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# PROJECT DATBLYGU BAND LLYDAN CYFLYM IAWN I FUSNESAU: AROLWG AEDDFEDRWYDD DIGIDOL CYMRU 2023

# SUPERFAST BROADBAND BUSINESS EXPLOITATION PROJECT: THE DIGITAL MATURITY SURVEY FOR WALES 2023

etic lab

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Cronfa Datblygu Rhanbarthol Ewrop
European Regional Development Fund

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# SUPERFAST BROADBAND BUSINESS EXPLOITATION PROJECT: THE DIGITAL MATURITY SURVEY FOR WALES 2023

Cynhaliwyd yr ymchwil hwn gan Etic Lab, fe'i comisiynwyd gan Lywodraeth Cymru ac fe'i ariannwyd yn rhannol gan Gronfa Datblygu Rhanbarthol Ewrop drwy gyfrwng Swyddfa Cyllid Ewropeaidd Cymru. Mae'n adeiladu ar astudiaethau blaenorol o aeddfedrwydd digidol yn economi Cymru, er enghraifft, yr arolygon a gynhaliwyd gan Ysgol Fusnes Caerdydd rhwng 2016 a 2020, gan gyflwyno cyfres newydd o dechnegau a luniwyd i gynyddu ehangder a dyfnder y wybodaeth sydd ar gael i lunwyr polisïau, ymchwilwyr a pherchenogion busnesau.

This research has been undertaken by Etic Lab, commissioned by the Welsh Government and part funded by the European Regional Development Fund via the Welsh European Funding Office. It builds on previous studies of digital maturity in the Welsh economy, for instance, the surveys carried out by Cardiff Business School between 2016 and 2020, whilst introducing a new set of techniques designed to increase the breadth and depth of information available to policymakers, researchers and business owners.

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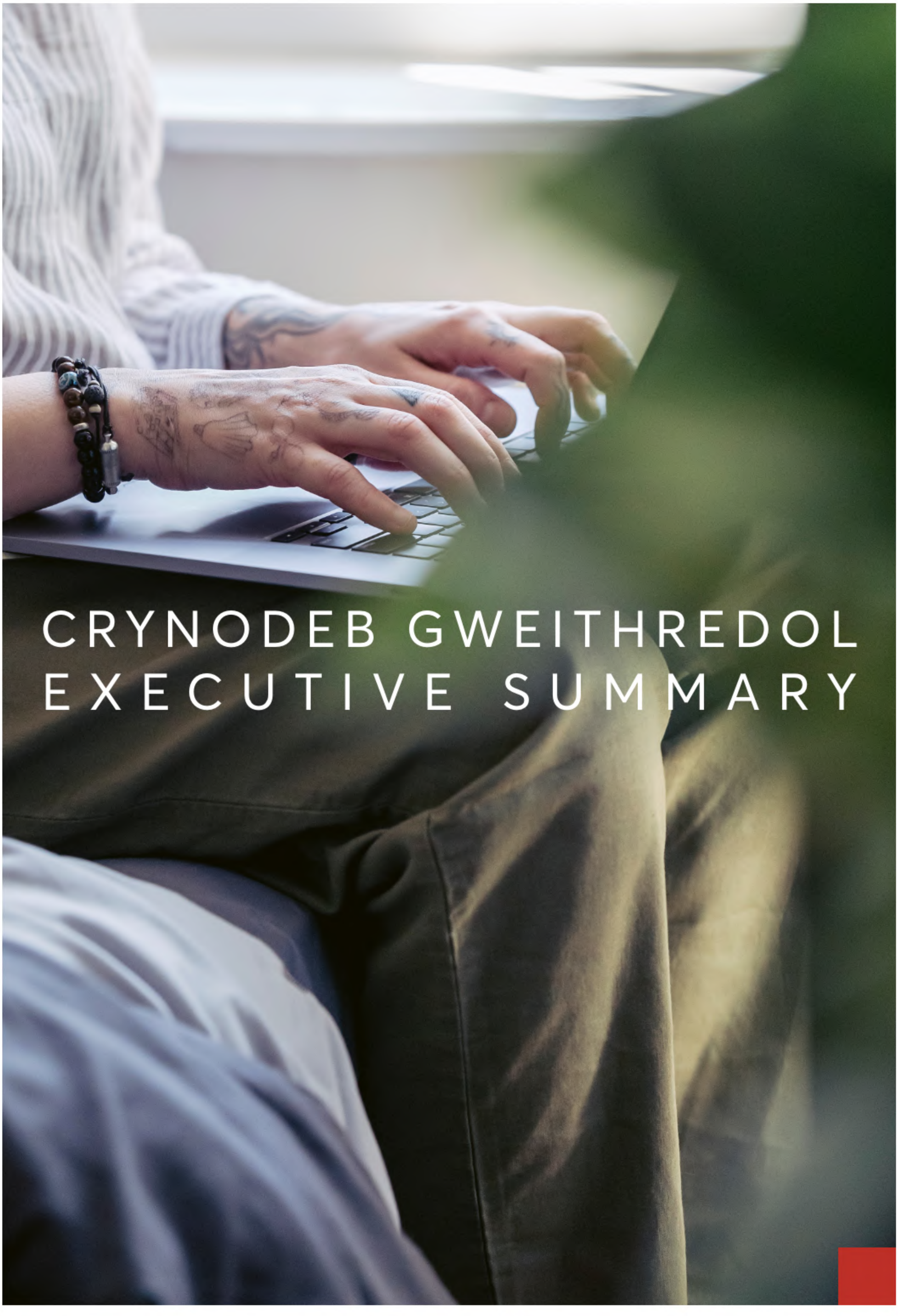

# CRYNODEB GWEITHREDOL
# EXECUTIVE SUMMARY

## Cefndir

Ers Covid-19, mae economi Cymru wedi ymgymryd â thon ddigynsail o ddigidoleiddio, diolch i gyflwyno band llydan cyflym iawn yn genedlaethol. Ledled y wlad, mae busnesau bach a chanolig (BBaCh) wedi bod yn integreiddio technolegau newydd megis fideogynadledda ac e-fasnach yn eu harferion busnes. Mae'r gallu i gynhyrchu'r gwerth mwyaf posibl o dechnolegau digidol nawr yn hanfodol i ddynamiaeth a gwydnwch busnesau Cymru a'r economi yn ei chyfanrwydd. I lunwyr polisïau, sefydliadau cymorth busnes a busnesau eu hunain, mae dod o hyd i ffyrdd newydd o fonitro mabwysiadu technolegau digidol a mesur i ba raddau y'u defnyddir i lywio arloesi yn hanfodol bwysig.

Mae Arolwg Aeddfedrwydd Digidol Cymru 2023 yn arolwg ar gyfer BBaCh a luniwyd i olrhain newidiadau o ran mabwysiadu a defnyddio technolegau digidol ymysg busnesau Cymru rhwng 2016 a 2023. Mae'n adeiladu ar yr arolygon blaenorol a gynhaliwyd gan Ysgol Fusnes Caerdydd ers 2016.

## Nodau'r arolwg hwn yw:

- Cynnig asesiad manwl o ddefnyddio a mabwysiadu technoleg ddigidol ar draws economi Cymru dros y saith mlynedd diwethaf, gan adlewyrchu effaith Covid-19, Brexit a'r argyfwng costau byw.

- Darparu canfyddiadau i roi effeithiau polisïau Llywodraeth Cymru, megis Llesiant Cenedlaethau'r Dyfodol a Strategaeth Arloesi Cymru, yn eu cyd-destun, a chynorthwyo cwmnïau Cymru â'u hymdrechion i ddigidoleiddio.

## Methodoleg

Mae'r arolwg hwn yn defnyddio dulliau cymysg, gan gyfuno ymchwil desg, cyfweliadau lled-strwythuredig ag unigolion allweddol a ffigyrau sy'n cynrychioli economi Cymru, ac arolwg digidol newydd o fusnesau Cymru. Drwy syntheseiddio canfyddiadau'r tri edefyn ymchwil hyn, y nod yw dangos yn fanwl sut y mae ymddygiad digidol cwmnïau Cymru wedi esblygu o 2016 hyd at ddechrau 2023.

Mae cydran arolwg digidol yr adroddiad hwn yn seiliedig ar ragosodiad syml, sef: **drwy fonitro'n uniongyrchol sut y mae cwmnïau'n defnyddio technolegau digidol i lunio eu presenoldeb ar-lein, gellir cynhyrchu mesuriadau dirprwyol cadarn sy'n cynrychioli eu hymgysylltiad cyffredinol â phroses digidoleiddio** ac fel hyn gellir **taro goleuni hollbwysig ar sut y mae digidoleiddio'n digwydd ar lefelau lleol, rhanbarthol a chenedlaethol.**

## Background

In the wake of Covid-19, the Welsh economy has embarked on an unprecedented wave of digitalisation, enabled by the national rollout of superfast broadband. All across the country, small- and medium-sized business (SMEs) have been integrating new technologies like video-conferencing and e-commerce into their business practices. The ability to generate maximum value from digital technologies is now essential to the dynamism and resilience of Welsh businesses and the economy as a whole. For policymakers, business support organisations and businesses themselves, finding new ways to monitor the adoption of digital technologies and to measure the extent to which they are being used to drive innovation is of vital importance.

The Digital Maturity Survey for Wales 2023 is a survey of SMEs designed to track changes in the adoption and use of digital technologies amongst Welsh businesses between 2016 and 2023. It builds on the surveys previously carried out by Cardiff Business School extending back to 2016.

### The goals of this survey are:

- To offer a detailed assessment of the use and adoption of digital technology across the Welsh economy over the past seven years, reflecting the impact of Covid-19, Brexit and the cost-of-living crisis.

- To provide insights to contextualise the effects of Welsh Government policies such as the Wellbeing of Future Generations and the Innovation Strategy for Wales and support the digitalisation efforts of Welsh companies.

## Methodology

This survey employs a mixed methods approach, combining desk research, semi-structured interviews with key actors and representative figures from the Welsh economy, and a new digital survey of Welsh businesses.
By synthesising the findings from these three research strands, it aims to provide a comprehensive picture of how the digital behaviour of Welsh companies has evolved from 2016 up to the beginning of 2023.

The digital survey component of this report is based on a simple premise: that **by directly monitoring how companies use digital technologies to shape their online presence, it is possible to generate robust proxy measurements that represent their overall engagement with the digitalisation process** and in this way produce **vital insights into how digitalisation is playing out at local, regional and national levels**.

Mae'r arolwg hwn yn defnyddio'r datblygiadau diweddaraf ym meysydd dadansoddeg data mawr a dysgu peirianyddol i asesu gweithgareddau digidol busnesau Cymru yn unol â phum metrig:

**Twf Digidol:** Ffordd o fesur cyfradd a maint gweithgareddau cynnal a chadw gwefannau dros amser, sy'n cynrychioli'r amser a'r adnoddau y mae cwmni'n eu neilltuo ar hyn o bryd i gynnal a diweddaru eu presenoldeb digidol.

**Aeddfedrwydd Digidol:** Ffordd o fesur soffistigeiddrwydd cymharol presenoldeb digidol cwmni, yn seiliedig ar y technolegau sydd wedi'u cynnwys yn eu gwefan, presenoldeb polisïau perthnasol, cysylltau â chyfrifon cyfryngau cymdeithasol a nodweddion eraill.

**Sgôr Arloesi**: I ba raddau y mae proffil digidol cwmni'n ymdebygu i broffil cwmni arloesol, sydd wedi'i gynhyrchu gan rwyd niwral sy'n ffocysu ar enghreifftiau o gwmnïau â hanes profedig o arloesi.

**Sgôr Llywodraethu Amgylcheddol, Cymdeithasol a Chorfforaethol (LlAC):** Ffordd o fesur i ba raddau y mae'r testun ar wefan cwmni ac ar ddeunyddiau eraill sydd ar gael i'r cyhoedd yn dangos ymrwymiad i'r gwerthoedd a'r pryderon a gynrychiolir gan fframweithiau LlAC.

**Defnyddio Cymraeg:** Ffordd o fesur faint o Gymraeg sy'n ymddangos ar draws presenoldeb digidol cwmni.

Defnyddiwyd y metrigau hyn ar sampl strwythuredig o bron i 6,000 o gwmnïau, wedi'u gwasgaru ar draws pob un o'r ddau awdurdod unedol ar hugain yng Nghymru, gan gynrychioli saith categori busnes allweddol. Mae'r arolwg yn defnyddio data sy'n mynd yn ôl at 2016, felly gall olrhain datblygiad digidol economi Cymru dros amser, gan ystyried effeithiau digwyddiadau mawr megis Brexit, Covid-19 a'r cynnydd diweddar mewn chwyddiant byd-eang.

Using the latest advances in big data analytics and machine learning, this survey assesses the digital activities of Welsh businesses according to five metrics:

**Digital Growth**: A measure of the rate and volume of website maintenance activity over time, representing the time and resources a company is currently investing in maintaining and updating its digital presence.

**Digital Maturity:** A measure of the relative sophistication of a company's digital presence, based on the technologies integrated into its website, the presence of relevant policies, links to social media accounts and other characteristics.

**Innovation Score:** The extent to which a company's digital profile resembles that of an innovative company, produced by a neural net trained on examples of companies with a proven track record of innovation.

**Environmental, Social and Corporate Governance (ESG) Score:** A measure of the degree to which the text on a company's website and other publicly available materials demonstrates an engagement with the values and concerns represented by ESG frameworks.

**Welsh Language Use:** A measure of the prevalence of the Welsh language across a company's digital presence.

These metrics were applied to a structured sample of almost 6,000 companies distributed across each of Wales' twenty-two unitary authorities, representing seven key business categories. The survey uses data going back to 2016, enabling it to track the digital development of the Welsh economy over time, registering the impacts of major events such as Brexit, Covid-19 and the recent rise in global inflation.

## Canfyddiadau

- Ar y cyfan, mae busnesau Cymru wedi dangos twf cymedrol o ran Aeddfedrwydd Digidol ers 2016, ac yn enwedig ers dechrau'r pandemig Covid-19 yn 2020. Mae hyn yn adlewyrchu cynnydd bach ond arwyddocaol yn soffistigeiddrwydd y modd y mae'r busnes cyfartalog yn defnyddio technoleg ddigidol yn eu presenoldeb ar-lein.

- Ar y cyfan, arafodd Twf Digidol busnesau Cymru rhwng 2016 a 2019, cyn arafu mwy a mwy ers dechrau'r pandemig Covid-19 yn 2020. Digwyddodd y cynnydd mwyaf o ran Twf Digidol yn ystod Gwanwyn a Haf 2022 – arwydd o hwrdd o weithgarwch digidol yn cyfateb i'r cynnydd mewn gweithgarwch economaidd ar ôl codi cyfyngiadau symud yn fyd-eang.

- Ar y cyfan, mae Sgôr Arloesi cwmnïau Cymru yn dangos cynnydd cyson ac nid anarwyddocaol o 1% rhwng 2016 a 2023.

- Cynyddodd cyfeiriadedd LlAC busnesau Cymru yn ystod y pandemig, ond mae'n dal i fod yn negatif o gymharu â'n model. Mae sgôr LlAC cyffredinol cwmnïau Cymru yn dangos diffyg ymroddiad i faterion LlAC.

- Mae cyfran gymharol siaradwyr Cymraeg mewn rhanbarth yn cyfateb yn agos i ganran y BBaCh yn y rhanbarth sydd â thestun Cymraeg ar eu gwefan. Yr eithriad i hyn yw Caerdydd, lle mae gwefannau'n fwy tebygol o ddefnyddio Cymraeg. Nid yw'r rhan fwyaf o fusnesau Cymru, ar hyn o bryd, yn defnyddio Cymraeg fel mater o drefn ar eu heiddo digidol.

- Ceir gwahaniaethau arwyddocaol yn sgorau Aeddfedrwydd Digidol ac Arloesi awdurdodau unedol sy'n cynnwys canolfannau trefol, a rhai sydd wedi'u gwneud o drefi bach ac ardaloedd gwledig. Mae dargyfeirio arwyddocaol rhwng economïau gwledig a threfol yn dechrau ymddangos yn ystod y pandemig. pandemic.

- Ers y pandemig Covid-19, mae busnesau Cymru wedi dechrau defnyddio llawer mwy o dechnolegau digidol, ac mae mynediad at fand llydan dibynadwy, datblygu sgiliau digidol a mynediad at hyfforddiant ac adnoddau digidol nawr yn allweddol i wydnwch economi Cymru.

- Mae gweithio hybrid yn rhan ganolog o arferion gwaith busnesau Cymru, ac mae hyn yn achosi goblygiadau i anghydraddoldeb cymdeithasol a rhanbarthol, anghenion seilwaith a seiberddiogelwch.

- Mae'r cynnydd mewn digidoleiddio'n cyflwyno cyfleoedd a risgiau newydd i gwmnïau Cymru, gan gynnwys mynediad at farchnadoedd byd-eang, dibyniaeth ar gyfrifiadura yn y cwmwl a'r economi apiau a'r ffaith eu bod yn wynebu cystadleuaeth ryngwladol.

## Findings

- Overall, Welsh businesses have demonstrated a modest growth in Digital Maturity since 2016, and particularly since the onset of the Covid-19 pandemic in 2020.

  This reflects a small but significant increase in the sophistication of the average business's use of digital technology in its online presence.

- Overall, the Digital Growth of Welsh businesses declined between 2016 and 2019, before increasingly sharply since the onset of the Covid-19 pandemic in 2020.

  The most significant increase in Digital Growth occurred across the Spring and Summer of 2022, indicating a burst of digital activity that corresponds to the increased economic activity following the global lifting of lockdown measures.

- Overall, the Innovation Score of Welsh companies shows a steady and not insignificant increase of 1% between 2016 and 2023.

- The ESG orientation of Welsh businesses increased during the pandemic, but remains negative in relation to our model. The ESG score of Welsh companies overall shows a lack of engagement with ESG issues.

- The relative proportion of Welsh speakers in a region closely matches the percentage of SMEs located in the region whose websites contain Welsh language text, with the notable exception of Cardiff, where websites are more likely to use Welsh language. Welsh businesses do not currently, in the majority of cases, routinely use Welsh language on their digital properties.

- There are some significant differences in the Digital Maturity and Innovation scores of UAs that contain urban centres and those that are made up of small towns and rural areas. A significant divergence between rural and urban economies begins to appear during the pandemic.

- Since the Covid-19 pandemic, Welsh businesses have greatly increased their use of digital technologies, and access to reliable high speed broadband, the development of digital skills and access to digital training and resources are now key to the resilience of the Welsh economy.

- Hybrid working is a central part of the working practices of Welsh businesses, with implications for social and regional inequality, infrastructure needs and cybersecurity.

- The increased level of digitalisation presents new opportunities and risks for Welsh companies, including access to global markets, reliance on cloud computing and the app economy and exposure to international competition.

## Argymhellion

- Dylid blaenoriaethu gwella cyfraddau mabwysiadu tariffau priodol o ran cyflymder a dibynadwyedd mynediad i'r rhyngrwyd ledled Cymru.  Mae band llydan wedi'i gyflwyno yn 95% o Gymru erbyn hyn, sy'n golygu bod gan y rhan fwyaf o'r boblogaeth fynediad digidol, ond mae cyflymder a dibynadwyedd rhyngrwyd busnesau'n dal i amrywio'n fawr, yn enwedig mewn ardaloedd gwledig a threfi bach.

- Parhau i adeiladu rhwydweithiau buddsoddi, cymorth i fusnesau a hybiau clyfar, yn enwedig mewn ardaloedd gwledig neu ardaloedd heb wasanaeth digonol er mwyn unioni anghysondebau rhanbarthol o ran Aeddfedrwydd Digidol ac Arloesi.

- Cefnogi datblygiad a gwasgariad apiau a llwyfannau o Gymru i'w defnyddio gan fusnesau Cymru a'r sector cyhoeddus, i ymateb i'r economi apiau sy'n tyfu a sicrhau bod swyddi, arian a data Cymru yn aros yn economi Cymru

- Deddfu er mwyn i apiau a llwyfannau nad ydynt o Gymru rannu data am economi fusnes Cymru â Llywodraeth Cymru, er mwyn i Lywodraeth Cymru allu cael yr un wybodaeth am fusnesau â chwmnïau o'r tu allan i'r Deyrnas Unedig, ac er mwyn gallu defnyddio'r wybodaeth i ychwanegu gwerth at economi Cymru.

- Deddfu ar gyfer rhagddodiad cod DDS i Gymru er mwyn gallu echdynnu data am fusnesau Cymru o Dŷ'r Cwmnïau, yn yr un modd ag y mae gan yr Alban ragddodiad DDS, a defnyddio'r codau hyn i dargedu cymorth i fusnesau a gohebiaeth sydd wedi'i theilwra i wahanol sectorau busnes.

- Mwy o gymorth wedi'i dargedu ar gyfer BBaCh ynghylch seiberddiogelwch, diogelu data a gwerth data. Nid yw llawer o BBaCh yn ymwybodol ar hyn o bryd o'r gwerth y gellir ei ychwanegu at eu busnes drwy drosoli data, nac o'r cynnydd mewn risgiau seiberddiogelwch a phreifatrwydd sy'n gysylltiedig â digidoleiddio a gweithio hybrid.

- Cymorth wedi'i dargedu ar gyfer BBaCh o ran LIAC a Sero Net. Yn yr un modd ag wrth sôn am seiberddiogelwch a diogelu data, ymddengys nad yw BBaCh bob amser yn deall perthnasedd y materion hyn i'w busnes na sut y byddai arfer gorau'n edrych yn eu sector.

- Dylai cwmnïau sicrhau bod eu gwerthoedd i'w gweld yn glir: Yn y blynyddoedd nesaf, bydd buddsoddwyr, partneriaid busnes a defnyddwyr yn fwy a mwy tebygol o wneud penderfyniadau ar sail agwedd cwmni at faterion megis Sero Net, cynaliadwyedd amgylcheddol a llywodraethu corfforaethol cyfrifol. Os yw cwmni wedi cymryd camau i roi sylw i'r materion hyn, dylent wneud yn siŵr eu bod yn dweud wrth bobl am y peth - yn enwedig ar eu gwefan a chyfryngau cymdeithasol, sef eu heiddo pwysicaf sy'n wynebu'r cyhoedd.

- Dylai cwmnïau drin eu gwefan fel blaen siop digidol: Hyd yn oed os nad yw cwmni'n gwerthu cynhyrchion neu wasanaethau ar-lein, gwefan y cwmni fydd y pwynt cyswllt cyntaf i lawer o ddarpar gwsmeriaid - yn enwedig ar y farchnad ryngwladol. Dylai pob math o fusnes flaenoriaethu buddsoddi mewn presenoldeb gwe digidol soffistigedig sydd wedi'i gynnal a'i gadw'n dda, ac sy'n adlewyrchu gwerthoedd y cwmni er ei bennaf les ei hun.

## Recommendations

- Improving the speed and reliability of internet access across Wales should be a priority, with a focus on areas with poor coverage. Broadband rollout across Wales has reached 95%, meaning most of the population have digital access, however the speed and reliability is still highly variable, particularly in rural areas and small towns.

- Continue the buildout of investment networks, business support and smart hubs, particularly in rural or underserved areas in order to address regional disparities in Digital Maturity and Innovation.

- Support the development and diffusion of Welsh apps and platforms for use by Welsh businesses and the public sector, to address the growing app economy and ensure that Welsh jobs, money and data remain in the Welsh economy.

- Legislate for non-Welsh apps and platforms to share data about the Welsh business economy with Welsh Government, so that Welsh Government has access to the same intelligence about businesses that non-UK companies do, and so the information can be used to measure add value to the Welsh economy.

- Legislate for a Welsh SIC code prefix in order to be able to extract Welsh business data from Companies House, just as Scotland has a Scottish SIC prefix, and use these codes to target businesses support and communications tailored to different business sectors.

- More targeted support for SMEs around cyber security, data protection and the value of data. Many SMEs are currently unaware of the value that can be added to their business by leveraging data, or the increased cybersecurity and privacy risks associated with digitalisation and hybrid working.

- Targeted support for SMEs on ESG and Net Zero. As with cybersecurity and data protection, there are indications that SMEs are not always able to grasp the relevance of these issues to their business or what best practice would look like in their sector.

- Companies should put their values front and centre: In the coming years, investors, business partners and consumer will be increasingly likely to make decisions based on a company's stance on issues such as Net Zero, environmental sustainability and responsible corporate governance. If a company has taken steps to address these issues, they should make sure to tell people about it - particularly on their website and social media, which will continue to be their most important public-facing properties.

- Companies should treat their website as their digital storefront: Whether or not a company sells its products or services online, its website is still the first point of contact for many potential customers - particularly on the international market. Investing in a digitally sophisticated, well-maintained web presence which reflects the company's value offering to its best advantage should be a priority for businesses of all types.

# GEIRFA
# GLOSSARY

# G E I R F A
# GLOSSARY

**Termau Cyffredinol**

**Cofrestr Tŷ'r Cwmnïau**: Y rhestr fwyaf cynhwysfawr sydd ar gael o fusnesau cofrestredig yn y Deyrnas Unedig; mae'n cofnodi enwau cwmnïau, eu statws, cyfarwyddwyr y cwmni ac unigolion â rheolaeth arwyddocaol, codau DDS, cyfrifon a gwybodaeth arall. Ffurfiwyd y sampl ar gyfer yr arolwg hwn o fusnesau o Gymru sydd wedi'u cofrestru yn Nhŷ'r Cwmnïau.

**LlAC:** Mae Llywodraethu Amgylcheddol, Cymdeithasol a Chorfforaethol (LlAC) yn gyfres o fframweithiau a luniwyd i helpu cwmnïau i gynnwys blaenoriaethau amgylcheddol, cymdeithasol a llywodraethu megis cynaliadwyedd ecolegol neu leihau anghydraddoldeb economaidd yn eu harferion busnes.

**Gweithio Hybrid:** Model o weithio hyblyg sy'n golygu bod gweithwyr yn rhannu eu hamser gwaith rhwng safle swyddogol a lleoliadau eraill (e.e. swyddfa gartref, desg boeth, caffi, llyfrgell).

**Data'r SYG:** Mae'r Swyddfa Ystadegau Gwladol (SYG) yn casglu data cynhwysfawr am berfformiad busnesau'r DU, a defnyddiwyd y rhain i ategu canlyniadau'r arolwg hwn a'u rhoi yn eu cyd-destun.

**Codau DDS:** Mae cod Dosbarthiad Diwydiannol Safonol (DDS) y DU yn system i gategoreiddio cwmnïau yn ôl eu gweithgareddau masnachol, ac mae wedi'i gynnwys fel rhan o'r rhestriad yn Nhŷ'r Cwmnïau. Mae'r arolwg hwn wedi defnyddio codau DDS y cwmnïau yn ei sampl i broffilio gwahanol lefelau gweithgarwch digidol ar draws gwahanol sectorau masnachol yn economi Cymru.

**Sampl Strwythuredig:** Cafodd y sampl o bron i 6,000 o fusnesau a arolygwyd ar gyfer yr astudiaeth hon ei bwysoli yn ôl maint y boblogaeth fusnes ym mhob AU a dosbarthiad cenedlaethol y busnesau yn ôl eu cod DDS, i adlewyrchu cyfansoddiad cyffredinol economi Cymru.

**Awdurdod Unedol:** Mae Cymru wedi'i rhannu'n ddau awdurdod unedol (AU) ar hugain, ac mae gan bob un gyngor lleol sy'n gyfrifol am lywodraethu lleol. Mae'r arolwg hwn yn darparu data am weithgareddau digidol busnesau ym mhob AU yng Nghymru, sydd i'w gweld yn llawn ar wefan y project [https://welshdigitalmaturitysurvey2023.eticlab.co.uk](https://welshdigitalmaturitysurvey2023.eticlab.co.uk)

## General Terms

**Companies House Register:** The most comprehensive available list of registered UK businesses, recording company names, statuses, company directors and persons of significant control, SIC codes, accounts and other information. The sample for this survey was assembled from Welsh businesses registered at Companies House.

**ESG:** Environmental, Social and Corporate Governance (ESG) is set of frameworks designed to help companies embed environmental, social and governance priorities such as ecological sustainability or reducing economic inequality into their business practices.

**Hybrid Working:** A model of flexible working where employees split their work time between official premises and other locations (e.g. a home office, hotdesk, cafe, library).

**ONS Data:** The Office for National Statistics (ONS) compiles comprehensive data on UK business performance, which have been used to support and contextualise the results of this survey.

**SIC Codes:** The UK Standard Industrial Classification (SIC) code is a system for categorising companies by their commercial activities, and is included as part of the Companies House listing. This survey has used the SIC codes of the companies in its sample to profile differing levels of digital activity across different commercial sectors in the Welsh economy.

**Structured Sample:** The sample of almost 6,000 businesses surveyed for this study was weighted according to the size of the business population within each UA and the national distribution of businesses by SIC code, reflecting the overall makeup of the Welsh economy.

**Unitary Authority:** Wales is divided into twenty-two unitary authorities (UAs), comprising a local council with responsibility for local governance. This survey provides data on the digital activities of businesses in each of Wales' UAs, which can be viewed in full via the project website [https://welshdigitalmaturitysurvey2023.eticlab.co.uk](https://welshdigitalmaturitysurvey2023.eticlab.co.uk)

## Metrigau Allweddol

**Twf Digidol:** Ffordd o fesur cyfradd a maint gweithgareddau cynnal a chadw gwefannau dros amser, sy'n cynrychioli'r amser a'r adnoddau y mae cwmni'n eu neilltuo ar hyn o bryd i gynnal a diweddaru eu presenoldeb digidol.

**Aeddfedrwydd Digidol:** Ffordd o fesur soffistigeiddrwydd cymharol presenoldeb digidol cwmni, yn seiliedig ar y technolegau sydd wedi'u cynnwys yn eu gwefan, presenoldeb polisïau perthnasol, cysylltau â chyfrifon cyfryngau cymdeithasol a nodweddion eraill.

**Sgôr Arloesi:** I ba raddau y mae proffil digidol cwmni'n ymdebygu i broffil cwmni arloesol, sydd wedi'i gynhyrchu gan rwyd niwral sy'n ffocysu ar enghreifftiau o gwmnïau â hanes profedig o arloesi.

**Sgôr LlAC:** Ffordd o fesur i ba raddau y mae'r testun ar wefan cwmni ac ar ddeunyddiau eraill sydd ar gael i'r cyhoedd yn dangos ymrwymiad i'r gwerthoedd a'r pryderon a gynrychiolir gan fframweithiau LlAC.

**Defnyddio Cymraeg:** Ffordd o fesur faint o Gymraeg sy'n ymddangos ar draws presenoldeb digidol cwmni.

## Key Metrics

**Digital Growth:** A measure of the rate and volume of website maintenance activity over time, representing the time and resources a company is currently investing in maintaining and updating its digital presence.

**Digital Maturity:** A measure of the relative sophistication of a company's digital presence, based on the technologies integrated into its website, the presence of relevant policies, links to social media accounts and other characteristics.

**Innovation Score:** The extent to which a company's digital profile resembles that of an innovative company, produced by a neural net trained on examples of companies with a proven track record of innovation.

**ESG Score**: A measure of the degree to which the text on a company's website and other publicly available materials demonstrates an engagement with the values and concerns represented by ESG frameworks.

**Welsh Language Use:** A measure of the prevalence of the Welsh language across a company's digital presence.

# RHAGYMADRODD
# INTRODUCTION

# RHAGYMADRODD
# INTRODUCTION

## Yr ymchwil

Mae Arolwg Aeddfedrwydd Digidol Cymru yn arolwg o fusnesau bach a chanolig (BBaCh) a luniwyd i fesur cynnydd busnesau Cymru o ran mabwysiadu a defnyddio technolegau digidol ers 2016. Dyma'r trosolwg mwyaf cynhwysfawr eto ar weithgarwch digidol busnesau Cymru; mae'n darparu data y gellir eu defnyddio i asesu effaith digwyddiadau mawr megis Brexit a'r pandemig Covid-19, ac i feincnodi effeithiau polisïau'r llywodraeth.

Cynhaliwyd yr ymchwil hwn gan Etic Lab, fe'i comisiynwyd gan Lywodraeth Cymru ac fe'i ariannwyd yn rhannol gan Gronfa Datblygu Rhanbarthol Ewrop drwy gyfrwng Swyddfa Cyllid Ewropeaidd Cymru. Mae'n adeiladu ar astudiaethau blaenorol o aeddfedrwydd digidol yn economi Cymru, er enghraifft, yr arolygon a gynhaliwyd gan Ysgol Fusnes Caerdydd rhwng 2016 a 2020, gan gyflwyno cyfres newydd o dechnegau a luniwyd i gynyddu ehangder a dyfnder y wybodaeth sydd ar gael i lunwyr polisïau, ymchwilwyr a pherchenogion busnesau.[1]

## The research

The Digital Maturity Survey for Wales is a survey of small and medium-sized enterprises (SMEs) designed to measure how the adoption and use of digital technologies amongst Welsh businesses has progressed since 2016. It presents the most comprehensive overview yet assembled of the digital activity of Welsh businesses, providing data which can be used to assess the impact of major events like Brexit and the Covid-19 pandemic, and benchmark the impacts of government policies.

This research has been undertaken by Etic Lab, commissioned by the Welsh Government and part funded by the European Regional Development Fund via the Welsh European Funding Office. It builds on previous studies of digital maturity in the Welsh economy, for instance, the surveys carried out by Cardiff Business School between 2016 and 2020, whilst introducing a new set of techniques designed to increase the breadth and depth of information available to policymakers, researchers and business owners.

[1] See https://www.cardiff.ac.uk/superfast-broadband-project

## Cefndir

Fel y nododd y Sefydliad ar gyfer Cydweithrediad a Datblygiad Economaidd (SCDE) mewn papur ymchwil yn 2021, "Mae BBaCh yn chwarae rhan allweddol o ran adeiladu cymdeithasau cynhwysol a gwydn." Mae mwy a mwy o bobl yn dod i ddeall bod digidoleiddio'n hanfodol i hybu twf a chynhyrchedd busnesau bach, gan eu galluogi i gyrraedd cwsmeriaid newydd, sicrhau darbodion gweithredol a rhoi patrymau gweithio hyblyg ar waith. Fodd bynnag, nid yw bob amser yn broses syml i BBaCh gael mynediad at y technolegau digidol diweddaraf, nac i fanteisio i'r eithaf arnynt ar ôl gwneud hynny.

Fel y myfyria'r SCDE ymhellach, "Ar lefel gyfanredol, profwyd bod y bwlch digidol BBaCh yn faich ar berfformiad cynhyrchedd gwlad ac yn cyfrannu at anghydraddoldebau cynyddol ymysg unigolion, cwmnïau, cymunedau a lleoedd."[2] Mewn geiriau eraill, gallai mynediad anghyfartal at dechnolegau digidol a'u defnyddio'n anghyfartal atgyfnerthu anghysondebau rhwng lleoliadau, rhanbarthau a demograffigau o fewn economi genedlaethol.

Yn y deng mlynedd diwethaf, mae Llywodraeth Cymru wedi buddsoddi adnoddau sylweddol i gyflymu digidoleiddio, yn bennaf drwy gynorthwyo â'r broses o gyflwyno band llydan yn genedlaethol, a hefyd drwy gyfrwng y cynllun cymorth busnes Cyflymu Cymru i Fusnesau. Mae'r mentrau hyn yn cyd-fynd ag ymrwymiad strategol ehangach y Llywodraeth "i greu a meithrin diwylliant bywiog o arloesi ar gyfer Cymru gryfach, decach a gwyrddach."[3]

Diben yr ymchwil hwn yw ategu'r ymrwymiadau hyn drwy ganiatáu i lunwyr polisïau, ymchwilwyr a pherchenogion busnesau gynnal asesiad mwy manwl gywir o lefel bresennol digidoleiddio ar draws economi Cymru, yn ogystal â gwerthuso effeithiau mentrau polisi a ddyluniwyd i ategu digidoleiddio. Lluniwyd y metrigau a ddefnyddir yn yr arolwg hwn yn benodol i adlewyrchu nodau a gwerthoedd llywodraeth Cymru, gan roi golwg ar strategaeth ddigidol cwmni, eu gallu i arloesi a'u hymroddiad cyhoeddus i gynaliadwyedd amgylcheddol, amrywiaeth a chydraddoldeb.

Mae'r data a gasglwyd ar gyfer yr arolwg hwn yn mynd yn ôl i 2016 - cyfnod a ddiffiniwyd gan darfu parhaus ar yr economi ac mewn gwleidyddiaeth, a siociau annisgwyl i gymdeithas. Mae'r arolwg hwn yn ymateb i'r hinsawdd ansicr newydd hon mewn dwy ffordd. Yn gyntaf, drwy ddarparu'r darlun mwyaf manwl sydd ar gael o weithgareddau digidol busnesau Cymru drwy gydol y cyfnod, mae'n ceisio dangos effeithiau digwyddiadau mawr megis Brexit a Covid-19 ar economi Cymru ac effeithiau'r camau a gymerwyd i'w lliniaru. Yn ail, drwy gynnig ffordd gyflymach, fwy gronynnog a mwy cost-effeithiol o fesur gweithgarwch digidol yn economi Cymru, mae'r arolwg hwn yn gobeithio cynnig ffordd o gofnodi effeithiau digwyddiadau sy'n tarfu ar gymdeithas yn agos at amser real, gan wella gallu llywodraeth a busnesau i gymryd camau effeithiol i hybu lles a ffyniant pobl Cymru.

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[2] *The Digital Transformation of SMEs*, OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris, OECD (2021), https://doi.org/10.1787/bdb9256a-en.

[3] Wales innovates: Creating a stronger, fairer, greener Wales. Welsh Government (2023) https://www.gov.wales/wales-innovates-creating-stronger-fairer-greener-wales-html

## Background

As the OECD stated in in a 2021 research paper, "SMEs play a key role in building inclusive and resilient societies." Digitalisation is increasingly understood to be vital to driving growth and productivity in small businesses, enabling them to reach new customers, access operational efficiencies and implement flexible working patterns. However, it is not always straightforward for SMEs to access the latest digital technologies, or to get the most out of them when they do.

As the OECD further reflects, "At an aggregate level, the SME digital gap has proved to weigh down on a country's productivity performance and to contribute to increasing inequalities among individuals, firms, communities and places."[4] In other words, uneven access to and use of digital technologies has the potential to reinforce disparities between localities, regions and demographics within a national economy.

The Welsh Government has in the last ten years invested considerable resources in accelerating digitalisation, primarily by supporting the nationwide rollout of broadband and 4G coverage, and also through the Superfast Business Wales business support scheme. These initiatives fit within the Government's broader strategic commitment "to create and nurture a vibrant innovation culture for a stronger, fairer, greener Wales."[5]

The purpose of this research is to support these commitments by allowing policymakers, researchers and businesses owners to more accurately assess the current level of digitalisation across the Welsh economy, as well as to evaluate the effects of policy initiatives designed to support digitalisation. The metrics used in this survey were specifically designed to reflect the goals and values of the Welsh government, providing insights into a company's digital strategy, innovative capacity and public commitment to environmental sustainability, diversity and equality.

The data gathered for this survey goes back to 2016 - a period defined by sustained economic and political disruption and unforeseen societal shocks. This survey responds to this new climate of uncertainty in two ways. First, by providing the most detailed available picture of the digital activities of Welsh businesses throughout this period, it seeks to demonstrate the impacts of major events like Brexit and Covid-19 on the Welsh economy and the effects of the steps taken to mitigate them. Second, by offering a faster, more granular and more cost-effective way to measure digital activity in the Welsh economy, this survey hopes to offer a way to register the effects of disruptive societal events in close to real-time, enhancing the ability of government and businesses to take effective measures to promote the wellbeing and prosperity of the people of Wales.

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[4] *The Digital Transformation of SMEs*, OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris, OECD (2021), https://doi.org/10.1787/bdb9256a-en.

[5] Wales innovates: Creating a stronger, fairer, greener Wales. Welsh Government (2023) https://www.gov.wales/wales-innovates-creating-stronger-fairer-greener-wales-html

## Diffinio Aeddfedrwydd Digidol

Mae'r arolwg hwn yn defnyddio dull gwahanol i ddatrys problem diffinio a mesur aeddfedrwydd digidol nag astudiaethau blaenorol. Yn y gorffennol, mae ymchwil wedi dibynnu'n bennaf ar holiaduron, a gwahodd cwmnïau i nodi eu hunain sut y maent yn defnyddio technolegau digidol yn eu gweithgareddau busnes rheolaidd. Mae astudiaethau o'r math hwn yn darparu trosolwg amhrisiadwy o agweddau tuag at ddigidoleiddio, a phrofiadau ohono, yn economi Cymru, ac mae'r arolwg presennol yn ychwanegu at y corff hwn o ymchwil drwy ddefnyddio cyfweliadau lled-strwythuredig.

Fodd bynnag, cyfyngedig yw gallu methodoleg holiadur i gynrychioli dynamiaeth gynhenid yr economi ddigidol. Yn yr amgylchedd masnachol sydd ohono, sy'n symud yn gyflym, gall y technolegau a'r arferion busnes diweddaraf un flwyddyn fod wedi dyddio erbyn y flwyddyn ganlynol, a gall y ffactorau diwylliannol ac economaidd sy'n llywio dewisiadau ynghylch defnyddio offer digidol newid yn gyflym fel ymateb i ddigwyddiadau ehangach mewn cymdeithas megis y pandemig Covid-19. Mae aeddfedrwydd digidol yn darged symudol, ac mae'n anochel y bydd yn anodd i holiaduron, sy'n amlwg yn methu â chyrraedd mwy na chyfran fach o fusnesau Cymru ac yn anodd eu dyblygu fwy nag unwaith y flwyddyn, gadw golwg arno.

Mae'r arolwg presennol yn seiliedig ar ragosodiad syml, sef: **drwy fonitro'n uniongyrchol gweithgareddau ar-lein cwmnïau dros amser, gellir cynhyrchu mesuriadau dirprwyol cadarn o'u hymgysylltiad â phroses digidoleiddio.** Mae'r datblygiadau diweddaraf ym meysydd dadansoddeg data mawr a dysgu peirianyddol yn golygu y gellir monitro ffenomena megis y canlynol o bell:

- Pa mor aml ac i ba raddau y mae cwmnïau'n newid eu gwefannau dros amser
- I ba raddau y maent yn cynnwys technolegau soffistigedig (ffurflenni gwe, botiau sgwrsio, e-fasnach) yn eu presenoldeb ar-lein.
- Y gwerthoedd a'r blaenoriaethau a fynegir mewn deunydd testun sydd ar gael i'r cyhoedd

Ar y cyd ag ystod o fesuriadau eraill, gall y data hyn daro goleuni bron mewn amser real ar ymddygiad digidol busnesau drwy economi Cymru i gyd. Ar ben hynny, drwy gymharu'r canlyniadau presennol â data wedi'u harchifo yn ôl cyn belled â 2016, gellir olrhain sut y mae gweithgarwch digidol cwmnïau Cymru wedi amrywio dros y cyfnod hwnnw. I grynhoi, **mae nawr yn bosibl mesur yn uniongyrchol sut y mae cwmnïau'n ceisio manteisio ar dechnolegau digidol drwy eu presenoldeb ar-lein**, ac fel hyn gallwn **daro goleuni hollbwysig ar sut y mae digidoleiddio'n digwydd ar lefelau lleol, rhanbarthol a chenedlaethol**.

Archwilir union fanylion y fethodoleg hon yn llawn yn yr adran ganlynol, ond yn y termau mwyaf cyffredinol, mae'r dull hwn yn darparu sail i fesur aeddfedrwydd digidol sydd:

- Yn bosibl ei defnyddio ar raddfa, heb y tueddiadau wrth ddethol sy'n anochel yn effeithio ar holiaduron gwirfoddol.
- Yn bosibl ei dyblygu'n rheolaidd i asesu effeithiau digwyddiadau sydyn mewn cymdeithas neu ymyriadau polisi penodol.
- Yn darparu darlun hanesyddol o ddatblygiad economi ddigidol Cymru y gellir ei estyn am gyfnod amhendant i'r dyfodol.
- Yn adlewyrchu gwir faint ac amlder gweithgarwch digidol yn economi Cymru ar un adeg neu dros gyfnod penodol.
- Yn caniatáu cymariaethau ystyrlon rhwng lleoliadau, rhanbarthau a diwydiannau..

## Defining Digital Maturity

This survey takes a different approach to the problem of defining and measuring digital maturity than previous studies. Past research has depended primarily on questionnaires, inviting companies to self-report their use of digital technologies in their regular business activities. Studies of this kind provide an invaluable overview of attitudes towards and experiences of digitalisation within the Welsh economy, and the present survey adds to this body of research through the use of semi-structured interviews.

