

MADE Cymru Dissertation

An analysis of the options the public sector has to support an increase in innovation and business performance of High Value Manufacturing (HVM) companies with a presence in Mid Wales

MSc International Innovation Management

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Executive Summary

Since writing the original research proposal, the everyday challenges of the Covid-19 pandemic have subsided with the current crisis being the energy price rises triggered by the war in Ukraine. With many Brexit issues still weighing heavy on UK manufacturing, many Mid Wales HVM businesses are still performing well in terms of growth.

The perennial problems of both labour and skills shortages in the region show no signs of easing and this is having an impact on many companies and their ability to grow faster. What is perhaps most alarming is the combination of a shrinking regional population and a workforce in which many of the essential skills are in the aging members of staff.

The elephant in the room is Climate Change and it isn't going away, yet the declared actions of every HVMs studied has barely scratched the surface in terms of a credible plan to be Net Zero by 2050, let alone meeting the intermediate IPCC target of 50% reduction of emission by 2030. 7 years is just around the corner.

The stated purpose of this study at the outset was to analyse and evaluate the options that the public sector has when looking to support and stimulate an increase in the performance of the regions HVMs in the future. What has been brought into sharp focus is the need to better define performance due to the tension between shareholder value today at one extreme and the climate change imperative of operating within planetary boundaries before it's too late at the other.

What the study has achieved is a clear picture of who the region's HVMs are, what they do, who owns and controls them and an evaluation of what challenges they will likely face over the next 10 years.

What appears clear is that the need to innovate remains as important as ever, but now the focus will have to shift to prioritising resource efficiency and meeting the emission reduction targets that 196 parties agree to in the 2015 Paris Agreement. Some would say, quite legitimately, that we must innovate as if our lives depended on it.

The study concludes by proposing a new menu of future public sector support package themes focused on the biggest challenges.

The submission date of this study happens to be in the same week as the Welsh Government launches its new Innovation Strategy for Wales. It will be interesting to see how this study's findings and recommendations for further work can contribute to the Welsh Government's stated aim of creating a stronger, fairer and greener Wales.

About the Author

For the past 9 years, the author of this dissertation has been employed by the Welsh Government in the role of Innovation Specialist. A core function of that role has been to support businesses across Wales with advice and guidance on RD&I (Research Development and Innovation), manufacturing, design and intellectual property. That support extends to facilitating collaborative activity between Welsh businesses, academia and research organisations in Wales and beyond.

The Welsh Government's Innovation Specialists – a team averaging 9 members over the past 10 years - also provide support to Welsh businesses seeking public sector funding from a number of RD&I grant schemes, of which the Welsh Government-administered SMARTCymru fund has been a major component.

Whilst the author has worked with companies in all regions of Wales - and many looking to establish a presence in Wales - the focus has been to support and work with businesses already in Powys and Ceredigion.

Prior to joining the Welsh Government, the author spent over 20 years in manufacturing, R&D and Product Management roles in both industrial and consumer electronics companies.

Acknowledgements

I gratefully acknowledge the generous help and support of the following during my work on this study:

The many businesses across Wales who have taken the time to show me around their facilities and share with me the details of the challenges they face and the opportunities they wish to take.

The many colleagues at Welsh Government who have supported my work during the period of this study offering insights into the activities of manufacturers large and small from Mid Wales and beyond.

Alan Mumby, lecturer and dissertation tutor throughout this period of study. Always available for chat - live and direct from his shed.

Mick Card of Innovate UK KTN and Natalie Crawley at Welsh Government for their assistance in providing both data and commentary on the long history of KTPs (Knowledge Transfer Partnerships) in Wales.

Dr Kevin Hogan of ETIC Lab who has been generous with his time over several years and whose insight into modern methods of identifying and measuring innovation activity together with his interest in the well-being and prosperity of Mid Wales has been an inspiration.

Finally, thank you to my family for their understanding during the many hours of me being in “my shed”.

Declaration Statement

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed  (candidate)

Date 27th February 2023

This submission is the result of my own investigations, except where otherwise stated. Where correction services have been used the extent and nature of the correction is clearly marked in footnotes. Other sources are acknowledged giving explicit references.

Signed  (candidate)

Date 27th February 2023

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Introduction

What could support for High Value Manufacturing in Mid Wales look like in 2025 and what impact could that have? This was the research question that emerged in early 2021 and has remained central to the study and analysis set out in this document.

Backdrop and Context

Climate Change, Brexit and the Covid-19 pandemic are having a profound impact on the lives and livelihoods of many living in the UK. The cost-of-living crisis which began in late 2021 (Institute for Government, 2022) has been exacerbated by Russia's invasion of Ukraine in February 2022 and the steep rise in inflation is adding to the pressure for most businesses. For manufacturers, the global supply chain problems triggered by Covid-19 restrictions are yet another complication.

Against the backdrop of these national and international disruptions, Wales, like many other regions, has its own set of challenges which it will need to address if it wants to improve the long-term well-being of those that live and work in the country.

These challenges can be categorised in several ways. Like all other elements of the social and economic fabric of Wales, the manufacturing sector continues to grapple with several persistent challenges as well as some that can be considered new and unique in their own right and unprecedented when viewed in combination.

Pre-pandemic, manufacturing GVA (Gross Value Added) as a proportion of the economy in Wales was 17% – the highest of any region in the UK - and the largest contributor to the Welsh economy (Stats Wales, 2019). Manufacturing clearly matters.

In looking at those manufacturers who are generally considered and classified as High Value Manufacturing (HVM) entities, their relative contribution to the UK and Welsh economy, in terms of GVA and median wages, is significantly higher than those classified as not HVM. (Policy Links, 2021).

Table 1 and Figure 1 below illustrate this and provides comparisons with the other sectors making up the UK economy.

	Sector	Industries covered	Value added per hour worked (£, 2015 prices) *			Share in UK value added**		
			2007	2017	Change	2007	2017	Change
Higher value added per hour ↕ Lower value added per hour	Medium/high-tech manufacturing	Pharmaceuticals, aerospace, automotive, etc.	37.1	57.1	53.6%	5.0%	4.8%	-0.2%
	Other production	Oil extraction, agriculture, forestry, etc.	61.5	50.3	-18.2%	11.6%	10.4%	-1.1%
	Knowledge services	Education; finance, professional, scientific, etc.	37.2	40.2	7.8%	27.0%	27.3%	0.3%
	Low/medium-tech manufacturing	Food, textiles, wood, rubber, etc.	25.9	26.9	3.9%	6.2%	5.4%	-0.8%
	Other services	Retail, hospitality administrative, real estate, health and social services, etc.	21.4	25.0	16.7%	50.3%	52.1%	1.8%

See Appendix 1 for full sector industry definitions. *Median Value ** Rounded

Table 1: GVA per hour worked and UK share by sector 2007 – 2017. (Source: Policy Links 2021)

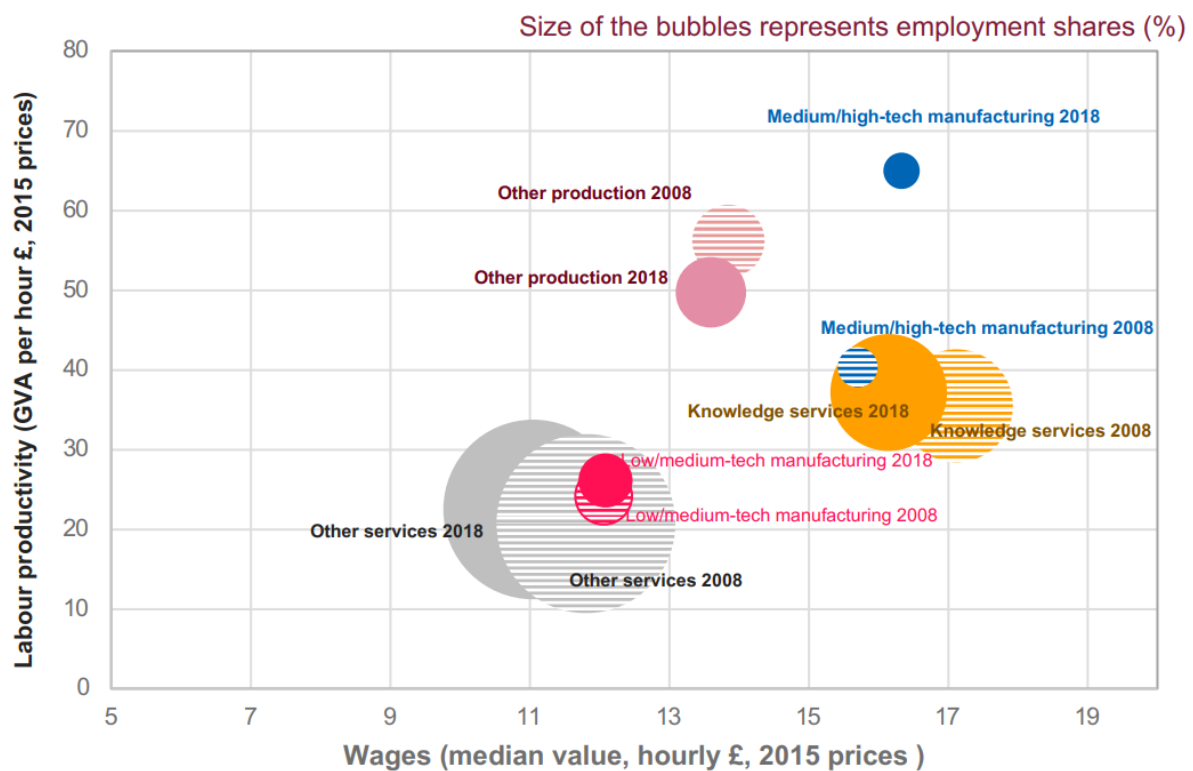


Fig. 1: UK Labour productivity, employment, and wages by industry 2008 – 2018. (Source: Policy Links, 2021)

All EU structural funded programmes that exist in Wales today will have been concluded by 2024. Many of these, together with their predecessors, have supported either directly or indirectly the growth of HVM businesses for over 20 years. The process of closing the remaining programmes has begun. This is likely to be one of the new emerging challenges for many in Wales' HVM community should comparable new programmes fail to take the place of those that have proved to be high impact in the past.

Whilst the current UK Government talks about a 'levelling up' of socio-economic prosperity, is the 'productivity puzzle' the nut Wales should be trying to crack? With the UK productivity level being persistently lower than those of almost all other major economies - and Wales having had the lowest productivity of any UK region - what interventions would have the most positive impact for Wales? Could a focus on direct support for HVM in Wales have a disproportionately positive impact? If so, what specific interventions would HVM most benefit from?

Or, should our governments focus on creating the best possible regional infrastructure and conditions that support those companies with the capability to equip themselves with the needed skills, technology and finance to become sustainable and resilient components of a balanced economy that supports the well-being of the whole of society.

To illustrate recent regional disparity in overall productivity, the following pre-Covid ONS (Office for National Statistics) figures from 2019 show that by some traditional measures of productivity – the output per hour worked and the output per job – Wales can be seen to be performing poorly against this metric.

