies in the region. It did so through a comprehensive programme of research managed and undertaken by a research team at Cardiff Business School's Welsh Economy Research Unit (WERU).

The objectives of the research were to:

- Provide impartial and objective research support which will assist strategic plans for delivery of business support for superfast broadband exploitation.
- Undertake research to support the realisation of successful exploitation of superfast broadband infrastructure in Wales.
- Provide SMEs with material that will help them to explore innovative outcomes from their access to superfast broadband and other e-connectivity.
- Examine comparative evidence from other areas and regions which could inform delivery of services and training in Wales.
- Seek to inform policy directions and to show the types of intervention that leverage the greatest impacts for the Welsh economy.
- Add value to, and gain a better understanding of, the levels of SME competitiveness in Wales as they make more innovative use of the opportunities presented by superfast broadband. This will be seen in improvements in the overall Programme outputs relating to process innovation, SME productivity and economic prospects, and with a final outcome in terms of improved economic performance within Wales.
- Provide a horizon- and thematic-scanning function within the Operation identifying and sharing new practice and technology developments in real-time and ensuring technology developments fit within wider policy, socio-economic and spatial trends. Findings from this horizon-scanning will be used to shape delivery activities to ensure interventions with businesses remain competitive, current and truly innovative.

The context for the research was the growing recognition of the importance of digitalisation to the Welsh economy and society more broadly. This has been reflected in its prioritisation in a number of Welsh Government strategies such as ‘Taking Wales Forward’¹ and the ‘Prosperity for All: Economic Action Plan’². These strategies form part of efforts to ensure that businesses both have access to digital infrastructure, but also that they have the skills to use it. Such challenges were reflected in the SFBE programme, with its provision of free workshops and one-to-one advice to SMEs across Wales.

The research was informed by the persistent economic disparities that exist between businesses and parts of Wales. Here, the research sought to identify the benefits that can be gained from businesses adopting and using superfast broadband, and how uplifts in digital technology use by SMEs may help to address the productivity weaknesses of the Welsh economy.

The research activities included:

1. **The Digital Maturity Survey for Wales** (the Survey) was a regular survey of small and medium-sized (SME) businesses and their adoption and use of digital technologies in Wales. The Survey examined the transition towards digitalisation of business processes and the benefits that are enabled by superfast broadband. Data from the Survey was used in the Digital Dashboard produced and updated annually.
2. **Annual Digital Maturity Economic Impact Reports** examined the economic impacts associated with business use of superfast broadband in Wales. These reports drew on evidence from the Survey, and SME case studies (see below). They provided annual estimates of employment and turnover effects from SME digital adoption and use.
3. **Case studies** elaborated how SMEs utilised both standard and superfast broadband access and the benefits that came as a result. This included individual business case studies and a number of longitudinal case studies, examining use and impacts over time.
4. **Horizon Scanning** research looked beyond the current context for digitalisation of SMEs in Wales, and to examine the technological, social and economic factors that could shape business activities and competitiveness in the coming decades.

A full list of all research outputs developed by the project can be found in the annex of this report.

¹ <https://gov.wales/sites/default/files/publications/2017-08/taking-wales-forward.pdf>

² <https://gov.wales/sites/default/files/publications/2019-02/prosperity-for-all-economic-action-plan.pdf>

The purpose of the research activities was to provide evidence that could help to inform policy makers, business representative bodies, business and local authority stakeholders. To achieve this the research team worked closely with the [SFBE Advisory Group](#) (led by Professor Tony Davies, Welsh Government) to identify topics and review outputs. The team also engaged with academic researchers across Europe in order to identify comparative research of interest to the project, as well as promote its outputs through conferences and academic journal articles. Such engagement was undertaken with the objective of maximising the impact of the research, and ensuring that results were disseminated widely to partners and media outlets.

Online engagement was facilitated by a dedicated project website (hosted by Cardiff University, <https://www.cardiff.ac.uk/superfast-broadband-project>). This acted as a tool to publicise and aid the work being carried out by Cardiff University in collecting data, carrying out analyses and providing intelligence on the take-up and exploitation of superfast broadband enabled services in Wales. The website also acted as a portal for the survey administration, a means of disseminating reports, publicising the Digital Dashboard for Wales; and revealing the findings from our ‘Horizon Scanning’ of upcoming issues, contextual issues around business use of broadband-leveraged resources, challenges and opportunities in digital communications for business enterprises etc. Social media was an additional mechanism for engagement with the project team establishing a Twitter profile [@CUWERU](#) and tweeting research outputs throughout the life of the project.

Conference and events attendance formed part of the research and dissemination strategy for the project. This included presenting research at academic conferences such as the [Regional Studies Association](#), [Regional Science Association International](#), and specialist digital economy conferences and events held by the [International Telecommunications Society](#). A number of industry focused events were also attended including IoT World, 2016; OECD Going Digital London, 2018.

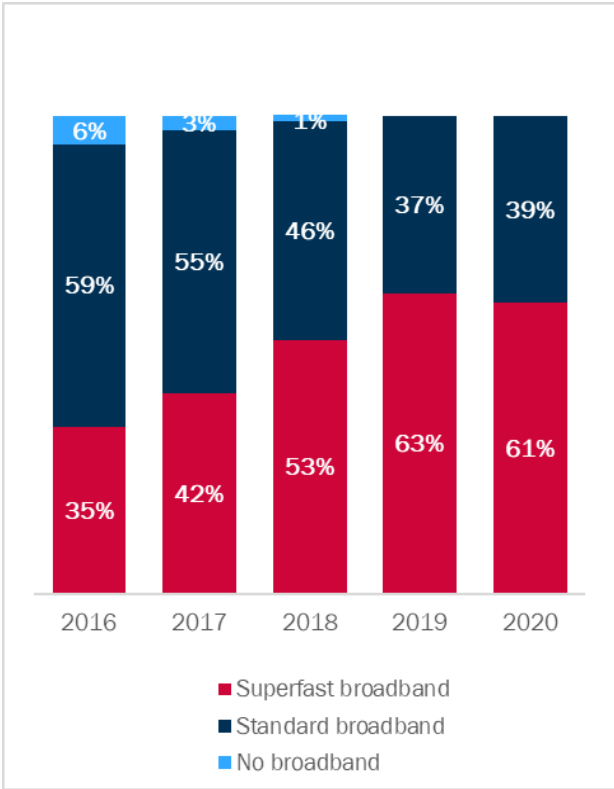
3. Digital maturity

The *Digital Maturity Survey* has been carried out annually from 2016 to 2020. Over this time, 1600 small and medium-sized enterprises (SMEs) have been involved in the study, reporting on their adoption and use of digital technologies in Wales. The *Survey* examines the transition towards digitalisation of business processes and the benefits that are enabled by superfast broadband. Data from the *Survey* was used in the *Digital Dashboard* produced and updated annually (see Section 3-4).

3.1. Synthesis of digital maturity findings

Adoption of broadband. In 2016 just over a third of SMEs in Wales (35%) reported that they were using superfast broadband, defined as being able to download data at speeds of at least 30 megabits per second (Mbps). Figure 3-1 shows that by 2020 there had been a 26-percentage point increase to 61%.

Table 3-1 Adoption of broadband, by type (% of SMEs)

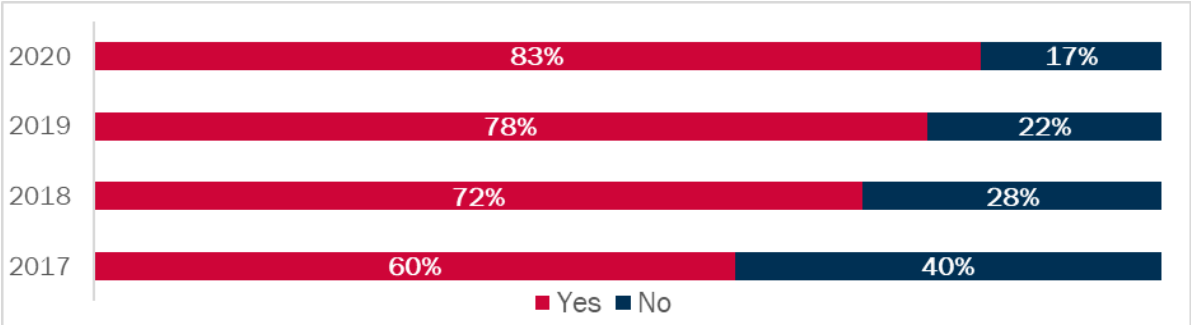


Use of cloud computing services. The use of basic, foundational cloud computing services (digital tools such as email, office software and file sharing/ storage) are separated in the *Survey* analysis from more advanced cloud computing services.

'Advanced' services are defined as: accounting and bookkeeping; data back-up; Voice over Internet Protocol; electronic payment; video conferencing; customer relationship management; project management software; computing power to run business software; human resource management software; and enterprise resource planning.

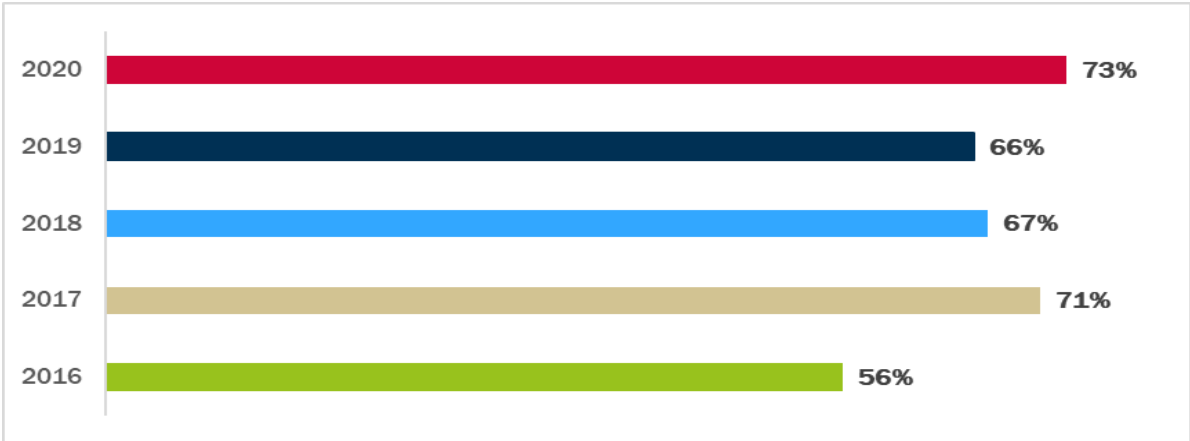
The proportion of SMEs using at least one advanced cloud computing service, shown in Figure 3-2, highlighted an increasing trend from 60% in 2017, to 83% in 2020.