However, a questionnaire-based methodology is limited in its ability to represent the inherent dynamism of the digital economy. In today's fast-moving commercial environment, technologies and business practices that were state of the art one year may be outdated by the next, whilst the cultural and economic factors driving the uptake of digital tools can shift rapidly in response to broader societal events like the Covid-19 pandemic. Digital maturity is a moving target, and questionnaires, which can of necessity only reach a small proportion of Welsh businesses and are hard to replicate on a more than yearly basis, will inevitably struggle to keep track of it.

The present survey is based on a simple premise: **by directly monitoring the online activities of companies over time, it is possible to generate robust proxy measurements of their engagement with the digitalisation process.** The latest advances in big data analytics and machine learning make it possible to remotely monitor phenomena such as:

- The frequency and extent of the changes companies make to their websites over time
- The degree to which they integrate sophisticated technologies (web forms, chatbots, e-commerce) into their online presence.
- The values and priorities expressed in publicly available textual material

Combined with a range of other measurements, this data can provide near real-time insights into the digital behaviour of businesses throughout the Welsh economy. Moreover, by comparing the present results with archived data going back as far as 2016, it is possible to track how the digital activity of Welsh companies has fluctuated over that period.

In summary, **it is now possible to directly measure how businesses seek to exploit digital technologies through their online presence**, and this can provide us with **vital insights into how the digitalisation process is playing out at local, regional and national levels**.

The precise details of this methodology will be fully explored in the following section, but in the most general terms, this approach provides the basis for a measurement of digital maturity which:

- Can be applied at scale, without the selection biases which inevitably afflict voluntary questionnaires.
- Can be replicated at regular intervals to assess the effects of sudden societal events or particular policy interventions.
- Provides a historical picture of the development of Wales' digital economy which can be extended indefinitely into the future.
- Reflects the actual volume and frequency of digital activity in the Welsh economy at a given moment or over a selected period.
- Allows for meaningful comparisons between localities, regions and industries.

# METHODOLEG
# METHODOLOGY

# METHODOLEG
# METHODOLOGY

## Trosolwg

Mae'r adroddiad hwn yn defnyddio dulliau cymysg i astudio aeddfedrwydd digidol yn economi Cymru. Mae'r rhain yn cynnwys:

- Arolwg digidol o sampl strwythuredig o bron i 6,000 o fusnesau Cymru.
- Adolygiad cynhwysfawr o'r llenyddiaeth academaidd a llwyd ddiweddaraf sy'n ymwneud â digidoleiddio, aeddfedrwydd digidol ac economi Cymru.
- Rhaglen o gyfweliadau lled-strwythuredig ag amrywiaeth o unigolion pwysig neu gynrychiadol o lywodraeth Cymru a'r gymuned fusnes.

Mae'r dulliau hyn yn darparu craffter cyfoethog o ymchwil desg, cyfweliadau a mynediad digynsail at ddata gronynnog ynghylch ymddygiad digidol cwmnïau o bob awdurdod unedol ledled Cymru. Yn hyn o beth, ei nod yw cadw'r agweddau gorau ar arolygon traddodiadol i fesur aeddfedrwydd digidol yn ogystal â tharo goleuni cwbl newydd ar economi ddigidol Cymru ar gyfer busnesau a llunwyr polisïau.

## Overview

This report adopts a mixed-methods approach to studying digital maturity in the Welsh economy. This comprises:

- A digital survey of a structured sample of almost 6,000 Welsh businesses.
- A comprehensive review of the latest academic and grey literature relating to digitalisation, digital maturity and the Welsh economy.
- A program of semi-structured interviews with a range of significant or representative individuals from the Welsh government and business community.

This approach provides rich insights drawn from desk research, interviews and unprecedented access to granular data on the digital behaviour of companies from every unitary authority across Wales. In this way, it aims to preserve what is best in the traditional, survey-based approach to measuring digital maturity whilst offering businesses and policy-makers an entirely new level of insight into Wales' digital economy.

## Arolwg Digidol

Cynhaliwyd yr arolwg digidol gan ddefnyddio Foresight SI, system sy'n defnyddio technolegau data mawr a dysgu peirianyddol i ganfod, categoreiddio a mesur ymddygiad digidol cwmnïau ar draws ystod o wahanol fetrigau.

Mae system Foresight SI yn seiliedig ar y rhagosodiad y gall agweddau mesuradwy penodol ar bresenoldeb digidol cwmni (er enghraifft, pa mor aml y maent yn diweddaru eu gwefan, neu soffistigeiddrwydd y technolegau a ddefnyddir ar eu gwefan), gyda'i gilydd, weithredu fel dirprwyon ar gyfer nodweddion economaidd arwyddocaol megis aeddfedrwydd digidol, tebygolrwydd o arloesi neu wydnwch.

Ategir y fethodoleg hon gan gorff cynyddol o ymchwil academaidd rhyngwladol, , Blazquez, D., Domenech, J. and Garcia-Alvarez-Coque, J.M., 2018; Daas, P.J. and van der Doef, S. 2021; Kinne J. and Lenz, D. 2021; Tranos, E., Carrascal-Incera, A. and Willis, G. 2023).

## Digital Survey

The digital survey was conducted using Foresight SI, a system which uses big data and machine learning technologies to find, categorise and measure the digital behaviour of companies across a range of different metrics.

The Foresight SI system is based on the premise that certain measurable aspects of a company's digital presence (for instance, the frequency with which it updates its website, or the sophistication of the technologies used on its website) can in combination serve as proxies for economically significant characteristics such as digital maturity, likelihood to innovate or resilience.

This methodology is backed by a growing body of international academic research, Blazquez, D., Domenech, J. and Garcia-Alvarez-Coque, J.M., 2018; Daas, P.J. and van der Doef, S. 2021; Kinne J. and Lenz, D. 2021; Tranos, E., Carrascal-Incera, A. and Willis, G. 2023).

## Adeiladu'r Samp

Er mwyn cynnal yr astudiaeth hon, roedd angen ffurfio sampl o fusnesau bach a chanolig eu maint a gofrestrwyd yng Nghymru ynghyd â'u gwefannau cysylltiedig. I gyflawni hyn, chwiliodd Foresight SI drwy restri Tŷ'r Cwmnïau am fusnesau a gofrestrwyd â chodau post yng Nghymru (**124,705** cwmni). Yna, chwiliodd am wefan ar gyfer pob cwmni, gan baru (lle bo'n bosibl) rhestriad Tŷ'r Cwmnïau â'i bresenoldeb digidol cysylltiedig (**34,749** cwmni).

Yna, trefnwyd y data hyn yn ôl y cod Dosbarthiad Diwydiannol Safonol (DDS). Er mwyn gallu gwneud cymariaethau ystyrlon, dyblygodd yr astudiaeth hon y saith categori DDS a ddefnyddiodd Prifysgol Caerdydd yn arolygon y blynyddoedd blaenorol:

- Gwasanaethau Llety a Bwyd
- Gwasanaethau Busnes ac Eraill
- Adeiladu
- Gwybodaeth a Chyfathrebu
- Gweithgynhyrchu
- Cludiant a Storio
- Masnach Cyfanwerthu ac Adwerthu; Atgyweirio Cerbydau Modur a Beiciau Modur

Roedd y sampl wedi'i strwythuro i adlewyrchu dosbarthiad cenedlaethol busnesau yn ôl categori SIC, gan greu sampl o **5,813** busnes. Mae'r sampl hwn yn cyfateb, o fewn lled gwall 3%, i ddosbarthiad cyffredinol busnesau ym mhob awdurdod unedol, yn ôl nifer a chategori.

Dyma'r sampl cynrychiadol mwyaf o fusnesau Cymru a gasglwyd erioed ar gyfer astudiaeth o'r fath.

## Building The Sample

To conduct this study, it was necessary to construct a sample of small- and medium-sized businesses registered in Wales along with their associated websites. To accomplish this, Foresight SI searched the Companies House listings for businesses registered in Welsh postcodes (124,705 companies). It then looked up a website for each company, creating a match (where possible) between the Companies House listing and its associated digital presence (34,749 companies).

This data was then organised by Standard Industrial Classification (SIC) code. So as to be able to make meaningful comparisons, this study replicated the seven SIC categories used in the previous years' surveys by the University of Cardiff:

- Accommodation and Food Services
- Business and Other Services
- Construction
- Information and Communication
- Manufacturing
- Transportation and Storage
- Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles

The sample was structured to reflect the national distribution of businesses by SIC category, creating a sample of **5,813** businesses. This sample matches the overall distribution of businesses within each unitary authority by number and category to within a margin of 3%.

This is the largest representative sample of Welsh businesses ever assembled for such a study.

## Metrigau Digidol

Ymwelodd Foresight SI â'r gwefannau sy'n gysylltiedig â phob un o'r cwmnïau yn y sampl a rhoi sgôr iddynt yn unol â chyfres o fetrigau i fesur gwahanol agweddau ar eu hymddygiad digidol.

Drwy gyrchu data a archifwyd ar-lein yn dyddio yn ôl i 2016, roedd Foresight SI yn gallu dadansoddi presenoldeb digidol pob cwmni nid yn unig fel yr oedd ar adeg yr astudiaeth (dechrau 2023), ond hefyd fel yr oedd wedi datblygu dros y saith mlynedd flaenorol. Felly, nid ciplun statig yw'r data a gynhyrchwyd, ond model dynamig o economi ddigidol Cymru fel y mae wedi datblygu dros amser, fel ymateb i amodau economaidd lleol a chenedlaethol, polisïau llywodraeth a siociau oddi allan megis Brexit a Covid-19, yr holl ffordd hyd at yr argyfwng costau byw presennol.

Disgrifir y metrigau a fesurwyd gan yr astudiaeth hon ar y tudalennau canlynol.

## Digital Metrics

Foresight SI visited the websites associated with each of the companies in the sample and rated them according to a series of metrics measuring different aspects of their digital behaviour.

By accessing archived online data dating back to 2016, Foresight SI was able not only to analyse each company's digital presence as it was at the time of the study (early 2023), but also as it had developed over the past seven years. The data produced, therefore, is not a static snapshot, but a dynamic model of Wales' digital economy as it has evolved over time, in response to local and national economic conditions, government policies and exogenous shocks such as Brexit and Covid-19, right up to the current cost of living crisis.

The metrics measured by this study are described on the following pages.

## 1. Twf Digidol

Ffordd o fesur cyfradd a maint gweithgareddau cynnal a chadw gwefannau dros amser, sy'n adlewyrchu'r amser a'r adnoddau y mae cwmni'n eu neilltuo i gynnal, diweddaru ac estyn eu presenoldeb digidol.

Mae cynnal a chadw gwefan yn weithgaredd rheolaidd, a pharhaus mewn llawer o achosion. Drwy fesur anwadaliadau yn y gweithgaredd hwn, ar lefel cwmni a hefyd ar raddfa, nid yn unig y gellir arsylwi ar wahaniaethau rhwng sut y mae gwahanol fusnesau, rhanbarthau neu ddiwydiannau'n rheoli eu presenoldeb digidol, ond gellir olrhain hefyd sut y mae cwmnïau'n ymateb i brosesau ehangach mewn cymdeithas ac yn yr economi. Er enghraifft, fel y manylir yn yr adran Canfyddiadau, mae data'r metrig hwn yn adlewyrchu cynnydd cyffredinol amlwg o ran Twf Digidol ar draws economi Cymru fel ymateb i'r pandemig Covid-19 a hefyd i'r ymchwydd mewn chwyddiant a ddechreuodd ar ddechrau 2022.

Mae Twf Digidol yn ffordd sensitif iawn o fesur agwedd cwmnïau at eu presenoldeb digidol, ac mae canlyniadau'r arolwg hwn yn awgrymu bod cydberthyniad ystyrlon rhwng hynny a nodweddion masnachol ystyrlon eraill megis hyder busnes. Mae metrig Twf Digidol Foresight SI yn cynhyrchu graff dros amser sy'n hynod o debyg i siâp Indecs Hyder Busnes y DU.

## 1. Digital Growth

A measure of the rate and volume of website maintenance activity over time, reflecting the time and resources a company is putting in to maintaining, updating and extending its digital presence.

Website maintenance is a regular and in many cases ongoing activity. By measuring fluctuations in this activity, both at a company level and at scale, it is possible not only to observe differences in how various businesses, regions or industries manage their digital presence, but also to track how companies are reacting to broader social and economic processes. For instance, as detailed in the Findings section, the data for this metric reflects marked overall increases in Digital Growth across the Welsh economy in response to both the Covid-19 pandemic and the inflation surge which began in early 2022.

Digital Growth is a highly sensitive measurement of the attitude companies take to their digital presence, which, the results of this survey suggest, can be meaningfully correlated with other commercially meaningful characteristics such as business confidence. Foresight SI's Digital Growth metric produces a graph over time that mirrors the shape of the UK Business Confidence Index remarkably closely.

## 2. Aeddfedrwydd Digidol

Ffordd o fesur aeddfedrwydd cyffredinol yr hyn sydd gan gwmni i'w gynnig ar y we o gymharu â'i gymheiriaid, gan adlewyrchu amrywiaeth o wahanol briodweddau gan gynnwys hygyrchedd, defnyddio technolegau megis botiau sgwrsio a nodweddion e-fasnach, presenoldeb polisïau perthnasol (er enghraifft, preifatrwydd a diogelu data) a chysylltau â chyfrifon cyfryngau cymdeithasol, ymysg eraill. Mae metrig Aeddfedrwydd Digidol Foresight SI yn cyfuno'r cydrannau hyn a chydrannau eraill wedi'u pwysoli i roi sgôr rhwng 0 (y lleiaf digidol aeddfed) a 50 (y mwyaf digidol aeddfed) sydd wedi'i gyfrifo gan ddefnyddio sgorau cymedrig y cwmnïau yn y sampl.

Mae'r metrig hwn yn dangos i ba raddau y mae cwmnïau'n ymgorffori technolegau newydd ac arferion gorau yn eu presenoldeb digidol. Gall ddangos soffistigeiddrwydd digidol cwmni o gymharu â'i gymheiriaid; lefelau gwahanol yr aeddfedrwydd digidol a ddangosir mewn gwahanol ddiwydiannau neu ranbarthau; neu newidiadau i aeddfedrwydd digidol dros amser, i'r fath raddau nes ei fod yn gweithio fel mesur dirprwyol ar gyfer defnyddio technolegau digidol.

## 2. Digital Maturity

A measure reflecting the overall maturity of a company's web offering relative to its peers, reflecting a range of different properties including accessibility, use of technologies like chat bots and e-commerce functions, the presence of relevant policies (for instance, privacy and data protection) and links to social media accounts, amongst others. Foresight SI's proprietary Digital Maturity metric is aggregated from these and other weighted components to provide a score between 0 (the least digitally mature) and 50 (the most digitally mature) calculated using the mean score of the sample companies.

This metric provides an indication of the extent to which companies are incorporating new technologies and best practices into their digital presence. It can demonstrate the digital sophistication of a company relative to its peers; the different levels of digital maturity exhibited by different industries or regions; or changes in digital maturity over time, to the extent that it acts as a proxy measure for take-up of digital technologies.

### 3. Sgôr Arloesi

Ffordd o fesur i ba raddau y mae proffil digidol cwmni'n ymdebygu i broffil cwmni â nodweddion arloesol, sydd wedi'i gyfrifo gan rwyd niwral sydd wedi'i hyfforddi i adnabod y priodweddau arsylladwy sy'n gysylltiedig â phresenoldeb digidol cwmnïau arloesol iawn. Hyfforddwyd y rhwyd niwral ar gorpws o briodweddau digidol 10,000 o gwmnïau â hanes profedig o arloesi.

Mae sgôr Arloesi pob Awdurdod Unedol (AU) a phob rhanbarth yn gyfartaledd sgorau'r busnesau yn y sampl sydd yn yr AU neu'r rhanbarth dan sylw. Yn yr un modd, mae sgôr cenedlaethol Cymru yn gyfartaledd sgorau Arloesi'r holl fusnesau yn y sampl. Mae graddfa'r metrig rhwng 0 ac 1 – sero yw'r sgôr isaf posibl ac 1 yw'r uchaf, yn erbyn model y rhwyd niwral. Felly, mae'r graffiau hefyd yn dangos graddfa o 0-1, sy'n dangos ble mae Arloesi cyfartalog Cymru o'i gymharu â'r model.

Yn wahanol i Dwf Digidol, nid yw arloesi'n fetrig sy'n tueddu i gynyddu na lleihau'n sydyn a dramatig dros amser. Felly, i ddehongli'r metrig hwn mae angen ystyried y cyfeiriad teithio, sefydlogrwydd y teithio a'i safle o gymharu ag 1 ar y graff. Yn gryno - a yw'n mynd i fyny ynteu i lawr? A yw'n symud ar hyd llinell gyson a pharhaus? A sut mae'n cymharu â'r sgôr uchaf posibl (1)?

### 3. Innovation Score

A measure of the degree to which a company's digital profile resembles that of a company with innovative characteristics, calculated by a neural net which has been trained to recognise the observable properties associated with the digital presence of highly innovative companies. The neural net was trained on a corpus of the digital properties of 10,000 companies with a proven track record of innovation.

The Innovation score for each Unitary Authority (UA) and region is an average of the scores of businesses in the sample for that UA or region. Likewise, the Welsh national score is an average of all of the Innovation scores of the businesses in the sample. The metric scale is between 0 and 1, with zero being the lowest and 1 the highest possible score, against the neural net model. The graphs therefore also show a scale of 0-1, showing where the Welsh average Innovation lies relative to the model.

Innovation, unlike Digital Growth, is a metric that is not given to sudden, dramatic increases or decreases over time. The key to interpreting this metric, therefore, lies in the direction of travel, stability of travel and its position relative to 1 on the graph. In short - is it going up or down? Is it moving in a sustained and constant line? And where does it sit in relation to the highest possible score (1)?

### 4. Sgôr Llywodraethu Amgylcheddol, Cymdeithasol a Chorfforaethol (LlAC)

Ffordd o fesur i ba raddau y mae'r testun ar wefan cwmni ac ar ddeunyddiau eraill sydd ar gael i'r cyhoedd yn dangos ymrwymiad i'r gwerthoedd a'r pryderon a gynrychiolir gan fframweithiau LlAC, sydd wedi'u meincnodi yn erbyn tueddiadau byd-eang. Mae'r sgôr LlAC yn ystyried presenoldeb polisïau, i ba raddau y trafodir LlAC ar eiddo digidol cwmnïau a pha mor bwysig yw'r cysyniadau a ddefnyddir yn y cyd-destun hwn. Mae'r sgôr LlAC yn seiliedig ar fodel o ymgysylltu rhagweithiol, felly gall y sgôr fod yn negatif neu'n bositif. Mae'r metrig LlAC yn cael sgôr ar raddfa o -1 i 1; 1 yw'r sgôr mwyaf posibl. Mae sgorau positif, uwchben sero, yn dangos ymgysylltu rhagweithiol ac i ba raddau o'i gymharu â thueddiadau byd-eang. Mae sgorau negatif yn adlewyrchu diffyg ymgysylltu, ac i ba raddau.

### 5. Defnyddio Cymraeg

Ffordd o fesur faint o Gymraeg sy'n ymddangos ar draws presenoldeb digidol cwmni. Yn syml, mae'r mesur hwn yn cyfrif nifer y gwefannau yn y sampl sy'n defnyddio testun Cymraeg yn ddigon helaeth i gael ei ganfod (h.y. paragraffau neu ddarnau cyfan o destun yn hytrach nag ambell air neu frawddeg). Mae'r adroddiad hwn yn nodi'r niferoedd sy'n defnyddio Cymraeg ym mhob Awdurdod Unedol, ym mhob rhanbarth ac yn genedlaethol, yn ogystal â'r canrannau.

### Benefits of This Approach

Fel modd o fesur aeddfedrwydd digidol ar draws economi Cymru, mae gan y dull hwn lawer o fanteision:

- Gellir mesur yn gyflym, dro ar ôl tro ac yn rheolaidd, sy'n golygu y gellir olrhain newid bron mewn amser real.
- Gellir cynhyrchu data yn gyflym i olrhain effaith tueddiadau economaidd newydd. Er enghraifft, mae effaith y chwyddiant byd-eang yn 2022 yn ymddangos yn glir yn y data yn gynnar dros ben, wrth i gwmnïau addasu eu presenoldeb digidol i ymdrin â'r realiti economaidd newydd.
- Drwy ddefnyddio sampl strwythuredig, gall y dull hwn gyflwyno darlun cymesur gynrychiadol o boblogaeth BBaCh Cymru, yn wahanol i arolygon confensiynol sy'n anochel yn dibynnu ar ddod o hyd i fusnesau sy'n fodlon ymateb i holiadur, ac yn gallu gwneud hynny.
- Yn hytrach na dibynnu ar fusnesau i gofnodi eu buddsoddiad digidol eu hunain, mae'r dull hwn yn mesur eu hymddygiad digidol yn uniongyrchol.
- Drwy sganio digidol, gall y dull hwn ddadansoddi sampl llawer mwy nag arolwg confensiynol.
- Am symiau cymharol fach o amser ac adnoddau, gellir defnyddio'r dull hwn â phoblogaethau busnes eraill (er enghraifft, yn Lloegr neu'r UE) gan ganiatáu cymariaethau uniongyrchol rhwng Cymru ac economïau eraill.

Fel y'i defnyddir ar hyn o bryd, mae gan y fethodoleg hon nifer o gyfyngiadau hefyd. Trafodir y rhain, ynghyd â strategaethau posibl i'w lliniaru neu eu dileu, yn y Casgliad.

### 4. Environmental, Social and Corporate Governance (ESG) Score

A measure of the degree to which the text on a company's website and other publicly available materials demonstrates an engagement with the values and concerns represented by ESG frameworks, benchmarked against global trends. The ESG score takes into account the presence of policies, the degree to which ESG is discussed on companies' digital properties and the salience of the concepts used in this context. The ESG score is based on a model of proactive engagement, therefore the score can be negative as well as positive. The ESG metric is scored on a scale of -1 to 1, with the highest possible score being 1. Positive scores, above zero, show proactive engagement and the degree of proactive engagement relative to global trends. Negative scores reflect a lack of engagement, and the degree of that lack.

### 5. Welsh Language Use

A measure of the prevalence of the Welsh Language across a company's digital presence. This measure simply counts the number of websites in the sample that use Welsh language text to a significant enough extent that it can be detected (i.e, whole paragraphs or chunks of text rather than occasional words or phrases). This report provides the use of Welsh language as a number per Unitary Authority, region and nationally, and as percentages.

### Benefits of This Approach

As a means of measuring digital maturity across the Welsh economy, this approach brings several benefits:

- Measures can be taken quickly, repeatedly and at regular intervals, meaning that change can tracked in near real-time.
- Data can be quickly produced to trace the impact of new economic trends. For instance, the impact of global inflation in 2022 shows up clearly in the data at an extremely early stage, as companies recalibrated their digital presence to deal with this new economic reality.
- By using a structured sample, this approach is able to present a proportionally representative picture of the Welsh SME population, unlike conventional surveys which inevitably depend on finding businesses that are willing and able to respond to a questionnaire.
- Instead of depending on businesses to self-report digital investment, this approach provides a direct measure of their digital behaviour.
- Digital scanning allows this method to address a much larger sample size than a conventional survey.
- With a relatively small expenditure of time and resources, this method can be applied to other business populations (for example, in England or the EU), allowing for direct comparisons between Wales and other economies.

As it is currently implemented, this methodology also has a some limitations. These will be discussed, along with potential strategies for mitigating or eliminating them, in the Conclusion.

## Ymchwil Desg

I roi canfyddiadau'r arolwg hwn yn eu cyd-destun, edrychodd y tîm ymchwil ar nifer o arolygon ac adroddiadau a oedd yn bodoli eisoes, yn enwedig fersiynau blaenorol yr Arolwg Aeddfedrwydd Digidol a gynhaliwyd gan Brifysgol Caerdydd, sy'n helpu i roi'r canfyddiadau meintiol ac ansoddol yn eu cyd-destun. Mae'r ymchwil desg a gynhaliwyd yn ymdrin â llenyddiaeth ddiweddar am gyflwr parodrwydd digidol, mabwysiadu a digidoleiddio BBaCh y DU ar ôl Covid-19 (ERC 2022, Lloyds 2022, SCDE); effeithiau mabwysiadu'n gynnar neu'n ddiweddarach yn economi ddigidol y DU (Russo 2016, Tranos et al. 2020); adroddiadau ac arolygon diweddar am economi BBaCh Cymru (Banc Datblygu Cymru 2022, Llywodraeth Cymru 2021); busnesau bach yn y DU (FSB 2022, ERC 2021); yr economi BBaCh wledig ledled y DU ac yng Nghymru (Morris eat al. 2022, Salemink 2021, Tiwaseng et al. 2022, Wilson et al. 2018); TGCh mewn cymunedau gwledig (Wallace a Vincent 2016); a methodolegau data gwe (Stich et al. 2021, Tranos et al. 2022). Hefyd, edrychodd y tîm ymchwil ar ddata SYG perthnasol. I gael rhestr lawn, gweler y llyfryddiaeth.

## Cyfweliadau

I ategu'r gwaith o ddadansoddi canfyddiadau'r arolwg a rhoi'r data meintiol yn eu cyd-destun, cynhaliodd y tîm ymchwil hefyd gyfres o gyfweliadau lled-strwythuredig â grŵp dethol o atebwyr. Dewiswyd yr atebwyr naill ai am eu bod mewn swyddi strategol bwysig yn economi Cymru, neu fel cynrychiolwyr categori busnes arwyddocaol. Maent yn cynnwys:

- **Cyfarwyddwr ymgynghoriaeth fawr yn y sector preifat sy'n darparu cymorth i fusnesau**
- **Cynghorydd mewn ymgynghoriaeth fawr yn y sector preifat sy'n darparu cymorth i fusnesau**
- **Rheolwr cyflymydd egin fusnesau**
- **Cyfarwyddwr Anweithredol mewn banc buddsoddi**
- **Cyfarwyddwr Buddsoddi mewn banc buddsoddi**
- **Cyfarwyddwr cwmni gwasanaethau busnes â phresenoldeb digidol soffistigedig**
- **Prif Weithredwr egin fusnes iechyd a gofal cymdeithasol**
- **Rheolwr Ymgysylltu rhaglen rhwydweithio busnesau a chefnogi twf**
- **Prif Swyddog Gweithredu egin fusnes technoleg**
- **Perchennog-Reolwr cwmni bach dylunio a lletya gwe**
- **Perchennog microfusnes â phresenoldeb gwe gweithgar**
- **Prif Weithredwr egin fusnes deallusrwydd artiffisial ar gyfer gofal iechyd**
- **Pennaeth Ymchwil ac Arloesi sefydliad sector cyhoeddus**

Diben cyfweliadau lled-strwythuredig yw canfod safbwyntiau ansoddol i'w defnyddio i roi cyd-destun i'r data digidol a gynhyrchwyd ar gyfer yr arolwg hwn. Roedd y cyfweliadau ar gyfer yr arolwg hwn wedi'u llunio i ganiatáu i'r atebwyr roi syniad cyffredinol o'u safbwynt a'u profiadau mewn perthynas â digidoleiddio ac economi Cymru, ac i'w hannog i awgrymu safbwyntiau ymholi na fyddai'r tîm ymchwil o bosibl wedi meddwl amdanynt fel arall. Cafodd y trawsgrifiadau eu codio mewn themâu i gynrychioli'r testunau pwysicaf a gododd o'r sgyrsiau hyn.

### Desk Research

To contextualise the findings of this survey, the research team consulted a number of extant surveys and reports, not least the previous iterations of the  Digital Maturity Survey carried out by Cardiff University, which help to contextualise the quantitative and qualitative findings. The desk research carried out covers recent literature on the state of digital readiness, adoption and digitalisation of UK SMEs after Covid-19 (ERC 2022, Lloyds 2022, OECD); effects of early versus later adoption in the UK digital economy (Russo 2016, Tranos et al. 2020); recent reports and surveys on the Welsh SME economy (Welsh Dev Banc 2022, Welsh Government 2021); small businesses in the UK (FSB 2022, ERC 2021); the rural SME economy across the UK and in Wales (Morris eat al. 2022, Salemink 2021, Tiwaseng et al. 2022, Wilson et al. 2018); ICT in rural communities (Wallace and Vincent 2016); and web data methodologies (Stich et al. 2021, Tranos et al. 2022). The research team also consulted relevant ONS data. For a full list, see the bibliography.

### Interviews

To support analysis of the survey findings and contextualise quantitative data, the research team also carried out a series of semi-structured interviews with a selected group of respondents. Respondents were chosen either because they occupy strategically important positions within the Welsh economy, or as representatives of a significant category of business.

They include:

- **Director of a large private sector business support consultancy**
- **Advisor at a large private sector business support consultancy**
- **Manager of a start-up accelerator**
- **Non-executive Director at an investment bank**
- **Director of a business services company with a sophisticated digital presence**
- **CEO of a health and social care start-up**
- **Engagement Manager for a business networking and growth support programme**
- **Chief Operations Officer at a tech start-up**
- **Chief Technology Officer at a tech start-up**
- **Owner-Manager of a small web design and hosting company Owner of a micro-business with an active web presence**
- **CEO of an AI for healthcare start-up**
- **Head of Research and Innovation for a public sector organisation**

The purpose of semi-structured interviews is to gain qualitative insights with which to contextualise the digital data generated for this survey. The interviews for this survey were designed to allow respondents to broadly articulate their perspective and experiences in relation to digitalisation and the Welsh economy, and to encourage them to suggest angles of inquiry which may not otherwise have occurred to the research team. Transcripts were coded into themes representing the most significant topics which emerged from these conversations.

# CANFYDDIADAU MEINTIOL
# QUANTITATIVE FINDINGS

# CANFYDDIADAU MEINTIOL
# QUANTITATIVE FINDINGS

Mae'r adran hon yn rhoi crynodeb o ganfyddiadau pwysicaf Arolwg Aeddfedrwydd Digidol Cymru 2023. Cyflwynir y rhain fel cyfres o drosolygon lefel uchaf o'r canfyddiadau ar gyfer pob metrig allweddol, gan ddechrau gyda'r canfyddiadau cenedlaethol, ac yna'n trafod canfyddiadau'r awdurdodau rhanbarthol ac unedol.

This section comprises a summary of the most significant findings of the Welsh Digital Maturity Survey 2023. These are presented as a series of top level overviews of the findings for each key metric, starting with the national findings, and then discussing the regional and unitary authority findings.

**Canfyddiadau: Lefel Genedlaethol**

Yn genedlaethol, mae'r canfyddiadau'n dangos newid cadarnhaol mewn Aeddfedrwydd Digidol, Arloesedd, Twf Digidol ac Amgylcheddol, Cymdeithasol a Llywodraethu (LIAC) ers 2016, gyda thwf digidol ac aeddfedrwydd yn cyflymu'n amlwg rhwng 2020-2021

**Findings: National Level**

Nationally, the findings show positive change in Digital Maturity, Innovation, Digital Growth and Environmental, Social and Governance (ESG) since 2016, with digital growth and maturity accelerating noticeably between 2020-2021.

## Digital Maturity

Ar y cyfan, **mae busnesau Cymru wedi dangos twf cymedrol o ran Aeddfedrwydd Digidol (AD) ers 2016**, ac yn enwedig ers dechrau'r pandemig Covid-19 yn 2020. Mae hyn yn adlewyrchu cynnydd bach ond arwyddocaol yn soffistigeiddrwydd y modd y mae'r busnes cyfartalog yn defnyddio technoleg ddigidol yn eu presenoldeb ar-lein.

**Cofnodwyd y gwelliant hwn ym mhob un o'r saith sector busnes** a gafodd sylw yn yr arolwg hwn. Digwyddodd cynyddiadau arbennig o fawr yn y sector Masnach Cyfanwerthu ac Adwerthu; Atgyweirio Cerbydau Modur a Beiciau Modur a'r sector Cludiant a Storio. Yn yr un modd, **cofnododd pob awdurdod unedol yng Nghymru gynnydd yn y sgôr AD cyfartalog dros yr un cyfnod**.

O'r data hyn, mae'n amlwg bod **pob sector busnes yn yr arolwg hwn yn defnyddio ei ddull ei hun o ran defnyddio gwefannau**. Er enghraifft, mae AD cwmnïau yn y categori Gwasanaethau Busnes ac Eraill wedi bod yn llawer uwch na chwmnïau Gweithgareddau Gwasanaethau Llety a Bwyd ers 2016 er bod y ddau sector wedi gwella dros y cyfnod.

**Mae'r gwahaniaethau rhwng AD awdurdodau unedol wedi aros yn sefydlog dros amser**; Ceredigion a gafodd y cyfartaledd uchaf yn 2016 ac yn 2023. Nid yw'n syndod bod lefelau AD yn uchel iawn yn Abertawe a Chaerdydd, ac mae'r ddau wedi gwella'n gyson ers 2016.

Efallai mai'r effaith fwyaf sydd i'w gweld yn y data hyn yw'r newidiadau i AD dros amser yn y wlad gyfan. **Gostyngodd lefelau cyfartalog AD o 2017 ymlaen, gan gyrraedd isafbwynt yn 2019. Bu gwelliant cyflym yng Ngwanwyn 2020, i gyd-daro â dechrau'r pandemig Covid-19**, pan saethodd sgorau AD yn ôl i fyny i lefelau 2017 yn gyflym cyn codi'n uwch na'r lefelau hyn erbyn 2023.

## Digital Maturity

Overall, **Welsh businesses have demonstrated a modest growth in Digital Maturity (DM) since 2016**, and particularly since the onset of the Covid-19 pandemic in 2020. This reflects a small but significant increase in the sophistication of the average business's use of digital technology in its online presence.

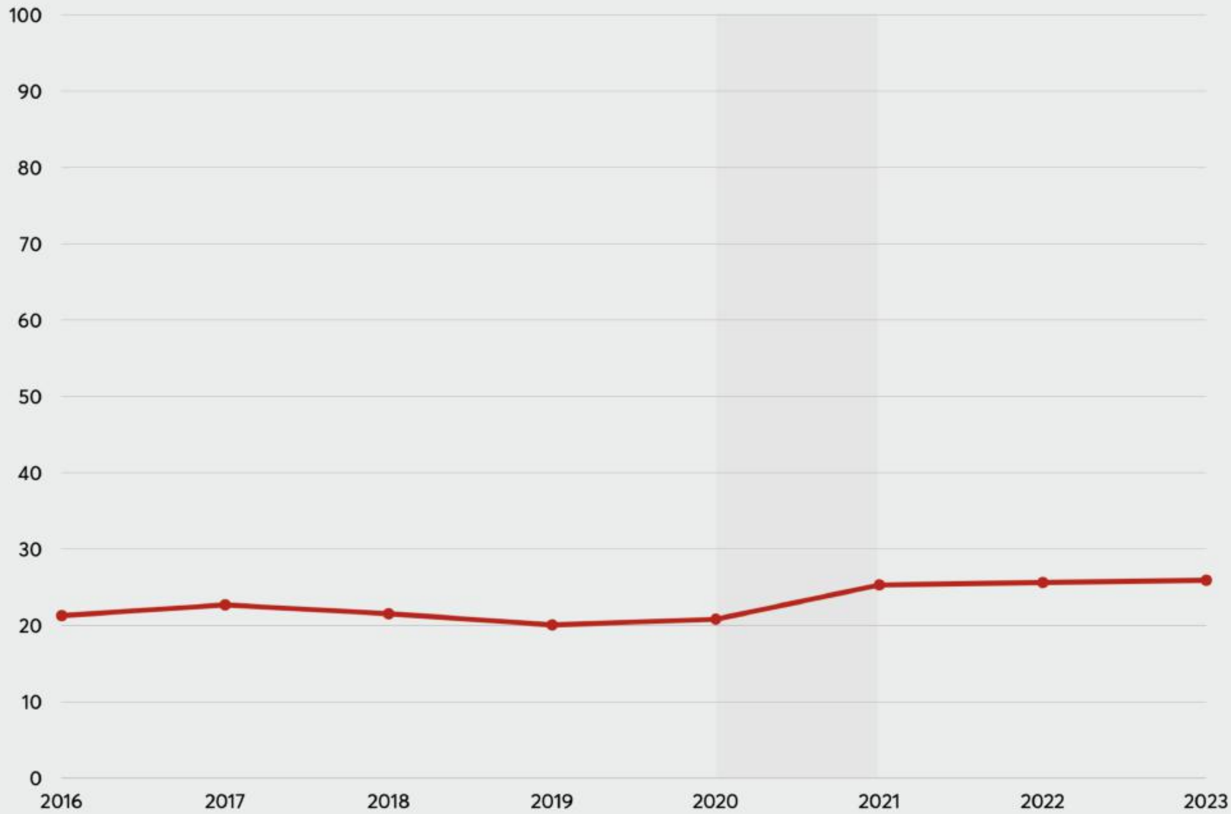
This **improvement was registered across all seven business sectors** covered in this survey. Especially large gains occurred in both the Wholesale and Retail trade; Repair of Motor Vehicles and Motorcycles and the Transportation and Storage sectors. Similarly, **each of Wales' unitary authorities recorded an increase in average DM score over the same time period**.

From these data it is clear that **each business sector in this survey has a distinct approach when it comes to the use of their websites**. For example, companies in the Business and Other Services category have had a much higher DM than Accommodation and Food Service Activities companies since 2016 although both sectors have improved over that time.

**Differences in DM between unitary authorities have remained stable over time**, with Ceredigion returning the highest average in 2016 and 2023. Unsurprisingly Swansea and Cardiff both have very high levels of DM and have steadily improved since 2016.

Perhaps the largest effect to be found in these data comes from the changes in DM over time for the country as a whole. **Average levels of DM declined from 2017, reaching a low point in 2019. The Spring of 2020, coincident with the onset of the Covid-19 pandemic, saw a rapid recovery**, with DM scores quickly reaching the levels achieved in 2017 and then exceeding these levels in 2023.

# WELSH NATIONAL AVERAGE: DIGITAL MATURITY 2016-2023




## MANYLION GRAFF / GRAPH DETAIL

**Aeddfedrwydd Digidol Cyfartalog Cenedlaethol Cymru 2016-2023 -** Efallai mai'r effaith fwyaf sydd i'w gweld yn y data hyn yw'r newidiadau i AD dros amser yn y wlad gyfan. Gostyngodd lefelau cyfartalog AD o 2017 ymlaen, gan gyrraedd isafbwynt yn 2019. Bu gwelliant cyflym yng Ngwanwyn 2020, i gyd-daro â dechrau'r pandemig Covid-19, pan saethodd sgorau AD yn ôl i fyny i lefelau 2017 yn gyflym cyn codi'n uwch na'r lefelau hyn erbyn 2023.

**Welsh National Average: Digital Maturity 2016-2023** Perhaps the largest effect to be found in these data comes from the changes in DM over time for the country as a whole. **Average levels of DM declined from 2017, reaching a low point in 2019. The Spring of 2020, coincident with the onset of the Covid-19 pandemic, saw a rapid recovery**, with DM scores quickly reaching the levels achieved in 2017 and then exceeding these levels in 2023.

## Twf Digidol

**Cynyddodd lefel Twf Digidol (TD)** - cyfradd fuddsoddi cwmnïau mewn cynnal, gwella ac estyn eu gwefannau - **dros amser ar gyfer y sampl o fusnesau Cymru yn yr arolwg hwn.**

Gwelwyd yr effaith hon ym mhob sector busnes a gafodd sylw gan yr arolwg, ac ym mhob awdurdod unedol yng Nghymru. Yn y **cyfnod o 2016 hyd 2019, roedd lefel Twf Digidol yn sefydlog ond yn gostwng, ac yna cynyddodd yn sydyn yng ngwanwyn 2020** wrth i gwmnïau ddechrau defnyddio mwy o'u heiddo digidol a thalu mwy o sylw i'w ddatblygu. Mae hyn yn arbennig o amlwg mewn busnesau adwerthu, ond digwyddodd ar draws pob sector.

Digwyddodd y newid mwyaf arwyddocaol i lefelau TD yn ystod Gwanwyn a Haf 2022 – cynnydd digynsail llawer mwy nag unrhyw ddigwyddiad arall yn y data yr holl ffordd yn ôl i 2016. Mae'r cynnydd rhyfeddol hwn yn cyd-daro â'r anwadalrwydd economaidd ar ôl codi cyfyngiadau symud Covid, gan gynnwys hwrdd o weithgareddau masnachol a rwystrwyd cyn hynny, rhwystrau yn y gadwyn gyflenwi, cynyddiadau cyflym iawn mewn chwyddiant a dechrau'r argyfwng costau byw. Er enghraifft, mae'r ymchwydd o ran Twf Digidol yn 2022 yn cyfateb yn agos i gynnyrch domestig gros (CDG) y DU – yn ôl amcangyfrif y Swyddfa Ystadegau Gwladol, cynyddodd hwnnw 4.1% yn 2022, ar ôl cynyddu 7.4% yn 2021.[6]

## Digital Growth

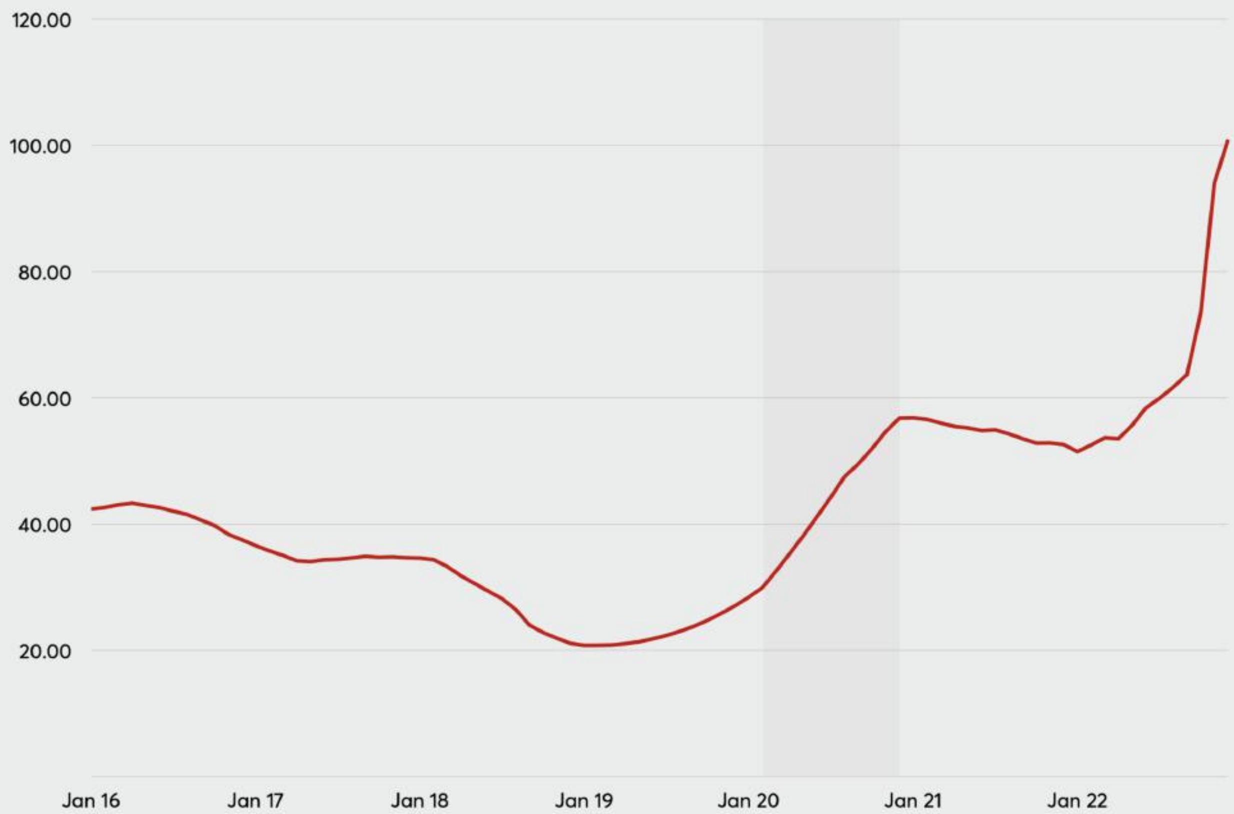
**The level of Digital Growth (DG)** - the rate at which companies invest in maintaining, improving and extending their websites - **increased over time for the sample of Welsh businesses in this survey.**

This effect was found in all business sectors covered by the survey and in all unitary authorities in Wales. The **period from 2016 to 2019 saw a stable but declining level of Digital Growth that increased sharply in the spring of 2020** as companies increased their use of and the attention they gave to the development of their digital properties. This is particularly apparent with respect to the retail trade but occurred across all sectors.