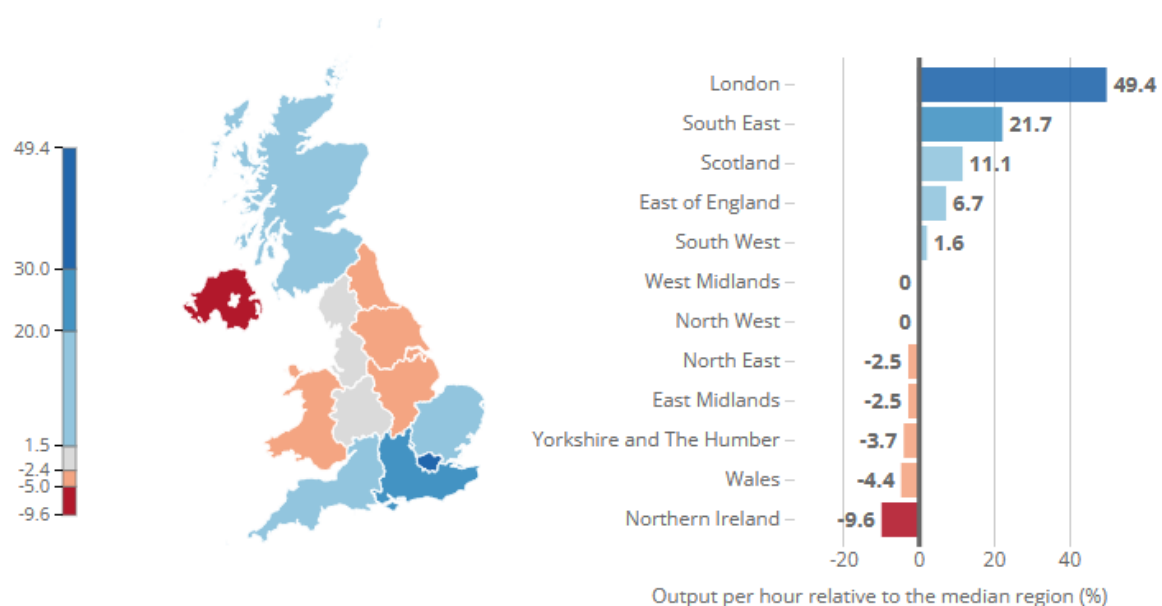
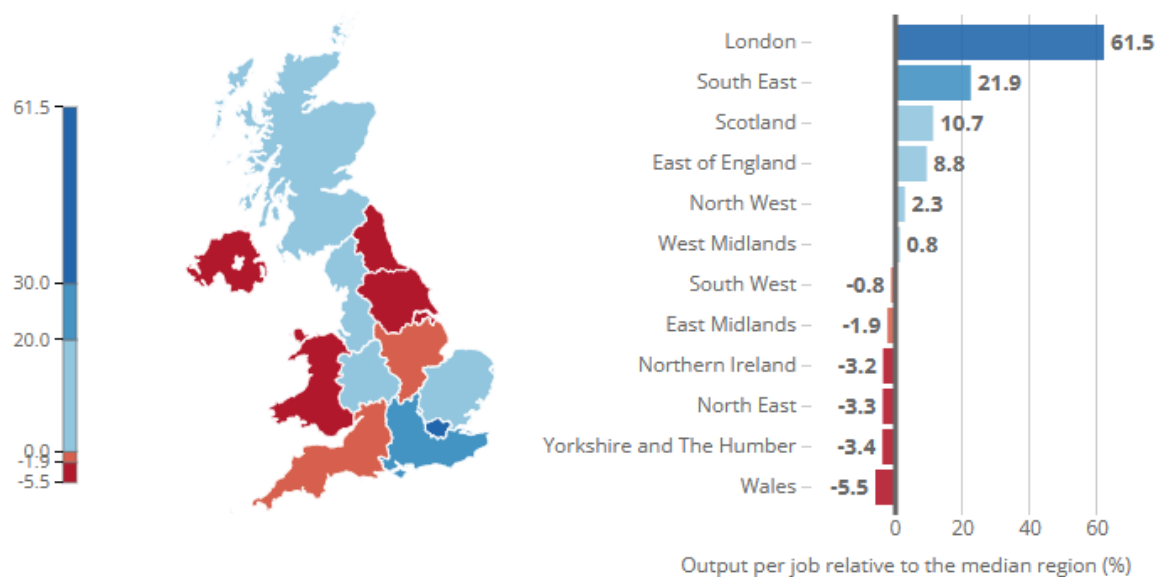


Fig 2a: UK Regional Productivity – output per hour – 2019 figures. (ONS).



Source: Office for National Statistics

Fig 2b: UK Regional Productivity – output per job – 2019 figures. (ONS).

When drilling down and looking at the regional economic numbers for the regions of Wales, Mid-Wales can be seen to have the lowest regional GVA per head. However, a deeper analysis of a broader set of socio-economic data shows that the region has quite a lot going for it. For example, it has consistently lower levels of unemployment than all other regions of Wales (ONS, 2022) and Llandrindod Wells regularly featuring in surveys as the happiest place to live in Wales and in the top 5 of the happiest places to live in the UK. (Rightmove, 2021).

Purpose of this Study

The purpose of this study is to analyse and evaluate the options that the public sector has to support and stimulate an increase in the performance of High Value Manufacturing (HVM) companies with a presence in Mid Wales.

This is important not only because of the significant contribution that HVM currently makes to the economy of the region but in a world where climate change will increasingly influence long-term national and international policies and regulations, Mid Wales needs to be cognisant of not only the future opportunities but also the activities that will likely be forced into extinction.

Whilst the research question is focused on the support provision for 2025, this study will also consider the likely fitness for purpose for the subsequent decade.

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Literature Review

To be able to set meaningful and robust boundaries for this work, the literature review has focused on the following topics:

- Defining HVM
- The geography and the manufacturing sectors within
- Public sector support for manufacturing businesses – past and present

Topic: Defining HVM

High Value Manufacturing is a term often used by governments, academics, and wider society to describe the activities of a subset of all manufacturing enterprises. In 2011 the UK Government even established the “High Value Manufacturing Catapult” to sit at the junction of business, research, and government to support the growth of manufacturing businesses and maximise the impact of technology transfer between the UKs research base and industry. (High Value Manufacturing Catapult, 2022).

HVM past and present

For many, HVM has been synonymous with “high and medium-high technology manufacturing” (Pilat et al 2006) or “advanced manufacturing” (World Economic Forum, 2023) and indeed, in the HVM Catapult’s own Annual Review 2020/21, Dick Elsy CBE, the outgoing Chief Executive referred to how the UK’s HVM Catapult had “... become the largest advanced manufacturing research capability in Europe” (Elsy, 2021 p. 4).

So, it appears that high value in the context of manufacturing has become interchangeable with both high-tech and advanced.

What do HVM companies do?

Within the literature reviewed, there exists a consensus that manufacturers who have combined the production and supply of products with a range of complementary value-adding services are exhibiting some of the defining criteria of a High Value Manufacturer. In this view, it would appear that the higher the number of value creating touch points a manufacturing organisation has, the more likely it will be seen as a HVM enterprise.

Livesey (2006) proposed the following framework for analysing and categorising manufacturing entities to assist with the qualitative categorisation.

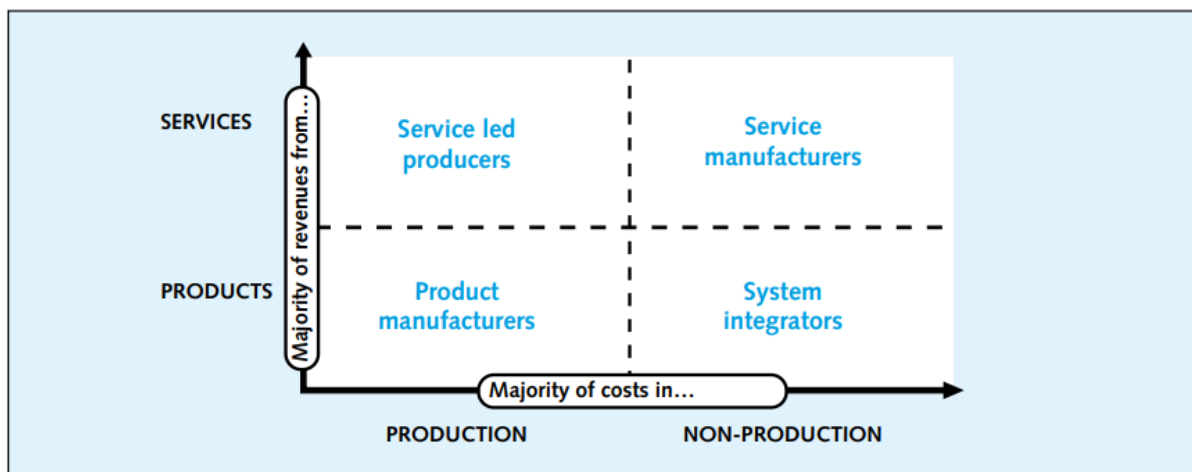


Fig 3: Types of manufacturers. (Livesey, 2006).

In his “Defining High Value Manufacturing” report, Livesey also shines a light on how narrow traditional definitions of manufacturing have been, i.e., the “transformation of raw materials into finished products”. The way in which this classic definition has underpinned industrial classification schemes, including the UK’s Standard Industrial Classification (SIC), are problematic. Further work by Hauge and O’Sullivan goes further by concluding that:

... these definitions and categorisations (and the associated economic statistics) can have significant limitations in terms of helping policy makers understand how manufacturing firms create and capture economic value. This, in turn, means the statistics have limitations in terms of accurately revealing trends in sectoral productivity and international competitiveness.

(Hauge and O’Sullivan, 2019, p. 9)

The work of both Livesey and Hauge & O’Sullivan have also presented just how important it is to include the activities that are up-stream of the production processes when defining contemporary manufacturing. The presence of Research & Development activities and supplier management can therefore be added to the list of what helps define HVM.

HVM in the future

With the need to address the effects of climate change and the trend towards taking actions to transition to Net Zero, manufacturing value chains are increasingly going beyond the traditional after-sales support functions associated with the normal service life of products and systems. The growth in re-use, re-manufacture, recycling and resource recovery as activities managed by manufacturers can also be seen to be extending the HVM definition and differentiating those manufacturers capable of capturing maximum value. Examples of this move towards the so called “circular economy” – and away from the traditional linear business model of take-make-use-dispose – can be seen in diverse industries from textiles (Ellen Macarthur Foundation, 2023) to satellite launch systems (SpaceX, 2023).

Example HVMs with built-in Circularity - Riversimple and Caterpillar

Mid Wales is home to Riversimple, a company being designed and built from the ground up to be the most sustainable car manufacturer by following a circular model in which they remain responsible for the cars they produce by providing them as a service and not selling them as a product (Riversimple, 2022).

Caterpillar’s Cat® Reman is an established, global example of this circular approach to resource efficiency which demonstrates how creating additional business value can go hand in hand with improved sustainability (Caterpillar, 2022). This Caterpillar example also illustrates the role and importance that Research, Development and Innovation can play in all parts of the value chain; the company has over 85 patents for remanufacturing processes alone.

The question of Value to whom?

The characteristics cited above – namely the presence of R&D, product and service design, supply chain management, production, after sales service, end-of-life management together with sales and marketing – appear to be those that define manufacturers often seen as HVM, enabling them to provide a compelling offer to their customers. However ...

Given that almost all manufacturing enterprises operate as for-profit organisations, value creation from a company perspective tends to focus on that which can be measured by a direct financial benefit to owners and/or shareholders. This value-added approach at the company level is what contributes to sectorial, regional, and national Gross Value Added (GVA) measures and underpins productivity statistics. Value in a purely financial sense is only part of the picture, especially to stakeholders outside of the company ownership.