Table 3-2 Use of advanced cloud computing services (% of SMEs)



ICT Skills. Figure 3-3 shows that from 2016 to 2020 the proportion of SMEs reporting that over half their workforce had intermediate or above ICT skills³ increased by 17-percentage points, to 73%. This highlights the level of “upskilling” in the Welsh economy in ICT knowledge over recent years.

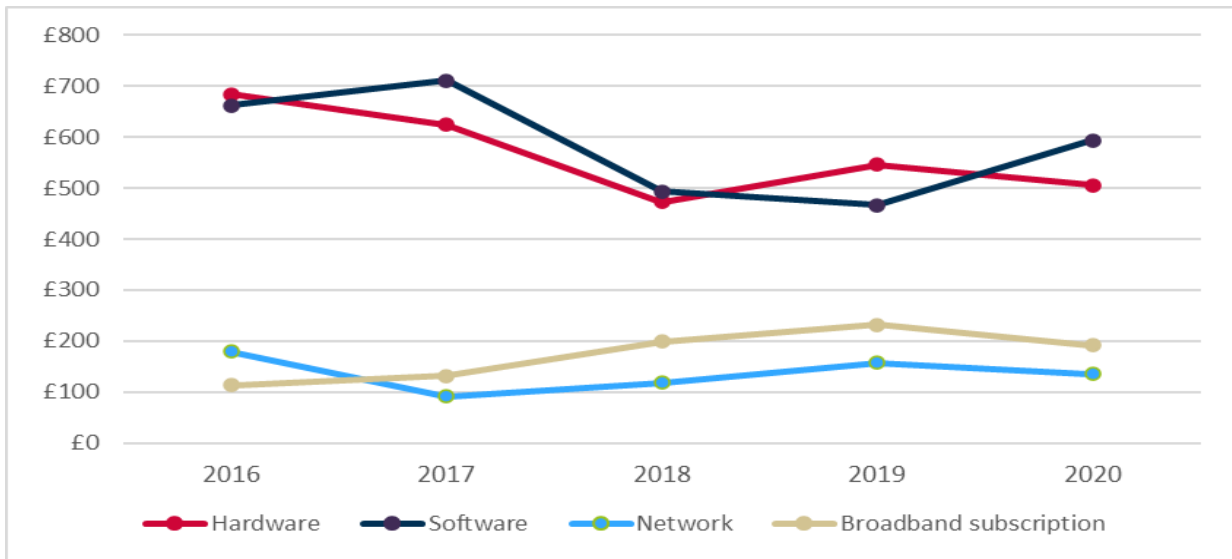
Table 3-3 Proportion of employees with intermediate or above ICT skills (% of SMEs)



Investment in ICT infrastructure. Figure 3-4 shows that annual ICT infrastructure investment per full-time worker waxed and waned over the period 2016 to 2020, but there was generally a downward push on hardware, software and network costs, and an increase in broadband subscription costs.

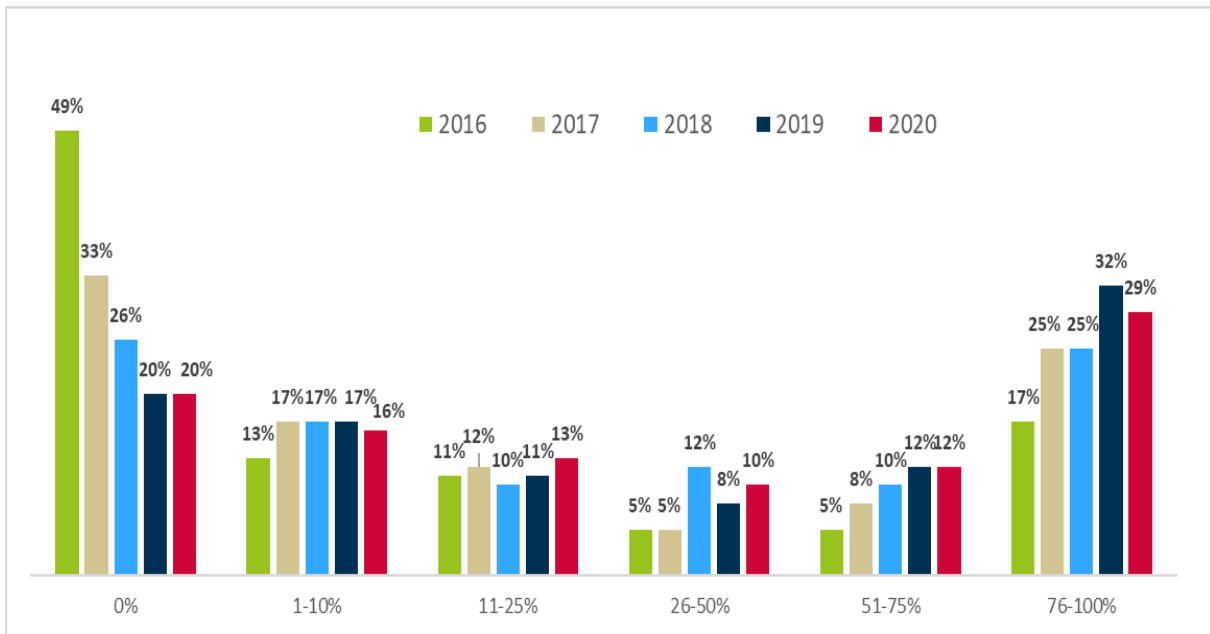
³ Intermediate computer skills include the working knowledge of the operations of the internet and email, computers, word processing, graphics and multimedia, and spreadsheets and databases.

Table 3-4 Average spend on ICT infrastructure per employee (£ per year)



Online sales. From 2016 to 2020 there has been a general trend of SMEs conducting a greater proportion of their sales online. Figure 3-5 shows that in 2016 nearly half of the SMEs in Wales did not sell online (49%). However, by 2020 this proportion had fallen to 20%.

Table 3-5 Proportion of total sales conducted online (% of SMEs)



At the other end of the scale, the proportion of SMEs reporting 76% to 100% of their sales being online was three-in-ten (29%) in 2020. This represented an increase of twelve percentage points from the equivalent figure in 2016 (17%).

Digital Maturity Index. For each SME responding to the Survey, a measure of the scale of their digital maturity level was calculated by scoring their answers to a ‘basket’ of 40 metrics⁴. Known as the Digital Maturity Index, analysis of the Survey findings identify four groups/ types of SMEs in relation to digital maturity. These are set out in Figure 3-6 as: Digitally Disengaged; Passive Exploiters; Active Exploiters; and Digitally Embedded.

Table 3-6 Digital maturity groups in Wales

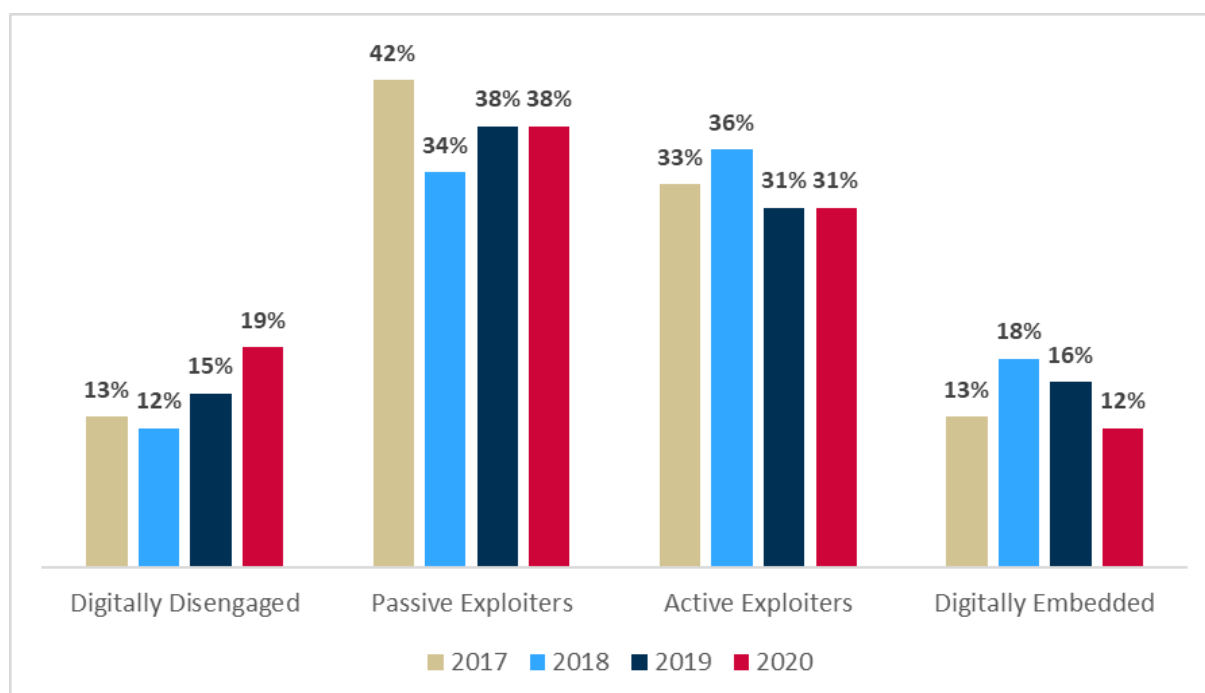
Digitally Disengaged	Passive Exploiters	Active Exploiters	Digitally Embedded
Businesses tending to be standard broadband users, with a high proportion of employees with below average ICT skills. The majority do not use digital technologies and report no sales from online transactions.	Businesses tending to have standard broadband, but more likely to have staff with above average ICT skills. Make use of basic cloud-based applications, but their use of online platforms to generate e-sales is low.	Businesses likely to have access to superfast broadband and a high proportion of staff with above average ICT skills. Use a wide range of digital platforms and technologies. Nearly half report online channel as the main source of sales.	Adopters of superfast broadband with a very high proportion of employees with above average ICT skills. Use a high number of digital applications and secure most of their sales from online transactions.

Results from the 2020 Digital Maturity Index showed that Digitally Embedded SMEs significantly outperformed other digital maturity groups in a number of outcome measures. More than 61% of the SMEs in the Digitally Embedded group reported increases in turnover, profitability and innovation activity as a result of having access to broadband. Some 33% of the Digitally Embedded SMEs reported an increase effect of broadband adoption on employment.

Figure 3-7 shows the distribution of SMEs by digital maturity group from 2017 to 2020. In 2017, nearly one-in-eight SMEs were in the Digitally Embedded category (13%), with this proportion increasing by five percentage points in 2018, to 18%, before decreasing in the following two years. This downturn in the proportion of Digitally embedded is likely to be linked to external factors impacting on business confidence and investment decisions around digital technologies.