The most significant shift in DG levels occurred across the Spring and Summer of 2022, an unprecedented upswing that overshadowed any other event in the data going all the way back to 2016. This remarkable increase coincides with the economic volatility following the global lifting of Covid lockdown measures, including a burst of hitherto suppressed commercial activities, supply chain blockages, rapid rises in inflation and the beginnings of the cost-of-living crisis. For instance, the 2022 surge in Digital Growth can be tracked closely to UK GDP, which (according to the Office of National Statistics) was estimated to have grown by 4.1% in 2022, following growth of 7.4% in 2021.

[6] GDP monthly estimate, UK: December 2022 (ONS 2023) https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/gdpmonthlyestimateuk/december2022

# WELSH NATIONAL AVERAGE: DIGITAL GROWTH 2016-2023




## MANYLION GRAFF / GRAPH DETAIL

**Twf Digidol Cyfartalog Cenedlaethol Cymru 2016-2023**
Yn y cyfnod o 2016 hyd 2019, roedd lefel Twf Digidol yn sefydlog ond yn gostwng, ac yna cynyddodd yn sydyn yng ngwanwyn 2020 wrth i gwmnïau ddechrau defnyddio mwy o'u heiddo digidol a thalu mwy o sylw i'w ddatblygu.

**The Average level of Digital Growth across Wales**
The period from 2016 to 2019 saw a stable but declining level of Digital Growth that increased sharply in the spring of 2020 as companies increased their use of and the attention they gave to the development of their digital properties.

## Sgôr Arloesi

Yn chwech o'r saith mlynedd diwethaf y mae data ar gael ar eu cyfer, **mae'r sgôr Arloesi cyfanredol ar draws pob sector busnes yn yr arolwg wedi cynyddu bron i 1 pwynt**, gan godi cyfartaledd cenedlaethol Cymru o 0.30 yn 2016 i 0.37 yn 2023.

Ymysg y gwahanol sectorau busnes, **Gweithgareddau Gwasanaethau Llety a Bwyd oedd â'r sgôr uchaf yn 2016** ac erbyn hyn maent **yn ail y tu ôl i Fusnesau Gwybodaeth a Chyfathrebu, sydd â'r sgôr arloesi uchaf yn y sampl, sef 0.46**, a'r cynnydd mwyaf dros y saith mlynedd diwethaf. Cofnododd Cwmnïau Cludiant a Storio gynnydd tebyg o ddeg pwynt rhwng 2016 a 2023, ond o fan cychwyn llawer is.

Mae'n ddiddorol nodi bod y cynnydd lleiaf yn lefel **Arloesi rhwng 2016 a 2022 wedi digwydd mewn Cwmnïau Gweithgynhyrchu**. Mae'n ymddangos yn debygol bod arloesi mewn sectorau eraill wedi cael ei lywio'n sylweddol gan ddigwyddiadau megis Covid-19 a'r cynyddiadau mewn prisiau a ddechreuodd yn 2022, ac felly efallai y bydd y ffactorau hyn yn cymryd mwy o amser i ymddangos yn ymddygiad digidol cwmnïau gweithgynhyrchu. Er bod Busnesau Gwybodaeth a Chyfathrebu (er enghraifft) yn gallu newid eu harferion busnes neu eu harlwy masnachol yn gyflym iawn fel ymateb i ddigwyddiadau allanol, mae'n cymryd mwy o amser a gwariant cyfalaf i weithgynhyrchwyr wneud yr un peth.

**Mae lefel gyfartalog y gallu i arloesi yn isel ar y cyfan** â sgôr o 0.36, allan o sgôr uchaf posibl o 1, ar adeg ysgrifennu'r adroddiad hwn. Mae hyn yn bryder i bobl sy'n gweld rôl bwysig i arloesi o ran cynyddu cynhyrchedd cwmnïau ac fel ffordd o wella safonau byw.

Fodd bynnag, ar lefel fwy gronynnog, mae'r canlyniadau'n dangos bod **nifer o fusnesau arloesol iawn yng Nghymru**. Ni ellir gweld y busnesau unigol arloesol iawn hyn wrth edrych ar y sgôr cyfartalog cenedlaethol, ond maent yn dystiolaeth bod rhai meysydd arloesi'n ffynnu yng Nghymru. Argymhellir taro golwg fanylach ar rai o'r BBaCh mwyaf arloesol yng Nghymru; roedd hynny y tu hwnt i gwmpas yr arolwg hwn. Mae'n bosibl y gellid dysgu llawer o'u strategaethau a'u dulliau ar gyfer arloesi yng nghyd-destun Cymru.

## Defnyddio Cymraeg

Ar y cyfan, ychydig iawn o Gymraeg a ddefnyddiwyd gan y cwmnïau yn y sampl; roedd busnesau gwledig ddwywaith mor debygol o ddefnyddio Cymraeg ar eu gwefannau â'u cymheiriaid trefol.

- Roedd 13% o'r gwefannau yn yr arolwg yn cynnwys dwy neu fwy o ieithoedd.
- Mae'r cwmnïau sy'n defnyddio Cymraeg yn eu presenoldeb digidol yn tueddu i fod yn yr ardaloedd â'r cyfrannau uchaf o siaradwyr Cymraeg, er bod Caerdydd yn eithriad amlwg i'r rheol hon ac yn gartref i 20.14% o'r holl wefannau yn yr arolwg a oedd yn defnyddio rhywfaint o Gymraeg.

## Sgôr LIAC

Cynyddodd ymgysylltiad â materion LIAC ychydig bach ledled y wlad, er bod y lefel gyffredinol yn dal i fod yn isel o'i chymharu â'r meincnod.

## Innovation Score

In six of the last seven years for which data is available, **the aggregate Innovation score across all surveyed business sectors has increased by almost 1 point**, moving from a Welsh national average of 0.30 in 2016 to 0.37 in 2023.

Amongst the different business sectors, **Accommodation and Food Service Activities had the highest score in 2016** and are still **second only to Information and Communication Businesses, which at 0.46 have the highest innovation scor**e in the sample and the largest gain over the last seven years. Transportation and Storage Companies registered a similar gain of ten points between 2016 and 2023 but from a much lower base.

It is interesting to note that the increase in level of **Innovation between 2016 and 2022 is lowest for Manufacturing Companies**. If, as seems probable, innovation in other sectors has been driven substantially by events such as Covid-19 and the prices rises which began in 2022, it may be the case that these factors take longer to show up in the digital behaviour of manufacturing companies. Whilst Information and Communication Businesses (for example) are able to quickly shift their business practices or commercial offering in response to external events, it necessarily requires more time and capital expenditure for manufacturers to do the same.

**The average level of innovation capability is low overall** with a score of 0.36, out of a possible highest score of 1, at the time of writing. This is a concern for those who see a significant role for innovation in uplifting the productivity of companies and a source of improvement in living standards.

However, at a more granular level, the results shows that **there are a number of very highly innovative businesses in Wales**. The presence of these highly innovative actors is rendered invisible in a national average score, but is evidence of thriving areas of innovation in Wales. Out of scope for this survey, but a closer look at the most innovative SMEs in Wales is recommended. There may be much to learn from their strategies and approaches to innovation in the Welsh context.

## Welsh Language Use

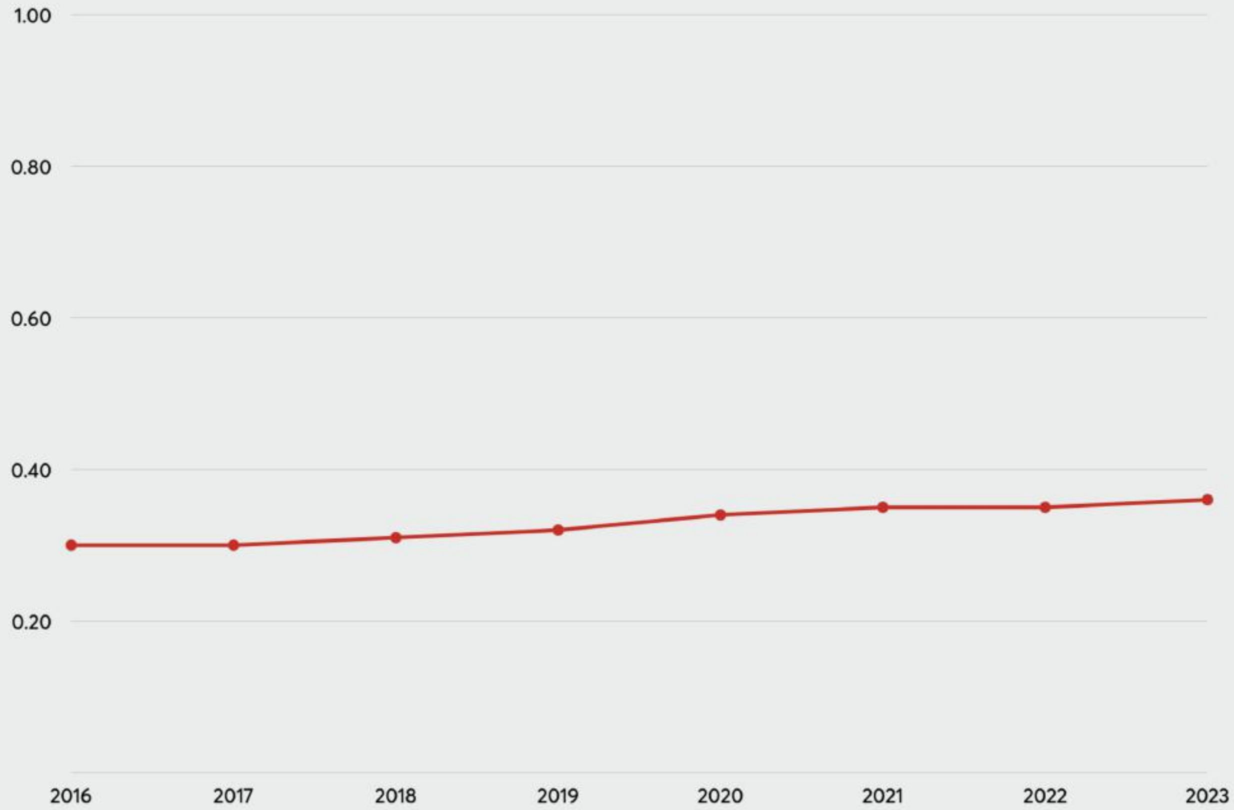
Overall, use of the Welsh language was very low amongst sampled companies, although rural businesses are twice as likely to use Welsh on their websites as their urban counterparts.

- 13% of websites surveyed contained two or more languages.
- Companies that do use Welsh in their digital presence tend to be concentrated in areas with the highest proportion of Welsh speakers, although Cardiff is a marked exception to this rule, being home to 20.14% of all websites surveyed which contained some use of the Welsh language.

## ESG Score

Engagement with Environmental, Social and Governance (ESG) issues rose slightly across the nation, although the overall level remains low relative to the benchmark.

# WELSH NATIONAL AVERAGE: INNOVATION SCORE 2016-2023

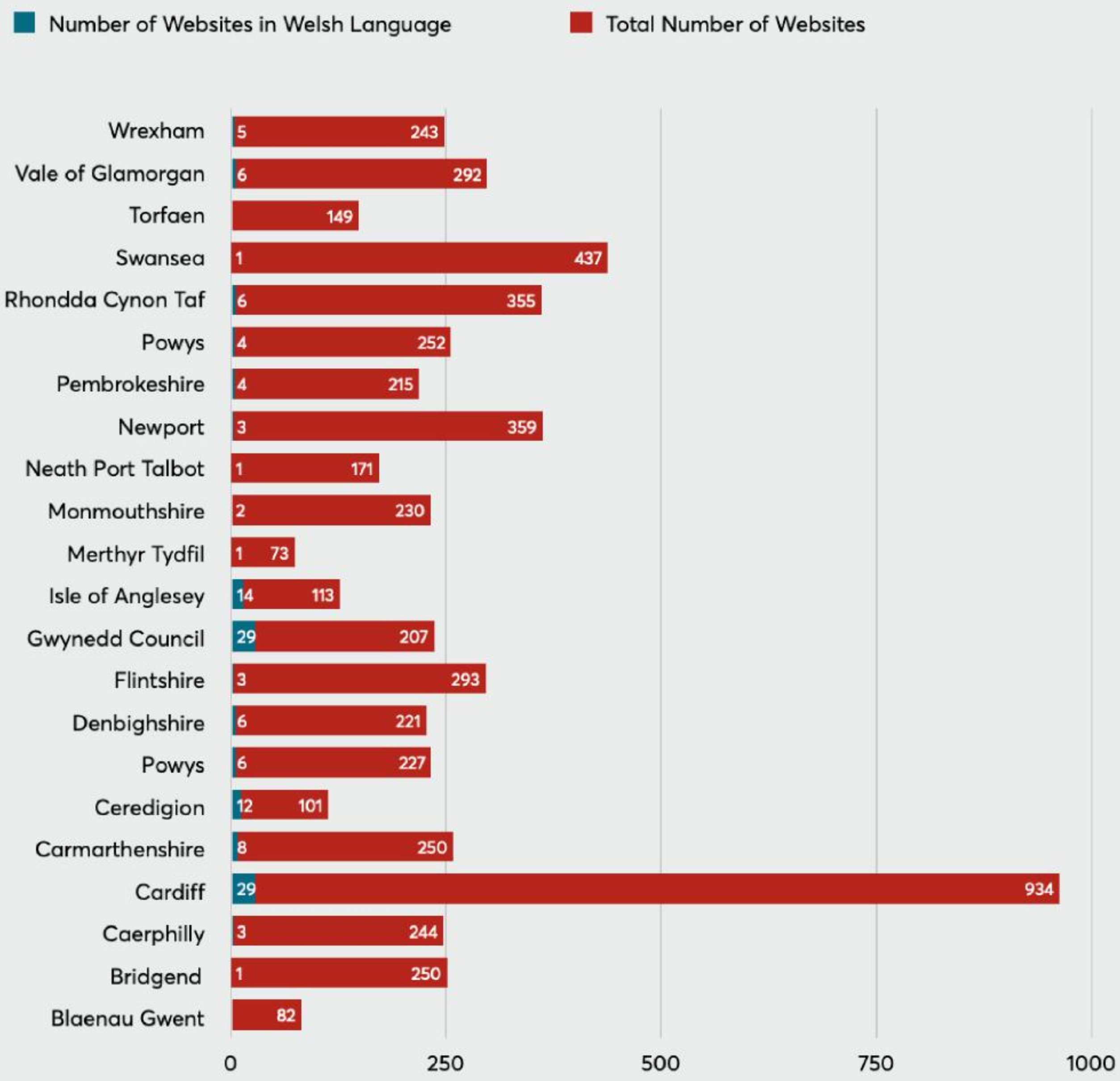



## MANYLION GRAFF / GRAPH DETAIL

**Arloesi Cyfartalog Cenedlaethol Cymru 2016-2023**
Yn chwech o'r saith mlynedd diwethaf y mae data ar gael ar eu cyfer, mae'r sgôr Arloesi cyfanredol ar draws pob sector busnes yn yr arolwg wedi cynyddu bron i 1 pwynt, gan godi cyfartaledd cenedlaethol Cymru o 0.30 yn 2016 i 0.37 yn 2023.

**Welsh National Average: Innovation Scores 2016-2023**
In six of the last seven years for which data is available, the aggregate Innovation score across all surveyed business sectors has increased by almost 1 point, moving from a Welsh national average of 0.30 in 2016 to 0.37 in 2023.

# REGIONAL WELSH LANGUAGE USE 2016 -2023




## MANYLION GRAFF / GRAPH DETAIL

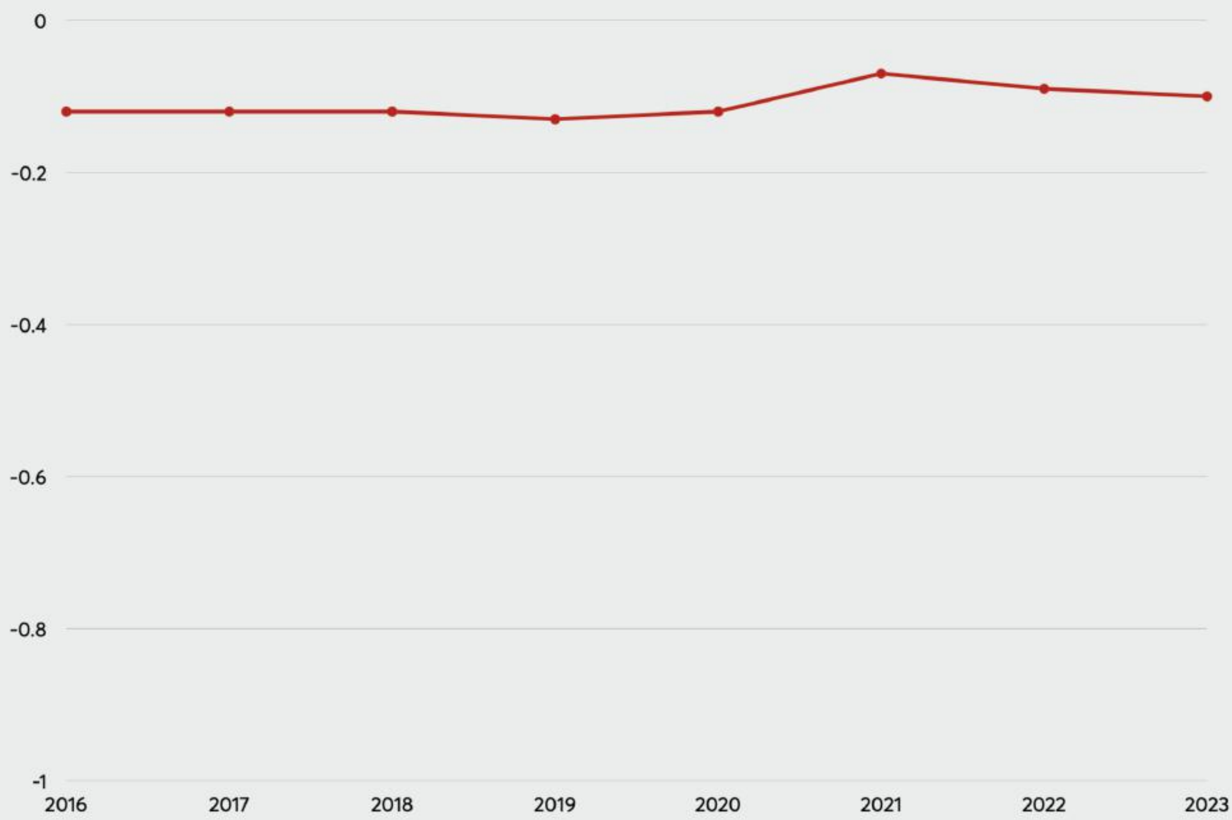
**Defnyddio Cymraeg**

Ar y cyfan, ychydig iawn o Gymraeg a ddefnyddiwyd gan y cwmnïau yn y sampl; roedd busnesau gwledig ddwywaith mor debygol o ddefnyddio Cymraeg ar eu gwefannau â'u cymheiriaid trefol.

**Welsh Language Use**

Overall, use of the Welsh language was very low amongst sampled companies, although rural businesses are twice as likely to use Welsh on their websites as their urban counterparts.

# WELSH NATIONAL AVERAGE: ESG SCORE 2016-2023




## MANYLION GRAFF / GRAPH DETAIL

**LIAC Cyfartalog Cenedlaethol Cymru 2016-2023**
Cynyddodd ymgysylltiad â materion LIAC ychydig bach ledled y wlad, er bod y lefel gyffredinol yn dal i fod yn isel o'i chymharu â'r meincnod.

**ESG Scores 2016-2023**
Engagement with ESG issues rose slightly across the nation, although the overall level remains low relative to the benchmark.

## Canfyddiadau: Lefel Ranbarthol

Yn yr adran hon rydym yn rhoi trosolwg o'r canlyniadau ar draws metrigau allweddol yr arolwg yng nghyd-destun y pedwar rhanbarth Cymreig, fel y'u dosbarthwyd gan yr arolygon Aeddfedrwydd Digidol blaenorol ers 2016: Gogledd Cymru (Ynys Môn, Conwy, Sir Ddinbych, Sir y Fflint, Gwynedd a Wrecsam), Canolbarth Cymru (Ceredigion a Phowys), De-ddwyrain Cymru (Sir Fynwy, Casnewydd, Caerdydd, Bro Morgannwg, Pen-y-bont ar Ogwr, Rhondda Cynon Taf, Merthyr Tudful, Blaenau Gwent, Caerffili a Thorfaen) a De-orllewin Cymru (Sir Gaerfyrddin, Sir Benfro, Castell-nedd Port Talbot ac Abertawe).

## Findings: Regional Level

In this section we give an overview of the results across the survey's key metrics in the context of the four Welsh regions, as classified by the previous Digital Maturity surveys since 2016: North Wales (Isle of Anglesey, Conwy Denbighshire, Flintshire, Gwynedd and Wrexham), Mid Wales (Ceredigion and Powys), South East Wales (Monmouthshire, Newport, Cardiff, Vale of Glamorgan, Bridgend, Rhondda Cynon Taf, Merthyr Tydfil, Blaenau Gwent, Caerphilly and Torfaen) and South West Wales (Carmarthenshire, Pembrokeshire, Neath Port Talbot and Swansea).

### Arloesi

Mae Canolbarth Cymru yn gyson yn cael y sgorau cyfartalog uchaf am Arloesi, rhwng 2016 a 2023, ac yn arwain 0.04 pwynt ar y blaen i'r rhanbarth yn yr ail safle, sef Gogledd Cymru - bwlch arwyddocaol sy'n gyfystyr â 4% ar ddechrau 2023. Roedd y bwlch rhwng Canolbarth a Gogledd Cymru ar ei leiaf yn 2021, ond wedi lledu eto erbyn 2022.

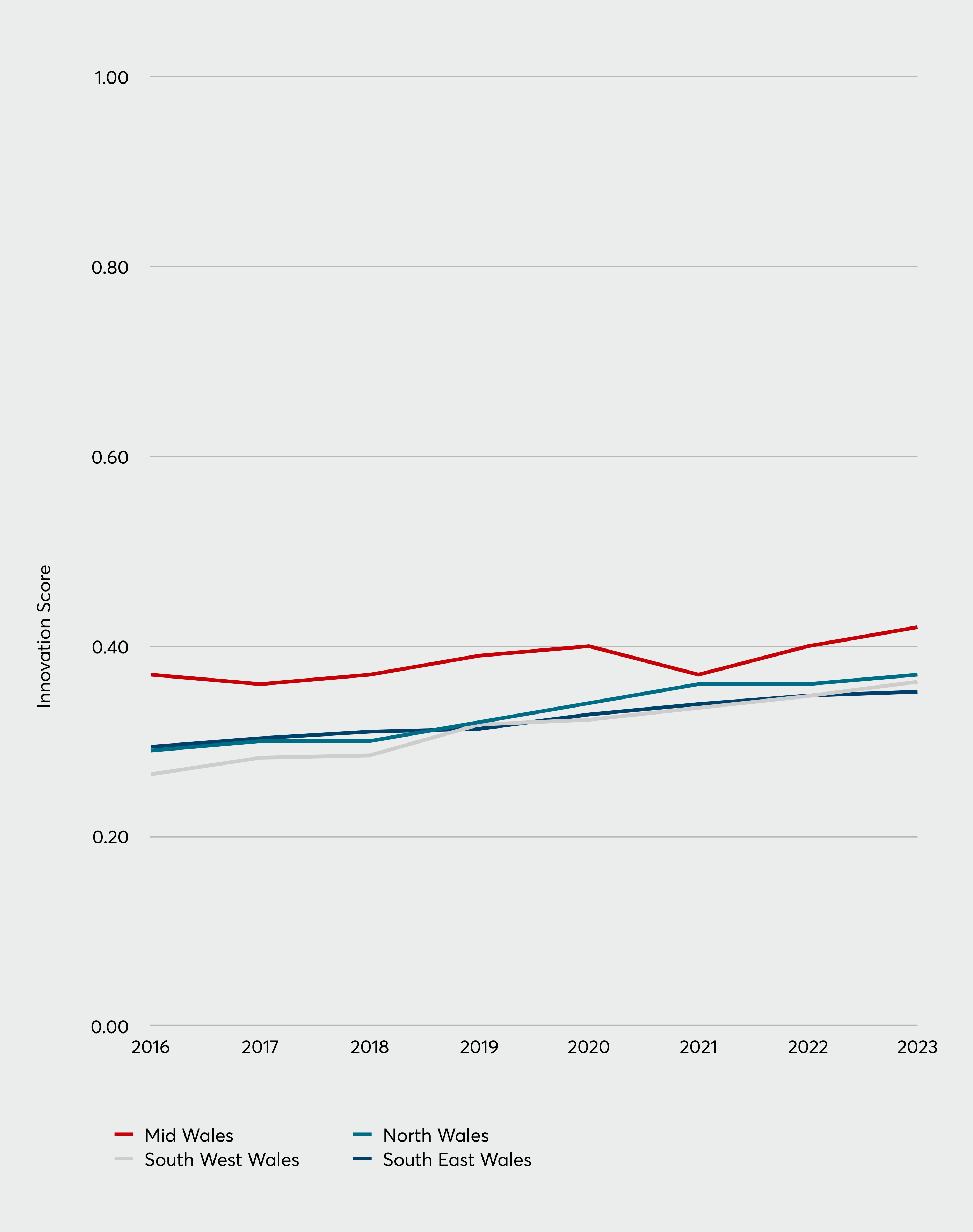
Mae graddfa'r mapiau - rhwng 0 ac 1 - yn ei gwneud yn anoddach deall arwyddocâd y gwahaniaeth hwn. Y rheswm dros eu rhoi ar y raddfa hon oedd er mwyn adlewyrchu'r sgorau mewn perthynas â'r amrediad o sgorau sydd ar gael; 1 yw'r sgôr uchaf posibl.

### Innovation

Mid Wales consistently scores highest on average for Innovation, between 2016 and 2023, leading with a significant 0.04 points above the next highest region, North Wales - equating to a 4% gap at the beginning of 2023. The gap between Mid and North Wales was at its smallest in 2021, but had diverged again by 2022.

The scale of the maps - between 0 and 1 - makes it harder to appreciate the significance of this difference. They are on this scale in order to reflect the scores relative to the range of scores available, with the highest possible being 1.

**Graph 5.**
Welsh Innovation by Region, 2016-2023



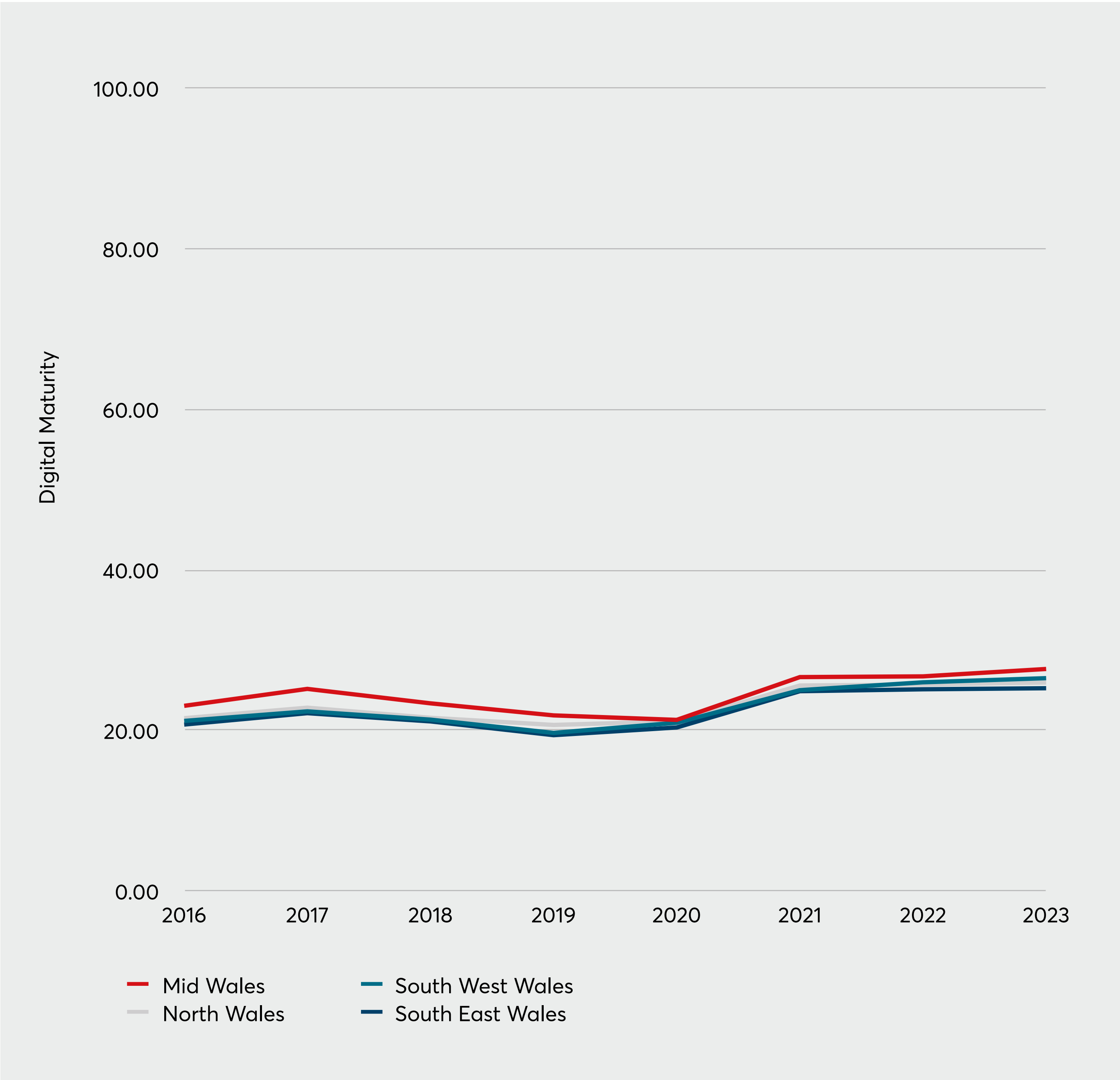
### Aeddfedrwydd Digidol

Mae Canolbarth Cymru hefyd yn gyson yn cael y sgorau cyfartalog uchaf am Aeddfedrwydd Digidol rhwng 2016 a 2023, 1.14% yn uwch na'r rhanbarth yn yr ail safle, sef De Orllewin Cymru, a 2.4% yn uwch na'r rhanbarth yn y safle olaf, sef De Ddwyrain Cymru, ar ddechrau 2023.

### Digital Maturity

Mid Wales also consistently scores highest on average for Digital Maturity between 2016 and 2023, 1.14% higher than the next highest region, South West Wales, and 2.4% higher than the lowest region, South East Wales, at the beginning of 2023.

**Graph 6.**
Welsh Digital Maturity by Region, 2016-2023



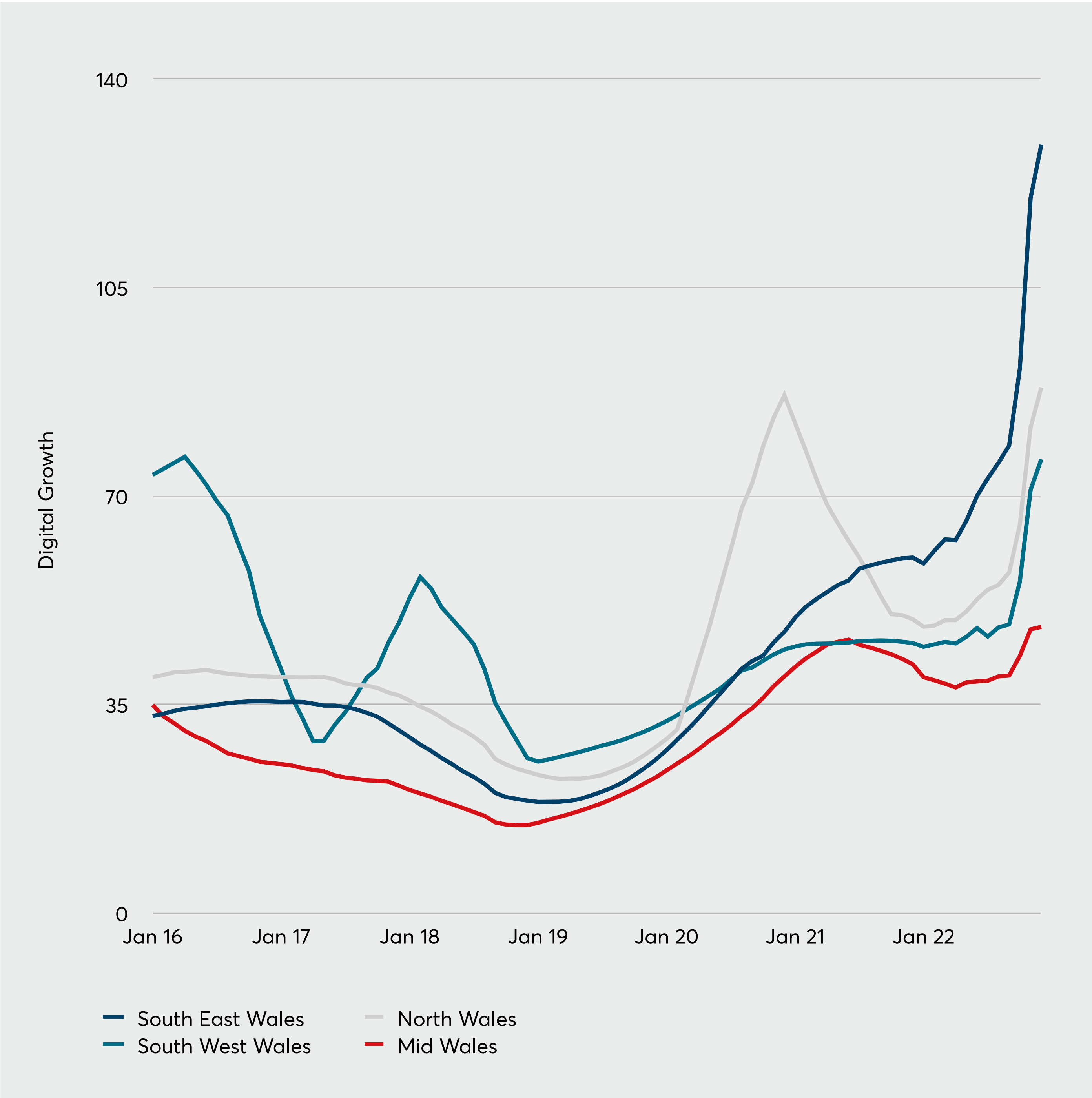
### Twf Digidol

Fodd bynnag, De Ddwyrain Cymru sy'n dangos y lefelau uchaf o ran Twf Digidol; maent wedi bod ar lwybr serth tuag i fyny ers 2021, dros ddwywaith a hanner yn fwy na'r twf lleiaf, yng Nghanolbarth Cymru.

### Digital Growth

South East Wales, however, shows the highest levels of Digital Growth, with a steep upwards trajectory since 2021, over two and a half times more than the lowest growth, in Mid Wales.

**Graph 7.**
Welsh Digital Growth by Region, 2016-2023



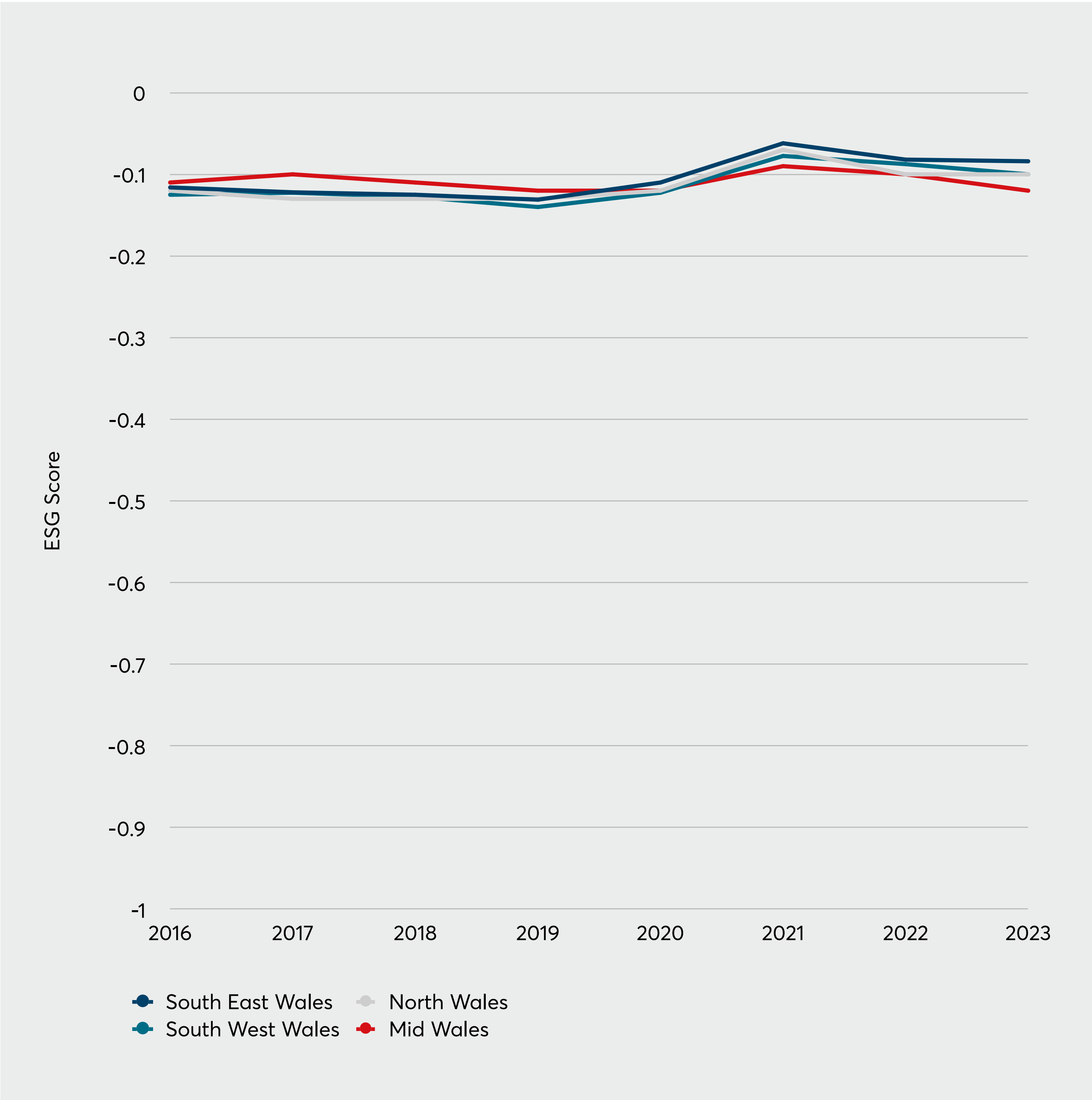
### LIAC

De Ddwyrain Cymru sydd hefyd yn cael y sgôr uchaf am agweddau at LIAC, 3.6% yn uwch na'r rhanbarth yn y safle olaf, sef Canolbarth Cymru. Mae'r De Orllewin a'r Gogledd bron yn union hanner ffordd rhwng y ddau, â'r un sgôr.

### ESG

South East Wales also scores highest for ESG posture, 3.6% higher than the lowest scoring region of Mid Wales, while the South West and North are almost exactly midway between them, with the same score.

**Graph 8.**
Welsh ESG by Region, 2016-2023



## Cymraeg

Gogledd Cymru sydd â'r gyfran uchaf o Gymraeg wedi'i chanfod ar wefannau; mae'r rhanbarth yn gyfrifol am bron i hanner (43.75%) y rhai a ganfuwyd.

## Welsh Language

North Wales has the highest proportion of Welsh language detected on websites, accounting for nearly half (43.75%) of those found.

**Table 2.**
Welsh Language Use Table,
Regional Comparison

| Unitary Authority | Welsh Language Count | Number of Websites | % containing Welsh in this location |
|---|---|---|---|
| Wrexham | 5 | 243 | 3.47 |
| Vale of Glamorgan | 6 | 292 | 4.17 |
| Torfaen | 0 | 149 | 0.00 |
| Swansea | 1 | 437 | 0.69 |
| Rhondda Cynon Taf | 6 | 355 | 4.17 |
| Powys | 4 | 252 | 2.78 |
| Pembrokeshire | 4 | 215 | 2.78 |
| Newport | 3 | 359 | 2.08 |
| Neath Port Talbot | 1 | 171 | 0.69 |
| Monmouthshire | 2 | 230 | 1.39 |
| Merthyr Tydfil | 1 | 73 | 0.69 |
| Isle of Anglesey | 14 | 113 | 9.72 |
| Gwynedd Council | 29 | 207 | 20.14 |
| Flintshire | 3 | 293 | 2.08 |
| Denbighshire | 6 | 221 | 4.17 |
| Conwy | 6 | 227 | 4.17 |
| Ceredigion | 12 | 101 | 8.33 |
| Carmarthenshire | 8 | 250 | 5.56 |
| Cardiff | 29 | 934 | 20.14 |
| Caerphilly | 3 | 244 | 2.08 |
| Bridgend | 1 | 250 | 0.69 |
| Blaenau Gwent | 0 | 82 | 0.00 |
| **TOTAL** | **144** | **5698** | **100.00** |

## Canfyddiadau: Lefel Awdurdod Unedol

Yn yr adran hon rydym yn sôn am y canlyniadau ar draws metrigau allweddol yr arolwg yng nghyd-destun 22 awdurdod unedol (AU) Cymru. Fel y dangoswn isod, mae'r gwahanol awdurdodau'n amrywio'n sylweddol yn nhermau'r darlun cyffredinol o ran digidoleiddio, y gallu i arloesi a chyfradd a lefel buddsoddi mewn asedau digidol. Mae gan bob AU ei batrwm datblygu ei hun ac, yn y gorffennol diweddar o leiaf, ymddengys bod llawer o wahanol lwybrau wedi dod i'r amlwg a allai beri goblygiadau ar gyfer datblygiad yn y dyfodol.

## Y Dosbarthiad Diwydiannol Safonol

Mae'r tri phrif fetrig sy'n cael sylw yn yr adroddiad hwn - Twf Digidol (TD), Aeddfedrwydd Digidol (AD) ac Arloesi - i gyd yn dangos gwahaniaethau rhwng y sectorau diwydiannol dan sylw. Mae hyn yn awgrymu y bydd lefel gyfartalog y metrigau hyn o fewn awdurdod yn dibynnu ar gyfrannau cymharol y gwahanol sectorau busnes ym mhob awdurdod. Ein methodoleg oedd creu sampl strwythuredig o gwmnïau i gyfateb yn agos i gyfrannau'r gwahanol sectorau o fewn pob awdurdod unedol, ac isod rydym yn cyflwyno data i grynhoi cyfansoddiad y portffolio o gwmnïau ym mhob awdurdod. Bydd cyfansoddiad y portffolio busnes mewn awdurdod penodol yn ffactor bwysig wrth drafod canlyniadau'r metrigau isod, felly archwiliwn y gwahaniaethau hyn yn gyntaf.