Whilst this analysis so far has studied the characteristics of an HVM enterprise, it has not yet explored the question of “value to whom?” beyond that of the financial value to shareholders. Livesey (2006, pp 12-14) digs into this and concludes that to quantify value more fully, it requires context, and proposed a simplified group of 4 stakeholders:

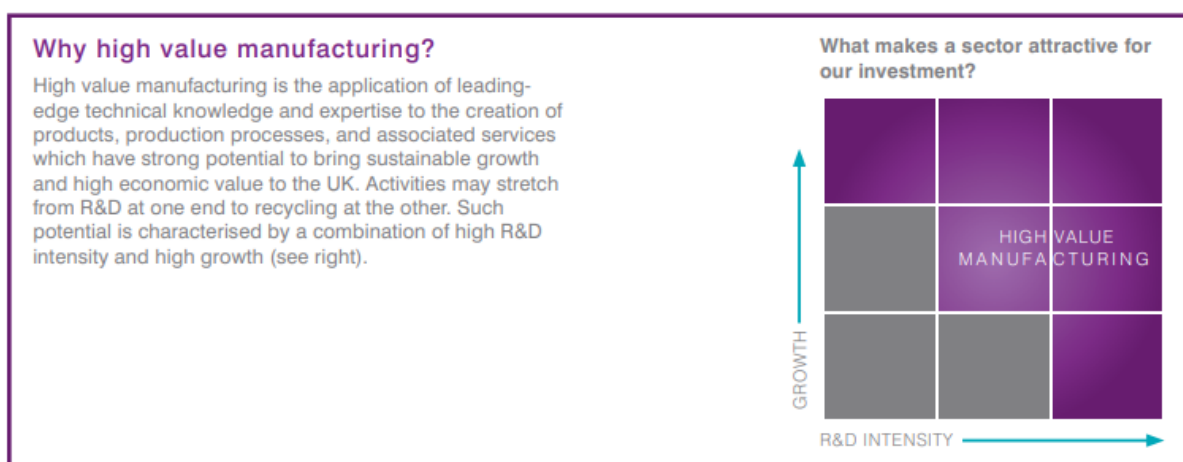
- the firm
- the nation/region
- investors
- employees

and 3 types of value:

- Financial value
- Strategic value
- Social value

Expanding the concept of value is essential for this study given its focus on what the public sector could do to help HVM in Mid Wales deliver better outcomes for the region in the long term.

In their High Value Manufacturing Strategy for 2012 – 2015, the then Technology Strategy Board, now Innovate UK, included sustainable growth as a key defining characteristic in their definition of HVM:



(Technology Strategy Board, 2012)

In Wales, the Welsh Government has made its view on what defines HVM with the following statement:

We need a manufacturing community which consists of companies who have a strong financial performance, who undertake strategically important activities and who make a positive social, economic, environmental and cultural impact on their local communities, their regions and the supply chain in Wales. This is how we define High Value Manufacturing in Wales – not by the sector, its complexity or its use of technology – but on how it impacts the well-being of the citizens of Wales.

(Welsh Government, 2021, p.4)

With these further examples of value from the strategic and social value perspectives, we can also add sustainable growth and positive contributions to citizen and planetary well-being as attributes of HVM.

The Climate Change Imperative

Research and policy making in the years since Livesey's 2006 study has seen a rise in the prominence of climate change. A broader acknowledgement of the planet as a stakeholder and the value of its threatened ecosystems is arguably the value that underpins all others.

Carney describes climate change as an issue that:

- i). involves the entire world, from which no one will be able to self-isolate,
- ii) is predicted by science to be the central risk tomorrow, and
- iii) we can address only if we act in advance,

(Carney, 2022, p.7)

and it is this thinking that has been pivotal in the development of many of the targets embedded in the UN's Sustainable Development Goals (United Nations, 2015) and legislation such as the Wellbeing of Future Generation Act in Wales (Welsh Government, 2015). Whilst not a legal requirement of businesses in Wales, the Act does permeate policy making in Wales and sets the agenda and the eligibility parameters of business support. Many Welsh Government funded support schemes are only open to those businesses that commit to taking actions to reducing carbon footprint via the Economic Contract as set out in the Economic Action Plan (Welsh Government, 2017).

With legislative frameworks at the Wales, UK and International level all committing to Net Zero over the coming decades, all manufacturers of the future will be compelled to contribute to achieving Net Zero. For many this will first require them to become increasingly cognisant of their Scope 1, 2 and 3 emissions and then competent at executing sustainable emission reduction and offsetting action plans.

With all the defining characteristics discussed and set out above, HVMs are facing a more complex pathway to Net Zero than those non-HVMs with inherently simpler business models.

The Ubiquity of Industrial Digital Technologies

In the case of all the defining HVM characteristics that have been identified and discussed in this literature review, there is one cross cutting theme that is increasingly woven into all; digitalisation.

Digital technologies play a part in all facets of contemporary society and HVMs have been adopting and integrating digital technologies since the 1950s and 60s when the rapid development of semiconductors, programmable logic controllers and the early computers catalysed what is now referred to as the third industrial revolution (Roser, 2015).

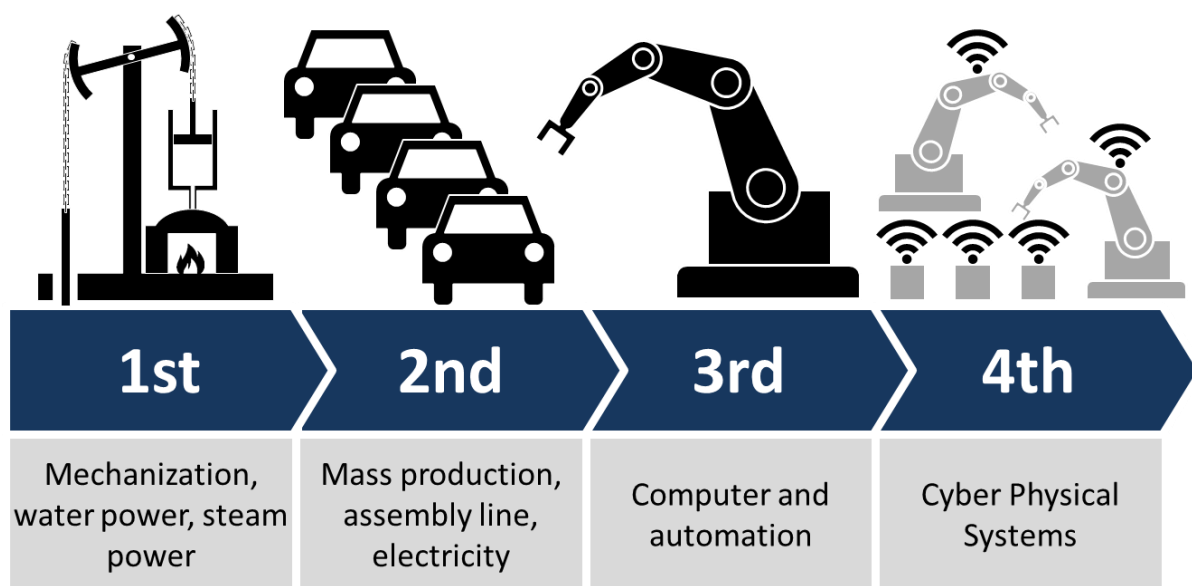


Fig 4: The 4 Industrial Revolutions. (Roser, 2015)

Cambridge University's Institute for Manufacturing (Leal-Ayala, 2020) lists Industry 4.0 as one of the megatrends within the broader topic of the Forth Industrial Revolution. (The other megatrends listed include Digital Economy, Digital Society, Smart Cities and Digital Government). What they all have in common is they are underpinned by the latest Information and Communication Technologies (ICTs) – often shortened to IT.

They go on to define Industry 4.0 as the “widespread use of cyber-physical systems (CPS) in industrial manufacturing”. A CPS is the integration of IT - the cyber layer- with the Operational Technologies (OT) being the physical layer.

After over a decade of research, development, investment, and significant doses of hype and debate around the fourth industrial revolution and the emergence of the term Industry 4.0, the European Commission began its work to define an approach to Industry 5.0 in 2020. The commission states that:

Industry 5.0 is characterised by going beyond producing goods and services for profit. It shifts the focus from the shareholder value to stakeholder value and reinforces the role and the contribution of industry to society. It places the well-being of the worker at the centre of the production process and uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet. It complements the existing "Industry 4.0" approach by specifically putting research and innovation at the service of the transition to a sustainable, human-centric and resilient European industry.

(European Commission, 2023)

In what appears to be a departure from the technology-centric drivers that took us from the first to the fourth industrial revolution and Industry 4.0, the next step for industry – as far as the European Commission is concerned – is one focused more on the needs and well-being of people and the planet.

Reflections on what defines HVM

In looking to the future, the author is proposing this definition for what a HVM enterprise will be:

A HVM business will be an enterprise utilising a suite of Industrial Digital Technologies to optimise performance internally and across value and supply chains in the creation of financial, strategic, and societal value. They will be R&D active and provide customers with value over and above that of the products they supply. They will be cognisant of their role in getting to Net Zero and executing a plan of action to get there. They will exhibit behaviours aligned to the definition of Industry 5.0.

Whilst this will no doubt face challenge and be seen by many as a high bar, particularly by those businesses who want to be seen to be as HVM, this definition is aligned to the wider and radically different economic models being called for by economists such as Raworth (2017) and Carney (2022) and the legal commitments nation states are making to achieving Net Zero in the coming decades.

With the above being proposed as a new definition for HVMs, the challenge for this study is to come up with a practical way to categorise today's manufacturers in Mid Wales into those that can be considered as HVM and those that are not HVM. Without this, the analysis of the public sector support options specific to HVMs will lack focus.

Work Package 1 of this study will propose a methodology by which HVMs in Mid Wales can be defined and categorised.

This HVM literature review has revealed that using a single or narrow set of metrics to determine an enterprise's value can be highly subjective. In recent years we have seen several annual rankings produced for companies in Wales; "The Wales Top 300" charts the biggest companies in Wales by a combination of turnover and pre-tax profits; the "Fast Growth 50" provides insight into the firms with the fastest growing revenue. Whilst these rankings chart the rise and fall of many of Wales most significant companies by turnover, they do not reflect value to Wales in the ways discussed in this literature review. Producing a similar set of rankings for manufacturers in Mid Wales would likely fail to highlight many that have the brightest futures and greatest value to the local economy and society at large, and this is important when looking to invest public money in supporting their innovation and business improvement activities.

By being able to identify the different types and magnitude of value for each of the stakeholder perspectives, this study will hopefully provide valuable insight for policy making, the design of public sector support and what it will fund, and the channels through which support will be delivered.

Topic: Geography and the Manufacturing sectors within

This section looks at the geography and its key characteristics, the business demographic and then examines the available literature and datasets to capture and evidence what manufacturing sectors are present in the region.

The Geography and Business Demographics

For the geographical boundary, the study will focus on Mid Wales which is generally viewed as being made up of the counties of Powys and Ceredigion.

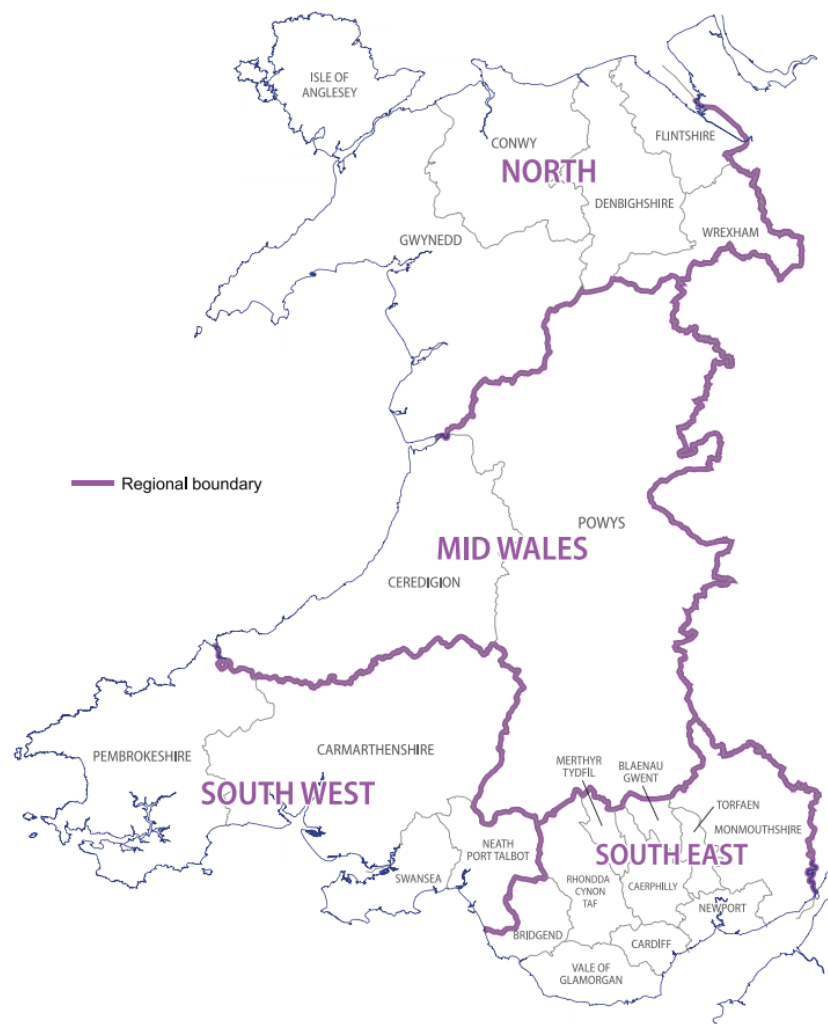


Fig 5: Regional Boundary Map of Wales (Welsh Government, 2021c, p100).