⁴ See page 25 of the Digital Maturity Survey 2017 report at: https://www.cardiff.ac.uk/data/assets/pdf_file/0007/1176829/SFBE-National-Digital-Maturity-Survey-Report_2017-0-6.pdf

Table 3-7 Digital Maturity Index (% of SMEs by category)



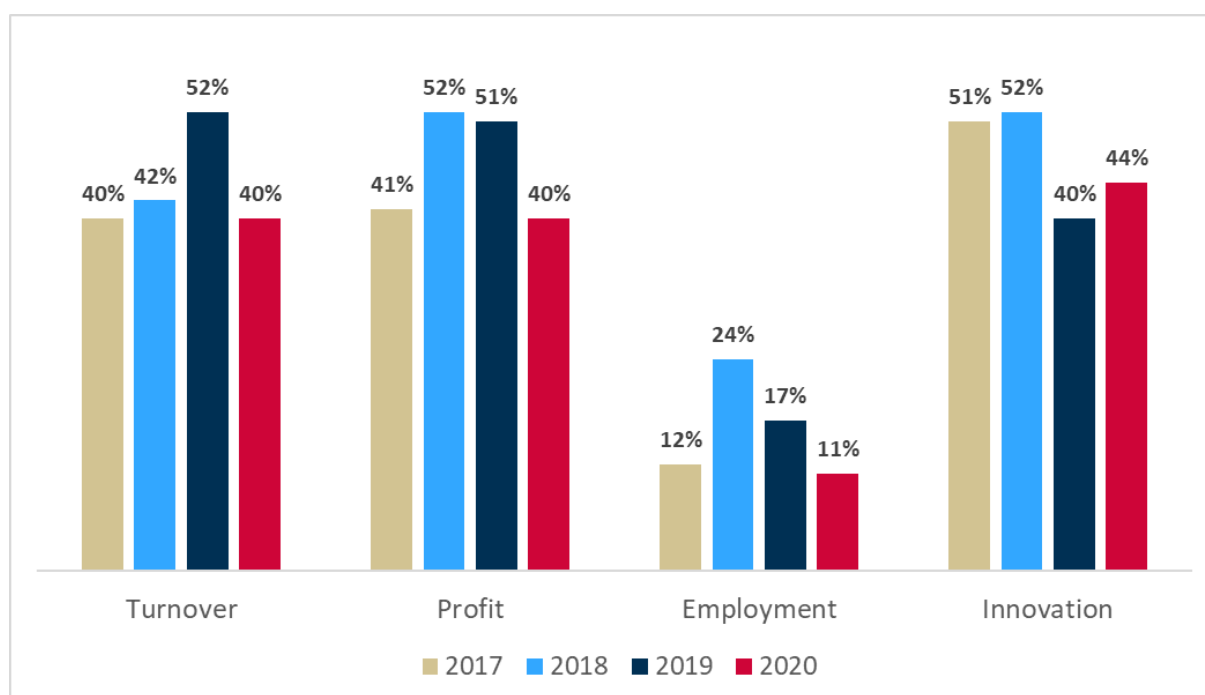
Performance of SMEs with superfast broadband. Figure 3-8 shows the proportion of SMEs indicating that they had positive outcomes in terms of turnover, profit, employment, and innovation, from adopting and using superfast broadband.

Two-fifths of SMEs in 2017 (40%) reported that turnover had increased due to exploiting access to superfast broadband speeds, and a similar proportion (41%) reported access to superfast had increased profits. Despite increases in these proportions in 2018, by the 2020 *Digital Maturity Survey* they had fallen back to the 2016 scores. Figure 2-8 shows that a similar trend was found in employment outcomes from 2017 to 2020, albeit at lower percentages. Overall, this may be due to the fact that superfast speeds are, in some places, becoming more mainstream and potentially less likely to be identified as a prominent factor accounting for such outcomes.

For many SMEs the financial data being referred to in the *Survey* predates the worst of the COVID-19 impact. However, Wales faced poorer economic conditions during the second half of 2019 which could have impacted performance indicators. Moreover, we cannot discount here that for some SMEs their latest financial year figures might have embraced the period following the outbreak, and with the Welsh SME sector known to have been badly hit, particularly in sectors such as tourism, food services and construction⁵.

⁵ See for example, Economic Intelligence Wales (2020) https://developmentbank.wales/sites/default/files/2020-09/EIW%20Quarterly%20report%20Q4%20ENG_FINAL.pdf

Table 3-8 Performance of SMEs with superfast broadband (% of businesses reporting positive outcomes)



SMEs with only standard broadband, tended to report positive outcomes at a lower percentage than SMEs with superfast broadband throughout the 2017 to 2020 on these indicators.

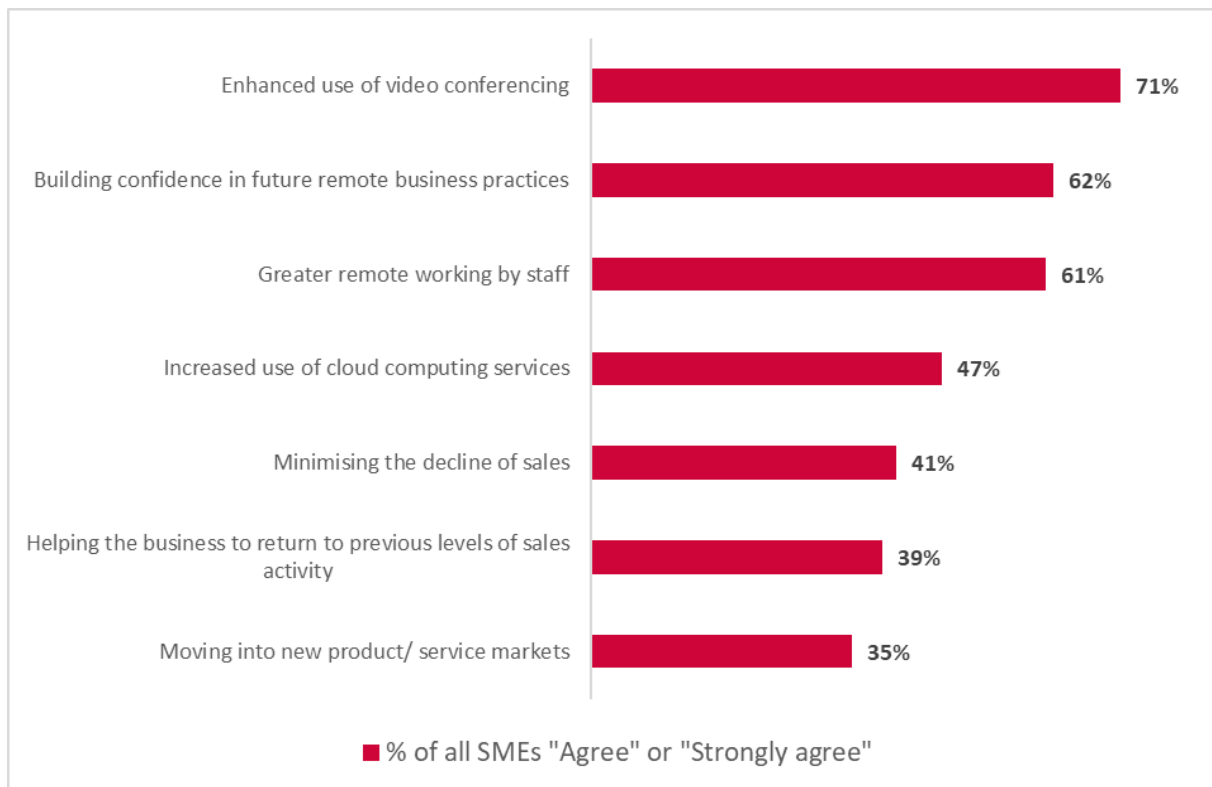
3.2. The impact of COVID-19

The 2020 *Survey* data gathering phase occurred during the global COVID-19 pandemic so, in this year, extra questions were asked on how access to broadband services allowed SMEs to respond to the pandemic, and whether the virus had exposed any challenges in their adoption.

Respondents were most likely to report that their broadband services allowed them to respond to COVID-19 by enhanced use of video conferencing, with seven out of ten SMEs agreeing or strongly agreeing with the statement (71%). Figure 3-9 also shows that just over three-in-five SMEs noted that access to their broadband services enabled them to build confidence in future business practices (62%), and a similar proportion reported greater remote working by staff (61%).

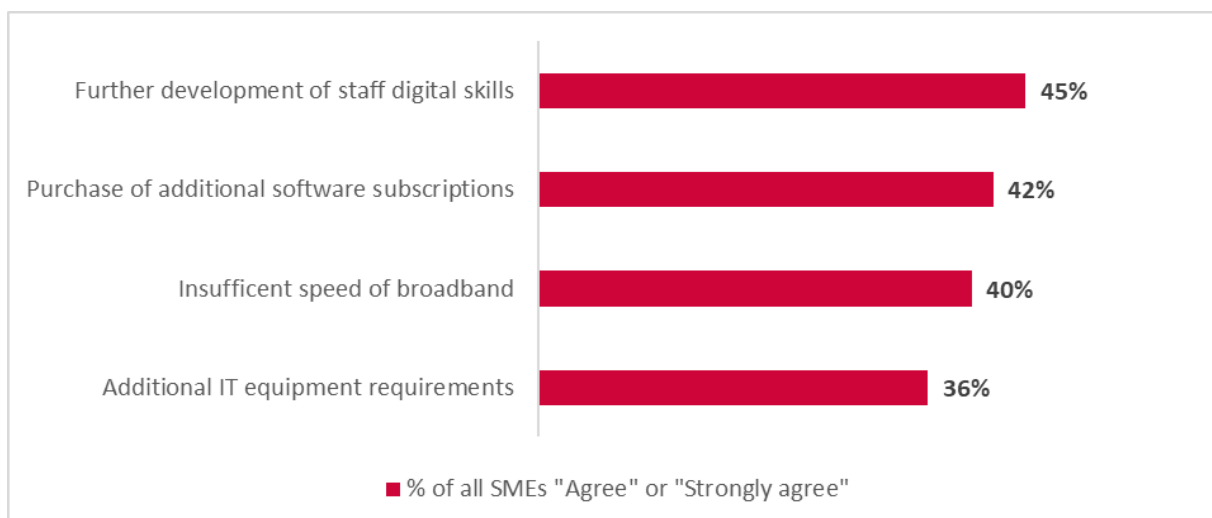
SMEs were least likely to report broadband services allowing them to respond to COVID-19 by moving into new product or service markets (35%).

Table 3-9 Responses to COVID-19 enabled by access to broadband services



The Survey also asked SMEs whether COVID-19 had exposed any challenges in relation to broadband technologies. Figure 3-10 shows that the biggest challenges reported were the need to further develop the digital skills of staff (45% of SMEs), and the need to purchase additional software subscriptions (42%).