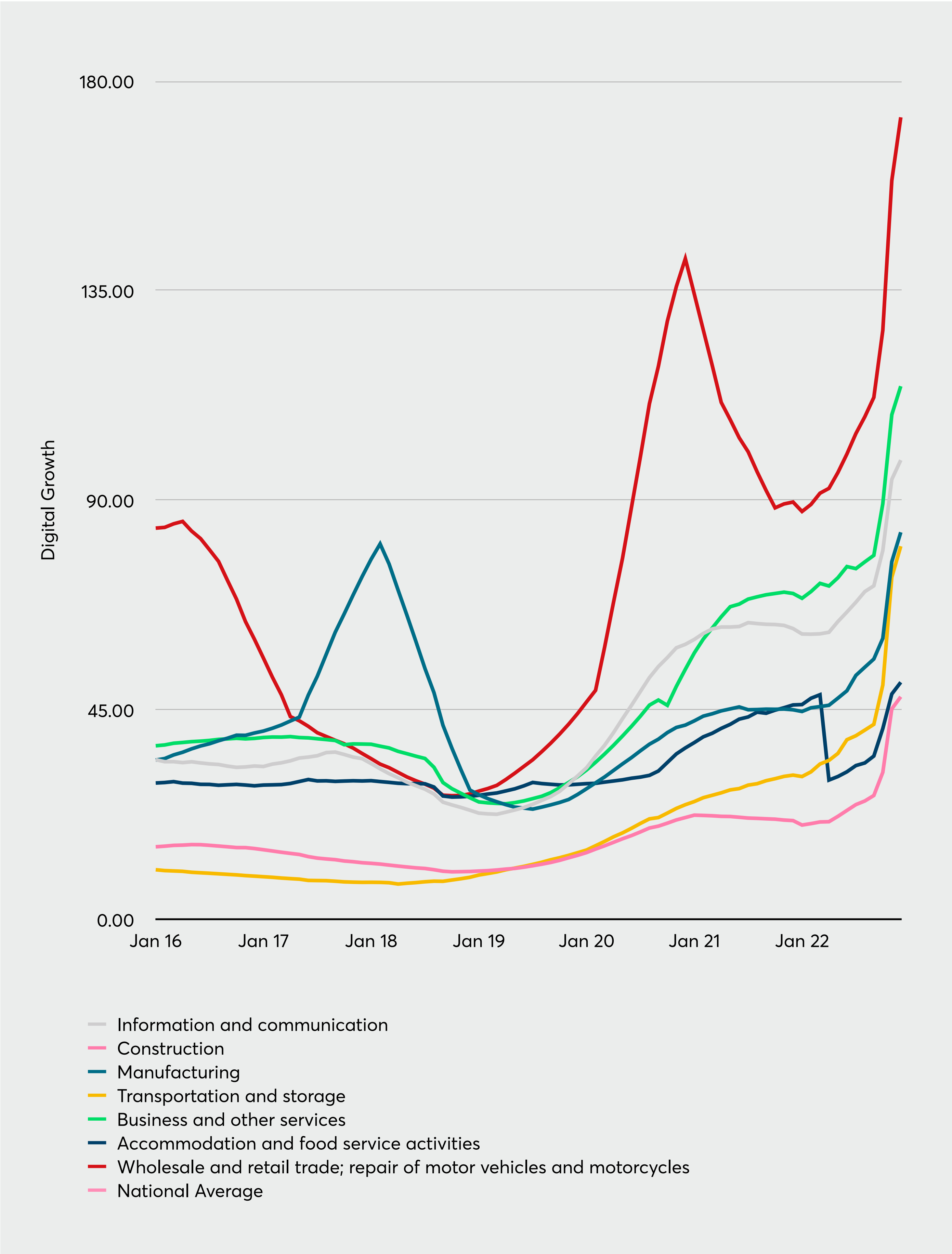
## Findings: Unitary Authority Level

In this section we report the results across the survey's key metrics in the context of Wales' 22 unitary authorities (UAs). As we show below, there is considerable variation between the different authorities in terms of the overall picture with respect to digitalisation, innovation capacity and the rate and level of investment in the digital. Each UA has its own pattern of development and, in the recent past at least, it would seem multiple different trajectories have emerged that might have implications for future development

## Standard Industrial Classification

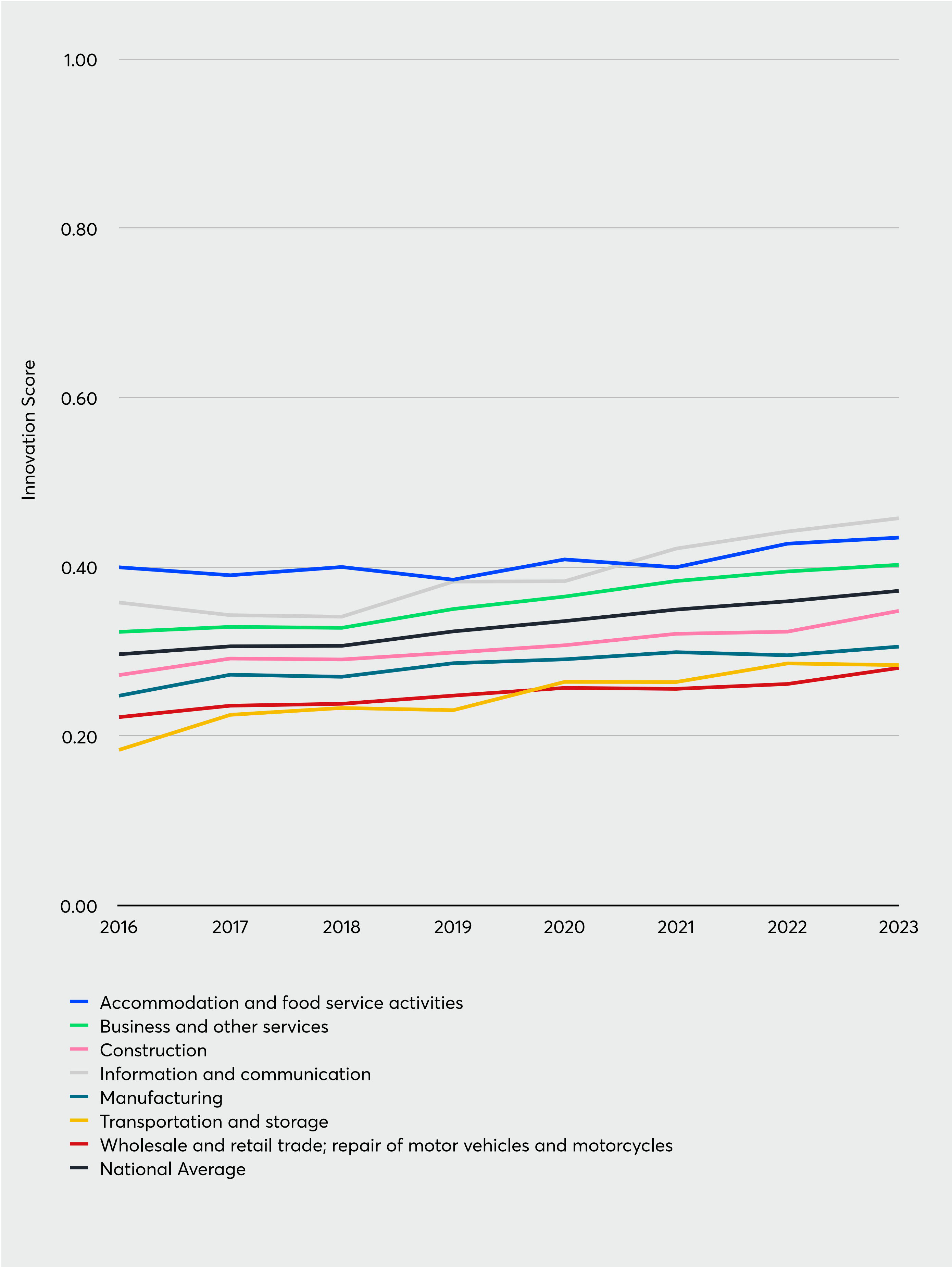
The three main metrics covered in this report - Digital Growth (DG), Digital Maturity (DM) and Innovation - all demonstrate differences between the industrial sectors we covered. This suggests that the average level of these metrics within an authority will be influenced by the relative proportions of the different business sectors in each authority. Our methodology was to create a structured sample of companies that closely matched the proportions of the different sectors within each unitary authority and we present data summarising the makeup of each authority's portfolio of companies below. Because the makeup of the business portfolio in a particular authority will be a major consideration when discussing the results of the metrics below, we first examine these differences.

**Graph 9.**
Welsh Average Digital Growth by Sector, 2016-2023

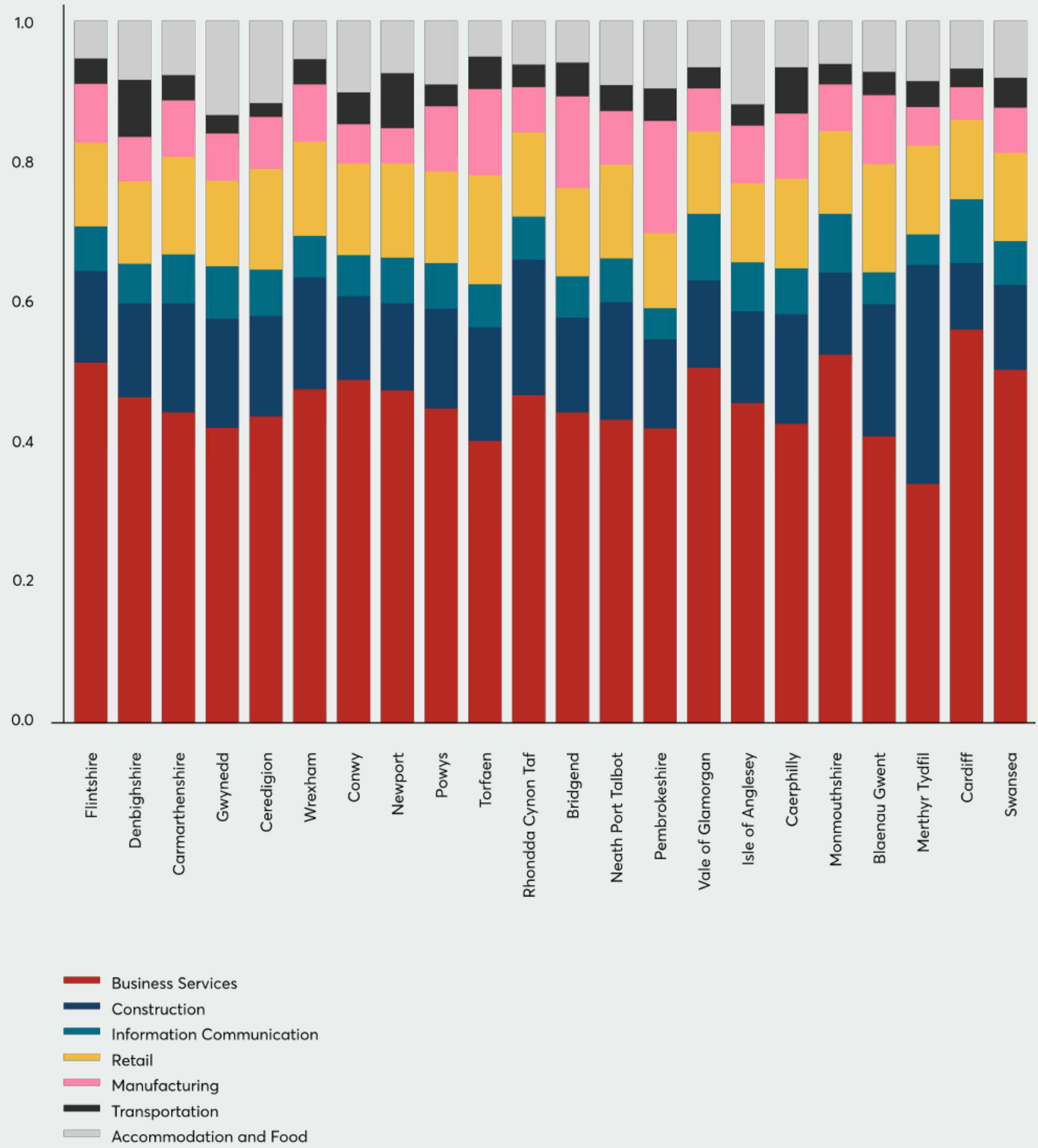


**Graph 10.**

Welsh Average Innovation by Sector, 2016-2023



**Graph 11.** Distribution of SIC Codes in Companies House, by Unitary Authority



Mae'r patrwm cyffredinol o ran maint cymharol y gwahanol sectorau busnes yn gyson ledled Cymru gyfan. Fodd bynnag, mae'n amlwg ar unwaith o'r data hyn bod gan bob un o'r awdurdodau broffil unigryw o ran pwysoliad cymharol y gwahanol sectorau busnes. Er enghraifft, mae gan y dosbarth mwyaf o gwmnïau at ei gilydd - Gwasanaethau Busnes - bresenoldeb llai mewn rhai awdurdodau o gymharu ag eraill. Ym Merthyr Tudful, er enghraifft, ceir llawer llai o gwmnïau Gwasanaethau Busnes na ledled y wlad gyfan, a cheir mwy o fusnesau Adeiladu na'r norm.

Nid yw'n syndod bod Caerdydd ac Abertawe'n dominyddu o ran pwysigrwydd y categori Gwasanaethau Busnes, mewn termau cymharol ac absoliwt, o ystyried nifer mawr y cwmnïau sydd wedi'u lleoli yn y ddwy ddinas. Yn ddiddorol, mae gan Sir y Fflint a Sir Fynwy grynhoad cymharol uwch na'r cyfartaledd o gwmnïau yn y sector Gwasanaethau Busnes.

Rydym eisoes wedi nodi nifer cymharol fawr y busnesau Adeiladu ym Merthyr Tudful. Ar y llaw arall, yng Nghaerdydd ac Abertawe mae'r cwmnïau hyn yn ffurfio cyfran lai o'r boblogaeth busnesau lleol nag mewn mannau eraill yng Nghymru. Mae cyfran y sector gwybodaeth a chyfathrebu yng Nghaerdydd, Sir Fynwy a Bro Morgannwg i gyd yn fwy nag sydd i'w gael mewn mannau eraill. Yn y sector Adwerthu, mae Torfaen ac i raddau llai Blaenau Gwent yn sefyll allan oherwydd bod cyfran gymharol fawr o'u busnesau yn y sector hwn.

O ran crynhoad lleol y busnesau yn y sector Gweithgynhyrchu, ond nid lefel gyffredinol cwmnïau o'r fath, mae gan Sir Benfro, Torfaen a Phen-y-bont ar Ogwr boblogaethau sy'n sefyll allan yn genedlaethol gan eu bod yn uwch na'r cyfartaledd. Mae gan Sir Ddinbych a Chasnewydd grynhoad uwch na'r cyfartaledd o gwmnïau yn y sector Cludiant, yn wahanol i Geredigion a Gwynedd lle mae cyfran y busnesau Cludiant yn is nag yng ngweddill Cymru. Yn olaf, mae gan Wynedd, Ceredigion ac i raddau llai Ynys Môn i gyd grynhoad llawer uwch o gwmnïau yn y sector Bwyd a Llety nag sydd i'w weld yn genedlaethol, sy'n adlewyrchu pwysigrwydd twristiaeth yn yr awdurdodau hyn.

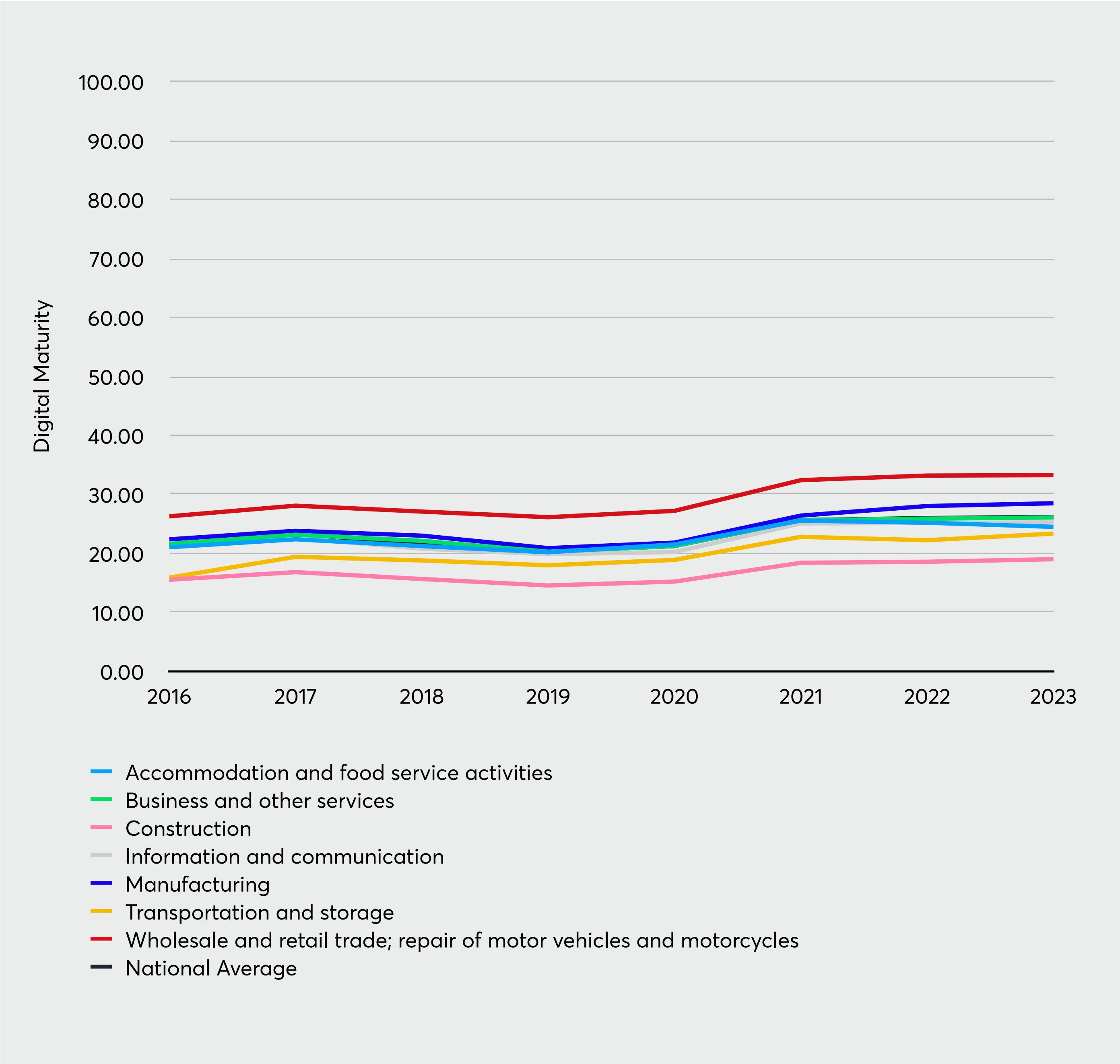
The overall pattern with regard to the relative size of the different business sectors is consistent across the whole of Wales. However, it is immediately apparent from these data that the different authorities each have a unique profile with respect to the relative weighting of the different business sectors. For instance, the largest overall class of companies - Business Services - has a smaller presence in certain authorities compared to others. In Merthyr Tydfil, for example, Business Services companies are much less frequent than across the nation as a whole, while Construction businesses are more common than the norm.

Unsurprisingly, Cardiff and Swansea dominate with respect to importance of the Business Services category, both relatively and absolutely, given the large size of the cohort of companies located in these two cities. Interestingly, Flintshire and Monmouthshire both have a relatively higher than average concentration of companies in the Business Services sector.

We have already noted the relative preponderance of Construction businesses in Merthyr Tydfil. By contrast, in Cardiff and Swansea these companies form a lower proportion of the local business population than elsewhere in Wales. Cardiff, Monmouthshire and the Vale of Glamorgan all have a proportionally larger information and communication sector than is found elsewhere. In the Retail sector Torfaen and to a lesser extent Blaenau Gwent stand out because of the relatively high proportion of their businesses in this sector.

In terms of the local concentration of businesses in the Manufacturing sector, but not the overall level of such companies, Pembrokeshire, Torfaen and Bridgend have populations that stand out nationally as being higher than average. Denbighshire and Newport have an above average concentration of companies in the Transportation sector, in contrast to Ceredigion and Gwynedd where the proportion of Transport businesses is lower than is the case in the rest of Wales. Finally, Gwynedd, Ceredigion and to a lesser degree the Isle of Anglesey all exhibit a much higher concentration of companies in the Food and Accommodation sector than is the case nationally, reflecting the importance of tourism in these authorities.

**Graph 12.**
Welsh Average Digital Maturity by Sector, 2016-2023




Y sectorau sy'n dangos y twf mwyaf o ran Aeddfedrwydd Digidol yw'r sector Masnach Cyfanwerthu ac Adwerthu a'r sector Gweithgynhyrchu. Mewn awdurdodau lle mae un neu'r ddau o'r sectorau hyn yn bwysig, mae'r effeithiau i'w gweld ar lefel gyffredinol aeddfedrwydd digidol. Ar y llaw arall, mae gan y sector Adeiladu lefel isel o aeddfedrwydd digidol a chyfradd dwf gymharol isel yn ôl y mesur hwn.

The sectors leading with growth in terms of Digital Maturity are Wholesale and retail trade and Manufacturing sectors. In authorities where either or both of these sectors are important the effects can be seen on the overall level of digital maturity. By contrast the Construction sector has both a low level of digital maturity and relatively low rate of growth in this measure.

## Aeddfedrwydd Digidol yn ôl AU

Mae lefel absoliwt sgorau AD yn amrywio rhwng yr awdurdodau ledled Cymru ac mae'n adlewyrchu nifer o wahanol ffactorau sy'n cyfrannu at bennu'r cyfartaledd mewn unrhyw leoliad penodol. Mae'r ffactorau hyn yn cynnwys cyfanswm nifer y busnesau mewn awdurdod a chyfran gymharol y gwahanol sectorau yn yr awdurdod hwnnw. I roi enghraifft, mae lefelau AD cyfartalog y gwahanol sectorau busnes yn wahanol yn gyson; mae gan y sector Adeiladu lefel AD arbennig o isel. Mewn awdurdod lle mae Adeiladu'n cyfrannu cyfran fwy o gwmnïau nag allai fod mewn mannau eraill, byddai lefel AD gyfanredol yr awdurdod yn tueddu i fod yn is nag mewn lleoliadau lle mae busnesau Adeiladu'n ffurfio cyfran lai. Bydd yr effaith hon yn arbennig o amlwg yn yr awdurdodau unedol hynny sydd â nifer bach o gwmnïau cofrestredig.

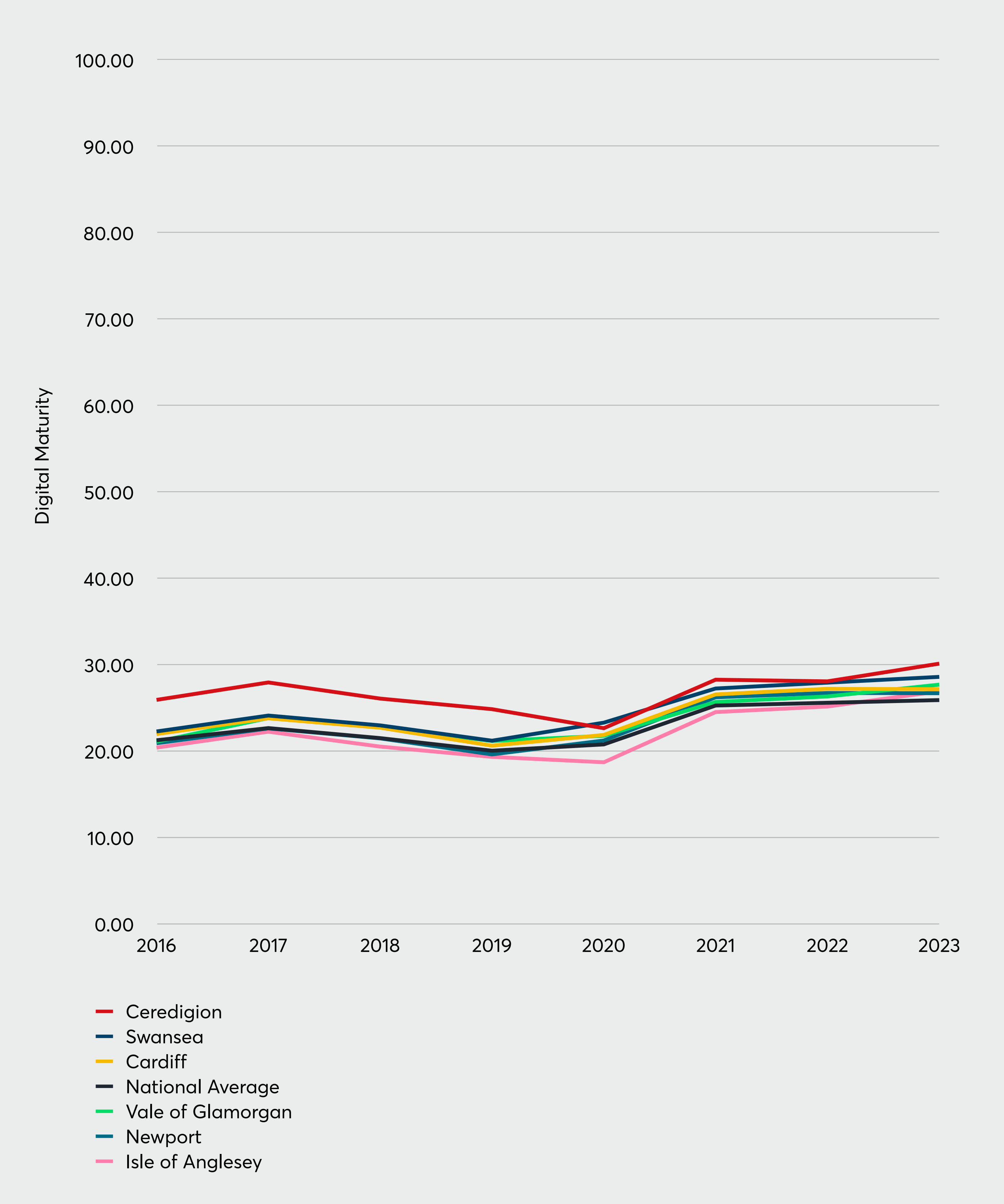
Ar y cyfan, mae **Abertawe, Caerdydd, Casnewydd, a Bro Morgannwg yn sefyll allan ag AD uwch na'r cyfartaledd yn 2023**. Mae'r rhain hefyd wedi dangos gwelliant cyson ers 2016, yn enwedig ar ôl 2019. Efallai mai'r mwyaf diddorol ymysg yr awdurdodau hyn sy'n perfformio orau yw **Ceredigion, sydd wedi cyflawni'r lefel Aeddfedrwydd Digidol gyfartalog uchaf drwy gydol y cyfnod.** Portffolio bach iawn o gwmnïau sydd gan Geredigion, ac yn debyg i Ynys Môn, o gymharu â'r safonau cenedlaethol, cyfran fach iawn o'r cwmnïau hyn sydd yn y sector Gwasanaethau Busnes. Mae Ceredigion ac Ynys Môn yn mwynhau lefel AD gymharol uchel o ganlyniad i'r ffaith bod cyfran gymharol fawr o'u cwmnïau yn y sector Adwerthu.

## Digital Maturity by UA

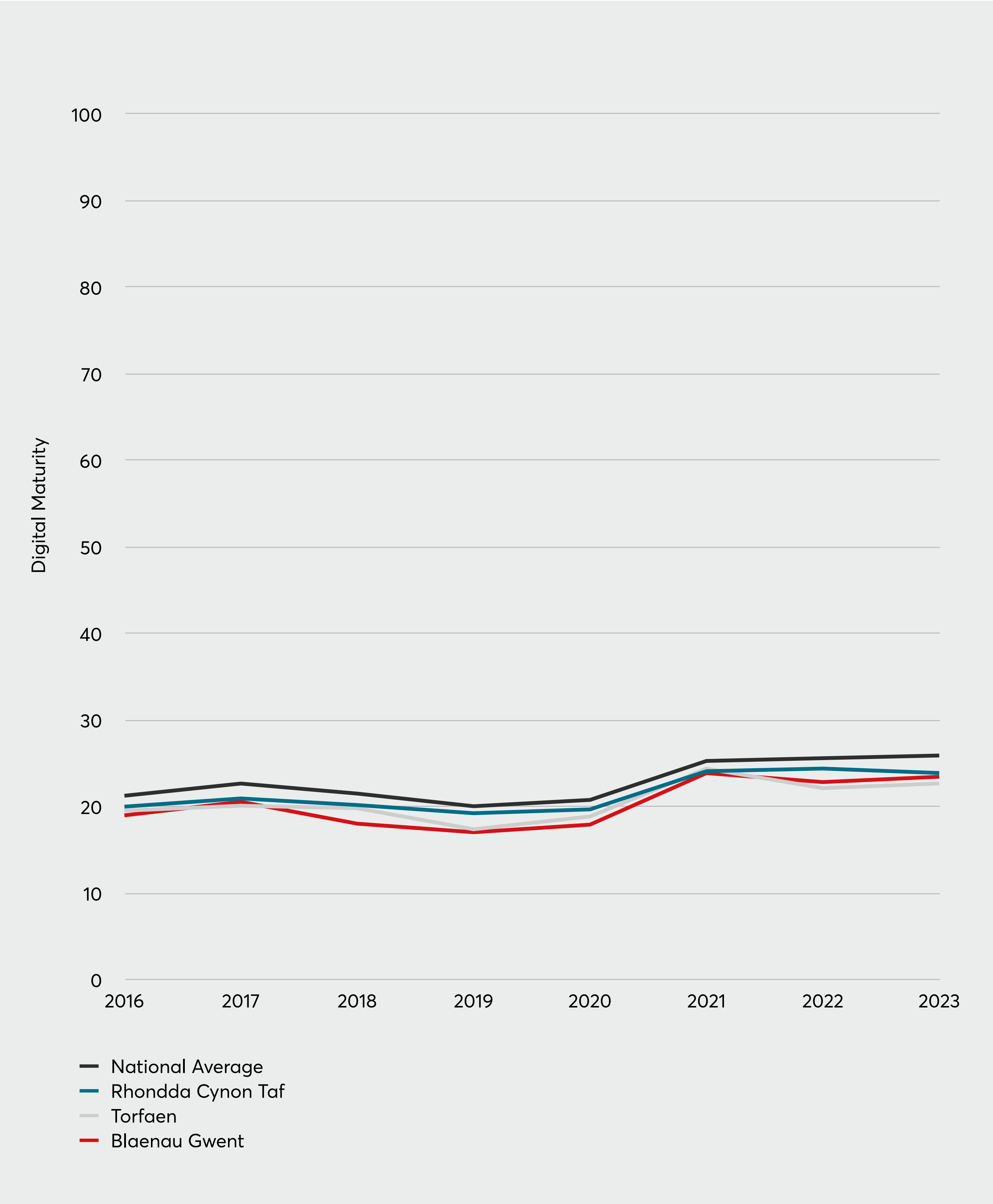
The absolute level of DM scores varies between the authorities across Wales and reflects a number of different factors at play in determining the average in any particular location. These factors include the overall size of the cohort of businesses in an authority and the relative proportion of the different sectors within that authority. To give an example, the different business sectors have consistently different average levels of DM, with the Construction sector having a particularly low level of DM. In an authority where Construction contributes a larger proportion of companies than might be the case elsewhere, the aggregate DM level for the authority would tend to be lower than in locations where Construction businesses form a smaller proportion. This effect will be especially pronounced in those unitary authorities that have a small cohort of registered companies.

Overall **Swansea, Cardiff, Newport, and Vale of Glamorgan stand out with a higher than average DM in 2023**. They have also shown consistent improvement since 2016, particularly after 2019. Perhaps most interesting amongst these higher performing authorities is **Ceredigion which has had the highest average level of Digital Maturity throughout.** Ceredigion has a very small portfolio of companies and in common with Isle of Anglesey by national standards a very low proportion of these companies are in the Business Services sector. Ceredigion and Isle of Anglesey enjoy a relatively high level of DM as result of having a high proportion of companies in the Retail sector.

**Graph 13.**
Digital Maturity of Swansea, Cardiff, Newport, Vale of Glamorgan, Ceredigion and Isle of Anglesey compared with the National Average



**Graph 14.**
Digital Maturity of Torfaen, Rhondda Cynon Taf and Blaenau Gwent compared with the National Average



Roedd gan yr awdurdodau unedol ag AD sylweddol is na'r lefel genedlaethol, sef Torfaen, Rhondda Cynon Taf a Blaenau Gwent, lefelau AD isel yn 2016 a dim ond gwelliant bach sydd wedi bod ynddynt ers hynny.

Cyn belled ag y mae Aeddfedrwydd Digidol cwmnïau'n adlewyrchu lefel digideiddio o fewn busnes ac yn awgrymu sut y gallai'r busnes gynyddu cynhyrchedd dros amser, mae'r data hyn yn ategu dau ganfyddiad allweddol:

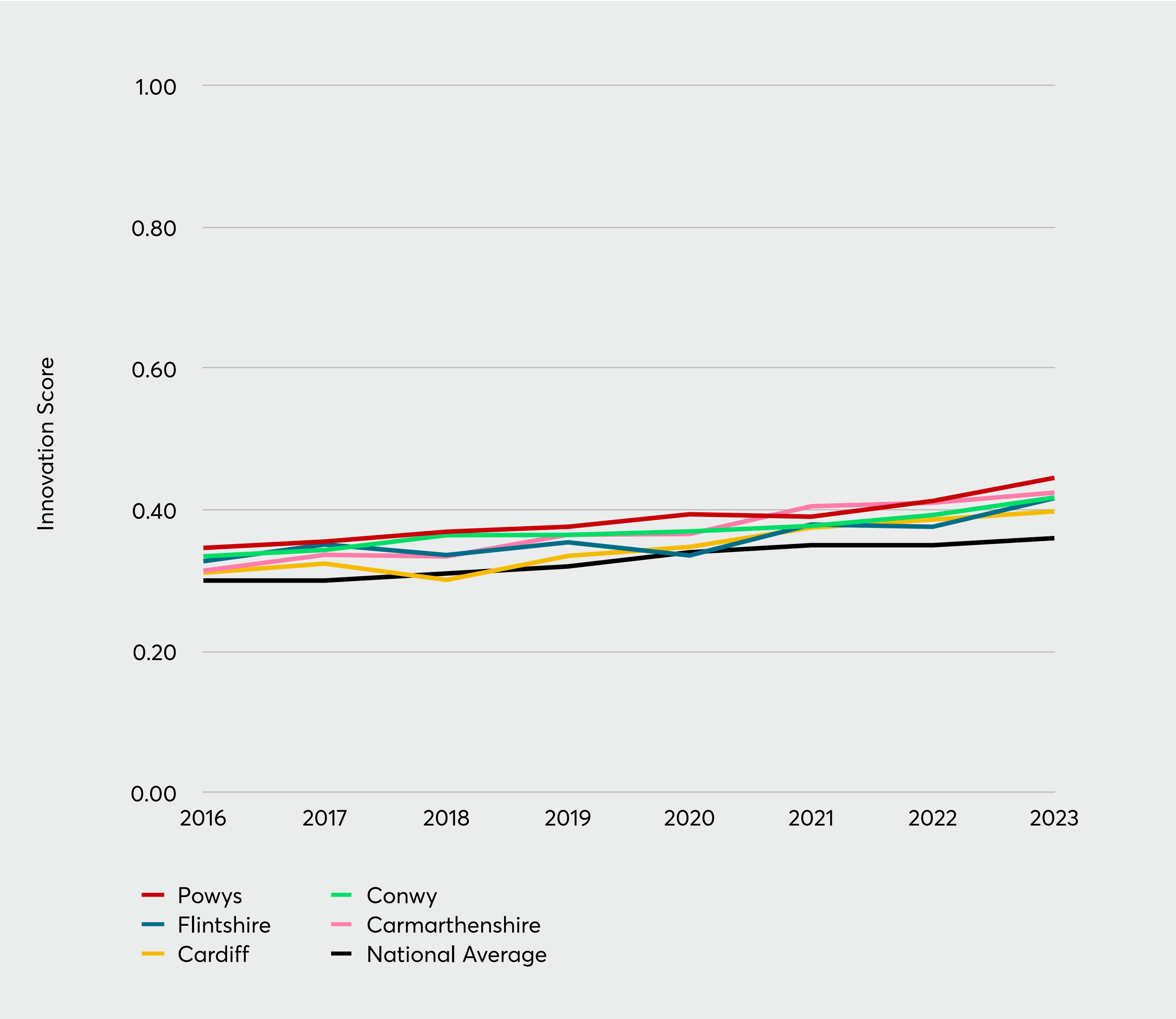
- Yn gyntaf, bod **y data hyn yn dynodi cynnydd cyfartalog yng nghyfradd twf cynhyrchiol sy'n llai nag 1% y flwyddyn**, sy'n gyson ag adroddiadau swyddogol am dwf CDG y DU yn ystod y cyfnod hwn.
- Yn ail, bod cyfradd debygol twf effeithlonrwydd cynhyrchiol ym Mro Morgannwg, Abertawe a Chaerdydd yn golygu **nad yw'r gwahaniaeth rhwng canlyniadau economaidd yr awdurdodau'n cael ei leihau**.

The unitary authorities with DM significantly below the national level; Torfaen, Rhondda Cynon Taf and Blaenau Gwent had low levels of DM in 2016 and have improved only slightly since that time.

Insofar as the Digital Maturity of companies reflects the level of digitisation within a business and suggests how the business might increase productivity over time these data support two key findings:

- First, that **the average increase in the rate of productive growth indicated by these data is less than 1% per annum**, which is in line with official reports of UK GDP growth during this period.
- Second, that the likely rate of growth in productive efficiency in the Vale of Glamorgan, Swansea and Cardiff is such that **the difference in economic outcomes between the authorities is not being reduced**.

**Graph 15.**
Innovation in Carmarthenshire, Conwy, Cardiff, Flintshire and Powys compared with the National Average

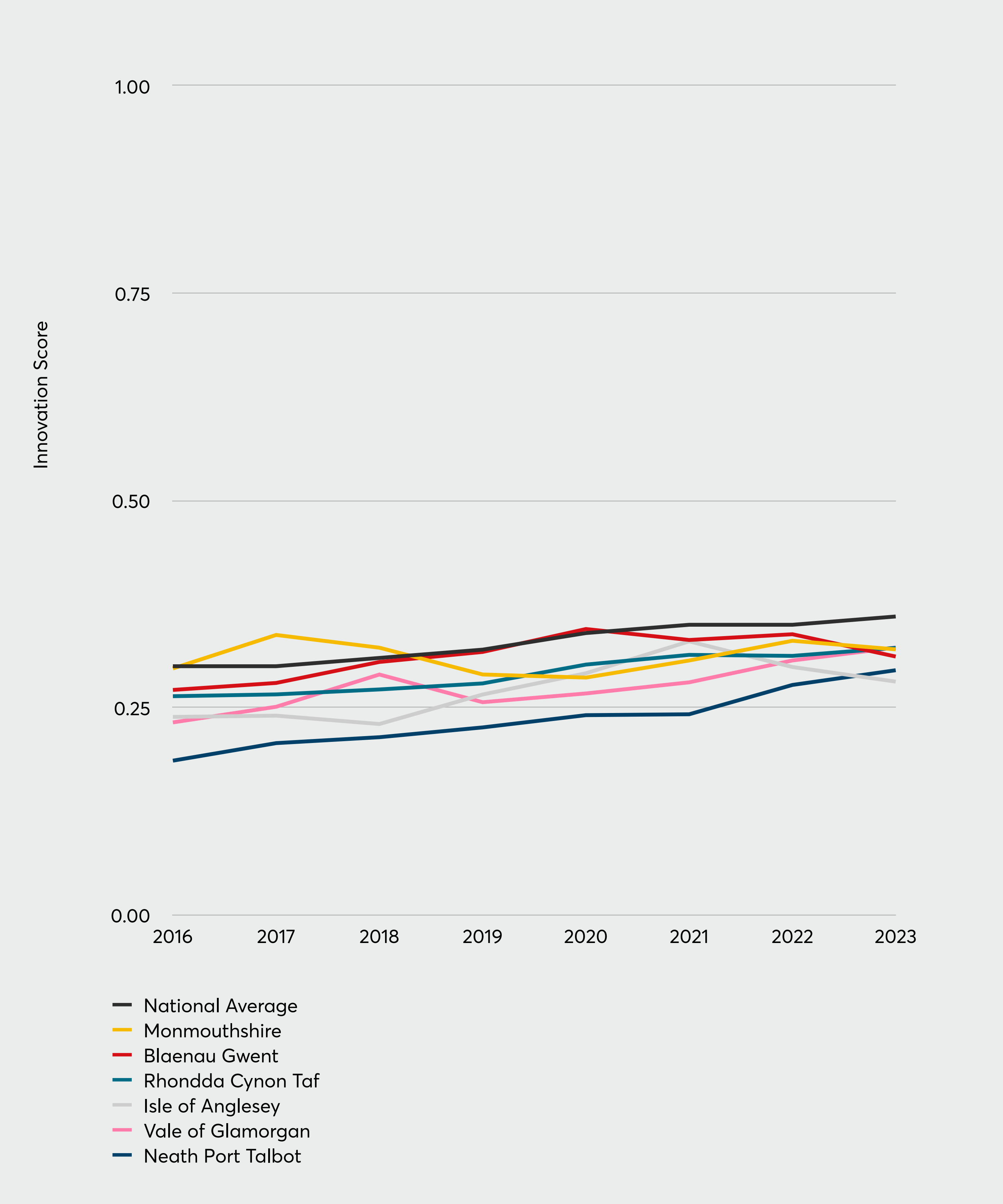



Mae canlyniadau'r metrig hwn yn dangos bod Arloesi'n wahanol i Aeddfedrwydd Digidol, yn enwedig o ystyried y gwahanol lefelau o allu i arloesi ar draws awdurdodau unedol Cymru. Mae gan Sir Gaerfyrddin, Conwy, Caerdydd, Sir y Fflint a Phowys i gyd lefel Arloesi uwch na gweddill Cymru. Nid yw Abertawe'n bell ar eu hôl, ac â nifer cymharol fawr o fusnesau mae'r perfformiad hwn yn gadarnhaol.

The results for this metric demonstrates that Innovation is distinct from Digital Maturity, especially with regard to the varying levels of innovation capacity across the unitary authorities of Wales. Carmarthenshire, Conwy, Cardiff, Flintshire and Powys all have a higher average Innovation level than the rest of Wales. Swansea is only slightly behind, and with a relatively large cohort of businesses this performance is positive.

**Graph 16.**

Innovation in Neath Port Talbot, Blaenau Gwent, Rhondda Cynon Taf, Monmouthshire, Vale of Glamorgan and Isle of Anglesey compared with the National Average



Mae Castell-nedd Port Talbot, Blaenau Gwent, Rhondda Cynon Taf, Sir Fynwy, Bro Morgannwg ac Ynys Môn yn dangos llai o allu i arloesi.

Mae dau awdurdod yn sefyll allan yn arbennig. **Blaenau Gwent oedd yr awdurdod lle mesurwyd y lefel isaf o allu i arloesi yn 2016, ac mae hynny'n dal i fod yn wir yn 2023.** Mae'r twf cenedlaethol cyffredinol o ran arloesi'n awgrymu bod y maes hwn mewn gwirionedd yn mynd yn bellach ar ei hôl hi. Yr ail awdurdod diddorol yw **Caerdydd, sydd wedi perfformio'n dda ac sydd yn ôl pob tebyg, o ystyried maint a chyfansoddiad ei boblogaeth fusnes, yn profi twf go iawn o ran arloesi mewn sectorau busnes penodol.** Mae'n werth nodi mai'r sector Gwasanaethau Busnes yng Nghaerdydd oedd yn gyfrifol am 60% o'r gallu i arloesi a gofnodwyd.

Unwaith eto, mae cynnydd cyson mewn lefelau arloesi wedi digwydd ledled Cymru - tua 1% y flwyddyn ers 2016. **Fodd bynnag, mae'r cynnydd hwn yn amlwg yn anghyfartal iawn ac unwaith eto'n awgrymu parhad tebygol y gwahaniaethau rhwng rhagolygon economaidd ar lefel awdurdodau unedol.**

Neath Port Talbot, Blaenau Gwent, Rhondda Cynon Taf, Monmouthshire, Vale of Glamorgan and Isle of Anglesey exhibit lower levels of innovation capability.

Two authorities stand out in particular. **Blaenau Gwent was in 2016 and is now in 2023 the authority with the lowest measured level of innovative capability.** The overall national growth in innovation suggests that this area is in fact falling further behind. The second authority of interest is **Cardiff, which has performed well and is probably, given the size and make up of its business population, experiencing real growth in innovation within specific business sectors.** It is worth noting that the Business Services sector in Cardiff was responsible for fully 60% of the innovation capability recorded.

Once again, a steady increase in innovation levels across Wales has occurred at approximately 1% per annum since 2016.

**However, this increase is clearly deeply uneven and again points to a likely continuation of the differences in the economic outlook at the unitary authority level.**

## Twf Digidol yn ôl Awdurdod Unedol

Y metrig TD a nodir yma yw'r ffordd fwyaf uniongyrchol a sensitif i amser o fesur ymddygiad digidol yn yr arolwg hwn. Mesurwyd nifer yr addasiadau a wnaethpwyd i unrhyw wefan yn y sampl mewn unrhyw fis penodol, cyn cydgasglu'r data. Mae'r metrig yn yr adroddiad hwn yn cynrychioli cyfradd newid y niferoedd hyn; yn syml, faint yn fwy (neu yn llai) o addasiadau ac ychwanegiadau a wnaethpwyd yn y mis dan sylw o gymharu â'r mis cynt. Felly, mae TD yn sensitif i newidiadau yn ymddygiad cwmnïau sy'n digwydd dros y tymor byr. TD sy'n rhoi'r darlun gorau o effaith y pandemig ar yr economi gyffredinol. Yn wir, ar adeg ysgrifennu'r adroddiad hwn byddai'n ymddangos, yn ôl TD, bod yr argyfwng yn parhau i effeithio ar ymddygiad cwmnïau ar raddfa mewn llawer o rannau o'r wlad, ond nid y cyfan ohoni.