One of the most striking features of Powys and Ceredigion is the fact that they have the lowest population densities of all the local authorities in Wales. Powys has 26 people/km² and Ceredigion has 40 people/km². (Wales average is 150 people/km² and England average is 434 people/km²).

Powys and Ceredigion account for 34% of the land mass of Wales yet are home to only 205,000 people - less than 7% of the total population of Wales. (ONS Nomis, 2022)

The size of the towns in the region with a population > 1,000 are shown below:

Rank in Mid Wales	Rank in Wales	"Built-up Area"	Population (2011 Census)
1	21	Aberystwyth	18,749
2	41	Newtown	11,357
3	*	Ystradgynlais (inc Ystalyfera)	10,248
4	59	Brecon	8,250
5	69	Welshpool	5,948
6	78	Llandrindod Wells	5,309
7	79	Cardigan (inc. St Dogmaels)	5,301
8	**	Knighton	3,007
9	117	Lampeter	2,970
10	118	Llanidloes	2,929
11	120	Builth Wells	2,829
12	141	Machynlleth	2,235
13	146	Crickhowell	2,063
14	**	Presteigne	2,056
15	**	Hay on Wye	1,954
16	154	Newcastle Emlyn (inc. Carms)	1,883
17	156	Rhayader	1,824
18	169	Aberporth	1,648
19	175	Bow Street	1,572
20	185	Llandysul	1,484
21	188	Four Crosses	1,438
22	189	Aberaeron	1,422
23	200	Penrhyn-coch	1,316
24	204	Borth	1,269
25	205	Talgarth	1,268
26	209	Guilsfield	1,220
27	211	Tregaron	1,213
28	225	Llanfyllin	1,105
29	230	Llanilar	1,085
30	231	Llanfair Caereinion	1,055
31	234	Llangynidr	1,036

Notes: * Included with Swansea in Wales Rank. ** Not ranked due to the element of Built-up area in England.
The 2011 Census included student term time address, so the Aberystwyth total included the 8,169-student population.
Location colour coding: Ceredigion, Powys

Table 2: Size and rank of Built-up Areas in Mid Wales. (Source: ONS, 2023a)

The following tables taken from the ONS's Nomis service show the extent to which all types of Manufacturing are providing direct employment to residents within the region.

Industry

	Persons	
	Powys Local Authority	
	count	%
All usual residents aged 16 years and over in employment the week before the census	61,728	100.0
A: Agriculture, Forestry and fishing	5,824	9.4
B: Mining and quarrying	134	0.2
C: Manufacturing	5,122	8.3
D: Electricity, gas, steam and air conditioning supply	307	0.5
E: Water supply; Sewerage, Waste management and Remediation activities	523	0.8
F: Construction	6,275	10.2
G: Wholesale and retail trade; repair of motor vehicles and motorcycles	8,600	13.9
H: Transport and storage	2,056	3.3
I: Accommodation and food service activities	3,076	5.0
J: Information and communication	1,347	2.2
K: Financial and insurance activities	788	1.3
L: Real estate activities	595	1.0
M: Professional, scientific and technical activities	2,835	4.6
N: Administrative and support service activities	2,525	4.1
O: Public administration and defence; compulsory social security	4,607	7.5
P: Education	5,193	8.4
Q: Human health and social work activities	9,116	14.8
R, S, T, U Other	2,805	4.5

In order to protect against disclosure of personal information, records have been swapped between different geographic areas and counts perturbed by small amounts. Small counts at the lowest geographies will be most affected.

Source: ONS - 2021 Census (TS060)

Industry (current) information

Definition: Classifies people aged 16 years and over who were in employment between 15 March and 21 March 2021 by the Standard Industrial Classification (SIC) code that represents their current industry or business.

The SIC code is assigned based on the information provided about a firm or organisation's main activity.

Comparability with 2011: Highly comparable

Table 3: Powys working population by Industry. (Source: ONS, 2023b)

Industry

	Persons	
	Ceredigion Local Authority	
	count	%
All usual residents aged 16 years and over in employment the week before the census	30,130	100.0
A: Agriculture, Forestry and fishing	2,313	7.7
B: Mining and quarrying	39	0.1
C: Manufacturing	1,419	4.7
D: Electricity, gas, steam and air conditioning supply	152	0.5
E: Water supply; Sewerage, Waste management and Remediation activities	228	0.8
F: Construction	2,582	8.6
G: Wholesale and retail trade; repair of motor vehicles and motorcycles	4,424	14.7
H: Transport and storage	848	2.8
I: Accommodation and food service activities	2,145	7.1
J: Information and communication	625	2.1
K: Financial and insurance activities	319	1.1
L: Real estate activities	367	1.2
M: Professional, scientific and technical activities	1,308	4.3
N: Administrative and support service activities	1,171	3.9
O: Public administration and defence; compulsory social security	2,252	7.5
P: Education	3,895	12.9
Q: Human health and social work activities	4,423	14.7
R, S, T, U Other	1,620	5.4

In order to protect against disclosure of personal information, records have been swapped between different geographic areas and counts perturbed by small amounts. Small counts at the lowest geographies will be most affected.

Source: ONS - 2021 Census (TS060)

Industry (current) information

Definition: Classifies people aged 16 years and over who were in employment between 15 March and 21 March 2021 by the Standard Industrial Classification (SIC) code that represents their current industry or business.

The SIC code is assigned based on the information provided about a firm or organisation's main activity.

Comparability with 2011: Highly comparable

Table 4: Ceredigion working population by Industry. (Source: ONS, 2023c)

As this census data is classified using the same International Standard Industrial Classification as that used in the Policy Links analysis summarised in table 1, it is possible to calculate an estimate for their relative value in GVA terms for the above classifications.

In comparing Powys and Ceredigion with the other 20 local authorities in Wales, we can see that the dependency on the manufacturing sector for employment differs significantly across Wales.

Local Authority Area	All residents in employment	Residents in Manufacturing employment	% in Manufacturing
Blaenau Gwent	28,797	4,859	16.9
Wrexham	61,801	9,791	15.8
Flintshire	73,817	11,555	15.7
Caerphilly	77,441	10,059	13.0
Torfaen	40,651	4,705	11.6
Merthyr Tydfil	25,635	2,849	11.1
NPT	59,195	6,579	11.1
Bridgend	63,982	6,783	10.6
RCT	103,394	10,051	9.7
Newport	72,796	6,144	8.4
Powys	61,728	5,122	8.3
Monmouthshire	42,821	3,374	7.9
Camarthenshire	81,953	6,364	7.8
Denbighshire	40,849	3,180	7.8
Anglesey	29,201	1,767	6.1
Swansea	100,617	6,001	6.0
Pembrokeshire	52,770	3,093	5.9
Gwynedd	51,810	2,678	5.2
Vale of Glamorgan	59,912	3,083	5.1
Ceredigion	30,130	1,419	4.7
Cardiff	160,438	7,142	4.5
Conwy	48,723	2,201	4.5
Totals	1,368,461	118,799	8.7

Table 5: Welsh residents employed in Manufacturing by Local Authority. (Source: ONS)

Based on this 2021 census data, the whole-Wales percentage of residents directly employed in the manufacturing sector is 8.7% with the average proportion of employment in the sector across the 22 local authorities at 9.0%.

The combined Mid-Wales figure of 6,541 employees out of a total working population of 91,858 gives a figure of 7.1% for the region's residents directly employed in manufacturing.

This dataset does not specify where those jobs are located; some residents travel to locations outside of their local authority area for work. Other studies, such as that conducted by the partners in the Understanding Welsh Places project (Understanding Welsh Places, 2021), have open access data on the extent of the cross-border population flows which goes beyond the scope of this study.

So where do the majority of these 6,500 residents work?

A study of the Companies House data set for all registered UK companies released on the 1st December 2022, (Companies House, 2022) revealed the following for all businesses registered in Powys and Ceredigion:

- There were 8,700 businesses on the Companies House register with postcodes that are within the boundaries of Powys and Ceredigion.
- Of the 8,700 businesses on the register, almost 12% have dormant accounts (1,020) with a further 17% with no accounts filed (1,474). These tend to indicate companies with no trading activity or recently incorporated companies.
- Of the 8,700, over 4% had a proposal to strike-off (339) or were in Liquidation or under receiver management (36).
- Of the 8,700, 26% of all registered entities (2,257) were newly incorporated since 2020.
- SIC Codes for 6% of all entries are those that tend to indicate low or no economic activity (84 Non trading, 220 Dormant, 75 Activities of a holding company, 45 Activities of head offices and 91 None supplied).

These observations are included to illustrate the challenges that researchers have when attempting to derive insight from Companies House data alone.

In turning to the Mid Wales manufacturing sub-set within this super-set, the analysis has shown that:

- 620 companies are registered with SIC codes falling into those classified as Manufacturing (i.e., codes 10110 to 33200).
- Another 36 companies with known manufacturing activities in the region but registered with a non-manufacturing SIC code have been identified. A number of these are significant members of the HVM community.
- Some of the 620 entries are in essence duplicates of the same trading entity and a result of group or holding company structures. Approx 20 would fit this definition. (Riversimple has the most with a total of 9 registered companies in the region, all with a manufacturing SIC code).
- With 2 in liquidation and 25 with a striking-off notice, this matches the 4.3% figure for all business types of the region.

However, the most significant outcome of this analysis is who is missing from the Companies House data. Many of the region's most significant manufacturers, with several fitting the HVM definition, are not in this list due to registration at an address outside the region. These include BSW Timber Ltd, Fashion Enter Ltd, GSM Automotive Ltd, Marrill (Powys) Ltd, PCI Pharma Services, Rachel's Dairy Ltd, Randall Parker Food Group Ltd, Teledyne Labtech Ltd, and Volac International Ltd.

The analysis above was only made possible by a very large amount of data cleansing and manual cross referencing to other data sources. Postcode location checks and company level investigations to confirm if their activities were correctly reflected in the assigned SIC code/s were conducted.

A summary of the problems with this dataset:

- Searching by SIC codes that fall into the International Standard Industrial Classification for manufacturing is not going to capture all manufacturers.
- Searching by the field "RegAddress.County" is deeply unreliable in terms of obtaining anything like a complete list of entities within a given county due to omissions.
- Whilst most of the region's business postcodes are prefixed by SY and LD, these do not fall neatly into county boundaries. Other postcode prefixes exist within the region including CF, HR, NP and SA. Whilst the CF postcodes in south Powys are very few, the number of HR in east Powys and NP and SA along the southern edge of both Powys and Ceredigion is significant.

Manufacturing Sectors and Sub-Sectors

This section summarises the research undertaken to understand the extent to which a consensus exists around which sectors are, and which are not considered to be High Value Manufacturing sectors in Mid Wales.

The June 2021 publication of the “Mid Wales Applied Research and Innovation Study” commissioned by the Growing Mid Wales Partnership (SQW, 2021) set out to

... provide an evidence base and strategic agenda around which applied research and innovation activity in the region can be framed over the medium to long term, informing projects, programmes and processes that deliver positive economic outcomes.

(SQW, 2021, p.1)

One of the 4 “deep dive” research themes was Advanced Manufacturing. The others being Agri-food and Bioscience, Low Carbon & Green Economy, and Enabling Digital Technologies.