Table 3-10 Challenges COVID-19 has exposed in SMEs in relation to broadband technologies



Following on from their responses to, and challenges arising from the coronavirus pandemic, respondents to the Survey in 2020 were further invited to submit any comments they may have had on their experiences of using digital technologies during the crisis. A number of SMEs, particularly in more rural areas of Mid and South West Wales, reported that a lack of superfast broadband access and/or no mobile signal, along with issues with the reliability of broadband service meant that they were not as competitive as other parts of the country. Broadband speed for staff working from home was raised as a concern, as was the cost of setting up such activity.

Despite this, many other SMEs reported that the use of digital technologies was invaluable and had basically enabled them to carry on trading through the challenging COVID-19 period- through holding meetings online and remaining in communication with clients and customers via digital channels/ social media. Digital technologies were seen as indispensable.

A number of SMEs had been forced to temporarily shut down during the *Survey* period- especially those in the Accommodation and food services sector- with staff furloughed. Some of these reported utilising the time to engage with digital technologies to help improve their future potential productivity - by learning new business skills, improving their social media communications, or looking at diversifying.

Businesses overall noted a move to online sales, with some having to rely on this as their only source of income. There were examples of SMEs realising that they had insufficient knowledge of how to utilise online sales and communications and they consequently felt at a disadvantage to more digitally mature competitors. The lack of new orders was remarked upon by respondents, who then faced a challenge of utilising digital technologies to widen their marketing, outside their usual geographic range. Others reported that a number of their business clients were struggling and had been reviewing what their digital technology needs were going forward.

Some SMEs had closed their offices permanently to save costs, moving to a working from home model, noting that without digital technologies this would not have been possible. Questions around ensuring data security with the expansion of working from home were raised by a minority here.

Generally, SMEs reported an increased proficiency in the use of digital skills as a result of responding to challenges brought upon by COVID-19 - especially in regard to utilising video conferencing applications. Superfast Business Wales webinars and one-to-one help in moving businesses online was also described as invaluable by some respondents.

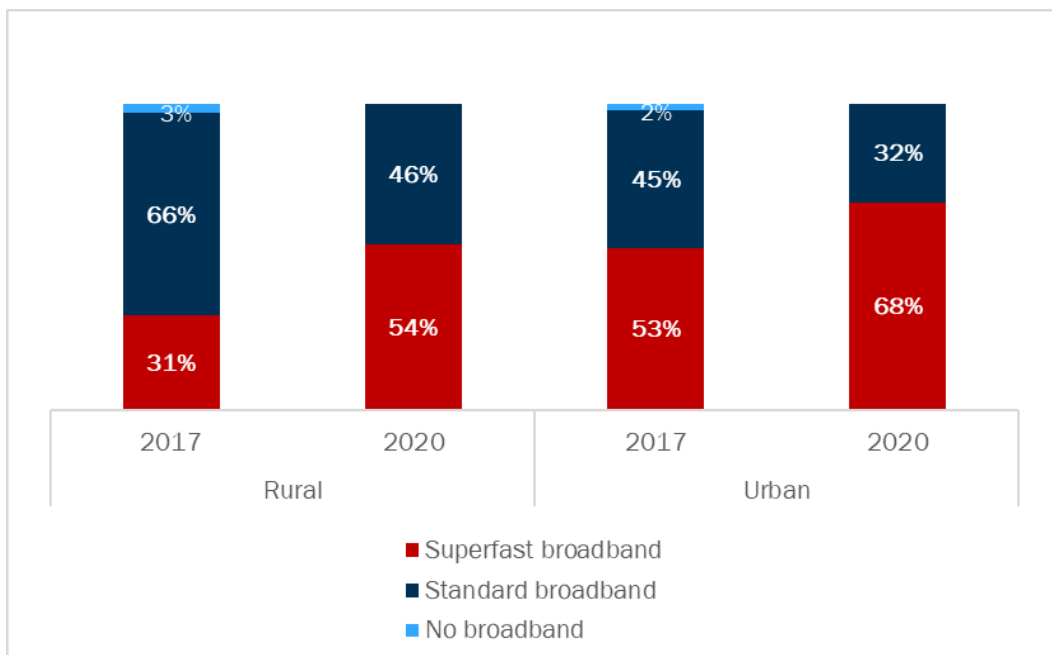
3.3. Remaining digital maturity challenges for the Welsh economy

Despite the progress achieved in many areas of digitalisation in Wales, outlined above in Section 3.1, there remain challenges for the Welsh economy in the future in terms of digital maturity. Of particular concern is the urban/rural divide in the adoption of superfast broadband speeds.

Data from the *Digital Maturity Survey* shown in Table 3-11, indicates that, in 2020, over a half of rural based SMEs (54%) reported adopting superfast broadband. This compares to over two-thirds of urban located SMEs (68%) and represents a gap of 15-percentage points.

Encouragingly, the gap between urban and rural adoption of superfast broadband speeds had reduced from the 23 -percentage points reported in the 2017 Survey, illustrating some success in providing access to superfast broadband in rural areas and promoting its adoption and use.

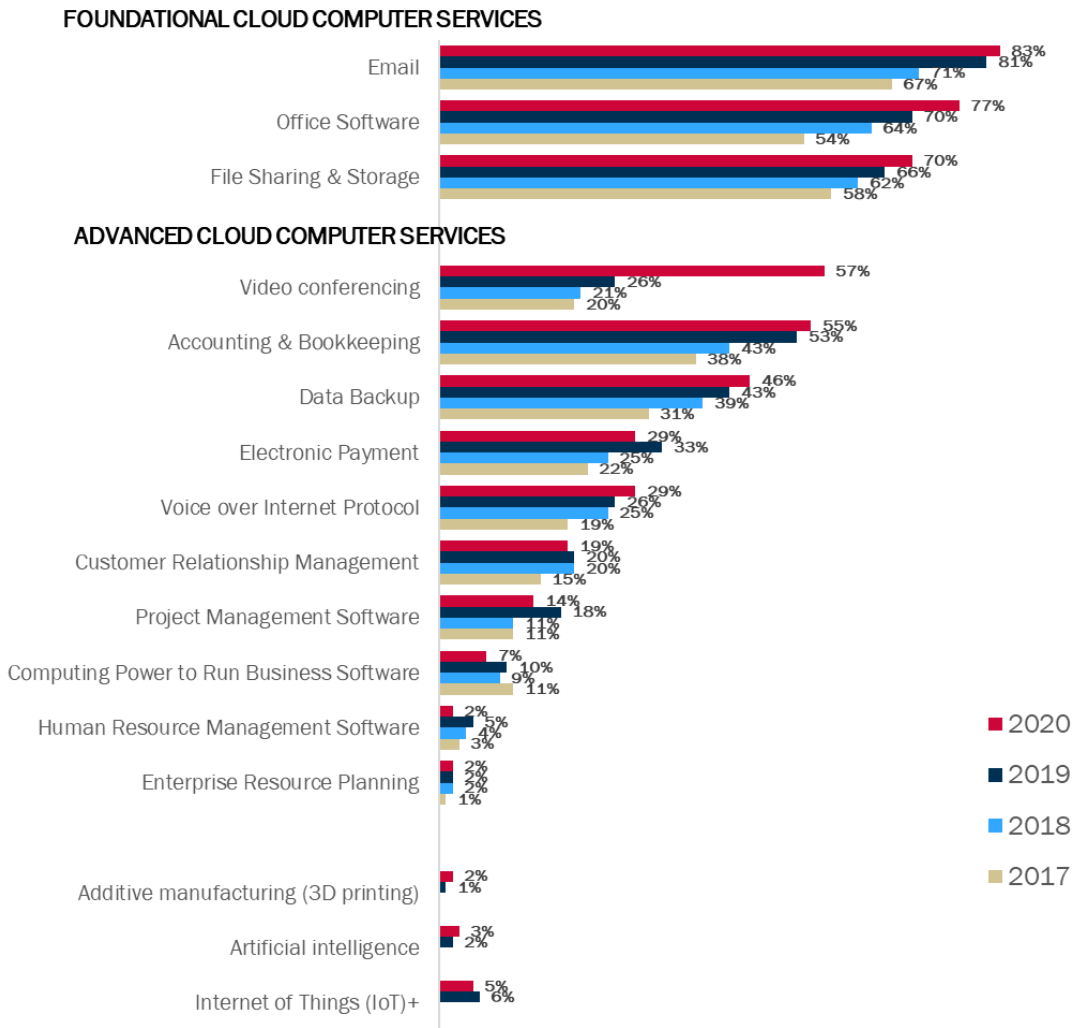
Table 3-11 Adoption of broadband, by type, by location (% of SMEs)



Another digital maturity challenge for Wales can be seen in the relatively low take-up so far in the more cutting-edge cloud enabled services. Figure 3-12 shows the increasing proportion of SMEs from 2017 to 2020 using at least one advanced cloud computing service. However, Figure 3-12 illustrates that the proportion of SMEs using some of the more complex advanced cloud computing services has decreased (e.g. reported use of computing power to run business software has fallen from 11% in 2017, to 7% in 2020).

Comparing data from 2017 to 2020, Figure 3-12 does show there were increases in the usage of the majority of advanced cloud computing services. Usage of video conferencing increased by 37 percentage points between 2017 and 2020, with much of the upsurge in the last year (a 31-percentage point increase from 2019 to 2020) as SMEs reacted to radically different working conditions due to COVID-19, including restrictions on face-to-face meetings.

Table 3-12 Proportion of businesses using cloud computing services, by category (% of SMEs)



Starting in the 2019 Survey, SMEs were additionally asked about their usage of three other cloud computing services: internet of things (IoT); artificial Intelligence (AI); and additive manufacturing (e.g. 3D printing). There were only single percentage point changes in the proportion of SMEs reporting using them in 2020, with the most used again being IoT (5%).

3.4. Summary

Digital maturity is an evolving issue, as new technologies are introduced, or existing technologies become more mainstream (the push to learn video conferencing skills in response to the 2020 COVID-19 pandemic), there are new skill and/or process requirements to be mastered in order for SMEs to remain productive and hence competitive.

A snapshot of the results of the *Digital Maturity Survey*, along with other (secondary) sources which provide supplementary contextual indicators, are illustrated in the Digital Dashboard for Wales, shown in Figure 3-13. The Dashboard provides an overview of digital maturity in three main areas: ICT Infrastructure, ICT Resources, and ICT Use. Under each area comparisons are drawn against results from earlier years (see Figure 3-13). This highlights the digital transition that has been underway in Welsh businesses in recent years. Here, the Digital Dashboard shows that this is resulting in incremental changes not only in how businesses are accessing broadband connectivity, but also how they are using it, and how this is leading to performance benefits.