Yn y bôn, ar unrhyw un adeg mae aelodau o'r gymuned fusnes yn gweithio i gynnal eu heiddo digidol ac mae'r ymdrech hon wedi cynyddu'n gyson dros amser. Mae cwmnïau unigol yn ymgymryd â'r dasg hon mewn gwahanol ffyrdd fel y trafodwn isod, ond at ei gilydd, mae hyn yn weithrediad enfawr a pharhaus. Mae hyn yn rhoi golwg i ni ar deimladau cyffredinol busnes ar draws yr economi; cadarnhaol, normal neu negyddol, sy'n llywio newidiadau i'r ymddygiad masnachol hwn. Bron fel y mae symudiadau yng ngwerth y FTSE 100 yn adlewyrchu effaith gronnus miliynau o benderfyniadau i brynu a gwerthu ac effaith digwyddiadau yn y byd go iawn, mae newidiadau i'r mesur hwn hefyd yn adlewyrchu effaith digwyddiadau allanol ar benderfyniadau a wneir. Gall y digwyddiadau hyn gael effaith dymor byr neu dymor hir, ond dros amser hwn yw'r metrig sy'n rhoi'r adlewyrchiad agosaf o lefel gweithgarwch yn yr economi sylfaenol.

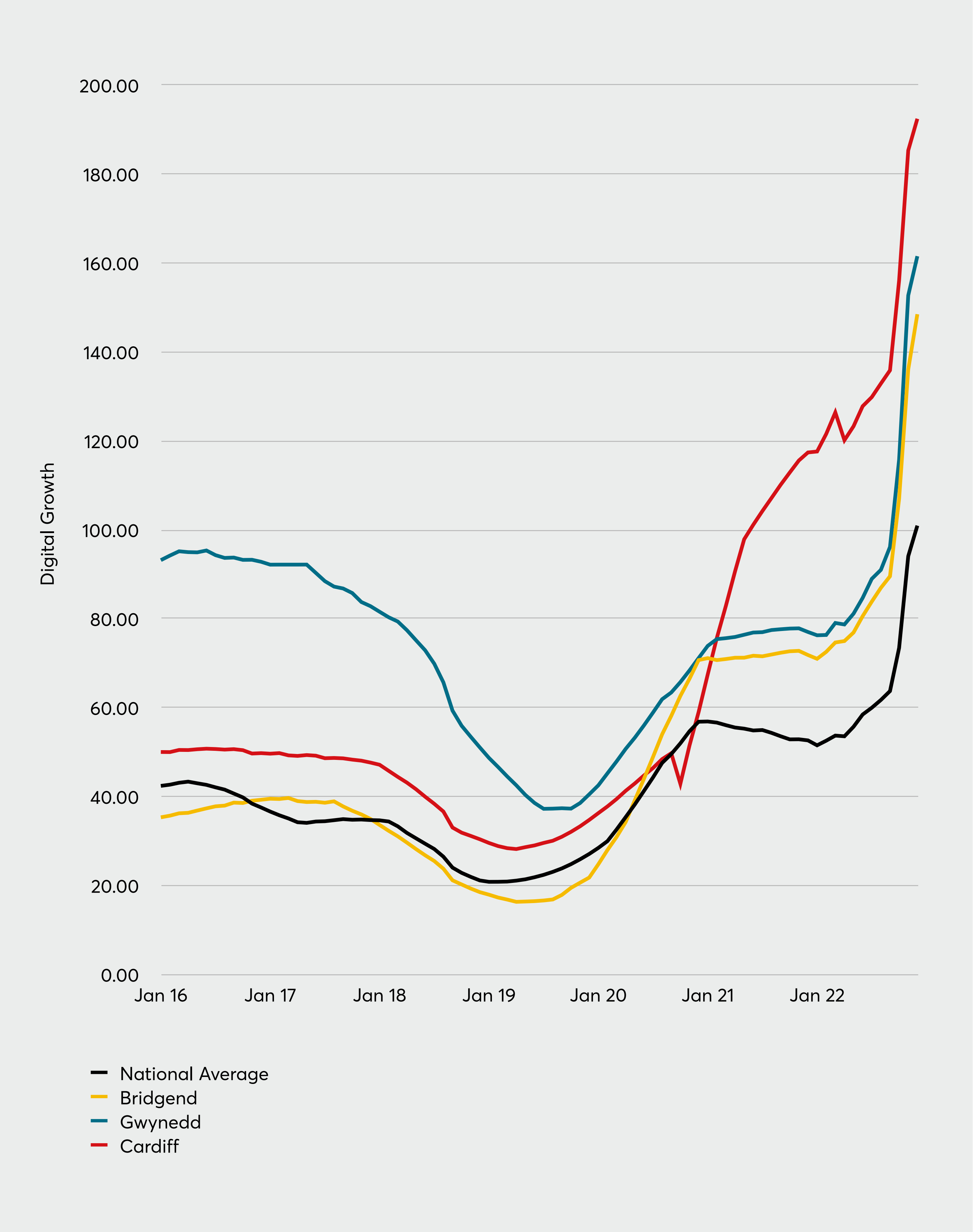
## Digital Growth by Unitary Authority

The DG metric reported here is the most direct and time sensitive measure of digital behaviour in this survey. We measured the number of modifications made to any website in the sample in any given month and aggregated these data accordingly. The metric we report represents the rate of change in these numbers; put simply, how many more (or less) modifications and additions were made in the month reported compared to the month before. DG is therefore sensitive to changes in the behaviour of companies that occur over the short term. It is DG that best illustrates the impact of the pandemic upon the economy at large. Indeed, at the time of writing it would seem, with respect to DG, that the crisis continues to impact company behaviour at scale in many but not all parts of the country.

Essentially, at any one time members of the business community are working to maintain their digital properties and this effort has steadily increased over time. Individual companies vary in their approach to this task as we will discuss below, but taken in the round, this is a massive and continuous operation. What this gives us is a window into the predominant business sentiment across the economy; positive, normal or negative, that is driving changes in this commercial behaviour. Almost as movements in the value of the FTSE 100 reflect the cumulative effect of millions of buy and sell decisions and the impact of real world events, so too do changes in this measure reflect the impact of external events on decision making. These events can be short-term or long term in their impact, but over time this metric most closely reflects the level of activity in the underlying economy.

**Graph 17.**

Digital Growth of Cardiff, Gwynedd and Bridgend compared with the National Average, 2016-2023



Fel y trafodwyd uchod, roedd TD yn dangos effaith dechrau cyfnodau o gyfyngiadau symud â chynnydd sydyn yn sgorau TD cyfartalog cenedlaethol Cymru yng ngwanwyn 2020, yn unol â'r gostyngiad a nodwyd yn CDG y DU. Yn achos Caerdydd a Gwynedd, mae effaith y 'cyfnod atal byr' yn hydref 2020 yn arbennig o amlwg. Yn yr un modd, mae lefelau'r TD a gofnodwyd yng ngwanwyn 2022 yn adlewyrchu'r ymchwydd yn nhwf y DU (CDG) a nododd y SYG yn yr un cyfnod.

O ran awdurdodau unedol Cymru, mae'r metrig TD yn dangos sut y mae canlyniadau TD dargyfeiriol iawn yn adlewyrchu'r gwahaniaethau rhwng eu cwmnïau a phwyslais cyffredinol yr economi leol. O ran digwyddiadau ers dechrau 2020, gellir rhannu'r awdurdodau unedol yn wahanol grwpiau, a phob un wedi gweld lefel effaith wahanol a dilyn llwybr gwahanol yn ystod y tair mlynedd diwethaf.

**Mae Pen-y-bont ar Ogwr, Caerdydd a Gwynedd i gyd nawr wedi cyrraedd lefelau TD llawer uwch nag a gofnodwyd cyn 2019, a llawer iawn uwch na'r lefelau a gofnodwyd yng Nghymru gyfan.** Cyrhaeddodd lefel TD Caerdydd a Phen-y-bont ar Ogwr lefel newydd ac uwch yn 2021, ond yna aeth cyfradd Twf Digidol Gwynedd yn uwch fyth. Cynyddodd twf digidol ym mhob un o'r tri lleoliad yn uwch eto wrth i'r economi ddechrau adfer yng ngwanwyn 2022.

Mae'r datblygiad yng Ngwynedd â'i dwf digidol rhyfeddol yn astudiaeth achos ar gyfer arloesi ar sail cyfle. Fel y dywedodd un atebwr cyfweliad yng Ngwynedd:

*Roedd angen help ar bobl ar ôl COVID. Wchi, efallai nad oedden nhw ar-lein neu'n gwneud pethau'n ddigidol cyn hynny. Ond wedyn, wchi, daeth 2020 a phawb yn meddwl, o, mae angen i ni fod ar-lein. Roedd rhaid sgrialu i ddechrau rhywbeth... Mae'n siŵr bod y diwydiant twristiaid yn unigryw, a dweud y gwir, on'd oedd? Dwy flynedd pan nad oedd pobl yn gallu teithio i unlle arall, allwch chi ddim wir gymharu ag unrhyw flwyddyn arall, na allwch?*

**Mae'r data hyn yn dangos ymateb busnesau Gwynedd i'r cyfleoedd a ddaeth yn sgil y pandemig Covid-19. Gellir sylwi bod haf a hydref 2022 wedi gweld cynyddiadau pellach yn lefel Twf Digidol yn yr ardaloedd hyn, gan gynnwys Gwynedd lle mae TD bron 4 gwaith cymaint ag yr oedd ym mis Ionawr 2020.** Mae Gwynedd yn un awdurdod lle nad yw'r seilwaith digidol craidd yn cyrraedd pob ardal a lle mae diffyg hygyrchedd a gwasanaeth yn dal i gael eu hunioni.

**Gwelodd Powys, Conwy a Chastell-nedd Port Talbot gynnydd bach iawn mewn TD yn ystod y pandemig Covid-19**. Roedd twf digidol y busnesau hyn yn llai ac yn hwyrach na chyfartaledd Cymru.

As discussed above, DG showed the impact of the onset of periods of lockdown with a sharp increase in the national average Welsh DG scores in the spring of 2020, in line with the recorded drop in UK GDP. In the case of Cardiff and Gwynedd the impact of the 'firebreak' lockdown in the autumn of 2020 is particularly notable. Similarly, the levels of DG recorded in the spring of 2022 reflects the spurt in UK growth (GDP) reported by the ONS over the same period.

With regard to the unitary authorities in Wales, the DG metric illustrates how their respective different cohorts of companies and the overall emphasis of the local economy is reflected in highly divergent DG results. In terms of the events since the start of 2020 the unitary authorities can be split into different groups each of which has seen a different level of impact and a different trajectory during the last three years.

**Bridgend, Cardiff and Gwynedd have all now reached much higher levels of DG than were recorded prior to 2019, very much higher than that recorded by Wales as a whole.** A new and higher level of DG for Cardiff and Bridgend in 2021 was surpassed by the rate of Digital Growth in Gwynedd. All three locations experienced even higher levels of digital growth as the economy began to bounce back in the spring of 2022.

The development in Gwynedd with its remarkable digital growth is a case study in opportunity-driven innovation. As an interviewee based in Gwynedd put it:

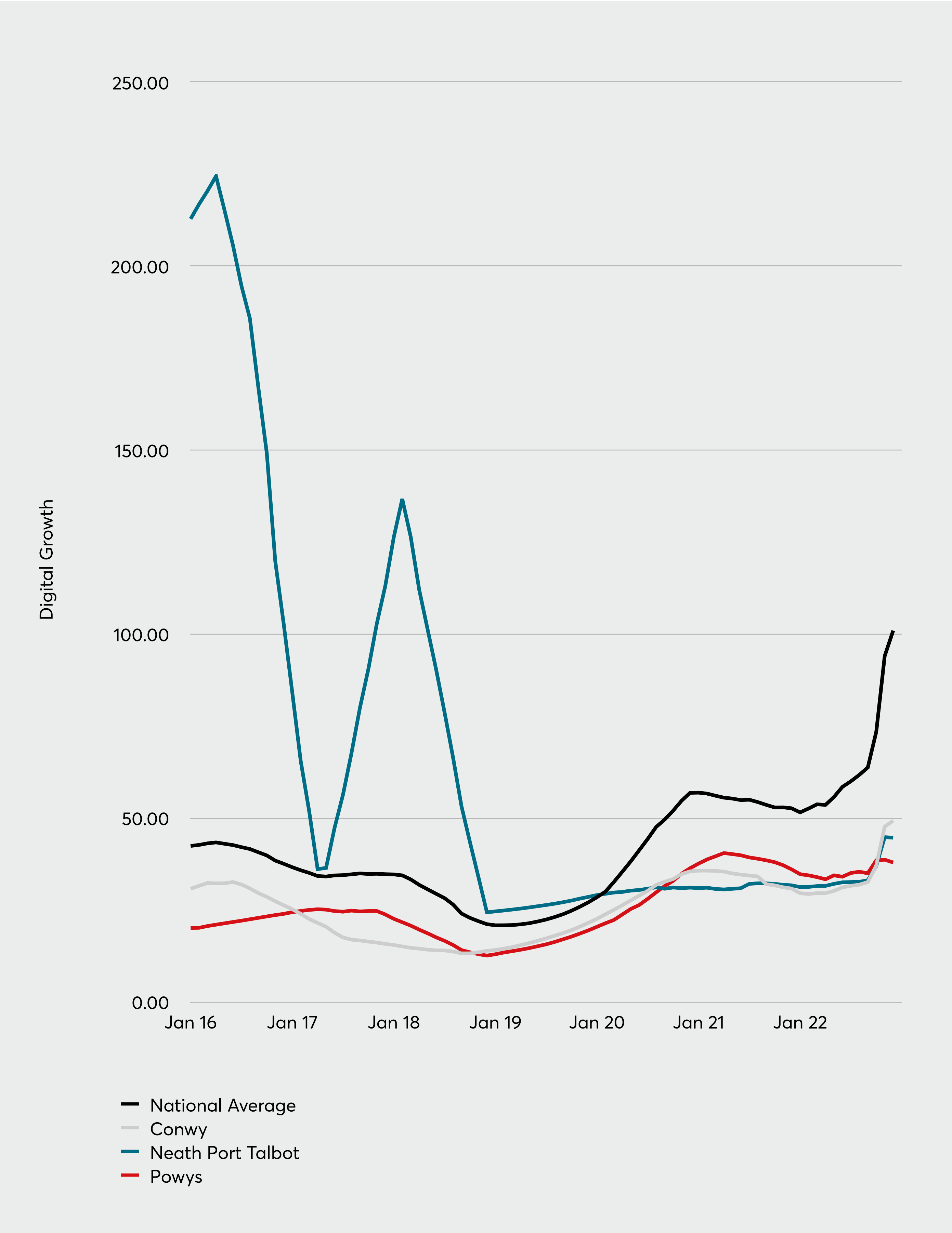
*People needed help after COVID. You know, they weren't online maybe or doing things digitally before. But then, you know, 2020 came when everybody thought, oh, we need to be online. It was a scramble to have something going…The tourist industry probably was unique, wasn't it, really? Two years when people couldn't travel anywhere else, it's not the same as any other year to compare really, is it?*

**These data show how businesses in Gwynedd responded to the opportunities arising from the Covid-19 pandemic. What is noticeable is that the summer and autumn of 2022 saw further increases in the level of Digital Growth in these areas, including Gwynedd where DG is currently almost 4 times what it was in January 2020.** Gwynedd is one authority where the core digital infrastructure does not cover all areas and where lower levels of accessibility and service are still being addressed.

**Powys, Conwy and Neath Port Talbot are all characterised by having a very low level of increase in DG during the Covid-19 pandemic**. The digital growth demonstrated by these businesses was both lower and later than was the average in Wales.

**Graph 18.**

Digital Growth of Powys, Conwy and Port Talbot compared with the National Average



Ledled y wlad, mae nifer o fusnesau wedi dangos lefelau arbennig o uchel o Dwf Digidol ers 2020:

- Grŵp o fusnesau'n gwerthu nwyddau gwerthfawr wedi'u gweithgynhyrchu â phwyslais ar eu hallforio ym Mhen-y-bont ar Ogwr;

- Grŵp tebyg o gwmnïau'n gwerthu bwydydd arbenigol, nwyddau metel domestig a chynhyrchion tybaco arbenigol yng Ngheredigion;

- Allfa newydd yn gwerthu amrywiaeth eang o ddarnau ac ategolion o safon uchel i geir a beiciau modur ar-lein â phrisiau mewn sterling ac ewros yn Wrecsam;

- Busnesau bach yn creu systemau busnes a gwerthu ar-lein integredig yn y sector llety a bwyd yng Ngwynedd;

- Busnesau yn cynnig gwasanaethau digidol soffistigedig yn y sector busnes-i-fusnes yng Nghaerdydd.

Efallai mai'r un ffactor allweddol sy'n gyffredin i'r rhain i gyd yw eu bod i gyd yn edrych tuag allan, o reidrwydd neu o fwriad. Ymddengys bod yr awydd i gynyddu nifer gwerthiannau drwy geisio denu cwsmeriaid a danfon o bell yn sbardun diffiniol ar gyfer twf digidol. Bydd rhaid aros i weld beth fydd effaith y newidiadau hyn ac yn wir, a fyddant yn parhau ar y llwybr hwn.

Across the country there are cohorts of businesses who have demonstrated particularly high levels of Digital Growth since 2020:

- A group of businesses selling high value manufactured goods with an emphasis upon exporting in Bridgend;

- A similar group of companies selling specialist foods, domestic hardware and specialist tobacco products in Ceredigion;

- A new outlet selling a large range of high quality car and motorcycle parts and accessories on-line and with prices in sterling and euros in Wrexham;

- Small businesses creating integrated on-line sales and business systems in the accommodation and food sector in Gwynedd;

- Businesses offering sophisticated digital services in the B2B sector in Cardiff.

Perhaps the one key factor they all have in common is that out of necessity or by design they are all outward looking. The drive to achieve sales volume by reaching out to attract customers and deliver at a distance is, it would seem a defining driver for digital growth. It remains to be seen what impact these changes have had and indeed, whether or not they will continue down this path.

# CWMNÏAU DIDDYMU
# DISSOLVED COMPANIES

# CWMNÏAU DIDDYMU
# DISSOLVED COMPANIES

Ar ddechrau'r project hwn, bwriad y tîm ymchwil oedd darparu dadansoddiad gwrthffeithiol i'r hyn a gyflwynir yn yr adroddiad hwn drwy broffilio gweithgarwch digidol busnesau Cymru a oedd - un ffordd neu'i gilydd - wedi dod i ben rhwng 2016 a 2023. Gallai hyn ddangos a oedd gwahaniaethau arwyddocaol rhwng, er enghraifft, proffiliau Twf Digidol neu Aeddfedrwydd Digidol busnesau llwyddiannus a chynaliadwy o gymharu â rhai a roddodd y gorau i fasnachu yn ystod cyfnod yr arolwg.

Fodd bynnag, roedd yr anawsterau methodolegol sy'n gysylltiedig â dadansoddi gweithgarwch digidol cwmnïau nad ydynt yn bodoli mwyach yn rhy gymhleth i'w goresgyn o fewn cyfyngiadau'r project presennol. Yn benodol, nid oedd y dull a ddefnyddiwyd yn yr arolwg hwn i ganfod a gwirio presenoldeb digidol busnesau Cymru yn gallu cynhyrchu set ddata ddigon mawr o fusnesau a gaewyd i wneud honiadau cadarn am y busnesau hynny ar y cyfan. Serch hynny, mae'r canlyniadau a gasglwyd yn awgrymog, ac yn darparu llwybrau addawol ar gyfer ymchwil yn y dyfodol.

Roedd 43,517 o gwmnïau wedi'u cofrestru yn Nhŷ'r Cwmnïau ym mis Mawrth 2016 nad oeddent yn bresennol mwyach ym mis Ionawr 2023. O'r rhain, dim ond 68 cwmni y llwyddasom i ganfod tystiolaeth eu bod wedi bod yn berchen gwefan wiriadwy tra'r oeddent yn bodoli. Gyda mwy o amser, byddai wedi bod yn bosibl chwilio am gwmnïau a ddiflannodd rhwng 2017 a 2023, rhwng 2018 a 2023 ac yn y blaen, a byddai wedi bod yn rhesymol disgwyl i hynny gynhyrchu sampl o tua 1000 cwmni sydd wedi marw ac wedi diflannu. Cafodd y rheoliad GDPR sy'n mynnu bod gwefannau'n lletya polisi maes - un o'r dulliau dilysu allweddol a ddefnyddiwyd i

baru cwmnïau â gwefannau yn yr arolwg hwn - ei roi ar waith yn ystod cyfnod yr arolwg, sy'n golygu y byddai'n haws canfod gwefannau cwmnïau a drwy hynny adeiladu sampl mwy ar gyfer dyddiadau diweddarach.

Wrth edrych ar y 68 busnes hyn a oedd wedi cau (i roi persbectif, mae hyn oddeutu seithfed rhan o faint sampl arolygon Aeddfedrwydd Digidol Cymru y blynyddoedd blaenorol), y canlyniad amlycaf yw'r gostyngiad dramatig yn Nhwf Digidol cyfartalog y cwmnïau hyn dros y cyfnod, nes bod tua hanner y cwmnïau wedi syrthio allan. Fel y nodwyd yn ein cafeat ynghylch dadansoddi'r prif sampl, mae'r ffiniau gwall a roddir i'r gwerthoedd yn cynyddu wrth i nifer y cwmnïau leihau, yn enwedig wrth ystyried yr indecs Twf Digidol sensitif iawn. Yn y prif sampl mae hyn yn digwydd wrth inni fynd yn bellach yn ôl mewn amser, ond yn y sampl hwn mae'r gwrthwyneb yn wir. Hynny yw, yr agosaf yr ydym at heddiw, y mwyaf o'r cwmnïau sydd wedi diflannu, sy'n lleihau'r hyder y gellir ei roi mewn honiadau eang am eu proffil digidol.

Yn ystod y cyfnod o 2016 hyd at 2018, mae'r Twf Digidol rhwng traean a chwarter maint y cyfartaledd cenedlaethol sydd wedi'i gyfrifo ar gyfer sampl y prif arolwg. Mae hyn yn dangos bod cwmnïau marw neu gwmnïau sy'n diflannu, yn gyffredinol, yn llawer llai tebygol o ddefnyddio eu heiddo digidol a buddsoddi yn eu presenoldeb digidol. Yn ddiddorol, erbyn i Covid-19 ddigwydd pan welwyd cynnydd cenedlaethol mewn Twf Digidol, adlewyrchir hyn hefyd ymysg y cwmnïau a oedd yn marw a bron â marw. Yn wir, o ran twf canrannol o'i gymharu â chyn hynny, roedd ymatebion y cwmnïau hyn yn llawer mwy na'r cyfartaledd cenedlaethol a awgrymwyd. Serch hynny, wrth gwrs, erbyn hyn dim ond 40 o gwmnïau sydd yn y sampl, felly mae'r ffiniau gwall wedi tyfu.

Er mai'r unig beth y gellir ei ddweud â sicrwydd am y cwmnïau hyn yw eu bod wedi'u cofrestru yn Nhŷ'r Cwmnïau ym mis Mawrth 2016, mae'n ymddangos nad oedd o leiaf un o bob pump ohonynt yn bodoli erbyn Haf 2020. Mae Haf 2020 yn un o ddau gyfnod - y llall yw Hydref 2022 - lle mae dirywiad sylweddol i'w weld. Mae hyn yn cyd-fynd â'r hyn a ddisgwylir o ddangosyddion eraill - mai siociau ariannol y cyfyngiadau symud Covid-19 ac ansicrwydd economaidd 2022 oedd digwyddiadau mwyaf arwyddocaol y cyfnod hwn.

Mae'n ymddangos bod Aeddfedrwydd Digidol y busnesau hyn yn cyd-fynd â'r Cyfartaledd Cenedlaethol, neu o fewn ambell bwynt iddo. Fodd bynnag, wrth edrych ar yr Indecs Arloesi (gan ystyried risgiau gwneud honiadau cryf o sampl mor fach), mae'r gwahaniaeth rhyngddo a'r cyfartaledd cenedlaethol i'w weld yn amlwg iawn. Mae rhai blynyddoedd yn dangos cymaint â 15% o wahaniaeth, sy'n awgrymu bod y cwmnïau a fu farw rywbryd rhwng 2016 a mis Ionawr 2023, ac y llwyddwyd i ganfod tystiolaeth o'u presenoldeb digidol, yn fwy arloesol na chyfartaledd cenedlaethol Cymru.

Ynghyd â thystiolaeth o'r rhifau Twf Digidol, ymddengys bod gan y sampl o gwmnïau yn yr arolwg a ddiflannodd cyn 2023 fwy o allu i arloesi, ond llai o weithgarwch a buddsoddiad digidol, na chyfartaledd cenedlaethol yr holl fusnesau yn y sampl.

Wrth astudio hyn yn y dyfodol, byddai'n ddiddorol iawn estyn y sampl hwn o gwmnïau sydd wedi diflannu er mwyn profi a fyddai astudiaeth lawn yn cadarnhau'r effeithiau hyn. Byddai hyn yn caniatáu i ymchwilwyr ddatblygu safbwyntiau cadarn ar y gwahaniaeth rhwng proffiliau digidol cwmnïau cynaliadwy a rhai sydd wedi rhoi'r gorau i fasnachu, gan ddarparu data a allai roi sail i lunio polisïau ac i strategaethau cymorth busnes.

At the outset of this project, it had been the intention of the research team to provide a counterfactual to the analysis presented in this report by profiling the digital activity of Welsh businesses which had - one way or another - ceased to exist between 2016 and 2023. This would potentially demonstrate whether there were significant differences in, for example, the Digital Growth or Digital Maturity profiles of successful and sustainable businesses as opposed to those which stopped trading during the timeline of the survey.

However, the methodological difficulties inherent in analysis the digital activity of companies which no longer exist in the present proved too complex to overcome within the constraints of the current project. Specifically, the method deployed in this survey to find a verify the digital presence of Welsh businesses was unable to produce a large enough dataset of shuttered businesses to make robust claims about the cohort as a whole. Nevertheless, the results that were collected are suggestive, and provide promising avenues for future research.

There were 43,517 companies registered at Companies House in March 2016 that were no longer present in January 2023. This resolved to only 68 companies for which we could find evidence of their having owned a verifiable website while they were in existence. With more time, it would have been feasible to search for companies that disappeared between 2017 and 2023, 2018 and 2023 and so on, which could reasonably have been expected to produce a sample of around 1000 dead and disappeared companies. The GDPR regulation requiring that websites host a privacy policy - one of the key methods of verification used to match companies with websites in this survey - was implemented during the period surveyed, meaning that it would likely be easier to detect company websites and hence build a larger sample for later dates.

Looking at this cohort of 68 closed businesses (which, for perspective, amounts to about one-seventh of the sample size of previous years' Digital Maturity for Wales surveys), the most noticeable result is the dramatic reduction in the average Digital Growth of these companies over the time period, until about half of them have fallen out. As with our caveat in relation to the analysis of the main sample, the error bounds attributed to the values increase as the number of companies in the cohort decrease, especially with the very sensitive Digital Growth index. Whereas in the main sample this happens the further back in time we go, with this sample the inverse is true. That is, the closer we are to today, the more of the companies have disappeared, and the confidence with which it is possible to make broad claims about their digital profile is reduced.

During the period from 2016 through to 2018, the Digital Growth is one-third to one-quarter the size of the national average calculated for the main survey sample. This shows that dead or disappearing companies are by any account dramatically less likely to be using their digital properties and investing in their digital presence. Interestingly, by the time Covid-19 occurs and we see a nation-wide uptick in the Digital Growth this is also reflected in the cohort of dying and soon-to-be dead companies. Indeed, in terms of percentage growth on what had gone before these companies' reactions were much greater than the national average suggested. Although of course by this time there are only 40 companies in the sample, so our error boundaries have grown.

Although the only thing that can be said with certainty about these companies lives is that they were registered at Companies House in March 2016, it seems that by Summer 2020 at least a fifth of them had ceased to exist. Summer 2020 represents one of two periods - the other being Autumn 2022 - during which we see significant decay.

This is in keeping with what we expect from other indicators - that the financial shocks of the Covid-19 lockdown and economic turbulence of 2022 were the most significant events of this period.

The Digital Maturity of this cohort seems to match with the National Average, give or take a few basis points. However, looking at the Innovation Index (bearing in mind the risks of making strong claims from such a small sample), the difference from the national average becomes extremely noticeable. With some years showing as great a difference as 15%, the implication is that as a cohort the companies that died some point between 2016 and January 2023 and for which we could find evidence of a digital presence were more innovative than the national average for Wales.

Coupled with evidence from the Digital Growth numbers it seems that on average the sample of survey  companies which disappeared before 2023 has a higher innovative capacity, but lower levels of digital activity and investment, than the national average of the sample cohort.

For future studies, it would be of great interest to extend this sample of disappeared companies in order to test if these effects bear out under the scrutiny of a proper study. This would allow researchers to develop robust insights into the difference in digital profiles between sustainable companies and those which have ceased trading, providing data which could inform policy-making and business support strategies.

**Table #.**
Digital Maturity Comparison Table

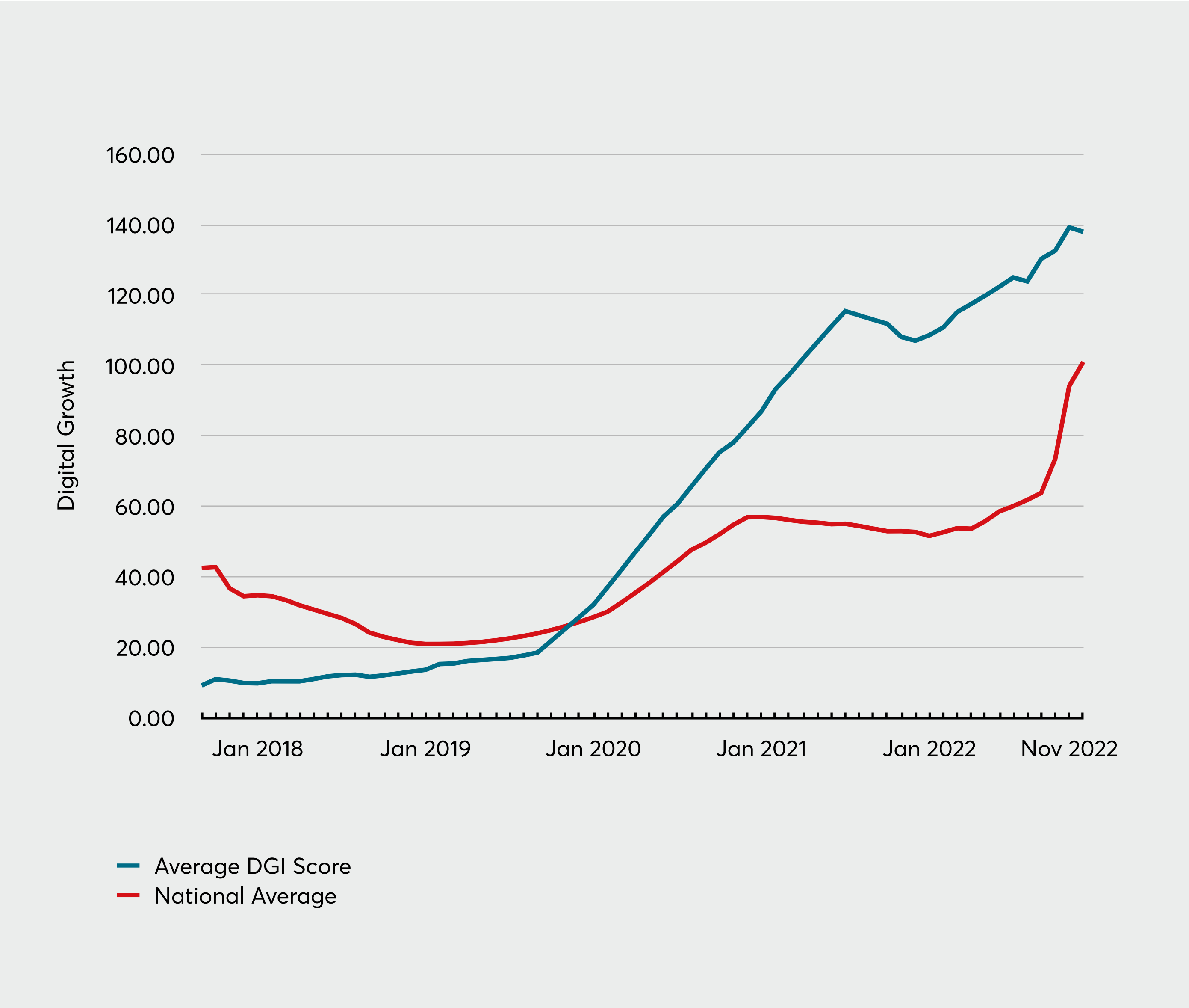
| Date | Average Digital Maturity | National Average | Number of Companies “live” |
|---|---|---|---|
| **Jan 2016** | 21.47 | 21.45 | 52 |
| **Jan 2017** | 25.56 | 23.00 | 58 |
| **Jan 2018** | 25.67 | 21.87 | 54 |
| **Jan 2019** | 23.61 | 20.31 | 55 |
| **Jan 2020** | 23.33 | 21.23 | 51 |
| **Jan 2021** | 25.46 | 25.63 | 53 |
| **Jan 2022** | 27.19 | 25.98 | 50 |
| **Jan 2023** | 26.83 | 26.17 | 45 |

**Table #.**
Innovation Index Comparison Table

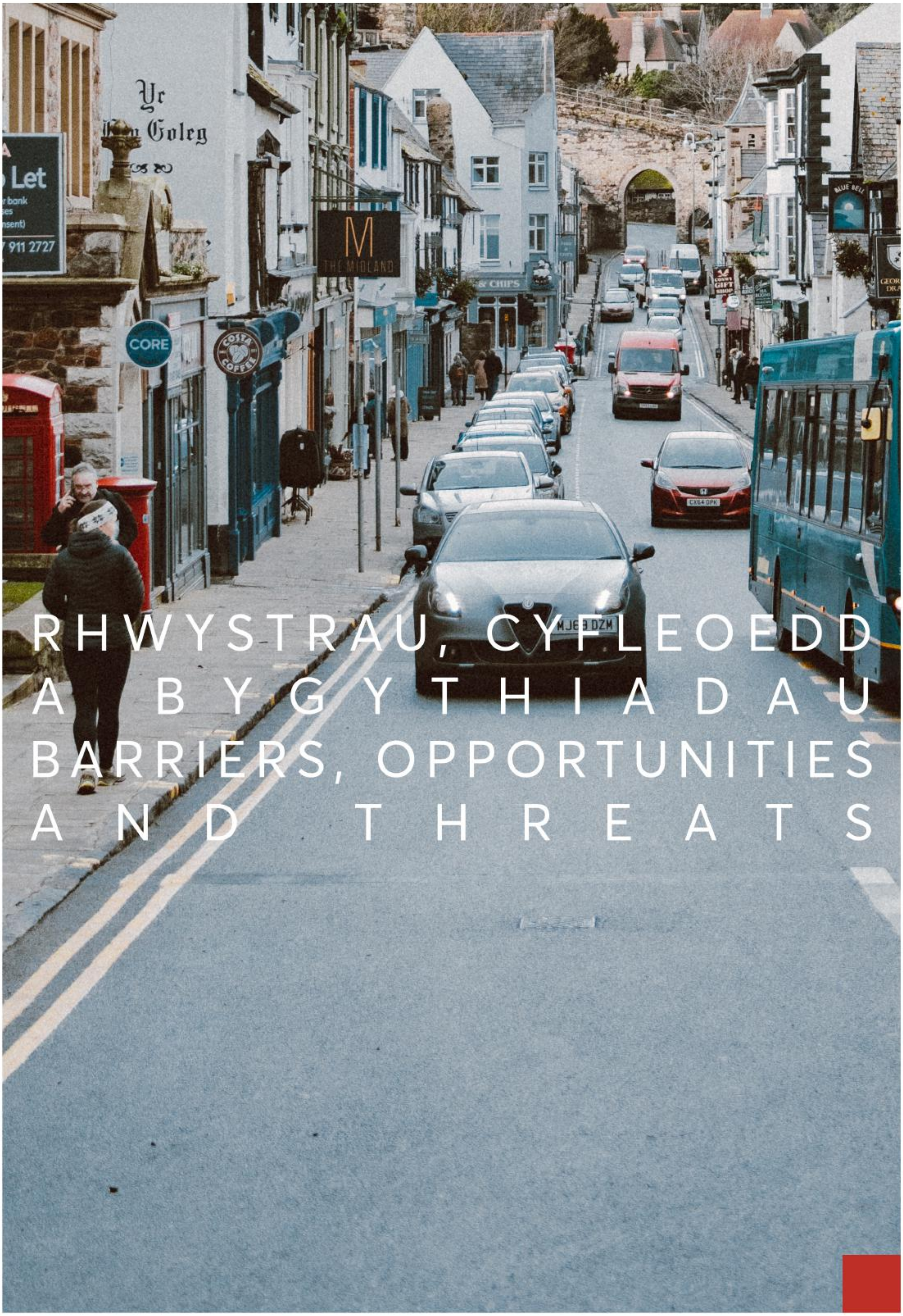
| Date | Average Innovation Score | National Average | Total Companies “live” |
|---|---|---|---|
| **Jan 2016** | 0.45 | 0.30 | 52 |
| **Jan 2017** | 0.40 | 0.31 | 58 |
| **Jan 2018** | 0.40 | 0.31 | 54 |
| **Jan 2019** | 0.44 | 0.32 | 55 |
| **Jan 2020** | 0.41 | 0.34 | 51 |
| **Jan 2021** | 0.41 | 0.35 | 53 |
| **Jan 2022** | 0.44 | 0.36 | 50 |
| **Jan 2023** | 0.46 | 0.37 | 45 |

**Graph #.**

Average DGI Score for Dead Companies Cohort



# RHWYSTRAU, CYFLEOEDD A BYGYTHIADAU
# BARRIERS, OPPORTUNITIES AND THREATS



# RHWYSTRAU, CYFLEOED A BYGYTHIADAU
# BARRIERS, OPPORTUNITIES AND THREATS

**Themâu o'r Canfyddiadau Ansoddol**

Daeth chwe thema gyffredinol i'r amlwg o'r rhaglen o gyfweliadau ansoddol:

- I Seilwaith a Chysylltedd
- Anghyfartaledd Rhwng Sectorau Busnes
- Mabwysiadu ac Arloesi Digidol
- Sgiliau ac Addysg Ddigidol
- Llywodraethu Digidol a Gwasanaethau Cyhoeddus
- Seiberddiogelwch, Diogelu Data a Sero Net

Trafodir pob un o'r themâu hyn yn ei thro, gyda chymorth dyfyniadau o gyfweliadau yn ogystal â data o'r arolwg digidol a thystiolaeth o ymchwil desg. Bwriad y drafodaeth hon yw ymateb i flaenoriaethau polisi cyffredinol Llywodraeth Cymru - h.y. lleihau anghydraddoldeb gan greu economi genedlaethol fwy dynamig, arloesol ac economaidd gynaliadwy. At y diben hwn, bydd y dadansoddiad yn canolbwyntio ar ddau gwestiwn:

- Anghyfartaledd rhwng rhanbarthau yn y presennol a'r dyfodol
- Cyfleoedd am ddatblygiad economaidd ar lefel genedlaethol yn y presennol a'r dyfodol

**Themes from Qualitative Findings**

Six overarching themes emerged from the programme of qualitative interviews:

- Infrastructure and Connectivity
- Disparities Between Business Sectors
- Digital Adoption and Innovation
- Digital Skills and Education
- Cybersecurity, Data Protection and Net Zero
- Digital Government and Public Services

Each of these themes will be discussed in turn, supported by quotes from interviewees as well as data from the digital survey and evidence from desk research. This discussion seeks to respond to the overarching policy priorities of the Welsh Government - i.e. to reduce inequality whilst creating a more dynamic, innovative and environmentally sustainable national economy. To this end, the analysis will centre on two questions:

- Current and future disparities between regions
- The Current and future opportunities for economic advancement at national level

## 1. Seilwaith a chysylltedd

### Mae cysylltedd digidol nawr yn hanfodol i ffyniant economaidd Cymru

Yn ôl adroddiad *Cenhedloedd Cysylltiedig* Ofcom, mae band llydan cyflym iawn ar gael i 95% o Gymru erbyn hyn, ac mae 4G ar gael yn yr awyr agored i rhwng 96-99%, neu 88-95% mewn ardaloedd gwledig. Mae'r ffigurau hyn yn adlewyrchu ymdrechion parhaus Llywodraeth Cymru i wella mynediad i'r rhyngrwyd drwy fuddsoddi mewn seilwaith a chysylltedd dros y degawd diwethaf.

Roedd cyflawni cysylltedd digidol ar raddfa eang - fel y dywedodd llawer o atebwyr cyfweliadau - yn hanfodol i gynnal gwydnwch economi Cymru yn ystod y pandemig. Fel y dangosir uchod, mae'r data'n dangos cynyddiadau clir o ran Twf Digidol ac Aeddfedrwydd Digidol o Wanwyn 2020 ymlaen, wrth i fusnesau "droi at ddigidol" fel ymateb i gyfyngiadau symud cenedlaethol, a chanfod ffyrdd newydd o gynnig eu gwasanaethau a chyrraedd eu cleientiaid ar-lein.

Yn amlwg, ni fyddai dim o hyn wedi bod yn bosibl heb fuddsoddiad y wlad mewn band llydan cyflym iawn na'r cynlluniau cymorth busnes a oedd yn cyd-fynd ag ef. I ddyfynnu un atebydd: "*Yr hyn y byddwn i'n ei ddweud am [ein busnes] yw diolch byth ein bod ni yn 2018 a 2019 [wedi buddsoddi yn] ein llwyfan digidol ein hunain, gan olygu bod… cydweithwyr yn gallu mynd adref i'w hystafelloedd sbâr a'u ceginau a dal i gynnal y [busnes].*"

Sbardunodd y pandemig Covid-19 fusnesau Cymru i wneud newidiadau sylweddol i'r ffordd yr oeddent yn defnyddio technolegau digidol, ac mae llawer o'r rhain bellach wedi'u hintegreiddio'n llawn yn eu harferion busnes cyffredin. Er enghraifft:

- Cynnal cyfarfodydd o bell. I ddyfynnu un atebydd, perchennog busnes gwasanaethau digidol bach: "*Mae pawb yn deall fideo nawr…ac wedi sylweddoli, yn hytrach na theithio am dair awr i Fanceinion am gyfarfod hanner awr ac yna teithio am dair awr yn ôl a'r holl gostau a dioddef ar y traffyrdd…mae hi'n llawer gwell agor ap ar eich cyfrifiadur neu ffôn a chael sgwrs. Ac ennill yr un faint o arian ag y bydden nhw'n ei gael am wneud y cyfarfod wyneb yn wyneb.*"

- Troi at werthu neu ddarparu gwasanaeth ar-lein. I ddyfynnu un atebydd, perchennog busnes crefftau bach: *"Cyn y pandemig, roedd tua 80% o fy musnes yn addysgu cyrsiau a 20% yn gwneud cynhyrchion…rhoddodd COVID gyfle i mi ailwerthuso popeth roeddwn i'n ei wneud…mae'n siŵr fy mod i wedi newid i 80% gwneud a 20% addysgu yn ystod y cyfyngiadau symud, ac erbyn hyn rwy'n gwneud tua 50/50."*

- Mabwysiadu patrymau gweithio o gartref neu weithio hybrid. I ddyfynnu un atebydd, prif swyddog gweithredu egin fusnes technoleg: "F*e wnaethon ni ddechrau'r busnes yn ystod y pandemig… dwi'n meddwl ei fod wedi gweithio'n dda iawn i ni a dweud y gwir… rydyn ni'n mynd i mewn i'r swyddfa, rydyn ni'n ceisio mynd ddwywaith yr wythnos ond rydyn ni'n hyblyg am y peth ac rydw i'n meddwl, a dweud y gwir, bod hynny'n gweithio'n well i bawb yn ein tîm.*"

Fel mae sylwadau'r atebwyr yn ei ddangos, anogodd y pandemig gwmnïau Cymru i arbrofi â strategaethau busnes digidol sydd wedi parhau i fod yn ddefnyddiol hyd yn oed ar ôl codi'r cyfyngiadau symud.