In the analysis of Advanced Manufacturing in the region it highlighted strength in automotive and power electronics, automation, additive manufacture and plastic injection mouldings and components. It also acknowledged the presence of a broader base of Advanced Manufacturing in electrical equipment, metal structures and machining.

Interestingly, what it omitted in the Advanced Manufacturing deep dive was the significant contribution to the region’s economy of the pharmaceutical manufacturing companies that are few in number, but large in terms of jobs and GVA. Instead, the study identified them in the Agri-food and bioscience deep dive which, due to its focus on the academic research and science strengths in Aberystwyth, failed to acknowledge the extent of their value as HVM enterprises who are located on the geographical periphery of the region.

In summary, the SQW study only captures a partial picture of HVM in the region irrespective of the definition used; be that the more traditional definition more closely aligned to Advanced Manufacturing, that of the Welsh Government or one aligned to that proposed by the author of this study.

With limited up-to-date study literature available for manufacturing at the sectors and sub-sector level in Mid Wales, the analysis of the region’s manufacturing base has had to revert to looking at company level data followed by aggregation once confident of adequate coverage.

Based on a further study of the latest Companies House data and the use of ground truthing, the sectors with enough instances of manufacturing entities to exhibit a collective sector-strength or the presence of a small number with very significant strength are:

- Food and Drink (>100 register entities. Majority being micro and small enterprises)
- Farm Animal Feeds (Dominated by the group companies of Wynnstay Group PLC)
- Textiles and Apparel (<30 register entries but several with significant activities)
- Sawmills & wood-based products (~40 register entries)
- Pharmaceuticals (Dominated by 2 companies; PCI Pharma Services, Protherics UK Ltd)
- Plastics goods (> 20 register entries)
- Metal components, fabrication, and structures (>50 register entries)
- Electrical and electronic equipment (~30 entries)
- Special purpose machinery inc. automation systems (> 10 entries. Majority being significant)

Note: Automotive, which is often referred to as a sector, is well represented in terms of component manufacturers across the above groupings that are based on the SIC codes.

When using the high-tech definition of HVM and the International Standard Industrial Classifications noted earlier, it is easy to split the observed sector list for Mid Wales into HVM and non-HVM sectors:

- Of the 9 sectors, 3 would be HVM: Pharmaceuticals, Electrical and electronic equipment, and Special purpose machinery.
- Apart from a subset of the Metal components group identified by company level analysis, all others would not be classified as HVM.

To complete the picture on sector analysis, it is important to identify the manufacturing sectors/industries seen to have no or a very limited presence in the region at this time. They are:

- Pulp, paper and paperboard (with the exception of Newmor wallcoverings)
- Petroleum products
- Chemicals and chemical products
- Glass, ceramics, and cement
- Basic metals
- Computers, telecoms, and optical products

This sector analysis will support the Work Package 1 tasks in identifying the HVMs in Mid Wales.

Topic: Public Sector Support for Manufacturing Businesses – Past and Present

Whilst the focus of the study has been on public sector interventions that stimulate Innovation, it has been important to extend the scope to understand the interplay with other types of support that have benefited HVM businesses.

At the individual company level, this has included non-financial activities such as specialist advice and guidance for things like R&D, international trade, skills development, de-carbonisation, property solutions, and investor readiness. It also includes direct financial support in the form of grants, loans, and equity co-investments to fund direct growth activities, skills development and RD&I (Research, Development & Innovation) projects using regional, Wales, UK and European funding.

At the community level, many of the public sector investments in shared physical and digital infrastructure have directly benefited the region's manufacturers. Projects such as the Newtown bypass, the new Bow Street rail station and the continuing roll-out of fibre broadband, mobile and IoT (Internet of Things) networks is acknowledged here but will be outside the scope of further analysis in this study.

The Public Sector and their appointed support delivery partners

This history of public sector support for industrial development in the region goes back many decades. In setting the context for designing and delivering HVM support in the future, it is worthwhile reflecting on what has gone before.

The late 1950s to 2022

The Development Board for Rural Wales (DBRW) was formed in 1977 and tasked with bringing economic and social development to Powys, Ceredigion, and Meirionnydd through a policy of building houses, developing industrial premises and marketing the region which would create new jobs. Prior to the formation of the DBRW, the work of the Mid-Wales Development Corporation (MWDC) had been successful in its work to do the same for Newtown from the late 1960s.

The MWDC worked in conjunction with the Mid-Wales Industrial Association which had been established in 1957 to attract industry to the region. The association was dissolved in 1973 and the MWDC was subsequently dissolved in 1977 with its responsibilities passing to the DBRW. (Joint Information System Committee, 2023).

In October 1998, the DBRW was merged with the Welsh Development Agency (WDA) and effectively become the WDA's Mid Wales Division. (Welsh Development Agency, 2003).

The WDA which had been established in 1976 continued to be the principal organisation delivering economic and business development support until it was abolished with its functions transferred to the Welsh Government in 2006.

Since the beginning of Welsh devolution in 1999 up until the time of the UK's EU exit transition period beginning in 2020, public sector support for economic development - and therefore business support in Wales - had largely been delivered by a combination of Welsh Government departments, their private sector sub-contractors under the Business Wales brand, academia, sponsored bodies, and Welsh Government owned companies such as the Development Bank of Wales (DBW).

This is now undergoing a radical shake-up given the decision by the UK Government to channel their successor to the old EU structural funding – the UK Shared Prosperity Fund - via local authorities and not via the Welsh Government. (UK Government, 2023).

UK-level funding for business focused research and innovation has remained largely unchanged as it was mostly delivered by Innovate UK before the EU's exit, and this continues. (Innovate UK, 2023).

Innovate UK employs a dedicated National Manager for Wales. Three Knowledge Transfer Advisors provide KTP (Knowledge Transfer Partnership) support across the whole of Wales.

The provision of the Innovate UK Edge service in Wales is subcontracted to BIC Innovation with staff based in both North and South Wales.

On a regional level, the local authorities for Powys and Ceredigion have also played a role in delivering some elements of business support. From building and leasing industrial premises to administering business grant schemes, a number of HVMs in the region will have had support from their local authority.

Another constant in Wales since 2007 to today has been the presence of 2 consecutive 7-year programmes of European Structural and Investment Funds many of which have been administered by the Welsh European Funding Office (WEFO).

At the time of writing, the stalemate over the UK joining the EU's Horizon Europe programme remains, leaving the schemes accessible to businesses unresolved.

The Funding Programmes and Schemes for Research and Innovation

Wales Only

The main sources of Wales's own funding for business-focused research and innovation, backed by EU structural funds, has been those in the ERDF (European Regional Development Fund) portfolios for both West Wales and the Valleys (WW&V) and East Wales (EW). Classified as a part of Wales less developed, Ceredigion was included in WW&V. Powys was included in the more developed EW region. Whilst many projects were delivered across both regions, some were specific to either WW&V or EW. The full list and details of all approved projects in the 2014 to 2020 programme can be found on the Welsh Government Website (Welsh Government, 2022).

Examples of some of these are plotted in the figure below showing which ones were designed to serve industry and under which technology theme or smart specialisation area they were targeting.

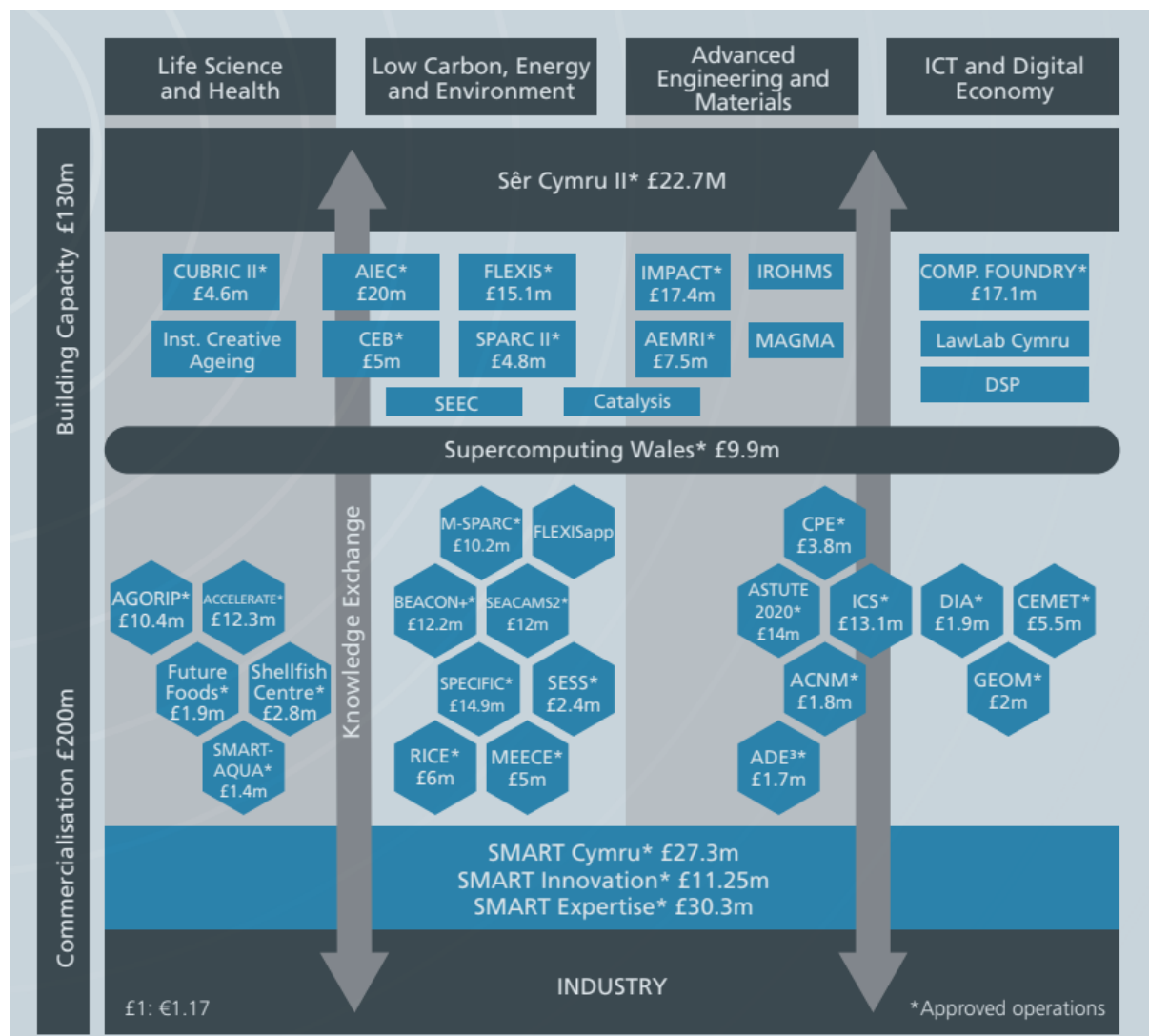


Fig 6: Welsh ERDF Research and Innovation portfolio at Q1 2019. (Welsh Government, 2019, p15)

In reviewing the full list of Research and Innovation projects in the 2014 – 2020 portfolio, the projects specifically targeting the manufacturing sectors present in Mid Wales are:

WW&V and EW:

- SMART Innovation/Cymru/Expertise (Lead: Welsh Government) – All sectors
- ASTUTE 2020 and ASTUTE East (Lead: Swansea University) - All Manufacturing
- Advanced Design Engineering (Lead: UWTSD) – All manufacturing
- BEACON/BEACON+ (Lead: Aberystwyth University) – Bio-based product manufacturing

WW&V only:

- AberInnovation (Lead: AIEC) – Food, health, Biotech, Bioenergy
- Future Foods (Lead: Aberystwyth University) – Food manufacturing
- Circular Revolution (Lead: Riversimple Movement Ltd) - Circular business models, all sectors

In addition to the ERDF research and innovation projects listed above, there are also several ESF (European Social Fund) projects within the Skill for Growth priority area. Those with a specific focus on manufacturers are:

- BioInnovation Wales (Lead: Aberystwyth University) Agri-food and biotech.
- Industry 4.0 Upskilling for Industry (Lead: UWTSD) – All advanced manufacturing
- Upskilling for Industry 4 Wales (Lead: UWTSD) – All manufacturing
- International Innovation Master (Lead: UWTSD) – All manufacturing (WW&V only)

Outside of the EU funded programme and currently available to participants from Wales are the SMART Partnership scheme, the SMART Digital Accelerator and an enhanced KTP which sit alongside the standard KTP offered jointly by Welsh Government and Innovate UK (Business Wales, 2023).