Although the overall picture is one of businesses increasingly adopting and using digital technologies in Wales, the analysis shows that the transition towards digital maturity is likely to be bumpy when viewed at the regional level, with some indicators going up, while others go down. The decline seen in the digital maturity index is a potential cause for concern and may point to ongoing challenges for businesses to maintain their digital maturity, and for policy intervention to support this.

The longitudinal data we now have covers five years examining ICT resource use and performance in Welsh SMEs. However, the time lapse creates its own challenges. Such has been the speed of the take-up of superfast broadband resources by the Welsh SME community that businesses are using the opportunities offered by the resource in very different ways than when the research programme started in 2016. Then there is the challenge to adapt the survey so as to pick up on changing SME use of ICT resources but at the same time to maintain elements that allow analysis of trends through time.

The fifth Survey has come at a time when SMEs have faced real challenges in terms of business continuation and with evidence in our report of more intensified use of digital resources, and indeed indications that some firms are facing up to having inadequate digital resources to face new challenges. The timing of the pandemic, coming as it does towards the end of the funded project, is unfortunate. However, the team will be seeking to continue elements of the Survey in 2021 and we welcome continued collaboration with our research partners as we move forward with this research agenda.

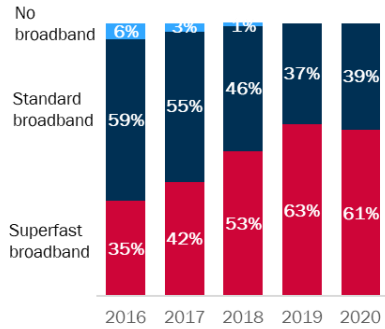
We strongly believe the *Digital Maturity Survey* has become an important intelligence resource. The Survey content will need to evolve in coming periods. This is important with questions still remaining on how far business use of superfast broadband will evolve into 2021 as hopefully the effects of the pandemic start to wane.

Table 3-13 Digital Dashboard for Wales

ICT INFRASTRUCTURE

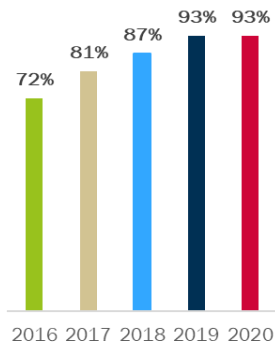
Adoption of broadband

Digital maturity survey, % of SMEs



Access to superfast broadband in Wales

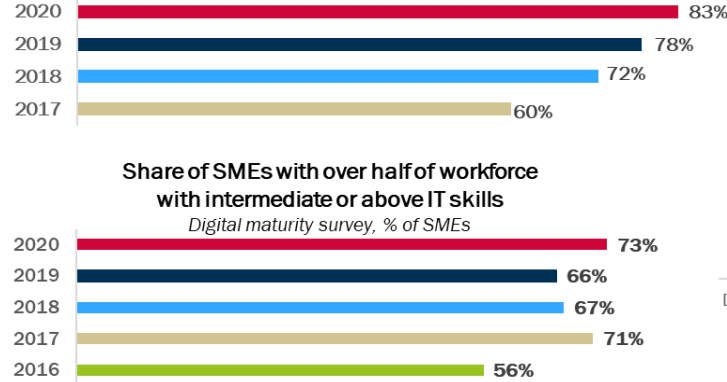
Ofcom, % of premises



ICT RESOURCES

Use of advanced cloud computing services

Digital maturity survey, % of SMEs



Share of SMEs with over half of workforce with intermediate or above IT skills

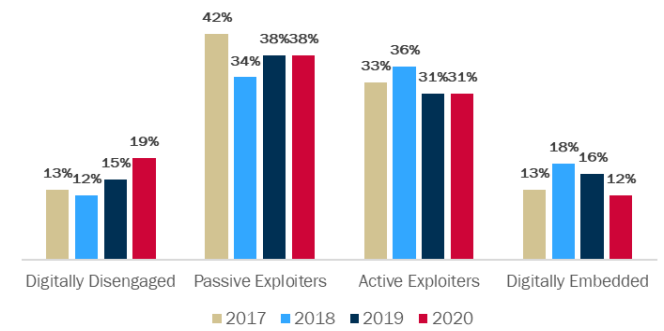
Digital maturity survey, % of SMEs



ICT USE

Digital maturity index

Digital maturity survey, breakdown of businesses by category



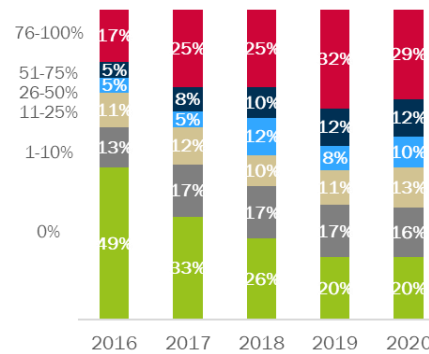
Annual IT costs

Digital maturity survey, £ per employee

Spending category	2016	2017	2018	2019	2020
Hardware	£684	£624	£473	£546	£506
Software	£662	£711	£494	£467	£594
Network	£180	£92	£119	£157	£135
Broadband subscription	£113	£132	£199	£232	£192

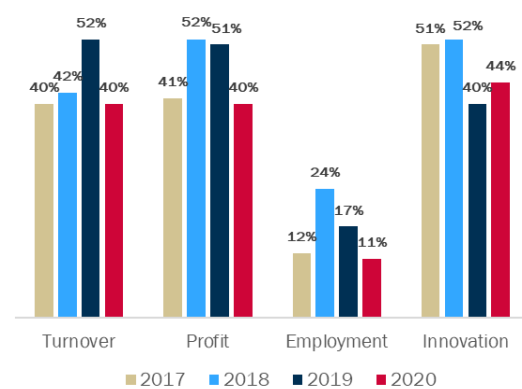
Share of e-sales in total sales

Digital maturity survey, % of SMEs



Performance of SMEs by type of broadband

Digital maturity survey, % of SMEs reporting positive outcomes from access to superfast broadband services



Over the last five years at least 1,600 SMEs have engaged with our work either through completing the Survey or being willing participants in case studies, seminars and bespoke research work. A real encouragement for the team has been the fact that even during this period of intense business disruption, that SMEs have continued to engage with our Survey, and that many of the key indicators and charts reveal a 'positive' direction of travel particularly in themes such as more intensive business use of digital channels and more use of the cloud. Then we are confident that SMEs in particular would have been in a much weaker position currently had it not been for the opportunities presented by Superfast access.

This is not a static canvas. There remain SMEs that are characterised by being relatively digitally disengaged and with our developing evidence base revealing economic penalties connected with persistent disengagement. Moreover, the broadest context for Wales-level interventions in the digital domain are little changed over the last five years. Business productivity in Wales still lags that in other regions of the UK but with our evidence base suggesting these lags might have been far worse in the absence of government support for SMEs to engage with superfast broadband. The economic challenges facing our SMEs are more acute than they were at the beginning of the Programme.

4. Economic impact

The annual *Digital Maturity Survey for Wales* provides evidence on the benefits that businesses achieve from using broadband. It shows that a growing number of SMEs report performance benefits from using superfast broadband, in areas such as profitability, turnover, employment and innovation outcomes. In order to examine how such performance outcomes are contributing towards economic impact this section considers the potential regional scale of the turnover and employment effects resulting from SME adoption and use of standard or superfast broadband⁶.

This section provides a comparison of the headline⁷ results from the 2017 to 2020 *Surveys*. The objective of the analysis was to first estimate overall numbers of businesses that might have been impacted by positive effects from broadband adoption (no distinction is made between standard and superfast broadband). Then estimate the numbers of Welsh SMEs positively affected (turnover and employment) by adoption and use of superfast broadband-enabled services. This was followed by estimation of the number of SMEs seeing positive employment connected to the adoption of superfast broadband.

4.1. Synthesis of the economic impact findings

Table 4-1 provides a comparison of the headline figures for the 2017 to 2020 period. Drawing inference from our *Survey* findings to the population of SMEs in Wales suggests that in 2020, for example, some:

- 84,100 SMEs in Wales could have improved turnover prospects, with an estimated total turnover attributable to broadband adoption and use in Wales of £128.6m (£83.4m was attributable to superfast broadband adoption).
- 28,200 SMEs (an estimated 18,100 were superfast broadband users) could have seen a sustained employment increase resulting from superfast broadband adoption and use, with an estimated employment effect attributable to broadband adoption of 920 jobs (with an estimated 603 new opportunities associated with superfast broadband).

⁶ This section uses unweighted data from the Digital Maturity Survey 2018.

⁷ A detailed overview of the methodology used in calculating economic impacts can be found at https://www.cardiff.ac.uk/_data/assets/pdf_file/0005/2398784/eir-2019-full-report.pdf

The effects experienced by SMEs from the adoption and use of broadband are, however, smaller than those reported in the 2017 to 2019 period. These differences may reflect some levelling off or decline in the impact of broadband adoption and use on turnover and employment over time, but are also a function of economic conditions affecting the statistics used in grossing up our estimates. It is also accepted that the differences between 2017 and 2020 reported impacts could also reflect the different characteristics of the two samples. Future Surveys will enable a better understanding of such trends.

The figures relating to turnover effects based on our conservative 1% assumption are affected strongly in the 2018 to 2020 period by a general decrease in average turnover per micro-sized firm last year⁸, and with this probably associated with falling business confidence and growing uncertainty in the period of COVID-19 pandemic and running up to the original planned Brexit date. Notwithstanding, the figures for the period 2018 to 2020, still reveal appreciable turnover effects associated with broadband adoption based on our conservative assumption. It is encouraging, however, that the respondents provided evidence of positive as opposed to negative effects, and with a high proportion of positive impacts expected to be sustained as opposed to short term.

Table 4-1 Broadband and superfast broadband comparisons

	Estimated Welsh SMEs (000s) seeing a turnover/employment increase due to broadband/superfast broadband adoption				Example of how much Welsh SME turnover/employment increases assuming a 1% increase in turnover/ employment in positively affected firms in the size cohort (£m or FTEs)			
Year	2017	2018	2019	2020	2017	2018	2019	2020
Turnover effect broadband adoption	111.4	102.6	65.9	84.1	229.3	166.8	110.9	128.6
Employment effect broadband adoption	32.1	48.6	46.7	28.2	1752	1636.6	1,586	920

⁸ <https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Businesses/Business-Structure/Headline-Data/latestbusinessstructureinwales-by-sizeband-measure>

Turnover effect superfast broadband adoption	47.1	51.7	55.5	49.4	124.2	91.5	94.4	83.4
Employment effect superfast broadband adoption	16.6	24.5	39.3	18.1	1056	859	1,457	603

4.2. Summary

The economic impact analysis undertaken between 2017 and 2020 highlights ongoing difficulties of accurately estimating the effects of broadband use on the Welsh economy. It shows that the calculations were influenced by the wider socio-economic context (including Brexit and Covid), but also the difficulties of estimating the marginal economic effects of improvements in adoption and use of the technology. While the focus of the section has been on increases in turnover and employment there is a need to recognise that the technology could be having positive effects even were turnover and employment in affected SMEs to be falling i.e. either the job and turnover losses might have been worse without the adoption of broadband, or falling employment is connected with improving productivity. In this context it is important to consider the findings of this section, with that in the following sections which reveal performance and productivity impacts connected with businesses adopting and using broadband-enabled services.