<u>Mae gweithio hybrid yma i aros, a rhaid i lunwyr polisïau ymateb yn briodol i hynny</u>

O'r llawer o newidiadau hyn, gweithio hybrid yw'r mwyaf arwyddocaol, o ran y manteision i fusnesau a staff a hefyd o ran y goblygiadau ehangach i lunwyr polisïau. I staff, mae gweithio hybrid yn cynnig mwy o hyblygrwydd o ran dewis ble i fyw a gweithio, yn ogystal â mwy o allu i gydbwyso ymrwymiadau teulu a/neu ofal. Cynigiodd un atebydd fod gweithio hyblyg yn cynnig manteision gwirioneddol i les gweithwyr: "*Mae pawb rydw i wedi siarad â nhw, sydd o oed gweithio, wir wedi gwerthfawrogi'r ffaith eu bod nhw wedi cael cyfle i stopio a meddwl am eu cydbwysedd mewn bywyd…a chanolbwyntio [ar] weithio [yn ystod] amser gwaith a chael ychydig bach mwy o… amser personol.*"

I fusnesau, mae modelau gweithio hybrid wedi ei gwneud yn haws gweithio'n fyd-eang, gan gwrdd â chleientiaid ar draws cylchfaoedd amser, ac wedi cynnig arbedion ar gostau teithio a chostau swyddfeydd. Mae hefyd wedi gwella eu gallu i ddenu a chadw staff cymwysedig. Fel y dywedodd un atebydd, cyfarwyddwr cwmni gwasanaethau busnes arbenigol iawn:

*Mae gennyn ni bobl sy'n byw yn Ewrop nawr yn gweithio i'r busnes…Wchi, mae gennyn ni unigolion eithaf unigryw'n gweithio i ni, a phan ddewch chi o hyd i rywun da, os yw eu hamgylchiadau personol yn newid, angen bod gyda phartner yn Sbaen, pam na fydden ni'n gwneud hynny er mwyn cadw'r unigolyn yn gweithio i ni?*

O safbwynt polisi, mae'r ffaith bod mwy o weithio hybrid yn digwydd yn golygu bod seilwaith a chysylltedd yn bwysicach nag erioed. Mae hyn, diolch i fentrau blaenorol, yn fwy o fater o ansawdd y gwasanaeth yn hytrach na mannau lle nad yw ar gael o gwbl. Yn ôl adroddiad Ofcom, mae mwy a mwy o fand llydan ffibr llawn a gwasanaeth 5G ar gael (mae ffibr llawn ar gael i 40% o adeiladau Cymru, ond dim ond 33% mewn ardaloedd gwledig; mae gwasanaeth 5G gan weithredwyr rhwydweithiau symudol unigol yn amrywio o 10-46%), ond llai nag mewn cenhedloedd eraill, ac mae llai ar gael mewn ardaloedd gwledig.

### 1. Infrastructure and connectivity

### Digital connectivity is now vital to Wales' economic prosperity

According to Ofcom's *Connected Nations* report, superfast broadband coverage in Wales has increased to 95%, while 4G outdoor premise coverage ranges between 96-99%, or 88-95% in rural areas. These figures reflect the concerted efforts of the Welsh Government to improve internet access by investing in infrastructure and connectivity over the past decade.

The accomplishment of widespread digital connectivity was - as many interviewees reflected - vital to sustaining the resilience of the Welsh economy during the pandemic. As demonstrated above, the data shows marked increases in both Digital Growth and Digital Maturity from Spring 2020, as businesses "pivoted to digital" in response to national lockdown measures, finding new ways to offer their services and reach their clients online.

Clearly, none of this would have been possible without state investment in superfast broadband or the business support schemes that went along with it. To quote one respondent: "*What I would say about [our business] is thank goodness in 2018 and 2019 [we invested in] our own digital platform, which meant that… colleagues could go home to their back bedrooms and their kitchens and keep running the [business].*"

The Covid-19 pandemic spurred Welsh companies to make significant changes in their use of digital technologies, many of which are now fully integrated into their ordinary business practices. For instance:

- Taking remote meetings. To quote one respondent, owner of a small digital services business: "*Everybody's got video savvy now…and they've realised that rather than travelling for three hours up to Manchester for a half an hour meeting and then travelling three hours back and all the expense and suffering of the motorways…it's far better to just pop open an app on your computer or phone, have a chat. And earn the same amount of money they did for doing that face-to-face meeting.*"

- Shifting to online sales or service provision. To quote one respondent, owner of a small craft business: "*Before the pandemic, my business was about 80% teaching courses to 20% making products…COVID just allowed me to reevaluate everything I was doing…I went to probably 80% making and 20% teaching during lockdown, and now I do about 50/50.*"

- Adopting work-from-home or hybrid working patterns. To quote one respondent, COO for a tech startup: "W*e started the business during the pandemic… I think it actually worked very well for us… we do go into the office, like we try to go twice a week but we're flexible around it and I think actually, that works better for everyone in our team.*"

As the interviewees comments show, the pandemic encouraged Welsh companies to experiment with digitally-enabled business strategies which have continued to prove useful even after the lifting of lockdown measures.

Hybrid working is here to stay, and policymakers must react accordingly

Of these many changes, hybrid working is the most significant, both in terms of the benefits provided to businesses and staff and the broader implications for policymakers. For staff, hybrid working offers greater flexibility in choosing where to live and work, as well as greater ability to balance family and/or care commitments. One respondent proposed that flexible working provides tangible benefits for employee wellbeing: *"Everybody I've talked to who's of working age really has appreciated the fact that they had a chance to stop and think about their balance in life…and focus [on] working [during] work time and have a bit more…personal time."*

For businesses, hybrid working models have made it easier to work globally, to meet clients across time zones and offered savings on travel and office expenses. It has also improved their capacity to attract and retain qualified staff. As one respondent, director of a highly specialised business services company, reflected:

*We've got people that are resident in Europe now working for the business…You know, we've got some fairly unique individuals work for us, and when you find somebody good, if they have a change in personal circumstance, need to be with a partner in Spain, why would we not do that if we can keep that individual working for us?*

From a policy perspective, the increased prevalence of hybrid working makes infrastructure and connectivity more important than ever. This is, thanks to previous initiatives, more an issue of the quality rather than the extent of coverage. Per the Ofcom report, the availability of full fibre broadband and 5G service is increasing (full fibre is available to 40% of premises in Wales, though only 33% in rural areas; 5G coverage by individual mobile network operators spans a range from 10-46%), but lags behind other nations, and is less prevalent in rural areas.

### 2. TMae'r gagendor digidol yn dal i fodoli rhwng rhanbarthau a hefyd rhwng demograffigau

Mynegodd nifer o atebwyr rwystredigaeth â chyflymder neu ddibynadwyedd y rhyngrwyd yn eu hardal leol, er eu bod yn cydnabod gwelliannau diweddar. Cwynodd un atebydd, "*Mae'n rhaid i mi aros ac mae'n teimlo fel fy mod i'n ôl ar gysylltiad deialu weithiau*", a nododd un arall fod cysylltedd "*yn wahaniaethol iawn [ar draws gwahanol ardaloedd].*" Roedd llawer o atebwyr yn hafalu cyflymder cysylltiad yn uniongyrchol â thwf masnachol - fel y dywedodd un atebydd, "*Pe bai gen i fwy o gyflymder llwytho i lawr a mwy o gyflymder llwytho i fyny, byddai hynny'n bendant yn gwella fy rhagolygon busnes.*" Mae cyflymder a dibynadwyedd cysylltiadau â'r rhyngrwyd nawr yn faen prawf eithriadol o bwysig i fusnesau sy'n dewis ble i sefydlu ac adleoli, ffactor a fydd hefyd yn cael mwy a mwy o ddylanwad ar benderfyniadau pobl am lety personol, gan fod gweithio hybrid yn mynnu bod cysylltiad eu cartref yn ddigon sefydlog at ddibenion gwaith, fel y pwysleisiodd un atebydd:

*Rydw i yn y broses o symud tŷ ac un o'r prif gwestiynau roedden ni'n eu gofyn i'r gwerthwyr tai oedd 'Ydych chi'n gwybod pa mor gyflym yw'r rhyngrwyd yma? Ac a yw'n gysylltiad ffibr optegol?' Dydw i ddim yn meddwl y byddwn i wedi symud i le heb gysylltiad ffibr optegol.*

Yn gyffredinol, mae hyn yn golygu, er bod yr anghyfartaledd daearyddol o ran seilwaith a chysylltedd digidol wedi culhau, bod ganddo'r potensial o hyd i waethygu anghydraddoldeb rhanbarthol sy'n bodoli.[7]
Ni fydd busnesau sy'n bodoli mewn ardaloedd lle mae'r cyflymder neu'r dibynadwyedd yn isel mewn cystal sefyllfa i fanteisio ar dechnolegau digidol y presennol a'r dyfodol, bydd busnesau newydd yn llai tebygol o sefydlu yn yr ardaloedd hyn, a bydd gweithwyr sy'n gweithio o bell yn fwy cyndyn i adleoli iddynt. Mae hwn hefyd yn fater pwysig i wasanaethau cyhoeddus - os ydynt yn ceisio cynnig darpariaeth ar-lein, bydd arnynt angen cysylltiadau rhyngrwyd cyflym a dibynadwy *ar eu safleoedd eu hunain ac i'w defnyddwyr* i gadw eu haddewidion am eu gwasanaethau.

Ar nodyn tebyg, nid yw manteision technoleg ddigidol o reidrwydd ar gael i'r un graddau i bob gweithiwr. Gall yr anghyfartaledd hwn ddod i'r amlwg mewn amryw o ffyrdd:

- **Oed**: Roedd atebwyr iau sy'n gweithio mewn egin fusnesau'n amlwg yn meddu ar lawer o sgiliau digidol ac yn gallu addasu i weithio ar draws amrywiaeth o rolau, ond roedd atebwyr hŷn mewn busnesau sefydledig yn tueddu i recriwtio ar gyfer sgiliau digidol newydd. Mae'n well gan yr atebwyr iau weithio o gartref gymaint â phosibl os oes ganddynt fan priodol i weithio ynddo, ond mae llawer o'r gweithlu hŷn o dan lefel uwch reolwyr yn gwerthfawrogi cyswllt personol ac yn awyddus i fod yn y swyddfa o leiaf rywfaint o'r amser.
- **Incwm:** Mae gweithwyr incwm isel yn llai tebygol o fod â man swyddfa pwrpasol ar gael gartref, ac mae'n anoddach iddynt dalu am dechnoleg o'u poced eu hunain.
- **Swydd:** Mae rhai rolau neu ddiwydiannau'n fwy tebygol o gynnig yr opsiwn o weithio o bell, er enghraifft, rolau gweithwyr gwybodaeth coler wen.
- **Addysg:** Mae gweithwyr sydd wedi cael mwy o addysg yn fwy tebygol o fod â'r sgiliau a'r profiad digidol sydd eu hangen i droi at rolau hybrid.

Bydd dod o hyd i ffyrdd o liniaru'r anghyfartaleddau hyn yn beth pwysig i'w ystyried wrth lunio polisïau yn y dyfodol.

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7 Mae archwiliad o effaith y gagendor digidol gwledig/trefol ar fusnesau Cymru i'w gael yn "Implications of the Digital Divide on Rural SME Resilience", Morris et al., Journal of Rural Studies, Rhifyn 89, 2022, t369. https://doi.org/10.1016/j.jrurstud.2022.01.005.

**2. The digital divide remains, both between regions and demographics**

A number of respondents expressed frustration with internet speed or reliability in their local area, while acknowledging recent improvements. One interviewee complained, "*I have to wait and it feels like I'm back on dial-up sometimes*", another observed that connectivity was "*very differential [across different areas].*" Connection speed was, for several respondents, directly equated with commercial growth - as one interviewee put it, "*If I had more download speed and more upload speed, it would definitely increase my business prospects.*" The speed and reliability of internet connections is now an extremely important criteria for businesses choosing where to set up and relocate, a factor which will also increasingly bear upon people's personal accommodation decision, as hybrid working demands that their home connection is stable enough for work purposes, as one respondent stressed:

*I'm just in the process of moving house and one of the main questions we were asking the estate agents was 'Do you know what speed of internet I can get here? And is it fibre optic?' If I didn't get fibre optic wherever I was moving, I think that would have meant I wouldn't move there.*

Altogether, this means that whilst geographic disparities in digital infrastructure and connectivity have narrowed, they still have the potential to exacerbate existing regional inequalities.[8]

Businesses that exist in low speed/reliability areas will be less able to exploit the benefits of current and future digital technologies, new businesses will be less likely to set up in the area, and remote workers disincentivised to relocate there. There is also a significant issue for public services - insofar as they attempt to offer online provision, these will require high speed, reliable internet connections *both in their own premises and for their users* if they are to uphold their service mandate.

On a similar note, the benefits of digital technology are not necessarily equally available to all workers. These disparities can manifest in various ways:

- **Age**: Younger respondents working in startups were notably digitally multi-skilled and adaptable, working across a range of roles, where older respondents in more established businesses tend to recruit for new digital skills. The younger respondents prefer to work from home as much as possible if they have an appropriate work space, while much of the older workforce below senior management level value in-person contact and are keen to be in the office at least part of the time.
- **Income:** Low-income workers are less likely to access to dedicated office space at home, and less able to pay for technology out of their own pocket.
- **Occupation:** Certain roles or industries are more likely to offer the option of remote working, for example, white-collar knowledge worker roles.
- **Education:** More highly educated workers are more likely to possess the digital skills and experience required to transition to hybrid roles.

Findings ways to mitigate these disparities will be an important consideration for future policy making.

[8] For an exploration of the impact of the rural/urban digital divide on Welsh businesses, see "Implications of the Digital Divide on Rural SME Resilience", Morris et al., *Journal of Rural Studies*, Vol. 89, 2022, p369. https://doi.org/10.1016/j.jrurstud.2022.01.005.

## 3. Mabwysiadu ac Arloesi Digidol

<u>Cynnydd yng nghyfradd digidoleiddio'n cyflwyno cyfleoedd a hefyd risgiau</u>

Fel y nodwyd yn yr adran flaenorol, yn y cyfnod ers dechrau 2020 mae busnesau Cymru wedi integreiddio nifer o dechnolegau a strategaethau digidol newydd yn eu harferion gweithio bob dydd. Adlewyrchir hyn yn y data gan gynyddiadau sylweddol mewn Twf Digidol (pa mor aml, ac i ba raddau, mae cwmnïau'n newid ac yn diweddaru eu gwefannau) ac Aeddfedrwydd Digidol (soffistigeiddrwydd presenoldeb gwe'r cwmnïau).

Mabwysiadwyd mwy o nodweddion digidol ar lawer o wahanol ffurfiau:

- **Defnyddio technoleg galwadau fideo** - Zoom neu Teams yn y busnesau mwyaf a mwy digidol aeddfed, galwadau fideo ar apiau Zoom, Facebook neu FaceTime yn y busnesau lleiaf.
- **Gweithio Hybrid -** gweithwyr naill ai'n gwneud eu holl waith o bell, neu'n rhannu eu hamser rhwng eu cartref a'r swyddfa.
- **Gwerthu/Darparu Gwasanaethau Ar-lein -** mae busnesau'n dod o hyd i fwy a mwy o ffyrdd o gyrraedd eu cwsmeriaid ar-lein gan ddefnyddio llwyfannau marchnad megis Instagram, Shopify ac Etsy.
- **Allanoli Digidol a'r Economi Apiau -** mae cwmnïau'n defnyddio mwy a mwy o lwyfannau digidol ac apiau i allanoli tasgau gweinyddu, logisteg a hyrwyddo, gan gynnwys marchnata, storio data, cyfrifyddu, monitro stoc, a gwerthu ar-lein (gweler Morris et al. 2022, t375).

Ar y cyfan, mae cyfradd mabwysiadu'r technolegau hyn wedi newid yr ystod o risgiau a chyfleoedd sy'n wynebu'r busnes cyfartalog yng Nghymru ar hyn o bryd. Mae defnyddio galwadau fideo, er enghraifft, wedi arwain at fanteision o ran trefniadau gweithio hyblyg ac arbedion costau, ond mae hefyd wedi creu set newydd o gostau, fel y nododd un atebydd: "*Roeddech chi'n arfer talu arian am X, ond does dim rhaid gwneud hynny wrth weithio o gartref. Eich rhent newydd chi yw pethau fel seiberddiogelwch ac yn amlwg gwasanaethau cwmwl.*" Nid yw'r "rhenti" newydd hyn, ar y cyfan, yn cael eu talu i fusnesau neu wasanaethau yng Nghymru, ond i gwmnïau technoleg rhyngwladol (wedi'u lleoli yn UDA yn bennaf). Mae'r rheol gyffredinol hon yn wir am gyfrifiadura yn y cwmwl a'r economi apiau, ac mae'n cynrychioli ffrwd o refeniw, arbenigedd, data a photensial arloesol sy'n draenio allan o economi Cymru. Yn yr un modd, er y gallai gweithio hybrid fod wedi ei gwneud yn haws i rai cwmnïau gyflogi a chadw staff, mae hefyd wedi ei gwneud yn fwy dichonadwy i weithwyr sy'n byw yng Nghymru gael eu cyflogi gan fusnesau sydd wedi'u lleoli yn Lloegr neu rywle arall.

Ar nodyn tebyg, mae gwerthu a darparu gwasanaethau ar-lein yn agor posibiliadau i fusnesau Cymru i farchnata eu cynhyrchion yn fyd-eang - cyfle sylweddol i gwmnïau ag arlwy cryf. Yn yr un modd, fodd bynnag, mae'r dynamig hwn hefyd yn golygu bod economi Cymru'n wynebu cystadleuaeth ryngwladol. Roedd hyn yn bryder arbennig i un atebydd sy'n gweithio mewn cwmni gwasanaethau busnes uwch-dechnoleg:

*Y peth sy'n fy mhoeni i yw datblygiadau technoleg amgen sy'n mynd i [gynrychioli] dewis arall yn lle ein gwasanaeth ni y byddai'n gallu cael ei wneud yn gyflymach na'r hyn rydyn ni'n ei wneud, oherwydd rydyn ni'n dal i wneud llawer o waith cynhyrchu data â llaw [i bob pwrpas]. Felly mae angen i ni gadw llygad ar y maes cystadleuol yna.*

Mae'r dimensiwn newydd hwn o gystadleuaeth ddigidol, wedi'i chyfuno ag ansefydlogrwydd economaidd ers y pandemig a chymhlethdodau parhaus o ganlyniad i Brexit, wedi cynhyrchu amgylchedd busnes heriol dros ben i lawer o BBaCh, fel y nododd yr ERC: *"Wynebodd BBaCh sy'n masnachu'n rhyngwladol heriau digynsail yn gysylltiedig â'r pandemig COVID-19, ac yna roedd rhaid iddynt hefyd ymdrin â goblygiadau Brexit yn ystod 2021. Mae'r tarfu ar gadwynau cyflenwi byd-eang wedi achosi anfantais anghymesur i BBaCh"*

(ERC 2021, t4). Mae'r data a gasglwyd ar gyfer yr arolwg hwn yn dangos bod nifer annisgwyl o uchel o gwmnïau wedi'u diddymu yn y flwyddyn ddiwethaf - ychydig dros 5,000, bron yr un maint â'n sampl strwythuredig, sy'n dangos amodau masnachu anodd y ddwy flynedd diwethaf i BBaCh.

Mae hyn i gyd yn golygu bod digidoleiddio'n taflu economi Cymru i mewn i farchnad fyd-eang gystadleuol lle mae'r gallu i arloesi'n allweddol, ac mae rhwystrau systemig rhag datblygu digidol yn achosi anfantais sylweddol.

### Rhwystrau rhag mabwysiadu ac arloesi

Nodwyd rhai rhwystrau rhag mabwysiadu ac arloesi digidol yn y cyfweliadau, gan gynnwy

- Costau caledwedd, meddalwedd a phecynnau tanysgrifio digidol
- Diffyg amser i ymwneud â strategaeth ddigidol neu addysgu gweithluoedd
- Diffyg arbenigedd digidol a sgiliau mewn cwmnïau
- Teimlad o ddiffyg arweiniad a chymorth ynghylch gweithredu ac arfer gorau

Yn y cyd-destun hwn, bydd gan fusnesau sydd eisoes wedi buddsoddi mewn digidoleiddio a sgiliau digidol fantais sylweddol, pwynt a bwysleisiwyd yn aml yn y llenyddiaeth ymchwil:

***"Mae busnesau â llawer o allu digidol… bron ddwywaith mor debygol o fod wedi cynyddu eu trosiant yn y 12 mis diwethaf, o gymharu â rhai â llai o sgiliau digidol. Y budd mwyaf a nodwyd, fodd bynnag, yw cyrhaeddiad cwsmeriaid y tu hwnt i'w hardal leol (23%), sy'n wahaniaeth pwysig, gan fod y pandemig wedi gorfodi llawer o fusnesau i edrych yn bellach er mwyn tyfu ac ehangu" (o Indecs Digidol Busnesau Lloyds 2022).***

Mae'r data Sgôr Arloesi a gasglwyd ar gyfer yr arolwg hwn yn dangos anghyfartaledd amlwg rhwng ardaloedd trefol a gwledig a barhaodd drwy gydol y pandemig; ar hyn o bryd mae busnesau trefol 1% yn uwch na busnesau gwledig, sy'n wahaniaeth arwyddocaol. O'r busnesau a arolygwyd, mae gan fusnesau trefol sgôr Aeddfedrwydd Digidol ychydig bach uwch ac mae gan fusnesau gwledig sgôr Arloesi ychydig bach uwch. Mae hyn yn dangos, fel y byddai rhywun yn ei ddisgwyl, bod rhwystrau uwch i atal busnesau gwledig rhag mabwysiadu systemau digidol ac arloesi, ac felly bod angen mwy o gymorth arnynt i gystadlu yn yr economi ddigidol newydd.

Mae cysylltiad digidol ar gael i'r rhan fwyaf o Gymru erbyn hyn, felly mae'r gagendor gwledig/trefol hwn yn ymwneud mwy â materion economaidd-gymdeithasol a demograffig na seilwaith. Y pryder yw, heb gymorth materol ac addysgol, y caiff ardaloedd gwledig a threfi bach a chanolig eu gadael ar ôl, neu, i ddyfynnu astudiaeth ddiweddar, "y gallai anghydraddoldebau materol a chymdeithasol sy'n bodoli eisoes ddyfnhau, ac y gellid creu gagendorau newydd." (Salemink 2022, t136). Ar y llaw arall, mae ymchwil academaidd diweddar wedi awgrymu y gall gwella cysylltedd digidol gynnig sail hanfodol i arafu 'draen dawn' o ardaloedd gwledig, cadw a denu pobl ifanc, a denu swyddi a busnesau newydd (Tiwasing et al. 2022, t3), cyn belled ag y ceir buddsoddiad cymesur mewn addysg a chymorth busnes.

## 3. Digital Adoption and Innovation

Rising rate of digitalisation brings both opportunities and risks

As mentioned in the preceding section, the period since early 2020 has seen Welsh businesses integrate a number of novel digital technologies and strategies into their everyday working practices. This is reflected in the data by substantial increases in Digital Growth (the frequency and extent of website changes and updates) and Digital Maturity (the sophistication of companies' web presence).

Increased digital adoption came in several different forms:

- **Use of video-calling technology** - Zoom or Teams for larger and more digitally mature businesses, in-app video-calling on Zoom, Facebook or through FaceTime for smaller businesses.
- **Hybrid Working** - employees are either fully remote, or split their time between home and the office.
- **Online Sales/Service Provision** - businesses are increasingly finding ways to reach their customers online through marketplace platforms such as Instagram, Shopify and Etsy.
- **Digital Outsourcing and The App Economy** - companies are increasingly using digital platforms and apps to outsource administrative, logistical and promotions tasks, including marketing, data storage, accounting, stock monitoring, and online sales (see Morris et al. 2022, p375).

Overall, the adoption of these technologies has shifted the range of risks and opportunities that the average Welsh business is now exposed to. The use of video calling, for instance, has brought benefits in terms of flexible working arrangements and cost savings, but has also imposed a new set of charges, as one respondent observed: "*Where you used to pay money for X, you don't have to do that working from home. Your new rent is things like cyber security and obviously cloud services.*" These new "rents" are not, on the whole, paid out to Welsh businesses or services, but to international (primarily US-based) tech companies. This rule of thumb holds true for cloud computing and the the app economy, representing a stream of revenue, expertise, data and innovative potential draining away from the Welsh economy. Equally, whilst hybrid working may have made hiring and retaining skilled staff easier for some firms, it has also made it more feasible for Wales-based workers to be employed by businesses based in England or elsewhere.

On a similar note, online sales and service provision opens up possibilities for Welsh businesses to market their products on a global stage - a considerable opportunity for companies with a strong offering. By the same token, however, this dynamic also exposes the Welsh economy to international competition. This was a particular worry for one respondent working at a high-tech business services company:

*The thing that concerns me is alternative technology developments that will [represent] an alternative service to what we do and could be delivered at pace compared to what we do, because we are still [effectively] hand cranking a lot of data generation. So that's a competitive space that we need to keep an eye on.*

This new dimension of digital competition combined with post-pandemic economic instability and ongoing complications created by Brexit has produced an extremely challenging business environment for many SMEs, as reported by the ERC: "*SMEs trading internationally not only encountered unprecedented challenges associated with the COVID-19 pandemic, but also had to deal with the implications of Brexit during 2021. SMEs have been disproportionally disadvantaged by the disruption caused to global supply chains*" (ERC 2021, p4). Data gathered for this survey indicates an unexpectedly high number of companies that have dissolved in the last year - just over 5,000, nearly the same size as our structured sample, reflecting the tough trading conditions of the last two years for SMEs.

All this is to say that digitalisation is exposing the Welsh economy to a competitive global market where the ability to innovate is key, and systemic barriers to digital development constitute a significant disadvantage.

Barriers to adoption and innovation

Barriers to digital adoption and innovation cited in interviews include:

- Costs of digital hardware, software and subscription packages
- A lack of time to engage in digital strategy or educate workforces
- A lack of digital expertise and skills within companies
- A perceived lack of guidance and support on implementation and best practice

In this context, a considerable advantage is conferred on businesses which have already invested in digitalisation and digital skills, a point repeatedly stressed in the research literature:

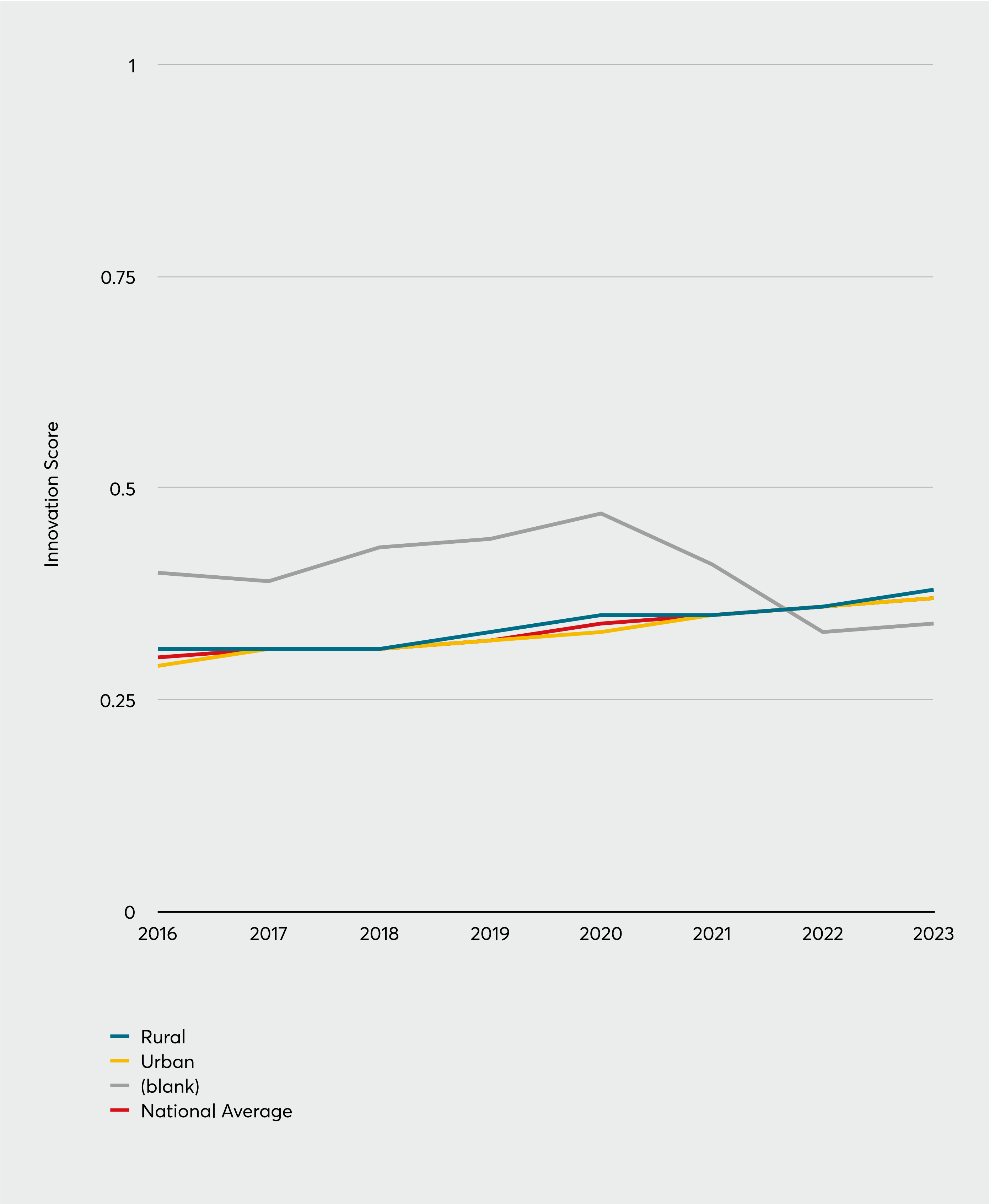
*"Businesses with high digital capability… are almost twice as likely to have increased their turnover in the last 12 months, in comparison to those who have lower digital skills. The greatest reported benefit though, is 'customer reach beyond their locality, (23%), an important distinction, as the pandemic has forced many businesses to look further afield for growth and expansion"* (from Lloyds' UK Business Digital Index 2022).

The Innovation Score data collected for this survey demonstrates a marked disparity between urban and rural areas which continued throughout the pandemic, with urban businesses currently a significant 1% higher than rural ones.

Of the businesses surveyed, urban businesses have a slightly higher Digital Maturity score and rural ones score slightly higher on Innovation. This indicates, as one would expect, that rural businesses experience higher barriers to digital adoption and innovation, and hence require greater support to compete in the new digital economy.

Now that most of Wales has access to a digital connection, this rural/urban divide is less grounded in infrastructure and more related to socio-economic and demographic issues. There is a concern that without material and educational support, rural areas and small- and medium-sized towns will be left behind, or, to quote a recent study, "that existing material and social inequalities potentially will be deepened, and new divides might be instigated." (Salemink 2022, p136). On the other hand, recent academic research has suggested that improvements to digital connectivity can offer a vital basis for slowing the 'brain drain' from rural areas, retaining and attracting young people, and bringing in new jobs and businesses (Tiwasing et al. 2022, p3), provided there is commensurate investment in education and business support.

**Graph 19.** Comparison of Rural and Urban Innovation, 2016-2023



Gwerth rhwydweithiau i ledaenu buddsoddiad, safonau technegol a dealltwriaeth ddigidol

Myfyriodd llawer o atebwyr ynghylch pwysigrwydd rhwydweithiau presennol a luniwyd i helpu i ddosbarthu arbenigedd digidol a/neu fuddsoddiad drwy economi Cymru i gyd. Roedd un atebydd yn pwysleisio pwysigrwydd estyn rhwydweithiau buddsoddwyr y tu hwnt i ganolfannau trefol De Cymru, gan ddadlau "*mae yna gymaint o gwmnïau y tu allan i Gaerdydd, Casnewydd ac Abertawe sydd hefyd yn gwneud pethau pwysig. Ond dydyn nhw ddim wedi'u cysylltu cystal â'r ecosystem.*" Dadleuodd atebydd arall y byddai polisi llywodraeth newydd, yn canolbwyntio ar greu safonau a rennir i fusnesau Cymru i roi technolegau digidol ar waith, yn helpu i ddatgloi arloesi: "*Pe bai'n bosibl i ni ddod o hyd i ffordd o ganolbwyntio mwy ar ledaenu technoleg drwy sector BBaCh ehangach Cymru, fel bod pawb rywsut yn ceisio defnyddio'r un peth. Does dim diffyg arloesi yng Nghymru, ond diffyg lledaenu.*"

Mae natur fyd-eang yr economi ddigidol yn ei gwneud yn arbennig o bwysig cynorthwyo BBaCh Cymru i ddatblygu apiau a llwyfannau a'u hyrwyddo'n genedlaethol ac yn rhyngwladol. Nid oes prinder apiau a llwyfannau llwyddiannus o Gymru sy'n gweithredu mewn llawer o feysydd yn yr economi, o letygarwch i iechyd a gofal cymdeithasol i wasanaethau gwybodaeth. Mae Yoello o Gaerdydd, er enghraifft, yn stori lwyddiant o Gymru yn y sector lletygarwch: llwyfan gwe sy'n galluogi cwsmeriaid i archebu a thalu o'u ffonau symudol heb orfod llwytho ap i lawr, gan gynnig ffioedd cystadleuol i gaffis a bwytai. Cynigiodd atebwyr cyfweliadau sylwadau cadarnhaol am y rhaglenni cymorth a buddsoddi digidol yng Nghymru, yn enwedig drwy Fanc Datblygu Cymru, yn ogystal ag enghraifft partneriaeth GIG Cymru â phrifysgolion Cymru, cydweithrediad sydd wedi recriwtio nifer o BBaCh i greu gwerth a gwybodaeth ar gyfer Cymru o setiau data sy'n eiddo i bobl Cymru.

The value of networks for diffusing investment, technical standards and digital know-how

Several respondents reflected on the importance of existing networks designed to help distribute digital expertise and/or investment throughout the Welsh economy. One respondent stressed the importance of extending investor networks beyond the urban centres of South Wales, arguing that "*there are so many companies outside of Cardiff, Newport and Swansea that are also doing important things. And they're just not as connected with the ecosystem.*" Another respondent argued that a government policy focussed on creating shared standards for the implementation of digital technologies by Welsh businesses would help unlock innovation: "*If we could find a way to focus more on diffusion of technology across the wider Welsh SME sector, so that everyone is kind of trying to use the same thing. There's no lack of innovation in wales, there's a lack of diffusion.*"

The globalised nature of the digital economy makes it particularly important to support Welsh SMEs developing apps and platforms and to promote them nationally and internationally. There is no shortage of successful Welsh Welsh apps and platforms operating across many areas of the economy from hospitality to health and social care to information services. Cardiff-born Yoello, for example, is a Welsh success story in the hospitality sector: a web-based platform that enables customers to order and pay from their mobile phones without having to download an app, offering cafes and restaurants competitive fees. Interview respondents commented positively on the programmes of digital support and investment in Wales, particularly through the Welsh Dev Banc, as well as the example of NHS Wales' partnership with Welsh universities, a collaboration which has recruited a number of SMEs to create value and knowledge for Wales from Welsh-owned datasets.

## 4. Sgiliau ac Addysg Ddigidol

Mae diffyg sgiliau digidol yn dal i fod yn broblem barhaus i lawer o fusnesau Cymru

Ar ôl y gwaith llwyddiannus i adeiladu seilwaith yn y blynyddoedd diwethaf, un o'r prif rwystrau sy'n weddill rhag ysgogi mabwysiadu ac arloesi digidol ledled Economi Cymru yw datblygu sgiliau digidol. Er y cymerwyd camau pwysig yn y maes hwn (mae rhaglen Cyflymu Cymru i Fusnesau yn un enghraifft bwysig), mae lefelau anghyfartal yr Aeddfedrwydd Digidol a gofnodwyd yn yr arolwg hwn yn awgrymu bod lefelau sgiliau digidol yn is mewn rhai ardaloedd o gwmpas trefi ac ardaloedd gwledig. Mae'n debygol bod nifer o ffactorau'n effeithio ar y ffenomen hon. I ddyfynnu astudiaeth academaidd ddiweddar "gwahaniaethau rhwng sgiliau digidol, eu mabwysiadu a'u defnyddio, gan ddibynnu'n bennaf ar ffactorau cymdeithasol, economaidd, demograffig a diwylliannol, megis lefelau addysg isel, llai o incwm, sgiliau iaith gwael, diffyg profiad â dyfeisiau digidol, oed hŷn a ffyrdd o fyw a chredoau sy'n tueddu i osgoi systemau digidol." (Salemink 2022, t131).

Ymysg atebwyr cyfweliadau'r arolwg hwn, cafwyd cytundeb cyffredinol bod datblygu sgiliau digidol yn hanfodol i wydnwch a ffyniant busnesau modern. Fodd bynnag, roedd hyd yn oed atebwyr cymharol dechnolegol fedrus yn mynegi pryder am eu gallu i barhau i newid yn ddigon cyflym. Er enghraifft, dywedodd un atebydd, prif swyddog technegol egin fusnes technoleg, "*Yr her fwyaf i ni yw cromlin dysg mabwysiadu technolegau newydd. Efallai y byddai mwy o gyfleoedd i ddysgu, gyda chyrsiau a phethau fel yna y byddai'n bosibl eu gwneud fel busnes, yn ddiddorol iawn.*" Nid dim ond mater o brinder sgiliau digidol perthnasol yw hwn; mae'n fater o allu gweld ble mae'r bylchau sgiliau o fewn busnes rhywun, a pha rai i'w blaenoriaethu. Mynegodd yr un atebydd awydd am fwy o arweiniad yn y maes hwn.

Yn gyffredinol, mae dau lwybr ar gael i fusnesau sy'n ceisio gwella ansawdd a gwasgariad y sgiliau digidol sydd ar gael i'w sefydliad:

- Meithrin sgiliau yn fewnol, naill ai drwy recriwtio (yn nodweddiadol, bydd busnesau mwy sefydledig â gweithlu mwy aeddfed yn ffafrio hyn), neu drwy hyfforddi (yn gyffredinol, bydd busnesau newydd neu egin fusnesau â gweithlu iau, mwy hyblyg â mwy o ddealltwriaeth ddigidol yn dewis gwneud hyn). Mae angen amser, buddsoddiad a gwybodaeth glir am fylchau sgiliau sy'n bodoli i wneud hyn.

- Allanoli tasgau digidol megis adeiladu gwefan, marchnata, rheoli data ac ati. I wneud hyn, bydd angen adnoddau ariannol, mynediad at farchnad datrysiadau digidol a'r wybodaeth i ymdrin â'r farchnad honno.

Yn ymarferol, bydd y rhan fwyaf o fusnesau'n dibynnu ar ryw gyfuniad o'r ddau ddull hyn. Beth bynnag fo'u strategaeth, i ddyfynnu ymchwil diweddar am berfformiad busnesau gwledig yn economi'r DU, "i lwyddo i wneud gwelliant technolegol, mae angen màs critigol o gyfalaf ariannol, dynol a chymdeithasol." (Tiwasing et al. 2022, t5) Yn syml, i adeiladu sgiliau digidol, yn aml bydd angen rhywfaint o allu amsugnol (gallu busnes i dderbyn a defnyddio gwybodaeth newydd) sy'n eithriadol o anodd i lawer o fusnesau bach ei fwstro. Mae hyn yn dangos pwysigrwydd datblygu rhwydweithiau cenedlaethol a rhanbarthol i rannu sgiliau ac adnoddau digidol, er mwyn i fusnesau allu galw ar gronfa gyffredin o arbenigedd. Mae nifer o fentrau addawol ar y gweill i geisio unioni'r union fater hwn - er enghraifft, y project Pentrefi Clyfar - a bydd yn ddiddorol gweld eu heffeithiau yn arolygon y dyfodol.[9]

[9] See https://businesswales.gov.wales/walesruralnetwork/innovation/smart-villages

## 4. Digital Skills and Education

A digital skills deficit remains a persistent issue for many Welsh businesses

Following the successful infrastructure buildout of recent years, one of the major remaining barriers to stimulating digital adoption and innovation across the Welsh Economy is the development of digital skills. Whilst important steps have been taken in this are (the Superfast Business Wales programme being one important example), the uneven levels of Digital Maturity recorded in this survey imply lower levels of digital skills in some peri-urban and rural areas. There are likely a number of factors bearing on this phenomenon. To quote a recent academic study "differences in digital skills, adoption and usage, mostly determined by social, economic, demographic and cultural factors, such as low education levels, less income, poor language skills, lack of experience with digital devices, older age and more digital-avoiding lifestyles and convictions." (Salemink 2022, p131).

Across respondent interviewed for this survey, there was general agreement that the development of digital skills is vital to the resilience and prosperity of modern businesses. However, even relatively technologically adept respondents expressed anxiety about their ability to keep up with the rate of change. For instance, one respondent, CTO of a tech startup, explained that, "*The biggest challenge for us is the learning curve of adoption of new technologies. Maybe more opportunities to learn, with courses and things like that we could get involved with as a business, would be really interesting.*" This is not simply an issue of lacking relevant digital skills, but being able to see where the skill gaps are within one's business, and which to prioritise. The same respondent expressed a desire for greater guidance in this area.

Generally speaking, there are two paths available to businesses looking to improve the quality and spread of digital skills available to their organisation:

- Build skills in-house, either through recruitment (typically favoured by long-standing businesses with a more mature workforce) or training (generally preferred by newer businesses or start-ups with a younger, more digitally-savvy and flexible workforce). This requires time, investment and clear knowledge of existing skills gaps.

- Outsource digital tasks such as website construction, marketing, data management etc. This requires financial resources, access to a market for digital solutions and the knowledge to navigate that market.

Practically, most businesses will rely on some combination of these two approaches. Whatever their strategy, to quote recent research on the performance of rural businesses in the UK economy, "successful technological improvement requires a critical mass of financial, human and social capital." (Tiwasing et al. 2022, p5) Quite simply, building digital skills often requires a degree of absorptive capacity (the capacity of a business to onboard and implement new information) that is extremely hard for many small businesses to muster. This points to the importance of developing national and regional networks to share digital skills and resources, allowing businesses to draw from a common pool of expertise. There are a number of promising initiatives currently underway that seek to address just this issue - for instance, the Smart Villages project - and it will be interesting to observe their effects in future surveys.[10]

[10] See https://businesswales.gov.wales/walesruralnetwork/innovation/smart-villages

## 5. Seiberddiogelwch, Diogelu Data a LlAC

Mae ymwybyddiaeth o seiberddiogelwch a diogelu data yn isel, a gallai hyn fod yn broblem yn y dyfodol

Mae troi at weithio hybrid wedi cyflwyno cyfres newydd o fygythiadau seiber i fusnesau. Mewn llawer o achosion, ar ôl cael eu gorfodi i wneud y newid hwn yn sydyn iawn, nid yw busnesau wedi cael y cyfle i ystyried y risgiau newydd a allai fod yn eu hwynebu, er enghraifft, drwy ddefnyddio llawer mwy o dechnoleg cyfathrebu digidol, neu gan fod aelodau tîm yn gweithio o bell ar ddyfeisiau personol. Fel y nododd astudiaeth ddiweddar, "yn ystod y cyfyngiadau symud COVID-19, mae gwendidau seiber, gan gynnwys ymosodiadau seiber wedi cynyddu'n sylweddol oherwydd gweithio o bell." (Tiwasing et al. 2022, t3). Mae cyfeiriadau'r papur yn argymell bod economïau'n "ystyried gwella'r amgylchedd seiberddiogelwch i wneud y DU yn lle diogel i fyw ynddo a gweithio ar-lein," gan y bydd mwy o ddigidoleiddio "yn anochel yn cynyddu nifer y bygythiadau seiberddiogelwch" (Tiwasing et al. 2022, t6).

Mae'r arolwg digidol a'r atebion i gyfweliadau'n awgrymu bod gan lawer o BBaCh ddiffyg adnoddau a sgiliau mewnol i roi sylw manwl i'r gofynion seiberddiogelwch, diogelu data a phreifatrwydd ar-lein sy'n gysylltiedig â gweithio mewn marchnad ddigidol fyd-eang. Roedd atebwyr a oedd yn gweithio mewn BBaCh yn lleisio pryder am y materion hyn ac yn mynegi awydd i'w hunioni, ond hefyd yn dweud bod gofynion cynnal eu busnes o ddydd i ddydd yn tueddu i gael eu blaenoriaethu dros fygythiadau sy'n aml yn teimlo'n bell i ffwrdd.