At the all-Wales level, there are also several sector-focused groups that operate their own distinct activities. For Mid Wales, the most significant is Food and Drink Wales. They maintain an extensive online presence with their own distinctive section on the Business Wales website and administer several focus area clusters and a specific Food Business Investment Scheme (Food and Drink Wales, 2023).

One very visual aspect of public sector support for HVMs in Mid Wales has been the property development projects that the public sector has undertaken to allow companies to grow. These have been successful over many decades and address the long-standing market failure for commercial property in Mid Wales.

HVM Engagement with Welsh Funded Support

Two of the largest support programmes best matched to the HVM cohort of Mid Wales were SMART Cymru and ASTUTE. Both are now closed. Below is the result of an analysis of their respective project portfolios.

SMART Cymru

Between January 2014 and March 2023, the Welsh Government SMARTCymru team appraised 993 applications from companies in Wales for funding support toward R&D and Innovative capital projects via it's ERDF and post ERDF co-investment schemes. Of these, 99 applications were rejected and 145 were withdrawn by the applicants.

- Of the all-Wales total of 749 accepted, 79 (10.5%) were from applicants in Mid Wales (Powys 65, Ceredigion 14).
- Of the 65 in Powys, 37 were in support of HVM, 14 for medium and 5 for lower value manufacturing projects. 5 were awarded to non-manufacturing technology companies, 3 were for software companies and 1 classified as Other.
- Of the 14 in Ceredigion, 6 were in support of HVM, 2 medium and 1 lower value manufacturing projects. The remaining 5 were award to non-manufacturing biotech, Life Science and software companies.

The overall engagement of Mid Wales with 10.5% of the projects in Wales, of which 82% were inside manufacturing companies, can be seen as good when you consider the region's 7% population share of Wales and the lower than all-Wales average reliance on manufacturing for jobs.

ASTUTE

Of the 105 industrial collaboration projects supporting 87 different companies across Wales reported by ASTUTE on their website, 7 of the companies (8%) were in Mid Wales. Off these, 4 were with established manufacturers with the remaining 3 being early stage, pre-revenue in regard to recurring manufacturing revenue. (Swansea University, 2023).

These two examples provide evidence that manufacturers in Mid Wales are active in engaging with the public sector support and accessing co-funded support for RD&I projects.

UK Wide

In April 2018, Innovate UK became part of UKRI (UK Research and Innovation) joining the existing 7 research councils, Research England in a new, 9 council public body sponsored by the now UK Government Department for Science, Innovation and Technology. (UKRI, 2023a).

Innovate UK currently manage an annual budget of over £1 billion. (Innovate UK, 2022, p.30).

Innovate UK provide public access to information about the projects co-funded by them since 2004 (UKRI, 2023b). The 6th Feb 2023 release has been analysed and the following summary helps quantify the degree to which Mid Wales manufacturing entities have successfully engaged.

- Of the 55,497 awards made by Innovate UK, 1,883 (3.3%) have been to project participants in Wales.
- Of the 1,883, 528 (28%) were non-business entities. (Academic institution accounting for 469).
- Of the Wales total of 1,883, 136 (7.2%) were awards made to entities in Mid Wales.
- Of these 136 awards, 40 went to Aberystwyth University and 2 went to UWTSD.
- Of the 94 awards made to Mid Wales registered companies, 28 went to 12 companies that are either established or start-up manufacturers in Mid Wales.

Observation: The reach of this funding has been more limited in Wales. Innovate UK funding is highly competitive and while there have been some good projects involving manufacturers from the region (e.g., Castalum's award of £504K in 2018 in a 3-year collaborative project with others), Mid Wales and Wales in general has been less successful than others on a per head of population comparison.

Where Mid Wales is currently doing well relative to the rest of Wales is with success in applications for KTP funding. Of the 28 currently active KTPs with all Welsh companies, 5 (17%) are in Mid Wales and of these, 3 are with HVMs. Since Jan 2003, there have been 405 KTPs with Welsh companies with 23 (6%) in Mid Wales.

In recent years, Welsh Government funding has backed a number of SBRI (Small Business Research Initiative) challenge-lead competitions. Two examples relevant to manufacturing are the recent competitions focused on Hydrogen and blockchain technology. These are open to non-Welsh entities so Welsh companies compete with others for funding. In recent competitions, Dulas and Rviersimple of Mid Wales have both been successful in early phase Hydrogen related SBRI's.

Although UK-wide schemes funded by the UK IPO (Intellectual Property Office), Welsh Government administer the application process for the IP Audit Plus and IP Access support in Wales. A small number of Mid Wales manufacturers have been recent recipients of this funding.

In concluding it will come as no surprise that businesses find the sheer number of schemes, many transient in nature, and the numerous delivery agencies involved in delivering advice, guidance and decision making somewhat confusing.

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Work Package 1: So, who are the HVMs in Mid Wales?

This work package builds on the findings of the literature review and conducts desk-based research to identify the manufacturers in Mid Wales who fit the higher technology-biased advanced manufacturing definitions of HVM.

The exercise is then repeated using the authors proposed HVM definition for the future to see how different the list then looks.

Manufacturers fitting the higher tech / advanced definition

The study of the business demographics has resulted in the creation of a comprehensive list of the region's manufactures - and not just those with a registered presence in the region.

Using this list of over 760 companies, the methodology used in arriving at the filtered list below is based on:

- Matching the observed actual activity of companies with the international SIC Division descriptions used by Policy Link to define the "Medium/High Tech manufacturing" cohort (See Table 1 and Appendix 1) and
- removing companies that are dormant, known to be not trading and have no discernible manufacturing activity in the region – even if they are registered as manufacturers.

List 1: Established HVMs fitting the higher tech / advanced definition

Company Name	Majority Overseas Ownership?
ABER INSTRUMENTS LIMITED	
ACTIA (UK) LIMITED	Yes - France
ATHERTON BIKES LIMITED	
BULK AUTOMATION LIMITED	
CAERBONT AUTOMOTIVE INSTRUMENTS LIMITED	
CAMBRIAN SOLVENTS LIMITED	
CHARCROFT ELECTRONICS LIMITED	
CLAYTON ENGINEERING LIMITED	
COMPACT ORBITAL GEARS LTD	
CONTACT ATTACHMENTS LIMITED	
DAVLEC LIMITED	
DULAS LTD	
DYFFRYN6 LTD	
ELECTRIC CLASSIC CARS LIMITED	
EXSEL ELECTRONICS LIMITED	
GAMIC TRAILERS LIMITED	
GUARTEL TECHNOLOGIES LIMITED	
HARRY HOCKLY MOTORSPORTS LIMITED	
IG INNOVATIONS LIMITED	Yes - USA

INVERTEK DRIVES LIMITED	Yes - Japan
JAMES TECHNICAL SERVICES LIMITED	
LEEMA ELECTRO ACOUSTICS LIMITED	
LT MACHINES LTD	
MAGNACOL LIMITED	
MANGAR INTERNATIONAL LIMITED	Yes - France
NERAK-WIESE LIMITED	
NIDEC CONTROL TECHNIQUES LIMITED	Yes - Japan
PCI Pharma Services (AndersonBrecon (UK) Ltd)	Yes - USA/Cayman Islands
PROTHERICS UK LIMITED	Yes - Belgium/Luxembourg
REECO AUTOMATION LTD	
REES MACHINERY GROUP LIMITED	
S.P. FILLING SYSTEMS LIMITED	
SKYE INSTRUMENTS LIMITED	
SPLOSH LIMITED	
SWALLOW BOATS LIMITED	
TELEDYNE LABTECH LIMITED	Yes - USA
TWMPA CYCLES LIMITED	
TYRE PROTECTOR MANUFACTURING LIMITED	Yes - German
VIKING MOTORSPORT LIMITED	
WILLPOWER ELECTRICAL LIMITED	
WINSLOW ADAPTICS LIMITED	
WOODTEK ENGINEERING LIMITED	
YASA LTD	Yes - German

Count: 43. Alphabetically listed.

In the process of filtering the above list, there were several other businesses observed who are in early-stage R&D and/or pre-revenue who would also fit the definition. These are listed below as an indication of the potential for new indigenous HVMs.

List 2: Early stage and/or pre-revenue HVMs fitting the higher-tech / advanced definition

Company Name	Majority Overseas Ownership?
AGROCEUTICAL PRODUCTS LTD	
AMPED PCR LTD	
GLOBALPAK LIMITED	
HARVST AUTOMATION LTD	
NELLIE TECHNOLOGIES LIMITED	
RIVERSIMPLE MOVEMENT LIMITED	
VERTIKIT LTD	
VIBRAT-ION LTD	

Count: 8. Alphabetically listed.

What these lists illustrate is that by using the international SIC Division descriptions in this way to define “Medium/High Tech manufacturing”, it is easy to discount many companies who are creating some high value products, engaged in long term R&D and providing customers with value-added services alongside the products they manufacture. Indeed, many of those on the Mid Wales full list that would fall into the “low/medium tech” category as set out in Appendix 1 are integral parts of global supply chains, using higher technology manufacturing processes and doing more R&D than many that have made it onto the “higher tech” list above.

There will always be a grey area between those that fit and don’t fit into these technology-based definitions of HVM. Using combinations of telephone calls, company visits, company websites and Companies House data, the following list 3 of companies are those the author has examined closely in terms of:

- the type and amount of technology used in manufacturing processes,
- the level of new product and process development activity
- the registered and unregistered intellectual property held by the company and
- the value-added services offered to customers

and are seen to fit enough of the advanced manufacturing definition criteria to also be considered a HVM.

List 3: Low/Medium tech category companies with good HVM characteristics

Company Name	Majority Overseas Ownership?
AIRFLO FISHING PRODUCTS LIMITED	Yes - USA
ARCITEKBIO LTD	
BEACON FOODS LIMITED	
BOYS & BODEN, LIMITED / Pear Stairs	
BSW TIMBER Ltd	
CARPENTER & PATERSON LIMITED	
CASTALUM LIMITED	
CUSTOM MARINE DEVELOPMENTS LIMITED	
DAWSON SHANAHAN LIMITED	
DYNACAST (UK) LIMITED	Yes - USA
FABER TECHNOLOGY LTD	
FASHION-ENTER LTD	
G S M AUTOMOTIVE LIMITED	
GOMER PRESS LIMITED	
HILLTOP HONEY LIMITED	
IN THE WELSH WIND DISTILLERY LTD	
INNOVA MILL (HOLDINGS) LIMITED	
INTERIOR PRODUCTS GROUP LIMITED	
MAKEFAST LIMITED	
MARRILL (POWYS) LIMITED	
MONTGOMERY WATERS LIMITED	
NEWTOWN PLASTICS LIMITED	
QUALITY PIPE SUPPORTS (Q.P.S.) LIMITED	

RACHEL'S DAIRY LIMITED	Yes - France
RADNOR HILLS MINERAL WATER COMPANY LTD	
SELECT PRODUCTS LIMITED	
SPLICE CAST LIMITED	
STAGECRAFT DISPLAY LIMITED	
T.S.HENDERSON & CO.LIMITED	
TECHNOCOVER LTD.	
THE BURGER MANUFACTURING COMPANY LTD.	
THE WELSH SAUSAGE COMPANY LIMITED	
TRAX J H LIMITED	Yes -German
TROPICAL FOREST PRODUCTS LIMITED	
TY NANT SPRING WATER LIMITED	
UNITE COMPONENTS LIMITED	
VOLAC INTERNATIONAL LTD	
WIPAK UK LIMITED	Yes - Finland
WYNNSTAY GROUP P.L.C.	
ZIP-CLIP LTD	

Count: 40. Alphabetically listed.