5. Case study performance

The case studies were a core part of SFBE Research and Intelligence project supporting the aim to look in-depth at SME adoption and use of digital technologies. The evidence was used to inform policy makers, business representative bodies, businesses and local authority stakeholders. This was enabled by the research team working closely with the SFBE Advisory Group to identify themes and businesses of interest.

The case studies sought to gather in-depth information on business adoption and use of digital technologies. The information complements the Digital Maturity Survey through exploring the challenges and opportunities encountered by SMEs. Participant businesses were selected to represent the range of business type and digital maturity evident within Wales. As a result, case studies also include SMEs at the early stages of broadband adoption and digital technology use, as well as business that were digitally mature. A full list of the case studies can be found in the annex of this report.

Interviews were undertaken with business owners or senior managers, with interviews lasting between 45 to 60 minutes. The recording was transcribed per dictum. Interview questions 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?

Secondary data was also drawn from the business' website and results of Digital Maturity Survey findings. The case studies were reviewed by the business and approved prior to upload on the website and promotion through Twitter. The results from the case-studies also informed the annual Digital Maturity Economic Impact Reports.

5.1. Synthesis of case study findings

The findings over the five year research period can be broadly summarised in three key themes: the antecedents that enable or inhibit the take-up of broadband-enabled technologies; how these technologies are used in a range of functions within the business; and the outcomes of this technology use for the business, workers, and the region.

Antecedents to adoption

Antecedents refer to the pre-existing factors within a business that will present a barrier or enable a business to adopt digital technologies. The principal barriers found across the case studies relate to infrastructure and connection. The Horizon Scanning '[Rural Report](#)' and '[Regions Report](#)' highlight that businesses in rural areas have a greater level of difficulty accessing broadband. This introduces a number of risks for businesses and communities. However, over the course of 5 years these access issues have increasingly been addressed, meaning that these risks are reducing. The risks now principally relate to the cost of broadband packages due to a lack of competition between providers.

Further, the instability of connection means that businesses are prevented from fully integrating technologies throughout the business ([Myddfai Trading Company](#); [Melin Tregwynt](#); [Bursali Towels](#); [Recycle Scooters](#)). This was due to the risk that is introduced when operations are reliant on fixed or mobile digital infrastructure that is intermittent, in turn restricting the ability of the business to fulfil customer expectations.

Alongside these infrastructural barriers such as availability, reliability, and market competition, the cost of installation was prohibitive to some of the businesses featured ([Sophrology Wales](#); [Menter Berllan Community Enterprise Hub](#)). The cost was prohibitive in areas where infrastructure was not readily available and therefore businesses were required to pursue both hardware and software options. Ongoing software licencing costs were also significant, where businesses highlighted how the licencing for one employee could cost several thousand pounds per annum ([F. P. Hurley and Sons](#)). Alongside these licencing costs, the adoption of Cloud services can both decrease costs with respect to hardware such as servers but also increase subscription costs and the need to keep abreast of technology and data storage legislation.

These ranging costs have varied impacts on businesses, depending on the size and number of employees. Micro businesses may not be as able to engage with particular technologies as larger businesses, as this comes as a result of the time, resources and skills required, where the demands are that much more onerous for smaller businesses. As a result, investment was sometimes delayed or implemented incrementally to avoid large upfront costs.

A further barrier might be the level of ICT expertise, with businesses requiring investment in employees' skills ([Hazelwood Carpentry; The White Room at Harlech Pottery](#)). However, due to the aforementioned limited access to infrastructure, not all businesses were equally placed to develop these capacities ([Menter Berllan Community Enterprise Hub](#)). This therefore exacerbates the impact of unstable or absent connectivity. The spatial impact of this is that rural areas were more likely to not have access to infrastructure and were further disadvantaged in the ability to grow their business through digital technologies. Further, confidence gaps were observed with respect to knowledge and access to resources for engaging with digital technologies. Generational gaps were observed in a reluctance to replace existing processes with digital alternatives. These concerns stem primarily from reduced familiarity with ICT and applications due to generational differences and access to broadband ([Hazelwood Carpentry; The White Room at Harlech Pottery](#)). Different strategies for overcoming these hurdles include staff training, and supply-chain support.

The enabling antecedents to adoption include an industry expectation to digitalise. In some industries, such as construction, this is driven by legislation ([F. P. Hurley and Sons; Hazelwood Carpentry; Diack Ltd](#)). In other industries such as tourism, customer expectation drives these processes with a demand to access quality broadband or utilise digital tools including cloud-based storage ([Royal Victoria Hotel; Pitton Cross Campsite](#)). Case study businesses did discuss that external support can provide an impetus for digitalisation through outlining the possibilities for the particular business. This support came through Welsh Government programmes such as Superfast Cymru, and the telecoms providers.

Adoption of technologies

The adoption of technologies relates to the types of broadband-enabled digital technologies accessed by businesses. The extent of this integration in part was determined by the business model adopted by the business, and the ability to replace traditional processes with digital alternatives ([Melin Tregwynt; The White Room at Harlech Pottery](#)). In this respect, the degree and speed of business model alteration was determined by digital confidence. In the main part, case study businesses implemented incrementally, with learning at each stage supporting the next iteration. Technologies are used to maximise business operations and extend across the business model, including communication, human resource management, finance and accounting. Case study SMEs reported the use of digital technologies in their major business processes ([D&S Photographic Services; Resources for Change \(R4C\)](#)). While there are sectoral differences, the transition taking place within case study SMEs was apparent. In particular, internal and external communication were the most prevalent areas of digitalisation. Employees use digital tools to share many different types of data with other employees and customers ([Bursali Towels](#)). Cloud based storage was a popular new application used by business so that files could be stored and shared in real time.

Other communication technologies such as WhatsApp and Zoom have grown in popularity for business use ([Carreg Construction; Diack Ltd](#)). WhatsApp was particularly praised for the ease with which team members could communicate and share data such as photos. Video conferencing software is also allowing better communication with customers; this was notable in those industries that undertake a protracted design process sharing large quantities of information ([F. P. Hurley and Sons](#)). Voice-over-Internet Protocol (VoIP) telephony has increasingly been used ([Accolade Executive Business Coaching](#)), with businesses taking advantage of additional functionality such as redirecting an incoming call to a mobile phone ([NLS Solicitors](#)).

Back office processes are also increasingly being digitalised, with the introduction of digital human resource management, accounting, and project management tools. Packages such as SAGE are able to collate time sheets and rotas to create an automated payroll system and digital payslips. Further, invoices can be created to send to clients. This introduction of automation within businesses can also support the streamlining of existing processes.

Social media and websites play a role in marketing, promotion and sales ([West Wales Holiday Cottages; Melin Tregwynt; Myddfai Trading Company](#)). Almost all businesses included in the sample utilised a website and the vast majority used at least one social media platform. There is evidence that businesses are using different social media tools dependent on the audience, where Facebook and Instagram are preferred to communicate with customers and LinkedIn and Twitter for business relationships ([Carreg Construction](#)). The type of information disseminated through these channels also varies. Some businesses are increasingly using live streaming to share information and interact with customers in real time.

The construction industry is home to a range of digital advances. The 'site based' nature of the industry has meant that attention has been paid to creating hub sites with broadband access ([Celtest; F. P. Hurley and Sons](#)). Businesses in this sector have invested in tablets and mobile wifi connection. Tablet technology is increasingly being utilised to allow in-situ data entry, reducing both data input in the main office and commuting for employees based on site. Further, the construction industry has introduced a range of digital design packages, where in-house 3D modelling has become an industry expectation ([F. P. Hurley and Sons](#)). Building Information Modelling (BIM) is mandatory for government funded projects, but the cost of such packages are high with estimates of £3,000 per annum subscription for the business and an additional £1,000 per employee. It is also necessary to invest in hardware that can sufficiently support the use of the software packages. This provides an insight to the costs that can come with digitalisation.

Outcomes of technology use

Whilst the observed outcomes for businesses have a wide range, the principal impacts were within business performance, labour market, and the region ([Resources for Change \(R4C\)](#)). Business performance outcomes are the most featured due to the nature of the case studies predominately exploring business-related implications of digital technology use. The most commonly observed outcomes include cost and time efficiencies. Businesses have been able to cut costs through streamlining processes such as data entry, reducing the need for employees to commute to the headquarters to submit paperwork, and internalising processes typically outsourced to third-parties ([Resources for Change \(R4C\)](#); [Little Inspirations](#); [Recycle Scooters](#)). Case study businesses cautioned that benefits can sometimes take a while to materialise and require full engagement with the digital technology.

Many businesses have been able to extend their market reach, as more customers were able to view their offering online ([Melin Tregwynt](#); [Recycle Scooters](#)). These technologies also created competitive advantage across all sectors. Businesses were able to improve the customer experience, offering greater flexibility and improving relationships between customers and businesses ([Bursali Towels](#)). Construction businesses that had implemented BIM were at a competitive advantage in tendering processes that did not require BIM processes due to the added value that the business was able to offer the customer ([F. P. Hurley and Sons](#)). Utilising BIM during the planning process reduces many of the design problems that were previously only found on site and this ultimately reduces costs and material wastage.

Case study SMEs also noted that the transparency of business operations have been improved with greater ability to demonstrate regulatory compliance ([Hazelwood Carpentry](#)). Through using digital applications to store data, the ability to show this compliance remains easy many years down the line. The digital storing of data also means that employees are able to access the information no matter their current location. This enables remote working and facilitates timely response to queries and concerns. Security of data is also improved. These multiple benefits support business improvement across the board.

There are labour market implications as broadband enabled tools can benefit workers. These technologies enable flexible working environments allowing remote working at home and on site. In many instances, employees were previously required to commute to the office to submit paperwork, now it is possible to do so from home or on location ([Resources for Change \(R4C\)](#)). Alongside this, workers are able to better manage work and personal commitments, also removing time and financial costs. Employees are better able to access online training, allowing skills boosting and time efficiency when compared to attending in-person training. Employers are also better able to communicate with staff through utilising a range of communication channels.