Yn y cyfamser, roedd atebwyr o'r gymuned cymorth busnes yn awgrymu nad yw llawer o BBaCh - ac yn enwedig microfusnesau lle mae digidoleiddio yn bennaf yn golygu mabwysiadu strategaethau marchnata digidol - yn gweld seiberddiogelwch fel mater pwysig, na hyd yn oed perthnasol. Meddai un atebydd, "*Rydw i wedi cynnal ambell i gwrs am hynny [seiberddiogelwch] a does neb byth yn cofrestru ar eu cyfer nhw!*" O ran bygythiad seiberdroseddu, dywedodd un atebydd:

***"Fe gawson ni sesiwn gyda heddlu Cymru ac roedden nhw'n dweud nad yw pobl wir yn meddwl am y peth [dioddef ymosodiad seiber] nes iddo ddigwydd iddyn nhw neu rywun maen nhw'n ei adnabod. Ac yna maen nhw'n dechrau poeni amdano…. Rydych chi'n meddwl, wel, wchi, mae angen i fwy o bobl glywed hyn ond maen nhw'n meddwl nad oes angen iddyn nhw ei glywed, felly allwch chi ddim gwneud llawer."***

Mae'r BBaCh sy'n pryderu am gydymffurfiad o ran diogelwch digidol a phreifatrwydd yn mabwysiadu amrywiaeth o strategaethau i reoli'r broblem hon, er nad yw'n ymddangos bod rhyw lawer o'n hatebwyr yn fodlon â'r trefniadau presennol. Roedd rhai atebwyr yn deall bod adnoddau ar gael, ac roedd rhai wedi defnyddio adnoddau i gael yr ardystiad Cyber Essentials. Fodd bynnag, y teimlad oedd bod hon yn broses gymhleth sy'n defnyddio llawer o adnoddau, ac nad yw ar raddfa briodol i fusnesau llai. Roedd y gromlin dysg yn serth, a gallai'r broses fod yn fwy esmwyth pe bai wedi'i theilwra'n fwy, ac yn cynnwys mwy o arweiniad wedi'i deilwra i fusnesau unigol. Roedd rhai egin fusnesau'n teimlo nad oeddent yn gwybod digon ac yn pryderu y gallent golli rhywbeth pwysig oherwydd diffyg adnoddau ac arweiniad.

I ddyfynnu un atebydd:

***Wrth i ni fynd drwy Cyber Essentials, un o'r pethau mawr oedd yn ein harafu ni oedd mapio'r holl wahanol offer roedden ni'n eu defnyddio, a'u holl effeithiau; roedd hynny'n llawer i'w ddysgu a doeddwn i ddim wir yn siŵr ble i fynd. Mae'r Ganolfan Seiberddiogelwch Genedlaethol yn cynnig llawer o wybodaeth ddefnyddiol, ond a dweud y gwir, rwy'n meddwl y byddai mwy o gyfleoedd hyfforddiant i ddysgu am seiberddiogelwch yn cŵl. Wedi dweud hynny, efallai fod yna lawer ar gael, ond nad ydw i wedi edrych arnyn nhw.***

Mae ein data'n awgrymu nad oes gan gyfran sylweddol o fusnesau bolisi preifatrwydd ar eu gwefan (sy'n ofyniad cyfreithiol); maent hefyd yn datgelu bod cyfran uchel o'r rhai y mae ganddynt bolisi preifatrwydd yn defnyddio templedi generig. O'n sampl strwythuredig cychwynnol o 7,988 BBaCh yng Nghymru, dim ond ar 1,461 gwefan y llwyddodd yr offeryn Foresight SI i ganfod polisïau preifatrwydd.

Mae angen mwy o waith eto yn y maes hwn i ddeall maint y broblem, gan gynnwys effeithiau dibynnu ar bolisïau seiberddiogelwch a phreifatrwydd llwyfannau ac apiau sy'n aml heb eu lleoli yn y DU ac sydd wedi'u hintegreiddio mewn llifoedd gwaith. Mae'r materion hyn y tu hwnt i gwmpas yr adroddiad hwn. Am y tro, yr unig beth y gallwn ei nodi ymhellach yw ei bod yn bwysig bod busnesau Cymru sy'n cystadlu mewn marchnad ddigidol (sydd felly bob amser â'r potensial i fod yn farchnad fyd-eang) yn sicrhau bod eu seiberddiogelwch yn ddigonol, a'u bod yn cydymffurfio â gofynion rheoleiddio cenedlaethol a hyd yn oed rhai rhyngwladol er mwyn cystadlu'n fyd-eang a'u diogelu eu hunain.

<u>Er bod cwmnïau'n ymwybodol o bwysigrwydd LIAC a Sero Net, nid yw llawer eto wedi'u hintegreiddio yn eu harferion busnes na'u brandio</u>

Yn y blynyddoedd diwethaf, mae fframweithiau amgylcheddol, cymdeithasol a llywodraethu wedi mynd yn bwysicach i gwmnïau sy'n ceisio sicrhau buddsoddiad, ac maent yn debygol o fynd yn bwysicach eto o safbwynt defnyddwyr ac o safbwynt rheoleiddio yn y dyfodol. Fodd bynnag, mae'r dystiolaeth yn awgrymu nad yw'r rhan fwyaf o BBaCh Cymru yn ymwneud rhyw lawer â'r materion hyn ar hyn o bryd, ac eithrio pan fydd eu prif farchnadoedd yn mynnu hynny. Ar y rhan fwyaf o wefannau BBaCh Cymru, ychydig iawn o sylw, os o gwbl, a roddir i bolisïau LIAC ffurfiol nac i faterion mwy cyffredinol cynaliadwyedd amgylcheddol neu sero net.

Roedd rhai atebwyr cyfweliadau'n mynegi agwedd debyg at faterion LIAC i'w hagwedd at seiberddiogelwch a phreifatrwydd digidol - teimlad o bryder cyffredinol wedi'i gyfuno â theimlad o ddiffyg gwybodaeth ac adnoddau naill ai i ddysgu mwy eu hunain neu i unioni'r materion hyn yn eu busnesau:

*O ran effaith amgylcheddol, dyna rywbeth arall dydw i ddim yn gwybod llawer amdano, ar gyfer cwmni technoleg. Dydw i ddim yn gwybod dim byd am hynny a byddwn i wrth fy modd yn dysgu mwy am sut mae cwmnïau technoleg yn edrych at ddyfodol sero net, fel sut rydyn ni'n rhoi hynny ar waith… mae yna lawer i'w ddysgu, a dydw i ddim yn gwybod sut i'w ddysgu. Eto, efallai nad ydw i wedi rhoi cymaint o amser ag y dylwn i i'w ddysgu.*

Roedd rhai atebwyr yn mynegi disgwyliad y byddent yn gallu rhoi mwy o sylw i'r materion hyn yn ddiweddarach, cyn gynted â bod eu busnes yn fwy aeddfed a bod eu gweithlu'n fwy, neu pe bai'n cynnig mantais iddynt ar unwaith. Nododd un atebydd cymorth busnes,

*Mae'r rhan fwyaf o BBaCh ar gam cynnar yn y cyfnod o bontio i sero net. Mae'r mwyafrif helaeth wedi cymryd o leiaf un cam ffisegol i leihau allyriadau, er bod y rhain yn tueddu i fod yn syml, megis gosod mesurydd deallus, yn hytrach na rhai mwy cymhleth, megis cyflwyno cerbydau ag allyriadau isel iawn.*

Fodd bynnag, soniodd atebwyr o'r gymuned cymorth busnes am fwy o ddiddordeb ymysg busnesau busnes-i-ddefnyddiwr mewn cael achrediadau LIAC megis ardystiad B Corp:

*Mae cryn dipyn o fusnesau'n mynd drwy'r achrediad B Corp ar hyn o bryd…Mae'n ymddangos bod hynny [wedi] casglu llawer o fomentwm. Yn bennaf y rhai sy'n wynebu defnyddwyr yn gyntaf oherwydd rwy'n meddwl mai bathodyn cydnabyddiaeth defnyddwyr ydyw.*

Maent hefyd wedi gweld fframweithiau LlAC yn cael eu rhoi ar waith yn ehangach mewn diwylliannau gweithle a gweithdrefnau cyflogi:

*Yn y [broses] recriwtio…yn sicr byddan nhw'n hyrwyddo'r cenadaethau a'u polisïau sy'n ymwneud ag amrywiaeth ac effeithiau amgylcheddol, eu hymrwymiad i dargedau sero net, beth bynnag ydyw, byddan nhw'n hyrwyddo'r rheini gymaint eto yn rhannol i gyflogi partner gan mai dyna yw diwylliant y cwmni.*

Mae hyn yn awgrymu y bydd gan gwmnïau fwy o gymhelliant i roi sylw i fframweithiau LlAC a'u hyrwyddo os ydynt yn teimlo y bydd hynny o fantais i'r busnes ar unwaith, syniad a ategwyd gan ymchwil arall:

Mae cymhellion personol yn bwysig i arwain newidiadau sefydliadol cymharol rad sy'n gysylltiedig â sero net, ond sbardunau allanol – rhai sy'n ymwneud â newidiadau i'r farchnad neu i reoliadau – yw'r pwysicaf o ran llywio ymyriadau technolegol mwy costus. Mae'n ymddangos mai'r galw gan gwsmeriaid am gynhyrchion a gwasanaethau carbon isel yw un o'r sbardunau pwysicaf i ymddygiad ecogyfeillgar ar draws bron bob arfer sefydliadol a thechnolegol (ERC 2021, t5).

### 5. Cybersecurity, Data Protection and ESG

Awareness of cybersecurity and data protection issues is low, and could be a potential future problem

The transition to hybrid working has exposed businesses to a new set of cyber threats. In many cases, having been forced to make this shift very suddenly, businesses have not had the opportunity to consider the new risks that they may have incurred, for example, by significantly increasing their use of digital communications technology, or having team members work remotely on personal devices. As a recent study observed, "during the COVID-19 lockdown, the cyber vulnerabilities, including cyber attacks have been significantly increased due to remote work purposes." (Tiwasing et al. 2022, p3). The paper reference recommends that economies "consider the improvement of the cyber security environment to make the UK the safe place to live in and work online," as increased digitalisation "will inevitably increase the cyber security threats" (Tiwasing et al. 2022, p6).

Both the digital survey and interview responses suggest that many SMEs lack the resources and in-house skills to thoroughly address the cybersecurity, data protection and online privacy requirements associated with operating in a global digital marketplace. Respondents working at SMEs voiced anxiety over these issues and expressed a desire to address them, but also stated that the day-to-day requirements of running their business tended to take precedence over what are often perceived to be remote threats.

Meanwhile, respondents from the business support community suggested that many SMEs - and especially micro-businesses for whom digitalisation primarily means adopting digital marketing strategies - do not see cybersecurity as a pressing or even relevant concern. One respondent comments, "*I've run a few courses on that [cybersecurity] and nobody ever signs up to them!*" With regard to the threat of cybercrime, one respondent reported:

*"We had a session with Wales police and they they said people don't really think about it [becoming a victim of a cyberattack] until it happens to them or someone they know. And then they start to worry about it…. You just got thinking, well, you know, more people need to hear this but they don't think they need to hear it, so you can't do much."*

The SMEs that do worry about compliance in regard to digital security and privacy adopt a variety of strategies to manage this problem, although few of our respondents seem satisfied with current arrangements. Some respondents understood that there are resources available, and some had accessed resources to undertake the Cyber Essentials certification. There was a sense, however, that the process was complicated, resource-intensive and not appropriately scaled for smaller businesses. There had been a steep learning curve and the process could have been smoother if it was more tailored, with more bespoke guidance. Some startups felt under-informed and concerned that they might miss something important due to lack of resources and guidance.

To quote one respondent:

*As we were going through Cyber Essentials, one of the big things that slowed us down was mapping out all of the different tools we were using, and all of the effects of those, which was a lot of learning and I wasn't really sure where to go. There is the National Cyber Security Centre, which has a lot of information on it, which was useful, but actually, I guess more training opportunities to learn around cyber security would be cool. Having said that there may be many that I just haven't looked at.*

Our data suggests that a significant proportion of businesses do not have a privacy policy on their website (a legal requirement); it also reveals that of those who do, a high proportion use generic privacy policy templates. Of our initial structured sample of 7,988 Welsh SMEs, the Foresight SI tool was only able to detect privacy policies on 1,461 websites.

There remains more work to be done in this area to understand the scale of the problem, including the effects of reliance on the cyber security and privacy policies of often non-UK-based platforms and apps integrated into workflows. These issues are beyond the scope of the present report. For now, we can only note further that it is important for Welsh businesses competing in a digital (and therefore always potentially global) marketplace to ensure they are adequately cyber secure, and that they comply with national and even international regulatory requirements in order to compete globally and to protect themselves.

<u>While companies are aware of the importance of ESG and Net Zero, many have not yet integrated them into their business practices or branding</u>

Environmental, social and governance frameworks have in recent years become increasingly significant for companies looking to secure investment, and are likely to become more significant from consumer and regulatory perspectives in future. However, the evidence suggests that most Welsh SMEs currently have little engagement with these issues except where their primary markets demand it. Most Welsh SME websites demonstrate little or no engagement either with formal ESG policies or broader issues of environmental sustainability or net zero.

Some interviewees expressed a similar attitude to ESG issues as to cybersecurity and digital privacy - a generalised sense of anxiety combined with a perceived lack of information and resources either adequately inform to themselves or to address these issues in their businesses:

*When it comes to environmental impact, that's another thing which, for a tech company, I don't know much about. I don't know anything about that and I'd love to learn more  about how tech companies like look towards a net zero future, in like how we're implementing that… there's a lot to learn and I don't know how to learn it. Again, maybe I haven't put the time into learning it as I should.*

Some respondents expressed an expectation that they would be able to deal with these issues more fully later, once their business is more mature and they have a larger workforce, or where it offers immediate returns. One business support respondent noted,

*Most SMEs are at an early stage in their transition to net zero. The vast majority have taken at least one physical action to reduce emissions, although they tend to be simple, such as installing a smart meter, rather than more complex, such as introducing very-low-emissions vehicles.*

However, respondents from the business support community reported increased interest amongst B2C businesses in attaining ESG accreditations such B Corp certification:

*There's quite a few businesses at the moment that are going through the B Corp accreditation…That seems to [have] gathered a lot of momentum. Mostly the consumer facing ones to begin with because I think it's a consumer recognised badge."*

They have also observed ESG frameworks being integrated more widely into workplace cultures and hiring procedures:

*In the recruitment [process]…they certainly will promote the missions and their policies around diversity and environmental impacts, their commitment to net zero targets, whatever it might be, those will be promoted so much again partly for hiring a partner because that's the culture of the company.*

This implies that companies will be most motivated to engage with and promote ESG frameworks where they perceive an immediate gain to the business, a proposition which has been supported by other research:

Personal motivations are important in driving relatively low-cost organisational changes associated with net zero, but it is external drivers – related to market or regulatory changes – which prove more important in driving more costly technological interventions. Customer demand for low carbon products and services appears to be one of the most important drivers of environmentally friendly behaviour across nearly all organisational and technological practices (ERC 2021, p5).

## 6. Llywodraethu Digidol a Gwasanaethau Cyhoeddus

Mae digidoleiddio gwasanaethau cyhoeddus yn cyflwyno cyfleoedd a risgiau

Roedd y cyfweliad yn yr arolwg hwn yn cynnwys cynrychiolwyr sector cyhoeddus Cymru, ac roedd y rhain yn dweud eu bod hwy a'r cyhoedd wedi defnyddio mwy o ddarpariaeth gwasanaethau digidol yn ystod y pandemig. Mae'r duedd hon wedi parhau hyd heddiw, fel yr esboniodd un atebydd:

*Nawr ein bod ni'n cael llawer mwy o gyfeirio aton ni ac mae yna lawer mwy o fynd, yn enwedig yn y lle digidol hwnnw. A dydw i ddim yn gwybod ydy hynny oherwydd y mwy, y symud o fewn COVID, a'i bod hi'n fwy derbyniol nawr i [gleientiaid] reoli eu hunain a defnyddio'r offer digidol yma. Yn amlwg, mae yna fwy o bwyslais ar ddigidol nawr.*

Dywedodd yr un atebydd hefyd fod y newid i ddigidol wedi cyflymu cyfleoedd am bartneriaeth â BBaCh Cymru:

*Mae'r cyhoedd yn derbyn y peth yn fwy, mae'n fwy derbyniol yn y [sector cyhoeddus] i gynnig y gwasanaethau yna. Ac wedyn os yw cwmnïau'n sylwi bod hefyd, wchi, bod yna botensial yn y farchnad, sy'n un eithaf ifanc o ran ei datblygiad. Felly, wchi, dydyn ni ddim er bod yna lawer o apiau a phethau ar gael, a dweud y gwir, mae'r systemau, mae llawer ohonyn nhw'n systemau eithaf hen... ac maen nhw yn y broses o gael eu diweddaru ac mae COVID wedi cyflymu hynny llawer.*

Mae digidoleiddio gwasanaethau cyhoeddus Cymru'n cyflwyno cyfleoedd a risgiau, yn yr un modd ag i fusnesau Cymru. Ar y naill law, mae'n cyflwyno cyfle i wella ymwybyddiaeth o wasanaethau cyhoeddus a mynediad atynt; ar y llaw arall, mae'n gwneud cwestiynau am gysylltedd, sgiliau ac addysg ddigidol yn fwy hanfodol nag erioed. Mae gwasanaethau cyhoeddus hanfodol yn cynnwys cydrannau ar-lein i raddau mwy a mwy, ac mae eu hygyrchedd yn dibynnu ar ryngrwyd cyflym, dibynadwy, y caledwedd diweddaraf, sgiliau digidol digonol ac ati nid yn unig yn y gwasanaeth ei hun, ond hefyd ymysg defnyddwyr. Mae hyn yn atgyfnerthu'r pwynt nad dim ond mater o ddynamiaeth economaidd yw digidoleiddio, ond ei fod yn gwbl ganolog i werthoedd cydraddoldeb a thegwch sydd wrth galon gweledigaeth Llywodraeth Cymru ar gyfer y wlad.

### Mae busnesau'n ceisio arweiniad a chymorth gan y llywodraeth

Mae canfyddiadau cyfweliadau'n awgrymu rhyw ddisgwyliad gan BBaCh y dylai'r llywodraeth ddarparu cymorth ac arweiniad i egin fusnes ar ei daith. Mae hyn yn estyn o swyddfeydd rhad a phecynnau cymorth digidol, i gymorth wedi'i deilwra i ddeall gofynion rheoleiddio megis GDPR, i raglenni cymorth wedi'u teilwra. Hoffent hefyd i'r llywodraeth fod yn fwy blaengar o ran canfod BBaCh i gynnig cymorth iddynt; y teimlad yw eu bod yn meddwl y gallai fod cymorth ar gael, ond nad ydynt yn gwybod sut i'w gael nac o ble. Awgrymodd llawer o atebwyr fod seiberddiogelwch yn fater y bydd rhaid i rywun arall, yn enwedig y llywodraeth, ei unioni. Edefyn cyffredin arall yw bod diffyg cyllid yn arafu cwmnïau mewn cyfnod ansicr.

### Mae digidoleiddio'n cynnig cyfle i ddatblygu cenhadaeth llywodraeth Cymru

Mae Llywodraeth Cymru wedi bod yn glir wrth amlinellu ei huchelgais i adeiladu economi decach, gwyrddach a mwy cyfartal ar draws llawer o ddogfennau polisi a fframweithiau deddfwriaethol. Nododd atebwyr cyfweliadau lawer o feysydd lle gallai digidoleiddio economi Cymru, gan gymryd bod hynny'n cael ei reoli yn y modd cywir, helpu i gyflawni'r nodau hynny.

Er enghraifft, mae gweithio hybrid yn cynnig y posibilrwydd y gellid gwasgaru swyddi sy'n talu'n dda yn fwy cyfartal ledled y wlad, neu gynnwys cymunedau ymylol yn well yn y gweithlu.

Nododd un atebydd: *Rydyn ni wedi gweld busnesau'n gweld y cyfleoedd i recriwtio rhywun… mwy gwledig gan nad oes angen iddyn nhw ddod i'r swyddfa bob dydd a bod yr unigolyn yna'n fodlon cymryd y swydd, ac mae hynny'n gweithio'n ehangach.*" Fodd bynnag, yn yr un modd nododd hefyd: *"Rwy'n gwybod ein bod ni wedi gweld cwmnïau o Lundain yn cymryd gweithwyr o'n busnesau yng Nghymru am eu bod nhw'n talu mwy o gyflog."*

Soniodd llawer o atebwyr am fwy o ymwybyddiaeth o bwysigrwydd lles a chydbwysedd rhwng gwaith a bywyd ers y pandemig. Nid dim ond gweithio o gartref yn amlach, ond gweithio llai o oriau at ei gilydd, gan gynnig gwell ansawdd bywyd a mwy o amser gyda'r teulu, sy'n rhywbeth y mae pobl yn awyddus i'w gadw:

*Mae Covid wedi newid y naratif tuag at les pobl. Dydyn ni ddim yn sôn am y broses Adnoddau Dynol fel blwch sydd wedi'i gau erbyn hyn. Mae yna lawer mwy o drafodaeth a llawr mwy o werth wedi'i roi i les. Y [darlun] mawr, cyflawn o gwmpas rhywun, ei gydbwysedd gwaith a bywyd, a sut i reoli hwnnw. Felly, rydw i'n meddwl bod pethau'n gwella a bod yma gyfle i arloesi.*

## Sectorau Busnes

<u>Mae mabwysiadu ac arloesi digidol yn amrywio'n sylweddol rhwng sectorau</u>

Fel y trafodwyd uchod, yr amrywiad ar draws categorïau DDS yw'r gwahaniaeth mwyaf sydd i'w weld yn ein data. Yn yr ystyr symlaf, mae gwahanol sectorau'n tueddu i fod â gwahanol gyfartaleddau ar gyfer Aeddfedrwydd Digidol neu Sgôr Arloesi, a Gwasanaethau Busnes a Gwybodaeth a Chyfathrebu'n fwy tebygol o ddangos lefelau uchel AD ac SA. O ganlyniad, mae busnesau mewn rhai sectorau penodol yn tueddu i ymwneud mwy â phroses digidoleiddio nag eraill, fel y nododd un atebydd: "*Rwy'n meddwl bod rhai o'r [cwmnïau] uwch-dechnoleg sydd gennyn ni, rhai o'r rhai meddygol, cystal â [chwmnïau] yn unrhyw le…[Ond] mae gennych chi sbectrwm cyfan ac mae'n anodd iawn cyffredinoli. Yn y bôn, y mwyaf uwch-dechnoleg yw'r busnes, y mwyaf o ddigidoleiddio sydd ynddo.*"

Gall amrywiaeth o ffactorau esbonio'r amrywiadau hyn, a gall rhai o'r rheini fod yn gysylltiedig ag agweddau diwylliannol at dechnoleg ac arloesi sy'n amlwg mewn diwydiannau penodol. Er bod un atebydd wedi dadlau "*[Mae technolegau gwe] yn allweddol i lwyddiant pawb*", nid yw rhai sectorau mor barod ag eraill i ymwneud â hwy: "*Y rhan fwyaf ohonyn nhw. Nid pob un, mae'n siŵr, oherwydd mae gennych chi rai hen-ffasiwn [agweddau mewn sectorau penodol, megis] y diwydiant bwyd, ond rydw i'n gweithio ym maes arloesi, ac [yn y sector hwnnw] mae'n tueddu i fod yn 'Ie' mawr gan bawb.*"

I'r fath raddau ag y mae cynyddiadau diweddar mewn gweithgarwch digidol wedi cael eu sbarduno gan argyfyngau oddi allan (e.e., y pandemig, neu chwyddiant), dylid cofio bod y digwyddiadau hyn wedi effeithio ar wahanol sectorau mewn gwahanol ffyrdd, fel y nododd un atebydd: "*Mae'n siŵr bod y diwydiant twristiaid yn unigryw, a dweud y gwir, on'd oedd? Dwy flynedd pan nad oedd pobl yn gallu teithio i unlle arall, allwch chi ddim wir gymharu ag unrhyw flwyddyn arall, na allwch?*"

Myfyriodd atebydd arall ymhellach ynghylch y pwynt hwn:

*Mae'n bosibl y gallech chi fod wedi cael cynnydd yn ystod COVID wrth i bobl roi pethau i mewn am bod rhaid iddyn nhw eu rhoi nhw i mewn, oherwydd bod pobl yn gweithio o gartref… ond byddai hynny'n dibynnu o sector i sector. Wchi, aeth busnesau gweithgynhyrchu ddim i gyd adref, mae'n rhaid iddyn nhw gario ymlaen fel yr oedden nhw. A gallai hynny achosi oedi, o ran gweithredu pethau newydd nawr oherwydd yr holl danau eraill [h.y. materion brys yn eu busnes ag angen sylw, megis costau'n codi neu faterion yn ymwneud â'r gadwyn gyflenwi].*

### Materion lle

Mae croestoriad ystyrlon rhwng gwahaniaethau rhwng sectorau ac amrywiadau rhwng lleoliadau. Er enghraifft, mae'r sector Llety a Bwyd yn agos iawn i sgôr cyfartalog y sector ar gyfer Aeddfedrwydd Digidol, ond yng Ngwynedd ac Ynys Môn mae busnesau Llety a Bwyd yn cyfrannu at gyfran lawer uwch o'u sgorau Aeddfedrwydd Digidol ar ddechrau 2023 o gymharu â nifer y busnesau sector Llety a Bwyd yn yr awdurdodau unedol hynny (tua dwbl). Gallai hyn adlewyrchu'r ffaith bod y sector twristiaeth wedi gweld cynnydd enfawr yn y galw yn rhai o awdurdodau unedol arfordirol gorllewin Cymru yn ystod y pandemig Covid-19, pan godwyd y cyfyngiadau symud

**Arloesi**

Yn yr un modd, yng Ngwynedd, Ynys Môn a Sir Benfro, mae busnesau Llety a Bwyd yn cyfrannu cyfran lawer uwch o'u sgorau Arloesi ar ddechrau 2023 o gymharu â nifer y busnesau sector Llety a Bwyd.

## 6. Digital Government and Public Services

The digitalisation of public services presents opportunities and risks

The interview portion of this survey included representatives from the Welsh public sector, who reported increased use of and public engagement with digital service provision during the pandemic. This trend has continue up to the present, as one respondent explained:

Now that we're getting much more sign posting towards us and there's much more drive, especially within that digital space. And I don't know if that's down to the more, move within COVID, and the more acceptable it is now for [clients] to self manage to use these digital tools. There's obviously a greater emphasis on digital now.

The same respondent also reported that the shift to digital had accelerated opportunities for partnership with Welsh SMEs:

There's more acceptability in the general public, there's more sort of acceptability within the [public sector] to offer those services. And then if companies are realising that there's also, you know, there's a market potential, which is relatively young in it's development. So, you know, we haven't while there's lots of sort of apps and things out there, actually, the systems, a lot of them are quite old systems… and they're in the process of being updated and COVID has rapidly accelerated that.

As with Welsh business, the digitalisation of Welsh public services brings both risks and opportunities. On the one hand, it presents a chance to improve both awareness of and access to public services; on the other, it makes questions of digital connectivity, skills and education more essential than ever. To the degree that essential public services increasingly involve an online component, their accessibility depends not only on the service itself having reliable, high speed internet, up-to-date hardware, adequate digital skills etc, but also their users. This reinforces the point that digitalisation is not simply a question of economic dynamism, but goes right to the heart of the values of equality and fairness that the Welsh Government has placed at the heart of its vision for the country.

### Businesses are looking to government for guidance and support

Interview findings suggest that there is some expectation from SMEs that the government should provide support and guidance for navigating the journey of a startup. This extends from low-cost office space and digital support packages, to bespoke help with understanding regulatory requirements such as GDPR, to tailored support programmes. They also want the government to be more proactive in finding SMEs to offer support; there is a sense that they think there may be support out there, but they do not know where or how to access it. Multiple respondents suggested that cybersecurity was an issue that someone else, particularly the government, is going to have to address. Another common thread is that a lack of finance is slowing down companies at a time of uncertainty.

### Digitalisation offers a chance to advance the mission of Welsh government

The Welsh Government has been clear in laying out its ambition to build a fairer, greener and more equal economy across multiple policy documents and legislative frameworks. Interview respondents identified several areas where the digitalisation of the Welsh economy, presuming it is managed in the right way, could advance these goals.

For instance, hybrid working potentially offers the chance to distribute well-paying jobs more evenly across the country, or to better include marginalised communities in the workforce. One respondent noted: *We've seen businesses see the opportunities to recruit somebody… more rural because they don't need them to come into the office every day and that person then is willing to take the job, and that works wider.*" However, by the same token they also pointed out: *"I know we've seen London based companies poaching employees from our Welsh face businesses because they pay a bigger salary."*

Several respondents mentioned an increased awareness of the importance of wellbeing and work-life balance since the pandemic. Not only working from home more often, but working fewer hours overall has offered a better quality of life and more time with the family that people are keen to maintain:

Covid has changed the narrative towards people's well being.We don't refer to the HR process as a closed off box anymore. There's a lot more discussion and a lot more value pushed over into wellbeing. The whole, bigger [picture] around someone and their work life balance and how that's managed. So, I think things are getting better and there is an opportunity for innovation around it.

### Business Sectors

Digital adoption and use varies markedly between sectors

As discussed above, the variation across SIC categories is the biggest difference shown in our data. In the simplest sense, different sectors tend to have different averages for Digital Maturity or Innovation Score, with Business Services and Information and Communication being more likely to show high levels of DM and IS. As a result, businesses in certain sectors tend to be more engaged with the digitalisation process than others, as one respondent observed: "*I think some of the high tech [companies] we've got, some of the medical ones, they're the equal of [companies] anywhere…[But] you've got a whole spectrum and it's really hard to generalise. Basically, the more high tech the business, the more embedded digitalisation is.*"

There are a range of factors that can account for these variations, some of which may be related to cultural attitudes to technology and innovation prevalent within particularly industries. Whilst one respondent argued that "*[Web technologies are] key to everyone's success*", some sectors are less ready to engage with them than others: "*Most of them. Probably not all of them, because you've got some old school [attitudes in certain sectors, such as] the food industry, but I work in the innovation space, and [in that sector] there tends to be a big 'Yes' all round.*"

To the extent that recent increases in digital activity have been driven by exogenous crises (e.g., the pandemic, or inflation), it should be remembered that these events impacted different sectors in different ways, as one respondent observed: "*The tourist industry probably was unique, wasn't it, really? Two years when people couldn't travel anywhere else, it's not the same as any other year to compare really, is it?*"

Another respondent provided further reflections on this point:

You may have had an uplift potentially in COVID with people putting things in because they have to put them in, because people were working from home… but that would depend sector by sector. You know, manufacturing businesses didn't all go home, they just have to carry on doing what they were doing. And there may be a lag then, in terms of new implementation now because there are so many other fires [i.e. pressing issues in their business that need to be dealt with, such as spiralling costs or supply chain issues].

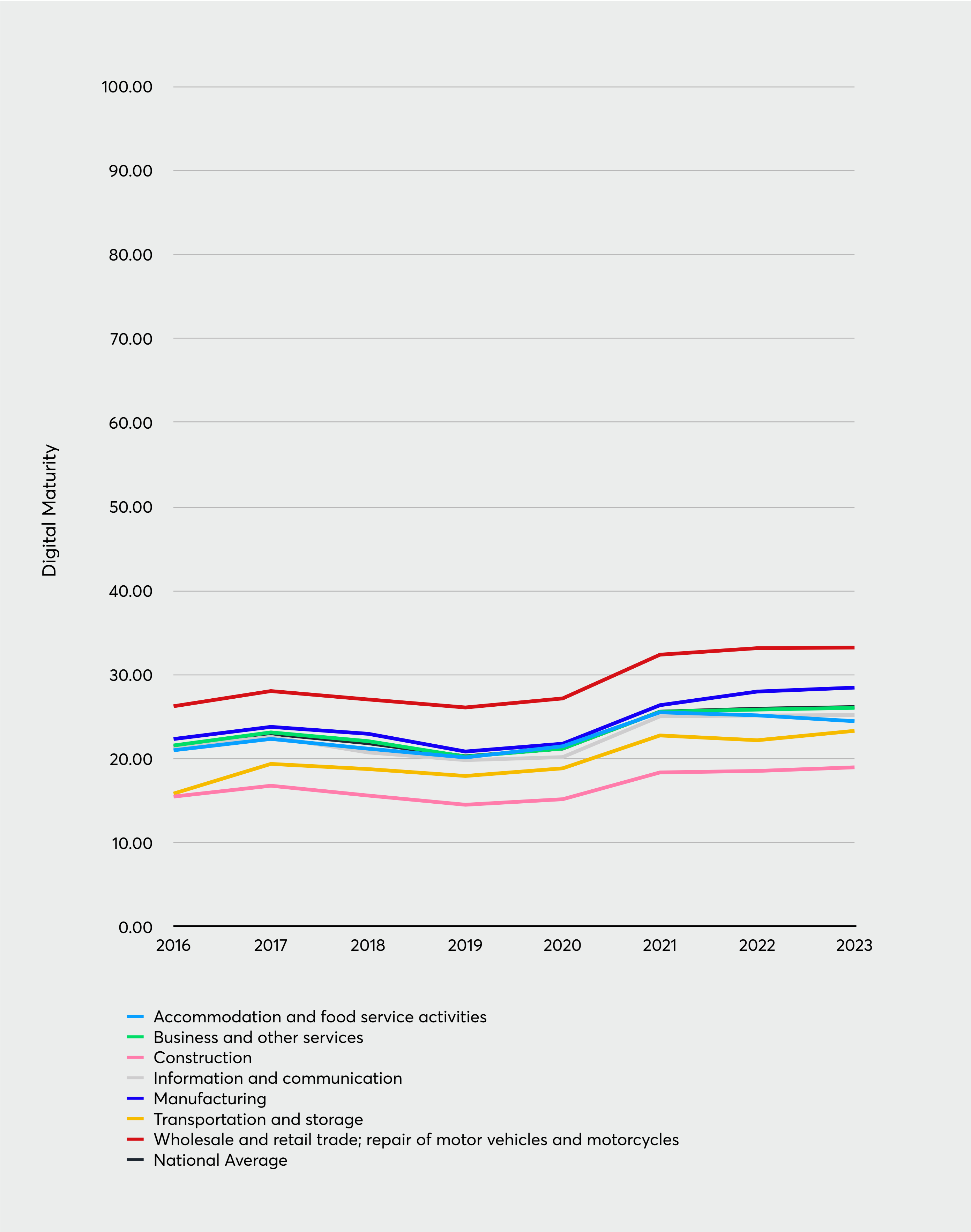
### Place matters

Differences between sector intersect meaningfully with variations between localities. For example, the Accommodation and Food sector is very close to the average sector score for Digital Maturity, but in Gwynedd and Isle of Anglesey Accommodation and Food businesses contribute a notably higher proportion of their Digital Maturity scores at the beginning of 2023 compared to the number of Accommodation and Food sector businesses in those unitary authorities (about double). This may reflect that during the Covid-19 pandemic, when lockdowns lifted, the tourism sector saw a huge increase in demand in some of the coastal unitary authorities in the west of Wales

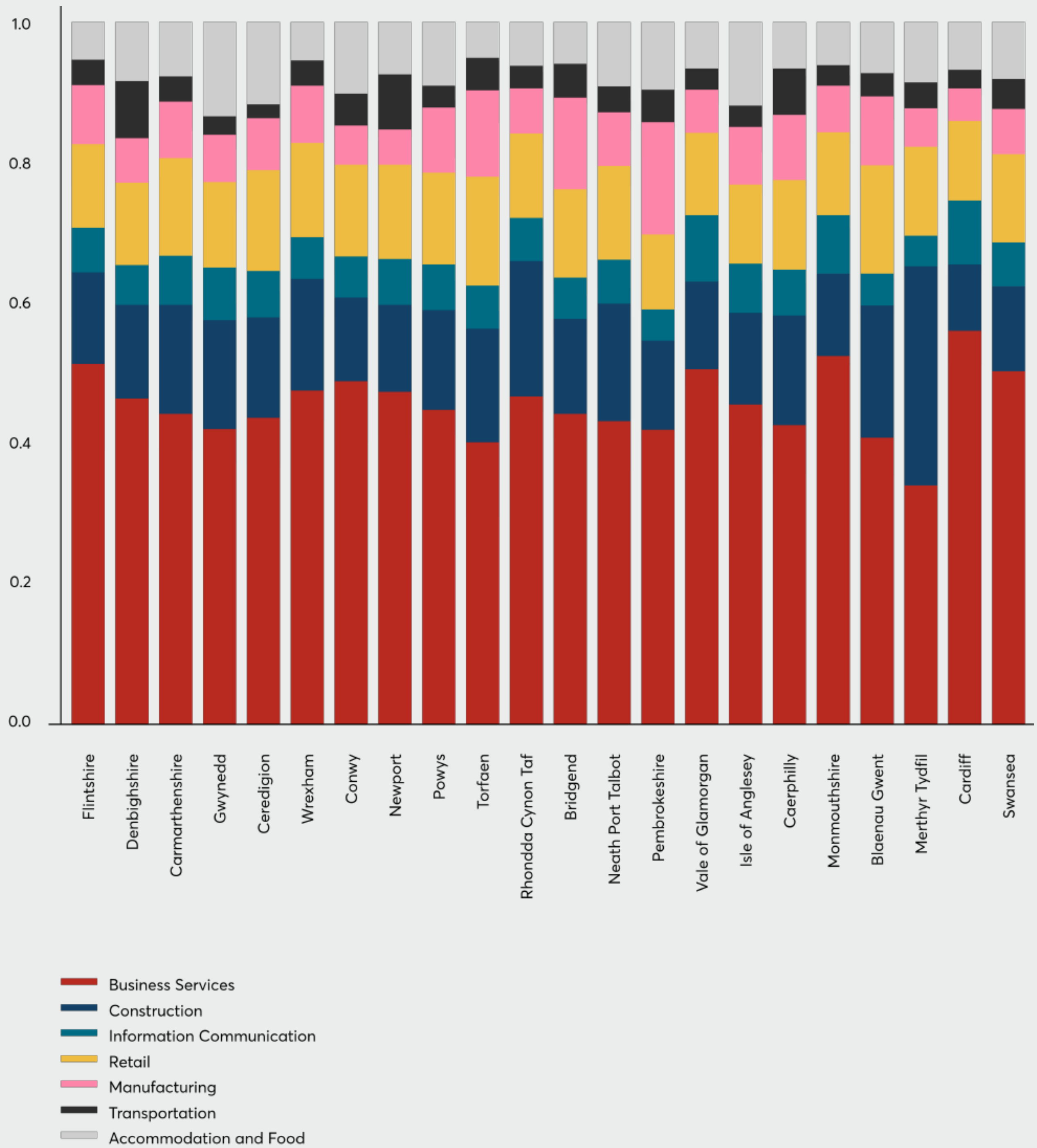
### Innovation

Likewise, in Gwynedd, Isle of Anglesey and Pembrokeshire, Accommodation and Food businesses contribute a notably higher proportion of their Innovation scores at the beginning of 2023 compared to the number of Accommodation and Food sector businesses.

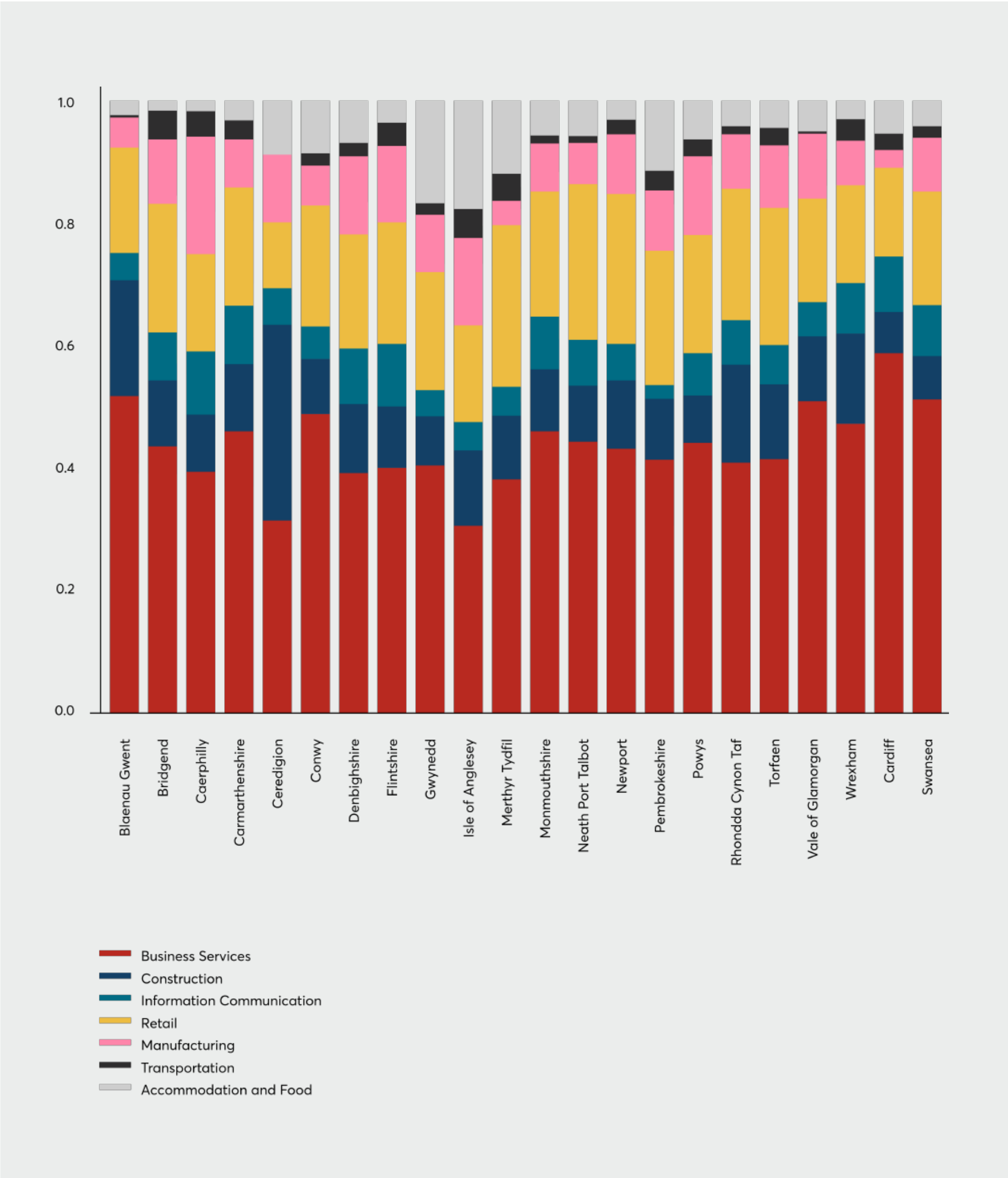
**Graph 20.**
Average Welsh Digital Maturity by Sector



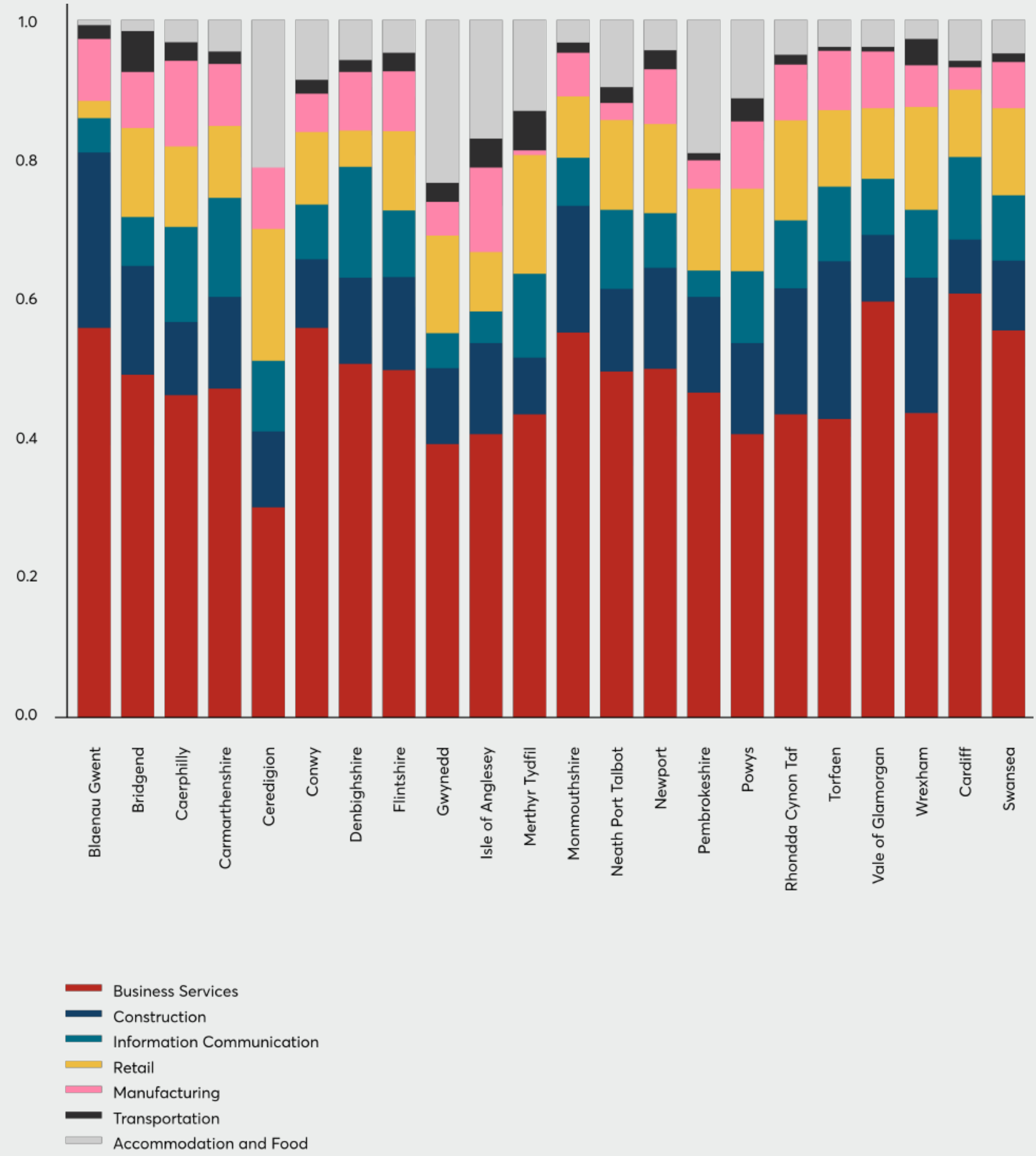
**Graph 21.**
Companies House Sector Distribution within
Unitary Authorities



**<u>Graph 22.</u>**
<u>Companies House Sector Digital Maturity within Unitary Authorities</u>



**Graph 23.**
Companies House Sector Innovation within
Unitary Authorities




# RHESTR DYMUNIADAU YMATEBWYR
# RESPONDENT WISHLIST

# RHESTR DYMUNIADAU Y MATEBWYR

# RESPONDENT WISHLIST

Fel rhan o'r broses gyfweld, gofynnwyd i atebwyr y cyfweliad enwi'r un peth yr hoffent ei weld yn newid er mwyn eu helpu i wireddu eu nodau. Mae'r atebion yn adlewyrchu ystod o werthoedd a blaenoriaethau, ond mae'n werth nodi eu bod yn ffocysu ar faterion yn ymwneud â mynediad, tegwch, sgiliau ac adnoddau digidol a chymorth digonol i berchenogion busnes.