HVMs as defined by the author's proposed definition

This section will breakdown the definition and set some initial criteria and proposes a simple methodology of how to establish a robust and defensible list of HVMs which is likely to work in any region or nation sharing similar core values.

A HVM business will be an enterprise utilising a suite of Industrial Digital Technologies to optimise performance internally and across value and supply chains in the creation of financial, strategic, and societal value. They will be R&D active and provide customers with value over and above that of the products they supply. They will be cognisant of their role in getting to Net Zero and executing a plan of action to get there. They will exhibit behaviours aligned to the definition of Industry 5.0.

Use of IDTs (Industrial Digital Technologies)

Examples of IDTs include robotics, cobots, flexible automation, 3D printing, connected sensor-actuator networks, simulation systems and digital twins. Evidence of continuous improvement using one or more of the IDTs would fit the definition.

Creating Financial, Strategic and Societal Value

Strong financial and strategic performance underpins a company's ability to invest in the people, skills, and technology to be both resilient and prosperous. Long term profitability is the key measure here. If the company level strategy is aligned to the strategic aims of other stakeholders, then consider that a multiplier (e.g., upskilling the workforce). Actions that deliver for wider society and the well-being of citizen is another multiplier (e.g., reducing carbon emission by investing in on-site renewable energy generation). On a local level, the sheer number of permanent jobs a company provides would be a key determinant of its societal value.

R&D Active

Companies that invest in R&D and innovate tend to grow faster and be more profitable than those that don't. According to Innovate UK, companies that receive innovation grants grow their turnover by 28% more than companies that do not, and their employment and productivity by 23% and 6% respectively (Innovate UK, 2023a). R&D often underpins a company's ability to do all the things mentioned above. If R&D leading to new products, process or services is evident, it counts.

Customer value through service

This can take many different forms and is best illustrated by an example. It is not currently possible to buy a personalised loaf of bread from Hovis. It is possible to buy a Mini from BMW to a personal specification and with a prepaid service plan for up to 5 years.

Getting to Net Zero

This is where many will struggle. Whilst many can evidence actions and plans to reduce harmful emissions, very few can currently evidence a plan all the way to Net Zero. Key question for consideration: By what year will this be unacceptable to customers and society? When will legislation make this a requirement for a business? This suggests that for now, evidence a growing commitment to reducing emission will have to suffice.

Behaviours aligned to Industry 5.0

Evidence of a shift in value focus, making a contribution to society and adopting new technology in order to prosper while respecting the production limits of the planet would meet this criterion. The cohort study evidence to date suggests the last part of this – the respecting planetary boundaries – will also be difficult and require some kind of derogation.

Proposed scoring methodology

For all but the Financial, Strategy and Societal Value criteria, credible evidence even if modest is enough for the others to count towards HVM status.

However, to deliver meaningful societal value will require a degree of scale in terms of jobs.

This can be illustrated using the example of Twmpa Cycles Ltd which made it onto the initial HVM list above by virtue of its SIC code and having launched and sold products:

- **Use of IDTs:** Twmpa Cycles uses computer aided design tools to design, visualise then simulate frame loadings using FEA (finite element analysis) before passing the digital manufacturing data to machine tools. (Twmpa Cycles, 2023).
- **R&D Active:** The Twmpa cycle is highly innovative product and the result of many years of R&D.
- **Customer value through service:** Twmpa offer a fully bespoke service, which it monetises, and gives the customer an experience that culminates in a unique cycle.
- **Getting to Net Zero:** One of the drivers behind the whole concept of building bikes from wood was to offer customers the least carbon intensive bicycles available.
- **Behaviours aligned to Industry 5.0:** The founder's blog comments and interviews suggest a set of values that are already aligned.

So far so good, but when we look at the value to society today, the latest information available on the company states 1 director and 0 employees. This will make it difficult for companies like Twmpa to meet either the authors criteria or that set out by the Welsh Government as discussed earlier.

If the number of employees is to have a minimum threshold, what would that be? Is it a fixed number or is it a number relative to the community in which the business resides? Losing 50 jobs in a rural town like Llanfyllin (population 1,105) is going to have a bigger long term societal impact than the loss of 50 jobs in Cardiff due to the lack of redeployment options in close proximity.

In adopting a framework such as this for the identification of HVMs in the future, where the jobs and societal value that a company provides are the key factors, we would end up with a different list to those based purely on the high tech, advanced manufacturing classification methodology.

List 4: HVMs meeting the proposed future HVM definition

Company Name	Majority Overseas Ownership?
ABER INSTRUMENTS LIMITED	
AIRFLO FISHING PRODUCTS LIMITED	Yes - USA
BEACON FOODS LIMITED	
BOYS & BODEN, LIMITED / Pear Stairs	
BSW TIMBER Ltd	
C D T SIDOLI (WELSHPOOL) LIMITED	
CAERBONT AUTOMOTIVE INSTRUMENTS LIMITED	
CARPENTER & PATERSON LIMITED	
CASTALUM LIMITED	
CLAYTON ENGINEERING LIMITED	
DAWSON SHANAHAN LIMITED	
DYNACAST (UK) LIMITED	Yes - USA
G S M AUTOMOTIVE LIMITED	
GOMER PRESS LIMITED	
HILLTOP HONEY LIMITED	
INTERIOR PRODUCTS GROUP LIMITED	
INVERTEK DRIVES LIMITED	Yes - Japan
MAKEFAST LIMITED	
MANGAR INTERNATIONAL LTD	Yes - France
MARRILL (POWYS) LIMITED	
MONTGOMERY WATERS LIMITED	
NIDEC CONTROL TECHNIQUES LIMITED	Yes - Japan
PCI Pharma Services (AndersonBrecon (UK) Ltd)	Yes - USA/Cayman Islands
PROTHERICS UK LIMITED	Yes - Belgium/Luxembourg
RACHEL'S DAIRY LIMITED	Yes - France
RADNOR HILLS MINERAL WATER COMPANY LTD	
RANDALL PARKER FOOD GROUP LIMITED	Yes - USA/Brazil
REES MACHINERY GROUP LIMITED	
STAGECRAFT DISPLAY LIMITED	
TECHNOCOVER LTD.	
TELEDYNE LABTECH LIMITED	Yes - USA
VOLAC INTERNATIONAL LTD	
WIPAK UK LIMITED	Yes - Finland
WYNNSTAY GROUP P.L.C.	

Count: 34. Alphabetically listed.

Note: These are all manufacturers with in-region staff numbers ranging from 50 to almost 700.

In answering the question of who are the HVMs in Mid Wales, this work package delivers comprehensively researched lists from different viewpoints and provides the baseline data for work packages 2 and 3. They are a snapshot as of the end of 2022.

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Work Package 2 – Regional HVM Activity today and tomorrow's Challenges

This work package attempts to characterise the nature of the common activities and consider the likely challenges the region's HVMs are going to face over the coming decade. This will then be used in work package 3 to propose areas of focused support for innovation and business improvement.

Of the 93 companies identified in Work package 1, a cohort of 32 emerged as having a strong aggregate score across the criteria of technology and scale in terms of jobs (set at >49 employees for the purposes of this exercise). This Work Package will focus on those 32 and use examples from the longer list where appropriate.

The headings below represent the broad challenge areas that have been identified. Under each, regional examples and context is added regarding market and customer demands, potential for breakthrough innovation to disrupt those markets and the regulatory landscape where applicable.

Many challenges will be common with those well known for the whole of the UK but the scale on a regional basis of some is noteworthy.

Fossil-fuel based material substitution

Hilltop Honey, Montgomery Waters, Radnor Hills, Rachel's Dairy, Splosh and Ty Nant all share the global FMCG challenge to reduce the impact of their packaging. Consumer preference and regulations such as the recently introduced EPR (Extended Producer Responsibility) regulation (UK Government, 2023a), will be something many in the packaging and packaged goods sector will need to comply with.

The region has 2 significant manufacturers of plastic-based packaging; WIPAK UK Ltd and Select Products Ltd. RM Group and Bulk Automation make specialist equipment that rely on the performance of these types of plastic packaging materials. Less carbon intensive solutions will be needed in the future if these companies want to continue to prosper and meet Net Zero.

These challenges are good examples of those already impacting many HVMs in Mid Wales across value chains.

Supply chains

Raw material price shocks and constrained supply in the wake of Covid-19 and the ongoing war in Ukraine have affected many of the regions HVMs. Shortages of integrated circuit components used in the electronic systems of some of the region's biggest HVMs still impact plant output. Growth at companies such as Atherton Bikes has been constrained by the shortage of components. In their example, many of the items needed are from the Far East. Wynnstay have had to carefully manage continuity of supply and pricing on internationally traded grain and other ingredients for their animal feed products whilst maintaining commitments to sustainably sourced soy for example.

Energy Efficiency

Whilst Mid Wales has none of the widely recognised energy intensive industries like steel, glass or cement, it does have some with high heat and cooling demands in metal casting, food and pharmaceuticals. Energy has become an even bigger cost concern since late 2021 so reducing consumption is a priority for many.

For companies like Nidec Control Techniques, Invertek Drives and YASA, this is good news as the global trend across many industries and sectors to electrify existing fossil-fuel powered systems and seek ever more efficient solutions plays to their strengths. These trends are being driven in a large part by initiative and law-making such as the Inflation Reduction Act of 2022 in the US and the European Green Deal approved in 2020.

Electricity Grid Capacity

Lack of grid capacity today and increased competition for what is available from the grid for electrification of transport and heat is a growth-limiting factor for many edge-of-grid businesses in Mid Wales.

Decarbonisation

Alongside taking direct action, companies will need to deepen their understanding of Scope 1, 2 and 3 emission measurements. Mid Wales's largest manufacturing companies already have a requirement to report their emissions using the SECR (Streamlined Energy & Carbon Reporting) framework (PwC, 2023) and carry out ESOS (Energy Saving Opportunity Scheme) assessments (UK Government, 2023). Policy trajectories suggest that these kinds of assessment and reporting requirements will apply to companies below the current criteria threshold over the next decade.

Productivity

Productivity is a key component of prosperity. It underpins competitiveness. How best to embed continuous improvements is still a challenge for many.

Continued adoption of automation and advanced technology for productivity gains is evident across many sectors. Notable exponents in the region are Radnor Hills in FMCG, Nidec and Invertek Drives in the electronics sector, RM Group, LT Machines and Makefast in metal fabrication. CastAlum, Atherton Bikes and Makefast in Additive Manufacturing or 3D Printing.

As well as improving productivity, automation can also ease the pressure on labour shortages but can create another challenge in the skill demands it creates to operate and maintain.

Labour shortage

Another nationwide issue but with a population decrease of 2.1% for Mid Wales between 2011 and 2021, versus an England & Wales increase of 6.3%, this exacerbates the problem for manufacturers in the region. (ONS, 2023d)

Ageing Population, skill shortages & vacant apprenticeships

Another national trend but increasingly commented on in discussions with the regions niche HVMs.

One challenge is to attract and retain talent but in smaller rural locations, competition between employers is high. Another is losing the multi-decade experience of key workers as they retire before those niche skills can be embedded in the next generation.

Being a good Global Citizen

The region is home to a small but growing number of companies aligning themselves to internationally recognised standards for societal good and a sustainable future. Hilltop Honey recently became the first honey producer in the UK to be B Corp certified (B Corporation, 2022). Airflo Fishing Products is a subsidiary of the US headquartered B Corp Mayfly Outdoors and since the acquisition in 2019, Airflo have made significant changes to improve their performance against the assessed criteria.

Be it B Corp, the Science Base Targets Initiative (Science Based Targets, 2023) or any other framework, the challenge and opportunity for business to align and act early is one that needs to be acknowledged.