Aspects such as the ability to remote work have further implications for the region. This is because businesses are able to maximise the skills, resources, and available customer base through using digital technologies to widen reach ([Resources for Change \(R4C\): Method4 Ltd](#)). A number of the case study businesses evidenced how their location in Wales was an advantage in accessing international markets ([Accolade Executive Business Coaching](#)). The low cost of premises, supported by digital technologies, ensured that these businesses were more price competitive and able to recruit the best employees no matter their location.

5.2. Summary

The implications of these three areas of findings are varied. The antecedent barriers highlight the need to enable access to infrastructure and skilled employees. Enablers of digital engagement include industry and customer expectations, as was the ability to access appropriate financial support and training. Incremental adoptions are dominant, policy implications in this respect highlight a need to support businesses to adapt in advance of digital infrastructure availability. In this way, businesses are better able to assess the degree of digitalisation potential within their business model and gain familiarity with the required processes and practices within operations. There are a wide range of outcomes that range from time and cost reduction to service improvement to heightened transparency. Workers also benefit with improved work-life balance.

6. Horizon scanning and trends

Beginning in 2017, Horizon Scanning formed a central part of the Research and Intelligence activities. A core aim of this strand of research was to provide evidence and informed commentary on upcoming opportunities and challenges that could shape the direction of business activities in the coming decades. As such, the reports focused on the potential impacts of technology diffusion alongside the wider social and economic factors that shape these trends in businesses adoption, use and impact. The reports draw on both primary research that was collected by the SFBE research team (in particular the Digital Maturity data and case study interviews) and secondary resources (for example external published reports). These methods were also supported by expert interviews and attendance at related technical and industry events. The analysis was presented in a non-technical format and designed to inform multiple audiences, including policy makers, business representative bodies, businesses, and local authorities. To ensure the Horizon Scanning reports reached the intended audiences the SFBE team disseminated the report and its findings to these regional partners and stakeholders.

This section details key themes from the reports summarised based on their relevance to business and sectors, work and employment and geographical space.

6.1. Synthesis of horizon scanning findings

As the preceding sections of the report have detailed, the access to and use of broadband enabled technologies is not uniform across businesses, sectors, workers and regions. Despite the overall trend pointing to improvements in businesses accessing superfast broadband infrastructure and advancements to businesses' Digital Maturity Index, there remains noteworthy variations. The Horizon Scanning work programme allowed for these nuances to be further investigated, assessing how external technological, social and economic trends may impact businesses and assessing how these outcomes might be different dependent on the business size, sector, workforce and location.

The key findings from the Horizon Scanning reports are summarised under these three core areas, namely (1) digitalisation across businesses and sectors, (2) digitalisation for work and employment, and (3) digitalisation across geographical space.

Digitalisation across businesses and sectors

The ways that businesses and sectors are accessing and using superfast broadband enabled technologies varies (see the Digital Maturity and Case Study sections above). To recognise and further examine these variations, the research team incorporated two sectoral reports ([Construction](#) and [Foundational Economy](#)) within its Horizon Scanning portfolio. Digitalisation in the *construction* sector is gaining heightened attention as more advanced technologies are emerging within the sector, which is predicted to shake up traditional business activities. Yet, change can be slow in a sector that has conventionally focused on offline methods and therefore been slower in the uptake of digital technologies to date. Thus, the disruption results in businesses being strongly encouraged to alter their businesses processes and incorporate digital advancements, but further training and resources are required to ensure a smooth transition from the old methods to a more digitalised future.

Similarly, the [Foundational Economy](#), otherwise referred to as the ‘everyday economy’, was selected because of its increasing prominence in Welsh economic and regional policy. The term refers to a bundle of sectors that provide the everyday and often local products and services, such as health, education, retail and food. These sectors are traditionally less digitally mature therefore the report detailed how greater digital diffusion could support these previously overlooked sectors in the coming years, as well as the difficulties for enacting these changes due to financial and resource based restraints. While digitalisation of these sectors could provide an opportunity for growth, the technology utilised is more likely to be incremental and adopted over time. There is potential for businesses to capitalise on the policy push to ‘experiment’ on new approaches to the foundational economy, including providing financial investments in digital solutions to foundational problems. As such, these reports show that greater digitalisation can be an enabler of growth and development for all sectors, even those with lower digital maturity.

The Horizon Scanning Report focusing on [business models](#) provided a more in-depth account of how digitalisation can affect the way businesses operate, make money and interact with the market. The report highlighted the potential for businesses to adapt their models in order to move more activities online. Across the sectors, this has included more everyday business practices such as email, data sharing on the Cloud, big data analytics and voice communications. However, business processes are also being digitalised with more advanced forms of technology, such as machine learning, 3D printing and advanced robotics. In particular, possible impacts to the manufacturing and service sectors are highlighted with digitalisation providing new opportunities for customer and supplier interfaces, back office functions and new product development. However, a key finding from the report was the need for businesses to incorporate digitalisation in order to support their creative and competitive businesses models, rather than a renewal of the business functions themselves. Thus, digital technologies complement rather than replace the processes inherent in a business.

Leading on from these reports and the existing SFBE primary data it becomes apparent that businesses are investing in both incremental and more advanced forms of digitalisation. The Horizon Scanning Reports confirmed the importance of the more gradual advancements and increasing inclusion of everyday digital tools to businesses across all sectors. Moreover, the research shows that incremental adoption is likely to represent the most prevalent strategy for most SMEs, especially for sectors such as construction and foundational businesses that start from a lower digital maturity base. In contrast, more digitally mature sectors such as IT services are more likely to pursue more advanced and innovative forms of digitalisation to gain competitive advantage. Yet, difficulties emerge in terms of access to the higher fixed and mobile broadband speeds in parts of Wales.

Moreover, it is the more advanced forms of digitalisation, such as artificial intelligence (AI) that offer the potential of transforming businesses and sectors. AI is defined by the OECD (2017) as ‘machines performing human-like cognitive functions’. Looking at detail at the more disruptive and advanced technologies, one report focused specifically on the opportunities and threats from [AI and automation](#). In particular, the report assessed the importance of these innovative applications for smaller businesses, finding that AI are particularly relevant for the customer interface and are becoming integrated into existing Customer Relationship Management (CRM) packages. However, advancements only go so far with a reliance on applications being structured and supervised by businesses, rather than operating unsupervised. The report predicts that it is likely to still be the larger businesses that access the more advanced technologies in the coming years. Nonetheless, AI is becoming more accessible to all businesses and offer the potential of improved business efficiency, reduction to costs and improvements to resource allocation through the automation of tasks. One of the biggest challenges is likely to be gaining customer trust, as concerns over data privacy and the appropriateness of AI use remain cumbersome.

A further area of interest and relevance is that of [cloud technologies](#). Here, the report confirms that Cloud technology has, and will likely continue to have, a pervasive influence on incremental and more advanced forms of digitalisation. Few sectors in Wales are likely to be untouched by the growth in cloud computing. More incremental cloud technologies are a commonplace feature for many businesses, these include Microsoft and other vendor productivity software, which allows for the merging desktop tools such as word processing, spreadsheets and cloud integration and remote access. As with other areas of technological developments, more advanced cloud technologies are also on the rise. As noted above, AI is becoming one of these areas. Businesses are replacing their traditional IT infrastructure with cloud services as a part of a wider strategic development of the businesses and to enable the business to significantly reduce upfront investment and ongoing costs. Despite the opportunities, concerns over security and the need for reliable network access also appear as potential barriers.

Digitalisation and work and employment

The Horizon Scanning reports identify a number of implications for work and employment associated with the access to digital technologies. A key theme was an emerging trend and acceptance of remote working, supported by enhancements in digital technologies. These were detailed in the [Rural Horizon Scanning Report](#), where the ability to perform daily tasks outside of a prescribed office location was seen to provide an opportunity for workers to live in rural areas, which has been associated with a higher quality of life. It may also offer assistance to workers in undertaking their tasks (referred to as labour augmentation), for example, by enabling machines to undertake repetitive tasks under worker supervision.

The [Foundational Economy Report](#) sets out the difficulties for the workforce, with the foundational sectors being noted to be disproportionately low-paid, low-skilled and with a number of restrictions preventing career progression. The report acknowledged the ongoing advancements and implementation of digital technologies as offering a potential benefit for the workers, improving the availability and dissemination of knowledge, resources and creating shared opportunities across foundational occupations. These potential benefits were supported by the *Digital Maturity Survey* findings which point to the increasing digital skills in Welsh SMEs over the period of the survey. Nevertheless, case study data also indicates that more is needed to boost the confidence and skillset of foundational workers when keeping up with developments in other, more digitally mature industries. The need to adapt is also highlighted across the Horizon Scanning research, suggesting there remains a need to continually invest in skills development to enable workers to adapt to the challenges and opportunities of digital transformation.

Despite opportunities for technologies to support workers, there are also challenges associated with these technological advancements. In particular, the [AI and Automation Report](#) addresses the potential risk to employment and the potential shifts to the nature of work. Technological developments in AI and automation make it possible to automate routine 'back office' tasks, and there remains a concern that these automations will also spread to higher end skills in decades to come. The impacts are likely to have uneven effects on occupations and the tasks that workers undertake. One such potential impact is the replacement of customer interfaces with technologies, for example chat bots (Business Insider, 2016). From these changes, a distinction emerges between the at risk jobs and those that are less likely to be automated, with those that require intuition, creativity or social intelligence falling into the latter category (Frey and Osborne, 2013). Current estimates put the percentage of jobs at risk as between 30-50%, with the largest impacts falling on the lower qualified and service jobs. While these trends may be cause for concern, increasingly they are met with the expectation that the changes will spark new business creation and generate new, albeit different, jobs.

Digitalisation and geographical space

Specific focus on the impact of digitalisation on geographical areas is explored in the Rural and Welsh Economic Region reports. The [Rural Report](#) investigates the challenges in access to digital networks relative to urban areas, as well as pinpointing opportunities that may come available by improving rural connectivity. For example, digital technologies such as cloud computing, video conferences and e-commerce can help to reduce costs, improve the market reach and widen the talent pool. In the short-term greater digital diffusion points to benefits in efficiency, sales and customer value. In the longer term, these advancements could encourage new businesses and sectors to relocate to rural areas, bringing geographical gains by improving the diversity of businesses activities and strengthening rural areas resilience to social and economic challenges.

The [Welsh Government Economic Regions Horizon Scanning Report](#) also evaluates the challenges and opportunities associated with digital technology adoption and improved access to superfast broadband for different regions across Wales. Specifically, the report focuses on the three economic regions identified in Wales, namely South East Wales, Mid and South West Wales and North Wales. The report shows that businesses in the urban areas of the three economic regions report higher rates of adoption of broadband enabled digital technologies. Many of the challenges are shared across the regions, though a key area of difference is gaining access to fixed and mobile broadband, where North Wales and Mid and South West Wales reported comparatively underdeveloped infrastructure. Moreover, in South East Wales recommendations related to providing additional support for the adoption of more advanced technology.