**"Un o'r pethau fyddai'n cyflymu lledaeniad arloesi ar draws y wlad yw ymwybyddiaeth a chyfranogiad yn y system math CRM fwyaf generig y gallen ni ei chael."**

**"Byddwn i wrth fy modd pe bai rhywun yn gallu dod at bob cwmni a dweud wrthyn ni beth yn union roedd angen i ni ei wneud."**

**"O gwmpas De Cymru, mae yna dipyn o fannau gweithio ar y cyd a phethau sy'n helpu egin fusnesau fel ni. Ond maen nhw i gyd yn eithaf drud a dydw i ddim yn deall sut mae egin fusnesau eraill yn fforddio bod ynddyn nhw, oherwydd maen nhw yr un mor ddrud â swyddfa arall. Felly…cymorth gan y Llywodraeth ar gyfer mannau a rhaglenni gweithio ar y cyd i helpu i wneud yn siŵr bod yr adnoddau hynny ar gael i'r busnesau bach."**

**"Mynediad ffibr llawn i bawb yng Nghymru yn ddi-dâl, yn ddelfrydol yn ddi-dâl neu am bris â chymhorthdal trwm iawn, iawn, ac yn dibynnu ar brawf modd, fel bod pobl ar fudd-daliadau'n gallu cael mynediad ffibr llawn"**

**"Un o'r pethau mwyaf, yw nad ydyn nhw [pecynnau cymorth y llywodraeth] yn weladwy. Mae'n anodd dod i wybod amdanyn nhw a dydych chi ddim yn gwybod amdanyn nhw nes i rywun arall ddweud wrthych chi amdanyn nhw. Felly efallai gweithio i wneud pethau'n fwy gweladwy a pheidio ag aros i fusnes bach fynd i chwilio amdano."**

**"Ei gwneud hi'n haws gwerthu i'r Llywodraeth fel busnes bach. Mae yna lwythi o rwystrau rhag mynediad i hynny. Yn enwedig o ran cynhyrchion digidol oherwydd yr holl bryderon diogelwch. Mwy o gymorth i oresgyn y rhwystrau hynny wrth geisio gwerthu i'r sector cyhoeddus, dyna rywbeth allai newid i wneud gwahaniaeth i lawer o fusnesau. Ac wedyn rydw i'n teimlo, pe bai'r sector cyhoeddus yn arwain y newid hwnnw, y gallai rhai o'r busnesau mwy fabwysiadu'r pethau hynny hefyd."**

**"Byddwn i'n adolygu, o safbwynt y Llywodraeth, beth yw eu mesuriadau... Dylen ni adolygu beth rydyn ni'n ei fesur ar hyn o bryd oherwydd dydy hynny ddim yn gyson â beth mae cwmni arloesol ifanc yn meddwl amdano... [sero net, datgarboneiddio]…Does gennyn ni ddim digon o ddata yn y cefndir i ddangos y modelu o ran pa mor gyflym mae'r cwmnïau hyn yn gallu tyfu. Dydyn nhw ddim yn dangos arwyddion o beth rydyn ni'n chwilio amdano o ran twf gweithwyr llawn-amser a thwf refeniw. Maen nhw'n tyfu y tu mewn iddyn nhw eu hunain ac yna maen nhw'n ffrwydro ac mae pobl yn mynd 'be' … ydy hyn?' ac yna mae'r farchnad stoc yn dechrau gweithio yn eu herbyn nhw oherwydd dydyn nhw ddim yn deall beth yw eu model busnes."**

**"Mae Llythrennedd Digidol yn rhwystr mawr a gwneud yn siŵr bod y boblogaeth [defnyddwyr gwasanaeth / cleientiaid / cwsmeriaid] yn gallu rhyngweithio â'r adnoddau hyn."**

As part of the interview process, interviewees were asked to name the one thing they would like to see changed to help them realise their goals. The answers reflect a range of values and priorities, but it is notable that they revolve around issues of access, fairness, digital skills and resources and adequate support for business owners.

*"One of the things that would accelerate innovation diffusion across the country is for the awareness and participation of the most generic CRM type system that we could have."*

*"I just wish that there was person that can come round to every company and tell us exactly what we needed to do."*

*"Around South Wales there are a few co-working spaces and stuff that help start ups like us. They are all pretty pricey though and I don't understand how other start ups afford to be in them, because they are just as expensive as another office. So…Government support for co-working spaces and programs that can help make sure the small businesses have access to those resources."*

*"Full fibre access for everybody in Wales free of charge, preferably free of charge or a very, very heavily subsidised rate and means tested, so people on benefits can get full fibre access"*

*"One of the biggest things, is that they [government support packages] don't have visibility. It's hard to find out about them and you don't know about them until someone else tells you about them. So maybe working on the visibility of stuff that is out there and not waiting on small business to go looking for it."*

*"Making it easier to sell to Government as a small business. There are loads of barriers to entry in that. Especially around digital products because there are a lot more security concerns. More support around navigating those obstacles when trying to sell to the public sector, that's something that could change to make a difference to a lot of businesses. And then I feel like if public sector was sort of driving that change, that some of the larger businesses might adopt those things too."*

*"I would review, from the Government's point of view, what are their measurements... We should review what we measure right now because it is not aligned to what a young innovative company thinks about... [net zero, decarbonisation]…We've not got enough data in the background to show us the modelling around how rapidly these companies can grow. They don't show traces of what we look for in full time employee growth and revenue growth. They grow inside themselves and then they explode and people go 'what the… is this?' and then the stock market starts working against them because they don't understand what their business model is."*

*"Digital Literacy is a big barrier and making sure that the population [service users / clients / customers] are able to interface with these resources."*

# CASGLIADAU
# CONCLUSIONS

# CASGLIADAU

# CONCLUSIONS

## Crynodeb o'r Canfyddiadau

- Mae Twf Digidol busnesau Cymru wedi cynyddu'n sylweddol dros gyfnod yr arolwg hwn, yn enwedig ers dechrau'r pandemig Covid-19 yn 2020. Mae hyn yn cynrychioli cynnydd cyffredinol yn yr amser a'r adnoddau y mae busnesau Cymru'n eu buddsoddi yn eu presenoldeb digidol, gan adlewyrchu amrywiaeth o strategaethau newydd a fabwysiadwyd gan gwmnïau fel ymateb i'r cyfyngiadau symud cenedlaethol.

- Digwyddodd y cynnydd mwyaf o ran Twf Digidol yn ystod Gwanwyn a Haf 2022, arwydd o hwrdd o weithgarwch digidol yn cyfateb i'r cynnydd mewn anwadalrwydd economaidd a ddaeth wrth godi cyfyngiadau symud yn fyd-eang (h.y. economïau'n dechrau tyfu eto mewn cyd-destun o darfu ar gadwynau cyflenwi, chwyddiant byd-eang, y rhyfel yn Wcráin ac, yn y DU, yr argyfwng costau byw a oedd ar ddechrau).

- Mae Aeddfedrwydd Digidol busnesau Cymru wedi cynyddu'n gymedrol dros gyfnod yr arolwg hwn, yn enwedig ers y pandemig Covid-19. Mae hyn yn cynrychioli cynnydd cyffredinol yn soffistigeiddrwydd technegol a masnachol economi ddigidol Cymru, er bod y ffaith bod TD wedi cynyddu'n gyflymach nag AD yn awgrymu nad yw llawer o fusnesau o reidrwydd yn manteisio i'r eithaf ar eu presenoldeb digidol.

- Mae'r cynnydd sylweddol mewn TD ar y cyd â chynnydd amlwg ond llai mewn AD yn awgrymu bod cyflwyno band llydan cyflym iawn yn genedlaethol wedi llwyddo i wella mynediad at dechnolegau digidol. Nawr, mae mynediad at sgiliau, hyfforddiant, adnoddau a buddsoddi digidol yn allweddol i wydnwch economi Cymru.

- Mae sgôr Arloesi cyfartalog busnesau Cymru'n cynyddu'n sylweddol dros saith mlynedd yr arolwg hwn; cyfanswm o 6% o gynnydd rhwng 2016 a dechrau 2023. Mae hyn yn cynrychioli gwelliant cadarnhaol yng ngallu busnes cyfartalog yng Nghymru i arloesi, er ei bod yn dal i fod yn weddol isel o gymharu â'n model, â sgôr o 0.36 allan o sgôr uchaf posibl o 1 ar adeg ysgrifennu'r adroddiad hwn.

- Mae hyn yn bryder i bobl sy'n gweld rôl bwysig i arloesi o ran cynyddu cynhyrchedd cwmnïau ac fel ffordd o wella safonau byw. Blaenau Gwent yn benodol oedd yr awdurdod lle mesurwyd y lefel isaf o allu i arloesi yn 2016, ac mae hynny'n dal i fod yn wir yn 2023; mae'r twf cenedlaethol cyffredinol o ran arloesi'n awgrymu bod yr ardal hon yn mynd yn bellach ar ei hôl hi. Dylid nodi fodd bynnag, wrth ddadansoddi ar lefel fwy gronynnog, bod data'r arolwg yn datgelu nifer o gwmnïau arloesol iawn yng Nghymru sy'n perfformio'n llawer gwell na'r sgôr cyfartalog hwn ac yn agos at y sgôr uchaf posibl.

- Mae anghyfartaledd rhanbarthol o ran Aeddfedrwydd Digidol ac Arloesi i'w weld ledled y wlad, yn fwyaf amlwg ar ffurf dargyfeiriad rhwng ardaloedd gwledig a threfol a ddechreuodd yn 2020. Roedd gan Dorfaen, Rhondda Cynon Taf a Blaenau Gwent lefelau Aeddfedrwydd Digidol isel yn 2016 a dim ond gwelliant bach sydd wedi bod ynddynt ers hynny. Cyn belled ag y mae Aeddfedrwydd Digidol cwmnïau'n adlewyrchu lefel digideiddio o fewn busnes ac yn awgrymu sut y gallai'r busnes gynyddu cynhyrchedd dros amser, mae hyn yn dangos bod y cynnydd cyfartalog yng nghyfradd twf cynhyrchiol yn llai nag 1% y flwyddyn, sy'n gyson ag adroddiadau swyddogol am dwf CDG y DU yn ystod y cyfnod hwn.

- Mae cyfradd debygol twf effeithlonrwydd cynhyrchiol yn yr awdurdodau sy'n perfformio orau (Bro Morgannwg, Abertawe a Chaerdydd) yn golygu nad yw'r gwahaniaeth rhwng canlyniadau economaidd awdurdodau'n cael ei leihau. Mae hyn yn gyson ag ymchwil diweddar a ddangosodd bod y math hwn o ddargyfeirio digidol - a dargyfeirio economaidd cyfatebol - yn debygol o dyfu oni chaiff sylw. Mae llenyddiaeth sy'n bodoli'n awgrymu y gallai fod potensial yr ardaloedd gwledig hyn yn cael ei ddal yn ôl gan gysylltedd digidol arafach a llai dibynadwy ynghyd â phoblogaethau gwasgaredig gwledig ac amddifadedd economaidd-gymdeithasol sy'n bodoli ac sy'n effeithio ar allu BBaCh gwledig i ddigidoleiddio.

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- Mae mabwysiadu mesurau LlAC, seiberddiogelwch a diogelu data wedi aros yn isel rhwng 2016 a 2023; mae'r rhain yn wendidau yn yr economi BBaCh y mae'n bwysicach nag erioed eu hunioni yn y cyd-destun cystadleuol byd-eang hwn y gall holl fusnesau Cymru nawr eu cael eu hunain ynddo, boed hynny'n rhagweithiol ai peidio, wrth i'r economi ddigidol wanhau ffiniau cenedlaethol a throi busnesau a arferai fod yn rhai lleol yn rhan o farchnad fyd-eang.

- Ychydig iawn o Gymraeg a ddefnyddir ar wefannau. Mae cyfran gymharol siaradwyr Cymraeg mewn rhanbarth yn cyfateb yn agos i ganran y BBaCh yn y rhanbarth sydd â thestun Cymraeg ar eu gwefan. Yr eithriad clir i hyn yw Caerdydd, lle mae gwefannau BBaCh yn fwy tebygol o ddefnyddio Cymraeg ar gyfradd uwch nag a awgrymir gan gyfran y siaradwyr Cymraeg sy'n byw yno.

# Conclusions

## Summary Findings

- The Digital Growth of Welsh businesses has markedly increased over the timespan of this survey, particularly since the Covid-19 pandemic beginning in 2020. This represents a general uptick in the time and resources that Welsh businesses are investing in their digital presence, reflecting a range of new strategies adopted by companies in response to national lockdown measures.

- The most significant increase in Digital Growth occurred across the Spring and Summer of 2022, indicating a burst of digital activity that corresponds to the increased economic volatility that accompanied the global lifting of lockdown measures (i.e. economies returning to growth in a context of supply chain disruption, global inflation, the war in Ukraine and, in the UK, the incipient cost-of-living crisis).

- The Digital Maturity of Welsh businesses has modestly increased over the timespan of this survey, particularly since the Covid-19 pandemic. This represents a general increase in the technical and commercial sophistication of Wales' digital economy, although the fact that DG has increased at a higher rate than DM suggests that many businesses are not necessarily exploiting their digital presence to its full potential.

- The substantial increase in DG accompanied by a marked but lesser increase in DM suggests that the national rollout of superfast broadband has succeeded in improving access to digital technologies. Access to digital skills, training, resources and investment are now key to the resilience of the Welsh economy

- The average Innovation score of Welsh companies increases steadily over the seven years of this survey, amounting to a 6% increase overall between 2016 and the beginning of 2023. This represents a positive improvement in the innovative capacity of the average Welsh business, although it still remains fairly low relative to our model, with a score of 0.36 out of a possible highest score of 1 at the time of writing.

- This is a concern for those who see a significant role for innovation in uplifting the productivity of companies and a source of improvement in living standards. Blaenau Gwent in particular was in 2016 and is now in 2023 the authority with the lowest measured level of innovative capability; the overall national growth in innovation suggests that this area is falling further behind. It should be noted however that, at a more granular level of analysis, the survey data reveal the existence of a number of highly innovative Welsh companies that perform well above this average score and are close to the highest possible score.

- Regional disparities in Digital Maturity and Innovation can be observed across the nation, most obviously in a marked rural-urban divergence that started began in 2020. Torfaen, Rhondda Cynon Taf and Blaenau Gwent had low levels of Digital Maturity in 2016 and have improved only slightly since that time. Insofar as the Digital Maturity of companies reflects the level of digitisation within a business and suggests how the business might increase productivity over time, this indicates that the average increase in the rate of productive growth is less than 1% per annum, which is in line with official reports of UK GDP growth during this period.

- Adoption of ESG, cyber security and data protection measures have remained low between 2016 and 2023; these are weaknesses in the SME economy that are ever more urgent to address in this global competitive context that all Welsh businesses may now find themselves a part of, whether proactively or not, as the digital economy makes national boundaries porous and the previously local becomes part of a global marketplace.

- The use of Welsh language on websites is very low. The relative proportion of Welsh speakers in a region closely matches the percentage of SMEs located in the region whose websites contain Welsh language text. The notable exception is Cardiff, where SME websites are more likely to use Welsh language at a higher rate than is suggested by the proportion of Welsh speakers who live there.

# ARGYMHELLION
# RECOMMENDATIONS

# A R G Y M H E L L I O N

# R E C O M M E N D A T I O N S

## Polisi

### #1
### Cyflwyno Band Llydan a Chymorth Gwell i BBaCh

Mae canfyddiadau'r arolwg hwn yn awgrymu mai'r flaenoriaeth gyntaf o ran polisi fyddai gwella cyflymder a dibynadwyedd mynediad i'r rhyngrwyd ledled Cymru, gan ganolbwyntio ar ardaloedd â mynediad gwael. Byddai hyn o fudd uniongyrchol i BBaCh o ran eu gallu i fabwysiadu technolegau digidol newydd, ac yn ei gwneud yn haws i BBaCh gysylltu â chwsmeriaid a chyflenwyr gwledig Cymru. Yn ail agos, argymhellir parhau â'r project rhwydweithiau buddsoddi, cymorth i fusnesau a hybiau clyfar, gan ganolbwyntio ar ardaloedd gwledig neu ardaloedd heb wasanaeth digonol sy'n dangos y perfformiad gwaethaf yn yr arolwg o ran Aeddfedrwydd Digidol ac Arloesi.

Yr awdurdodau unedol â'r perfformiad gwaethaf o ran Aeddfedrwydd Digidol yw Torfaen, Rhondda Cynon Taf a Blaenau Gwent; ac ar gyfer Arloesi Castell-nedd Port Talbot, Blaenau Gwent, Rhondda Cynon Taf, Sir Fynwy, Bro Morgannwg ac Ynys Môn. Gallai BBaCh yn yr awdurdodau hyn elwa o gymorth wedi'i dargedu; mae awdurdod Blaenau Gwent yn peri pryder penodol.

## Policy Based

### #1
### Broadband Rollout and Enhanced SME Support

The findings of this survey suggest that the first policy priority should be improving the speed and reliability of internet access across Wales, with a focus on areas with poor coverage. This would benefit SMEs directly in terms of ability to adopt new digital technologies, and in enabling better connection of SMEs to rural Welsh customers and suppliers. This is closely followed by a recommendation that the project of investment networks, business support and smart hubs be continued, with a focus on the rural and underserved areas that perform least well in the survey on Digital Maturity and Innovation.

The lowest-performing unitary authorities for Digital Maturity are Torfaen, Rhondda Cynon Taf and Blaenau Gwent; and for Innovation are Neath Port Talbot, Blaenau Gwent, Rhondda Cynon Taf, Monmouthshire, Vale of Glamorgan and Isle of Anglesey. SMEs in these authorities might benefit from targeted support, with Blaenau Gwent being an authority of particular concern.

### #2
### Economi Apiau

Mae'r adroddiad hwn yn argymell cynhyrchu polisi newydd i gynorthwyo i ddatblygu a lledaenu apiau a llwyfannau o Gymru. Mae canfyddiadau'r arolwg yn dangos bod yr economi apiau'n bwysig i lifoedd gwaith BBaCh Cymru; a'i bod yn tyfu ac yn debygol o barhau â thwf cyflym o anghenraid cystadleuol, wrth i ddigidoleiddio cenedlaethol a byd-eang barhau ac wrth i 5G gael ei gyflwyno ledled Cymru a'r DU. Byddai datblygu apiau o Gymru a'u mabwysiadu'n eang ar draws busnesau a'r sector cyhoeddus yn helpu i gadw mwy o swyddi, arian a data yn economi Cymru, gan liniaru effaith economaidd economi apiau ryngwladol sy'n ennill tir.
Argymhelliad ategol yw ystyried goblygiadau apiau a llwyfannau nad ydynt o Gymru ac nad ydynt ar hyn o bryd yn rhannu'r data y maent yn eu casglu am economi fusnes Cymru â Llywodraeth Cymru, er mwyn i Lywodraeth Cymru allu cael yr un wybodaeth am fusnesau â chwmnïau o'r tu allan i'r Deyrnas Unedig, ac o bosibl archwilio sut y gellir defnyddio'r data hyn i helpu i fesur economi Cymru ac ychwanegu gwerth ati.

### #3
### Data Busnes Cymru ar gyfer Monitro, Gwybodaeth a Chymorth wedi'i Dargedu

Deddfu ar gyfer rhagddodiad cod DDS i Gymru er mwyn gallu echdynnu data am fusnesau Cymru o Dŷ'r Cwmnïau, yn yr un modd ag y mae gan yr Alban ragddodiad DDS, a defnyddio'r codau hyn i dargedu cymorth i fusnesau a gohebiaeth sydd wedi'i theilwra i wahanol sectorau busnes.

Rydym yn deall bod llywodraeth Cymru eisoes yn darparu cymorth busnes ac yn estyn y cymorth hwnnw o ran seiberddiogelwch, diogelu data a gwerth data; mae'r ymchwil hwn yn awgrymu nad yw hyn yn cael effaith ddigon eang ar hyn o bryd ac y gallai fod angen defnyddio dulliau newydd i lwyddo.

### #2
### App Economy

This report recommends generating new policy to support the development and diffusion of Welsh apps and platforms. The survey's findings show that the app economy is significant for Welsh SMEs' workflows; and that this is growing and likely to continue with rapid growth born of competitive necessity, as national and global digitalisation continues and 5G rolls out across Wales and the UK. The development and wide adoption of Welsh apps across businesses and the public sector would help to retain more jobs, money and data within the Welsh economy, mitigating against the economic impact of an encroaching international app economy.

A complementary recommendation is that consideration is given to the implications of non-Welsh apps and platforms which currently do not share the data they collect about the Welsh business economy with Welsh Government, in order that Welsh Government has access to the same intelligence about businesses that non-UK companies do, perhaps exploring how these data can be used to help measure and add value to the Welsh economy.

### #3
### Welsh Business Data for Monitoring, Intelligence and Targeted Support

Legislate for a Welsh SIC code prefix in order to be able to extract Welsh business data from Companies House, just as Scotland has a Scottish SIC prefix, and use these codes to target businesses support and communications tailored to different business sectors.

We understand that Welsh government already provides and is extending business support with regard to cyber security, data protection and the value of data; this research suggests that their impact is not sufficiently widespread and that success may require a new approach.

## #4
## Hyrwyddo Gwerthoedd Cymreig

Ar lefel genedlaethol, byddai'r economi BBaCh gyfan yn elwa o arweiniad, cymorth ac anogaeth i gymryd camau cadarn i fabwysiadu mesurau LlAC, seiberddiogelwch a diogelu data a defnyddio Cymraeg. O ystyried y flaenoriaeth isel y mae BBaCh yn ei rhoi i bolisïau preifatrwydd, mae'n debygol y bydd angen mwy na dim ond mesurau rheoleiddio i gyflawni hyn. Yn aml, nid yw BBaCh yn deall perthnasedd materion LlAC, seiberddiogelwch a diogelu data i'w busnes, na sut y byddai arfer gorau'n edrych yn eu sector.

Mae'r materion hyn yn debygol o fod yn bwysicach a phwysicach i gynnal busnes cynaliadwy a denu buddsoddiad yn y dyfodol agos; mae LlAC a defnyddio Cymraeg hefyd yn hanfodol i'r gwerthoedd Cymreig a fynegwyd mewn polisi, megis Deddf Llesiant Cenedlaethau'r Dyfodol. Er bod y gwerthoedd Cymreig hyn o reidrwydd yn llunio cenhadaeth a strategaeth y sector cyhoeddus, nid yw'n ymddangos eu bod wedi lledaenu drwy'r sector preifat. Ar hyn o bryd, ychydig iawn o deimlad o werthoedd Cymreig sydd fel rhan unigryw o hunaniaeth BBaCh Cymru. Mae polisi sy'n cynorthwyo busnesau Cymru i ymateb i fusnes yn y sector cyhoeddus, a chystadlu amdano'n llwyddiannus, yn hanfodol. Ond ni fyddai hynny'n ddigon ynddo ei hun o ystyried ymagwedd llawer o BBaCh at y materion hyn. Byddai mwy o gaffael lleol o bosibl yn well i Gymru o safbwyntiau ecolegol ac economaidd.

## #4
## Promoting Welsh Values

At a national level, the whole SME economy would benefit from guidance, support and encouragement for robust adoption of ESG, cyber security and data protection measures and Welsh language use. Given the low importance SMEs assign to privacy policies, this is likely to require more than just regulatory measures. SMEs often do not comprehend the relevance of ESG, cyber security and data issues to their business, or what best practice would look like in their sector.

These issues are likely to be increasingly important for sustainable business and attracting investment in the near future; ESG and Welsh language use are also integral to the Welsh values expressed in policy, such as the Wellbeing of Future Generations Act. While these Welsh values necessarily shape the public sector's mission and strategy, they do not seem to have dispersed across the private sector. There is currently little sense of Welsh values as a unique part of Welsh SMEs' identity. A policy that supports Welsh businesses to respond to and successfully compete for business in the public sector is essential. But not enough in itself given the approach taken by many SMEs to these issues. More local procurement is potentially both ecologically and economically better for Wales.

## Busnesau a Chymorth Busnes

Dylai cwmnïau sicrhau bod eu gwerthoedd i'w gweld yn glir. Yn y blynyddoedd nesaf, bydd buddsoddwyr, partneriaid busnes a defnyddwyr yn fwy a mwy tebygol o wneud penderfyniadau ar sail agwedd cwmni at faterion megis Sero Net, cynaliadwyedd amgylcheddol a llywodraethu corfforaethol cyfrifol. Os yw cwmni wedi cymryd camau i roi sylw i'r materion hyn, dylent wneud yn siŵr eu bod yn dweud wrth bobl am y peth - yn enwedig ar eu gwefan a chyfryngau cymdeithasol, sef eu heiddo pwysicaf sy'n wynebu'r cyhoedd.

Dylai cwmnïau drin eu gwefan fel blaen siop digidol. Hyd yn oed os nad yw cwmni'n gwerthu cynhyrchion neu wasanaethau ar-lein, gwefan y cwmni fydd y pwynt cyswllt cyntaf i lawer o ddarpar gwsmeriaid - yn enwedig ar y farchnad ryngwladol. Dylai pob math o fusnes flaenoriaethu buddsoddi mewn presenoldeb gwe digidol soffistigedig sydd wedi'i gynnal a'i gadw'n dda, ac sy'n adlewyrchu gwerthoedd y cwmni er ei bennaf les ei hun.

## Cymorth Busnes

Mwy o gymorth wedi'i dargedu ar gyfer BBaCh ynghylch seiberddiogelwch, diogelu data a gwerth data. Nid yw llawer o BBaCh yn ymwybodol ar hyn o bryd o'r gwerth y gellir ei ychwanegu at eu busnes drwy drosoli data, nac o'r cynnydd mewn bygythiadau seiberddiogelwch a phreifatrwydd sy'n gysylltiedig â digidoleiddio a gweithio hybrid. Ar y naill law, mae'r sefyllfa hon yn cynyddu'r ffactor risg i fusnesau Cymru a'u cwsmeriaid, ond ar y llaw arall, mae'n dangos anallu neu anfodlonrwydd i ymwneud â rhai o'r posibiliadau trawsnewidiol sydd ar gynnig gan dechnolegau digidol. Er y dystiolaeth gryf y gall cwmnïau gael manteision cyffredinol drwy ddadansoddi data, er enghraifft, mae llawer o BBaCh yn ddealladwy yn anfodlon gweithredu heb brawf clir o'r manteision y byddai defnyddio'r offeryn hwn (neu eraill) yn eu darparu *i'w busnes penodol hwy.* I rai busnesau, nid oedd hyd yn oed y pandemig yn ddigon o ysgogiad i sbarduno cynnydd sylweddol mewn Aeddfedrwydd Digidol, sy'n pwysleisio'r dasg hanfodol ond heriol sy'n wynebu pobl sy'n ceisio arwain twf cynhyrchedd ac arloesi yn economi Cymru.

Cymorth wedi'i dargedu ar gyfer BBaCh o ran LIAC a Sero Net. Yn yr un modd ag wrth sôn am seiberddiogelwch a diogelu data, ymddengys nad yw BBaCh bob amser yn gallu deall perthnasedd y materion hyn i'w busnes na sut y byddai arfer gorau'n edrych yn eu sector.

### Businesses and Business Support

Companies should put their values front and centre. In the coming years, investors, business partners and consumer will be increasingly likely to make decisions based on a company's stance on issues such as Net Zero, environmental sustainability and responsible corporate governance. If a company has taken steps to address these issues, they should make sure to tell people about it - particularly on their website and social media, which will continue to be their most important public-facing properties.

Companies should treat their website as their digital storefront. Whether or not a company sells its products or services online, its website is still the first point of contact for many potential customers - particularly on the international market. Investing in a digitally sophisticated, well-maintained web presence which reflects the company's value offering to its best advantage should be a priority for businesses of all types.

### Business Support

More targeted support for SMEs around cyber security, data protection and the value of data. Many SMEs are currently unaware of the value that can be added to their business by leveraging data, or the increased cybersecurity and privacy threats associated with digitalisation and hybrid working. On the one hand, this situation increases the risk factor for Welsh businesses and their customers, on the other, it indicates an inability or unwillingness to engage with some of the transformative possibilities offered by digital technologies. However strong the evidence of the general benefits companies can attain through, for example, data analytics, many SMEs are understandably unwilling to act on it absent clear proof of the gains that using this tool (or others) would provide *for their particular business*. For some businesses, even the pandemic did not provide sufficient impetus to spur a substantial increase in Digital Maturity, emphasising the vital but challenging task facing those trying to drive innovation and productivity growth in the Welsh economy.

Targeted support for SMEs on ESG and Net Zero. As with cybersecurity and data protection, there are indications that SMEs are not always able to grasp the relevance of these issues to their business or what best practice would look like in their sector.

## Cyfyngiadau a Chyfarwyddiadau ar gyfer Ymchwil yn y Dyfodol

Mae Arolwg Aeddfedrwydd Digidol Cymru 2023 yn cynrychioli'r tro cyntaf i fethodoleg arolwg digidol gael ei ddefnyddio ar raddfa genedlaethol ar gyfer economi Cymru. Dyma'r darlun mwyaf cynhwysfawr sydd ar gael hyd yma o weithgarwch digidol busnesau Cymru dros gyfnod o saith mlynedd o 2016 hyd at 2023; mae'n dangos effeithiau Brexit, Covid-19 a'r anhrefn economaidd diweddar. Gwir werth y dull hwn, fodd bynnag, fyddai ailadrodd y mesuriadau a ddisgrifir uchod yn rheolaidd dros y blynyddoedd nesaf, i roi trosolwg strategol parhaus ar economi ddigidol Cymru i ategu gwaith llunwyr polisïau ac asiantaethau cymorth busnes ac i ganiatáu i berchenogion busnes ddeall sut y mae eu cwmni eu hunain yn cymharu â'u cymheiriaid yn eu rhanbarth ac yn eu sector. Gan fod y sampl cychwynnol nawr wedi'i sefydlu, gellid cyflawni hyn am gost resymol, o fewn amser rhesymol.

Hefyd, ceir cwmpas sylweddol i estyn yr ymchwil a wnaethpwyd yn yr adroddiad hwn:

- Mae nifer o gwmnïau arloesol iawn yng Nghymru'n gwneud yn llawer gwell na'r cyfartaledd ac yn wir, yn dod yn agos at y sgôr uchaf posibl, ac mae'r rhain i'w cael ym mhob rhan o'r wlad. Nid 'egin fusnesau' yw'r rhain ond cwmnïau cofrestredig sefydledig, ac nid dim ond yng Nghaerdydd y maent wedi'u lleoli. Gallai archwiliad manylach o darddiad a llwybr y cwmnïau hyn roi golwg werthfawr ar beth yw arfer gorau digidol yng nghyd-destun Cymru.

- Wrth lunio sampl yr astudiaeth hon, lleolodd y tîm ymchwil gofrestriadau a phresenoldebau digidol cannoedd o gwmnïau a roddodd y gorau i fasnachu rhwng 2016-2023. Drwy fuddsoddi mwy o amser ac adnoddau, byddai'n ddichonadwy astudio proffil digidol y cwmnïau hyn i ddarganfod a oes tueddiadau a allai ragweld methiant y cwmni i'w gweld yn y data, gan daro goleuni amhrisiadwy ar yr hyn sy'n gwneud busnes gwydn yn economi'r 21ain ganrif.

- Un o gyfyngiadau'r dull presennol yw na all gynnwys busnesau y mae eu presenoldeb digidol wedi'i gynrychioli'n llwyr ar apiau neu lwyfannau sy'n eiddo i gwmni arall, megis Facebook, Etsy, Amazon, Shopify, AirBnB ac ati (er y gall ganfod os yw busnesau'n cysylltu â'r llwyfannau hyn o'u gwefannau eu hunain). Byddai estyn yr arolwg i gynnwys y llwyfannau hyn yn her dechnegol a chyfreithiol sylweddol, ond yna byddai'n gallu archwilio haenau cwbl newydd o economi ddigidol Cymru.

## Limitations and Directions for Future Research

The 2023 Digital Maturity Survey for Wales represents the first time that a digital survey methodology has been applied at national scale to the Welsh economy. It offers the most comprehensive picture yet available of the digital activity of Welsh businesses over a period of seven years from 2016 up until 2023, demonstrating the impacts of Brexit, Covid-19 and recent economic turmoil. The real value of this approach, however, would lie in repeating the measurements described above at regular intervals over the coming years, providing an ongoing strategic overview of Wales' digital economy to support the work of policymakers and business support agencies and allowing business owners to understand how their own company compares to their regional and sectoral peers. With the initial sample now established, this could be achieved without prohibitive costs or turnaround times.

There is also considerable scope for extending the research carried out in this report:

- A number of highly innovative Welsh companies perform well above the average and are indeed, close to the highest possible score were found in all parts of the country. These are not 'start-ups' but established registered companies and they are not limited to Cardiff. A closer examination of the origins and trajectory of these companies could provide valuable insights as to what digital best practice looks like in the Welsh context.

- In constructing the sample for this study, the research team located the registrations and digital presences for hundreds of companies which ceased trading between 2016-2023. With a further investment of time and resources, it would be feasible to study to digital profile of these companies to discover whether or not trends predictive of company failure are observable in the data, providing invaluable insights into what makes for a resilient business in the 21st century economy.

- One of the limitations of the current approach is that it cannot capture businesses whose digital presence is solely represented on proprietary apps or platforms, such as Facebook, Etsy, Amazon, Shopify, AirBnB and so on (although it can detect where businesses link to these platforms from their own websites). Extending the survey to cover these platforms would represent a considerable technical and legal challenge, but would allow it to explore

## Edrych Ymlaen

Yn y cyfnod o 2016 hyd 2023, gwelwyd ton ddigynsail o ddigidoleiddio yn Economi Cymru. Mae Twf Digidol busnesau Cymru wedi mwy na dyblu dros y saith mlynedd, sy'n dangos cynnydd cyffredinol yn yr amser a'r adnoddau y mae cwmnïau'n eu neilltuo i gynnal a gwella eu presenoldeb digidol. Gan ddechrau yn 2020, mae'r cynnydd hwn yn adlewyrchu effaith y pandemig Covid-19, ond mae'r naid enfawr mewn gweithgarwch sydd i'w gweld ers dechrau 2022 yn dangos bod busnesau'n ymateb i anwadalrwydd economaidd diweddar â thon bellach o ddigidoleiddio. Mae hyn yn awgrymu bod technoleg ddigidol nawr yn ganolog i ddynamiaeth a gwydnwch economi Cymru.

O ran Aeddfedrwydd Digidol a'r Sgôr Arloesi, mae'r darlun yn fwy cymysg. Mae'r cynnydd cyffredinol yn y metrigau hyn wedi bod yn llawer arafach, sy'n awgrymu, er y cynnydd mewn gweithgarwch digidol yn economi Cymru, nad yw pob cwmni'n gwella soffistigeiddrwydd eu harlwy digidol neu'n ei drosoli'n llwyddiannus i lywio arloesi. Fodd bynnag, ceir busnesau ym mhob rhan o Gymru sy'n defnyddio technolegau digidol i hybu cynhyrchedd a dod o hyd i ffyrdd newydd o gyflwyno eu cynhyrchion a'u gwasanaethau i'w cwsmeriaid - enghreifftiau y gellir eu hastudio a dysgu ohonynt yn y dyfodol. Mae'n rhaid pwysleisio hefyd bod Aeddfedrwydd Digidol a Sgorau Arloesi'n tueddu i'r cyfeiriad cywir ar y cyfan.

Ni fyddai dim o hyn wedi bod yn bosibl heb fuddsoddiad y llywodraeth mewn estyn darpariaeth band llydan cyflym iawn a chynnig cymorth busnes am ddim i gwmnïau Cymru. Mae canlyniadau'r arolwg hwn, a'r gyfres o arolygon blaenorol a gynhaliwyd gan Brifysgol Caerdydd rhwng 2016 a 2020, yn awgrymu y bydd estyn egwyddorion y rhaglenni hyn o roi mynediad i bawb yn hanfodol i feithrin arloesi, twf, cynhyrchedd a thegwch yn economi Cymru dros y blynyddoedd nesaf.

## Looking Forward

The period from 2016 to 2023 saw an unprecedented wave of digitalisation in the Welsh Economy. The Digital Growth of Welsh businesses more than doubled over the seven years, indicating an overall increase in the time and resources companies are spending maintaining and improving their digital presence. Beginning in 2020, this increase reflects the impact of the Covid-19 pandemic, but the huge leap in activity visible from the beginning of 2022 indicates that businesses are responding to recent economic volatility with a further wave of digitalisation. Digital technology, this suggests, is now central to the dynamism and resilience of the Welsh economy.

With regard to Digital Maturity and Innovation Score, the picture is more mixed. Overall increase in these metrics has been much slower, suggesting that whilst the amount of digital activity in the Welsh economy is increasing, not all companies are improving the sophistication of their digital offering or successfully leveraging it to drive innovation. There are, however, businesses in all areas of Wales who are using digital technologies to boost productivity and find new ways to bring their products and services to their customers - examples to be studied and learned from in future. It must also be stressed that overall, both Digital Maturity and Innovation Scores are trending in a positive direction.

None of this would have been possible without government investment in extending superfast broadband coverage and offering free digital business support for Welsh companies. The results of this and the series of previous surveys carried out by Cardiff University between 2016 and 2020 suggest that extending the principles of universal access behind these programmes will be essential to fostering innovation, growth, productivity and fairness in the Welsh economy over the coming years.

# CYDNABYDDIAETHAU
# ACKNOWLEDGEMENTS

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# ACKNOWLEDGEMENTS

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# LLYFRYDDIAETH

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# ATODIAD YR ADRODDIAD
# REPORT ANNEX

# ATODIAD YR ADRODDIAD

# REPORT ANNEX

## Overview of 2023 Sample

This survey is designed to cover small and medium sized businesses registered with Companies House at an address contained within a Welsh postcode. We did not include either micro-businesses or large businesses or businesses whose ownership clearly lies outside of Wales.

It is based on a sample of companies within each Welsh unitary authority weighted by SIC code proportions and the size of the business population within that authority, based on data we obtained from Companies House.

We have created a sample of companies along with their associated websites which represent the relative size of the different business sectors in Wales and the relative number of Welsh companies located in each Unitary Authority. We retrieved the relevant details of all companies registered at Companies House, based upon the data available in January 2023.

We removed all companies that filed accounts in the format required of large companies and hence to limit our subsequent search to SME's only. For the remainder we determined the total number of businesses registered at Companies House with a Welsh postcode and used this data to carry out two counts:

- We counted the number of businesses in each of 7 top level SIC categories. Using the categories reported in previous surveys of the Digital Maturity of Welsh companies.
- We counted the number of businesses in each of the 22 UA's from the same sample of SME Welsh SME's present in Companies House.

Finally, we created a sample of companies within each UA weighted by these SIC proportions and the size of the business population within that authority. The number of companies and their SIC categories in the final sample are reported below. In no case did our actual sample vary from the target figure by more than 3%.

| sic sector | Sample Count | Sample Promotions | Sample Target |
|---|---|---|---|
| Accommodation and food service activities | 333 | 0.057 | 0.073 |
| Business and other services | 2702 | 0.465 | 0.476 |
| Construction | 786 | 0.135 | 0.135 |
| Information and communication | 459 | 0.079 | 0.072 |
| Manufacturing | 479 | 0.082 | 0.073 |
| Transportation and storage | 171 | 0.029 | 0.041 |
| Wholesale and retail trade; repair of motor vehicles and motorcycles | 883 | 0.152 | 0.130 |
| Grand Total | 5813 | 1.000 | 1.000 |

**Table 6. Makeup of SIC Proportions in the Sample**

| Unitary Authority | Sample Count | Sample Proportions | Target Proportions |
|---|---|---|---|
| Blaenau Gwent County Borough Council | 82 | 0.014 | 0.011 |
| Bridgend County Borough Council | 264 | 0.045 | 0.043 |
| Caerphilly County Borough Council | 245 | 0.042 | 0.039 |
| Cardiff Council | 953 | 0.164 | 0.178 |
| Carmarthenshire County Council | 256 | 0.044 | 0.053 |
| Ceredigion County Council | 102 | 0.018 | 0.019 |
| Conwy County Borough Council | 230 | 0.040 | 0.036 |
| Denbighshire County Council | 225 | 0.039 | 0.035 |
| Flintshire County Council | 300 | 0.052 | 0.050 |
| Gwynedd Council | 210 | 0.036 | 0.032 |
| Isle of Anglesey County Council | 115 | 0.020 | 0.015 |
| Merthyr Tydfil County Borough Council | 76 | 0.013 | 0.013 |
| Monmouthshire County Council | 234 | 0.040 | 0.037 |
| Neath Port Talbot County Borough Council | 179 | 0.031 | 0.030 |
| Newport City Council | 366 | 0.063 | 0.063 |
| Pembrokeshire County Council | 216 | 0.037 | 0.043 |
| Powys County Council | 253 | 0.044 | 0.041 |
| Rhondda Cynon Taf County Borough Council | 361 | 0.062 | 0.062 |
| Swansea Council | 448 | 0.077 | 0.089 |
| Torfaen County Borough Council | 151 | 0.026 | 0.021 |
| Vale of Glamorgan Council | 295 | 0.051 | 0.049 |
| Wrexham County Borough Council | 252 | 0.043 | 0.040 |
| Grand Total | 5813 | 1.000 | 1.000 |

**Table 7. Makeup of Unitary Authority Proportions in the Sample**

| rural/urban | name (Count All |
|---|---|
| rural | 816 |
| urban | 4986 |
| (blank) | 11 |
| Grand Total | 5813 |

**Table 8. Makeup of Urban-Rural Proportions in the Sample**

The data for each individual unitary authority can be found on the website: [https://welshdigitalmaturitysurvey2023.eticlab.co.uk](https://welshdigitalmaturitysurvey2023.eticlab.co.uk)