6.2. Summary

The Horizon Scanning reports augment the research programme by evaluating how external technological, social and economic trends may impact businesses and assessing how these outcomes might be different dependent on the business size, sector, workforce and location. The eight Horizon Scanning reports covered specific sectoral challenges, disruptive and more incremental advancements in digital technologies, changes to business processes, and the varying impact of digitalisation for different regions. Here, the key findings are summarised under three headings; (1) digitalisation across business and sectors, (2) digitalisation work and employment, and (3) digitalisation and geographical space.

The reports demonstrate how businesses and sectors face differing opportunities and threats, with the less digitally mature sectors (for example, the foundational sectors) requiring additional resource and training support. Moreover, digital developments are often incremental for SMEs, though as more advanced and disruptive forms of technology enter the sector then there is additional need to implement these changes. Nonetheless, for many SMEs the ways their businesses operate is changing with broadband-enabled digital technologies increasingly being used to augment the businesses' activities. These changes bring with them work and employment outcomes, with remote working and advancements in digital skills becoming commonplace. Though there remains a risk that jobs might be lost through automation, optimism exists in relation to the creation of new job opportunities aligned to digitalisation and innovation. Yet, not all places are set to experience the same possibilities or threats, as difference between urban and rural areas take time and resources to overcome.

7. Conclusions

7.1. Reflections on the project, its findings and next steps

The Cardiff Business School engagement with the Welsh Government's SFBE project has been maintained over a period of six years. This is one of the longest research projects undertaken by the Welsh Economy Research Unit within the School. Throughout the work we have benefitted from a strong Advisory Group comprised of members from Welsh Government, local authorities, industry and organisations such as the FSB Wales and IoD Wales. This group has shaped the research questions and been a critical sounding board for the findings from the work. Moreover, we have benefitted from strong engagement from the SME sector in Wales, both in terms of completing our *Surveys*, but also as willing participants in case study development and our horizon scanning projects.

As we approach the end of the project there is an opportunity to reflect on the progress of the work and next steps.

A critical component of the work has been the annual *Digital Maturity Survey*. We now have five years of data for SMEs in respect of patterns of digital adoption and its impacts. In large measure our reporting to date has focused on description of the *Survey* findings but with much left to do in terms of more detailed analysis of the findings across different industries and places across Wales. We have been able to provide evidence of the SME benefits connected with engagement with digital resources. Challenges remain in terms of making harder connections between digital adoption among Welsh SMEs and productivity improvements. At the start of the research in 2015-16 concerns were being voiced about the poor productivity performance of the contemporary Welsh economy and these issues remain. Undoubtedly without the pattern of digital adoption evidenced in our reporting, the productivity tale could have been much worse.

We strongly believe as a research team that the framework of the *Digital Maturity Survey* should be maintained. We are investigating means of achieving this and believe that the current COVID-19 problems will provide an important backdrop to future *Surveys*. We also accept that our *Survey* framework will need to evolve in line with changes in digital technology, particularly in terms of SMEs taking up more sophisticated digital technologies.

While the research to date has been used to inform elements of government intervention it will be interesting to see how far the research findings will inform further intervention once the current round of ERDF funding draws to an end. The research has revealed that interventions in the digital adoption space can provide real dividends for the regional economy. But this is a dynamic space and SMEs face the challenge of having to continually engage with new digital opportunities. Nowhere has this been more evident than during the COVID-19 pandemic. We still find evidence of variation in the adoption of digital technologies both across industries and across different geographies and these differences need further investigation if policy is to be well informed.

In summary we hope to continue to develop the *Digital Maturity Survey* while developing high quality research articles from the data collected. It is also hoped that the links we have made through the Advisory Group for the project will be maintained after the funding for the project ends.

7.2. External factors and their impact on SME digitalisation

The opportunities and barriers to digital transformation are influenced by local, national and global events. In the period in which the research programme was undertaken two disruptive events have occurred; first, the United Kingdom's vote to leave the European Union in June 2016, and second, a global COVID-19 pandemic and its large-scale impact on health, society and the economy. With these developments come a number of challenges for SMEs as they attempt to adapt and survive the turbulence.

As trade and migration negotiations remain underway, the trading partners and full extent of recruitment options available to SMEs once the United Kingdom's transition period ends remain uncertain. Moreover, further uncertainties relate to the extent of funding for projects and research supporting SMEs and their digital transformation now the funding period from the European Union has ceased. With these changes, SMEs may need to adapt their networks, look more locally and develop alternative international networks for sales and supplies. It also remains unclear how the developments will impact industry regulation, and whether there may be additional support or challenges for procurement and business model delivery. For example, construction is one industry where regulation in recent years has encouraged the uptake of digital technologies to support the safety and transparency of its operations. It is still unclear if these will be developed further, and what regulations might alter for other industries.

At the time of this report in late 2020, COVID-19 has entered its second wave and bringing with it further devastating effects to lives and livelihoods. SMEs are one of the group that have experienced devastating financial impacts, as some businesses are forced to close and others need to adapt to a changing external environment. These events have brought sizeable changes to the ways that businesses operate. Where possible, SMEs have switched quickly to remote working, which in the most part relies heavily on digital infrastructure and cloud-based technologies. In a relatively short period of time there has been significant digital alterations to support staff working remotely. In the longer term, this may lead to a further uptake in cloud-based technologies and incremental technological advancements. However, it remains unclear how it will impact more advanced digital technologies, such as automation and AI. Arguably, sectors such as social and health care may need to develop these tools quicker to support sectors with only a finite amount of physical resource. Yet, SMEs as they navigate the turbulence may struggle to invest in these more advanced resources as their financial commitments shift to remote working and retaining reserves. A further longer term shift may be a heightening of the shift towards rural areas, as workers and businesses move their business models online and opt to relocate to areas outside urban clusters. Moreover, the foundational economy has been pivotal in providing support during the pandemic, which may lead to further support and investment in these everyday sectors in the years to follow.

7.3. Implications for policy

Three broad areas of potential digital policy intervention emerge from the research, including implications for digital policy, digital business support and digital skills. These implications presented below draw from the research conducted by the project and illustrate a range of ways in which the challenges of ongoing digital transformation in SMEs might be further assisted.

Connectivity and public policy for digital

i. Continue to support the ongoing deployment of fixed and mobile broadband across all parts of Wales

While the main focus of the project has been to examine the use of digital technologies associated with superfast broadband access, the research has highlighted the uneven nature of adoption and use amongst Wales economic regions. These results point to the importance of ensuring that the remaining premises in Wales have access to superfast broadband. This challenge is recognised by Welsh Government and partners, and calls for ongoing efforts not only to deploy fixed line broadband, but also consider the challenges of deploying mobile broadband (4 and 5G) and specialist (e.g. IoT) connectivity across the region. Such access will be central to ensuring that digital maturity develops across all parts of Wales.

ii. 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

Digitalisation presents a range of challenges to businesses, including adaptation of the business model, supporting staff skills and the ability to access public services. The Welsh Government Brown Review outlines the development of digital activities across Wales via policy agenda and Welsh Government's partners. This will create new forms of support for business, but also complexify the policy mix for digital business in Wales. Integrating policy measures including linking business support and skills will promote good practice and knowledge flow, maximising the outcome of this initiative.

SME business support

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

The findings highlight that it may be more appropriate to target business advisory support by sector, digital maturity, and policy agenda. The evidence suggests that the ability to engage is influenced by skill level and business model, reflecting this in the support offered will improve outcomes. Examples would be specific support for businesses in the foundational economy or located rurally. The development of this type of support is likely to require additional advisory staff training.

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

The case studies highlighted that the Welsh economy has increasingly digitalised over the period of the project and continues to do so. A number of case study businesses highlighted future plans to become more digital and to overcome pre-existing implementation hurdles. This suggests a required focus on understanding and examining future trends. This knowledge would also ensure that policy is adaptive in supporting Welsh SMEs to respond to the opportunities presented by digital technologies. This future focus relates not only to technology but political, social, environmental, and health opportunities also.

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

The case studies precede the outbreak of COVID-19, but the global events of 2020 further highlight the opportunities presented through digital technology to provide services online and offer greater working from home opportunities. There are sectors, however, where face-to-face interactions remain the mainstay of the sector. Looking to the future, supporting businesses to blend these two service aspects will support operational resilience and the policy process.

Ensure that business digital advisory capacity keeps abreast of emerging technology developments

The requirement for business advisor skills to be constantly updated in line with advances in digital technologies (and the sophistication of SME questions) is noted in the Horizon Scanning research. It suggests an ongoing role for advisory services to not only engage in continuing professional development, but to develop strategies to manage the 'hype' associated with emerging technology solutions, and to represent digital technologies as opportunities for a broad range of business processes.

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

It is notable that supply chains can support the adoption of digital technologies. Generational differences are observed where younger employees typically are more confident with digital tools. Offering bespoke training to those that are older or less digitally engaged will bypass some of the incremental steps to digitalisation. An example would be highlighting the security of data which could be facilitated through pairing those that are digitally engaged and those that are not. Small, more personalised changes such as this can lead to greater digitalisation.

Digital skills

Consider the potential for the public sector to support the future employment skills needs for AI and automation

The potential role for government in helping to strengthen outcomes from digital technology use and ensure that business and employees are able to adapt is highlighted in the research. The AI Horizon Scanning paper, for example, points to the implications of automation for jobs and tasks, and suggests preparation for the future skills requirements of workers may be needed. Such responses may require a cross-governmental policy action targeting key weaknesses such as policies for entrepreneurship, innovation (R&D) and skills. The findings also suggest the need for research such as WERU's Vulnerability Index⁹ to be refreshed over time to monitor the evolution of the potential impact of digital technology development on Wales.

Examine the potential opportunities associated with digital hubs to support digital skills and adoption in rural areas

Place-based opportunities to provide advice on digital technologies may present an area for policy intervention. Hubs or virtual networks have been adopted in other regions such as Lincolnshire (Price et al., 2018). This, it is argued, is an area where there may be potential to consider virtual networks of like-minded businesses, or indeed physical solutions such as regional hubs, where co-working space and business support is available. Such hub and spoke models have recently been announced in four locations in Wales¹⁰, and may provide the basis for place-base support for future digital exploitation.

⁹ https://www.cardiff.ac.uk/_data/assets/pdf_file/0007/1437154/Horizon-Scanning-AI-and-Automation-Redraft-v2docx.pdf

¹⁰ <https://gov.wales/newsroom/businessandconomy/2018/181121-new-enterprise-hubs-to-spark-welsh-business-announced/?lang=en>



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