Freeports

The plan for Freeports across the UK are seen by some as a threat to areas that will be without freeport status. Critics point to the un-levelling of the playing field leading to the displacement of jobs. Time will tell.

Net Zero Challenge

Arguably humanities biggest ever challenge. Removing harmful emission from the activities of our HVMs will be universal. Expect the next decade to be pivotal in the long-term viability of many businesses as carbon pricing becomes a reality.

Early movers in emission reduction and on-site energy security projects who have been studied in this work include Aber Instruments, Innova Mill (Adventa), and Montgomery Waters. Airflo Fishing Products look set to be the next to invest in a major on-site solar PV installation.

Some have the challenge of redesigning their products to be Net Zero. Clayton Engineering who build diesel-powered specialist vehicles will, one day, have the added challenge of re-engineering their powertrain for low or zero tailpipe emission.

To grow, sustain or plan for degrowth

Not all HVMs are growing all the time. Castalum is a company heavily dependent on winning long term automotive component supply contracts. As those programmes ramp up and ramp down, the impact on revenue and jobs follow. Even before the disruption triggered by Covid-19, the company was in a contraction phase; in 2017 turnover was £34M with 217 employees, in 2019 turnover was £20M with 136 employees (Creditsafe, 2023). Castalum is a good example of a company investing heavily in new technologies to remain a supplier of choice for many of the world's biggest car makers. It is leading the way with 3D printing of tooling elements which deliver new design freedoms that can lead to lighter components that use less raw material and energy to manufacture.

This local example illustrates some elements of the debate amongst economists and politicians on how the planet addresses climate change; green growth vs. degrowth (New York Times, 2021). The dominant political and economic goal for many of the world's economies for decades has been the pursuit of constant GDP growth and many, such as Ehsan Masood, now evidence a strong argument for why this policy, in his words, must change now. (Masood, 2021).

Maintaining Market Share

Maintaining Market share in the long run demands a commitment to R&D and New Product Introductions. Some of the tools to continue to do this competitively will be new. Just like the mass CAD (Computer Aided Design) adoption in the late 1980s, mastery of today's new tool and techniques such as big data analytics and Artificial Intelligence will underpin competitive advantage as decision making happens faster. The rapid uptake and democratisation of open-source solutions such as OpenAI's ChatGPT removes the cost barrier. The challenge for the regions HVM's is to work out how to harness its full potential.

In concluding, the long list of challenges above, many which have not been a priority for the region's HVMs in the past, are now coming into sharp focus. Consumer behaviour and legislation changes that have been observed in response to the climate emergency in recent years are on an accelerating path. This will change what our HVMs will be able to sell and where.

The ability to innovate in many of these areas, which lie outside the traditional areas in which HVMs have sought most public sector support in the past, needs to be addressed. The output of this work package is the input to the final work package.

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Work Package 3 – Support/Intervention Design Requirements

In Wales, maintaining many of the innovation and business performance support schemes the public sector has been able to provide to HVMs in recent years is not an option. EU exit and the re-direction of what is currently a reduced level of equivalent funding will mean that a lot of those schemes will be scaled back, re-imagined, or disappear completely. Delivery is likely to fragment as the channels through which funds are distributed increase. New support delivery teams will appear. Others will likely disappear. New initiatives have and will continue to appear as the UK Levelling Up funding and the UK Shared Prosperity Fund begin to flow into local authorities across Wales from the UK Government.

Against this backdrop, now is arguably the best opportunity in the past 20 years for every organisation involved in the delivery of support to the manufacturing community in Mid Wales to come together to plan, design and test a coherent and impactful public sector support offer that both respects and integrates well with support available from non-public sector suppliers and stakeholders.

Mid Wales has been fortunate to benefit from the longevity of the Mid Wales Manufacturing Group. As a not-for-profit, member-owned organisation that has been a constant in Mid Wales since its formation in 1994, it has supported and promoted the manufacturing sector with activities in education, training, skills, supply chain, knowledge transfer and playing a key advisory and lobbying role on behalf of members. There are many other organisations that operate on a local and national level from schools and colleges, AberInnovation, UK centres of excellence like the HVM Catapult network and specialists like the National Physical Laboratory and WRAP to name a few. These all have a valuable part to play in the HVM community in Mid Wales.

Knowing who all the HVMs in Mid Wales are, understanding what they do and the challenges they face provides a solid foundation for this next step.

The Menu

Using the analogy of a well-run restaurant serving great value, nutritious food, this section will propose what stays on the menu, what dishes get a refresh and what new dishes need to be added to fully satisfy the needs of customers over the next decade. Critical to this is the coordination and communication between the front of house, table waiting staff, head chef and everyone else from pot washer to restaurant manager.

Like any good restaurant, the people delivering advice and guidance to manufacturing businesses need to have the best possible ingredients. Below are some of the new and improved ingredients needed.

Business Intelligence

To get around the problem of using disparate and often poor-quality datasets as illustrated in the literature review of this study, the public sector needs to embrace the new breed of data insight platform products such as those from companies like Configur (Configur, 2023) and Network Praxis (Network Praxis, 2023). This is not only to inform their own work but also to be able to impart the benefits of using these kinds of tools in the HVM businesses that receive their support.

Advisor Skills - Hard

As well as designing the packages of support that will be offered, a team needs to be built to deliver them with maximum impact.

As evidenced in the research, Mid Wales is not home to every industrial sector. It would therefore be wise to use advisors with credible experience and up to date knowledge to best serve the sectors that are present. As this may change over time, the training offered to advisors needs to keep pace. For organisations supporting pan-Wales or UK wide programmes, Mid Wales needs to have access to, and get to know the best people. Just because an advisor lives nearby should not mean that's the one the HVM gets to work with when domain knowledge can make a difference. One good outcome of the Covid crisis means that remote working tools and practices are commonplace and no longer the barrier they were pre-Covid.

Advisor Skills - Soft

Of equal importance to being able to assimilate technical domain knowledge is the ability of advisors to be good communicators and convenors of the right people case by case. Projects are a team effort, and building networks of trust and respect and being an honest broker when required are the skills needed to create positive impact. As evidenced in the research, the support offer in Wales for innovation and business improvement is complex to navigate and likely to get worse not better in the years to come. A good advisor will lighten the load for HVMs in the region by filtering and highlighting what is and isn't relevant.

With the right people equipped with the best possible information, this new support menu can be offered with confidence. Below are the items for the proposed Menu based on the outcomes of work package 2.

Innovation in Materials

In looking to address the challenge of fossil-fuel based material substitution, the menu should have something designed to assist HVMs in these transitions. There is a good track record in funding these kinds of projects with the WRAP-delivered Circular Economy Fund. The lesson learned from that should be sought in the design of new interventions.

For advice and guidance, the work of the existing Innovate UK Knowledge Transfer Network's Materials Team should be leveraged to better effect than it has in the past.

Supply Chain

To address the long-term challenges of building more resilient and sustainable supply chains, specific support for feasibility studies around "make vs. buy", reshoring and onshoring should be offered. Using examples applicable to several of the region's food and feed producers, projects that look at lower impact alternatives to traditional sources of things like sweeteners and protein would also sit well in this part of the menu and benefit from existing local expertise and facilities already in the region at Aberystwyth University and AberInnovation.

Energy Efficiency / Electricity Grid Capacity / Decarbonisation

At the time of writing the Development Bank of Wales has launched their Green Business Loan Scheme which is a funding package aligned to these challenges. Alongside the existing Business Wales Sustainability Advisors who can offer free advice and guidance to HVMs, the menu in this area is already taking shape.

There are also many Innovate UK and UK Government funding competitions for proof-of-concept and early-stage technologies proposals in electrification, renewables and CCUS (Carbon Capture, Utilisation and Storage).

Mid Wales is also home to the Centre for Alternative Technology and an organisation with whom the co-design of HVM specific interventions should be explored.

Before populating this part of the menu further, it is recommended that these existing support offers be evaluated in the coming year before deciding what, if anything else, is appropriate to help HVMs on a regional basis to decarbonise their operations and make energy efficiency gains.

Productivity Improvement

Multiple support schemes exist today to assist manufacturers in Wales to address productivity challenges. Fully funded 3-day productivity health checks are currently available via the SMART Innovation programme. Where applicable, 5-day follow on support to embed recommendations can be fully funded.

Welsh Government subsidised training and on-site consultancy in Lean methodologies are delivered by the North Wales based Toyota Lean Management Centre. These are available to all manufacturers. Delivered by world class practitioners, Mid Wales is lucky to have this almost on their doorstep.

Both of these interventions receive positive feedback from the companies that engage so as a mechanism by which any HVM can review their productivity performance and take action to improve, these should remain on the public sector support menu into the next decade.

In terms of what could be added to the Productivity Improvement section of the menu specific to Mid Wales would be a specific intervention to support the sharing of local best practice. Mid Wales Manufacturing Group would be a strong candidate to formalise this, acknowledging similar work by them in the past.

Labour shortage + Ageing Population, Skill Shortages & Apprenticeships

The established Mid Wales Regional Skills Partnership is best place to lead on addressing these challenges. The design and co-ordination of regional interventions is also a project for that group to lead.

Being a better Global Citizen

The Hilltop Honey and Airflo examples cited in Work Package 2 can inspire the wider HVM community in the region. These need to be used as local exemplars and public sector support should be offered to enable deep knowledge transfer.

As part of its Economic Action Plan the Welsh Government's "Economic Contract" has been developed over recent years to gain the commitment from the companies it supports to address issues aligned to this challenge.

Mid Wales is also home to the newly formed Black Mountains College. Designing an intervention around this topic should explore the valuable contribution they could make in taking on this challenge.

Net Zero Challenge + Grow, Sustain or plan for Degrowth

Due to the legislative frameworks of Wales, the UK, and international agreements to address the causes of climate change, our HVMs are going to need more support to transition to Net Zero.

Designing products with modularity, re-manufacturing and material selection compatible with circular systems in mind will become key to both remaining competitive and compliant with emerging legislation. Those that do not allow customers to extract the maximum useable life from a product will lose out to competitors that do. Those that fail to use the lowest impact materials will find their customers shifting to competitor offerings. Those that fail to design for easy and economical repair will likely see both customers leave and legislation such as the "EU right to repair" become a barrier to business as usual.

The business outreach activities of the WEFO-funded project Circular Revolution (Circular Revolution, 2023) have been working with a number of companies in Wales as they embark on this journey.

This is where R&D co-funding could be deployed at Feasibility, Industrial Research, Experimental Development and Exploitation phases in the same way that previous open call SMART Cymru and InnovateUK funding has been awarded. Achieving Net Zero is going to require a multitude of actions so a general-purpose funding scheme that gives higher scores to projects that address these challenges is recommended for the menu.

Maintaining Market Share

Maintaining and protecting market share in the long run demands a commitment to R&D and New Product Introductions. As well as a similar R&D co-funding scheme outline for the Net Zero Challenge above, support for the adoption of Industrial Digital Technologies, new tools such as the previously mention AI solution and taking a proactive approach to cyber security will all help equip HVMs to protect existing value and create fresh revenue streams from new and improved products and services.

Things to scale back on

The best restaurants normally have a short Menu and focus on quality. It is worth considering applying that logic to the HVM support menu especially given the current budgetary constraints for innovation funding from the Welsh Government and the UK Government via its UKSPF.

Whilst popular in the past, the Welsh Government Innovation Vouchers for capital expenditure (capex) projects often failed to engage and support companies in becoming R&D and Innovation active in a sustained way. If the focus over the next decade is to be aligned to the challenges set out above, support for unaligned capex should perhaps be taken off the menu. If a capex project offers a strong and relatively risk-free return on investments, then other non-grant funding instruments should be used.

Today's Stakeholder Landscape

With the requirements for a proposed new support menu based on the specific future challenges of the region's HVMs set out on a somewhat clean sheet, the reality of the existing stakeholders commitments needs to be acknowledged and taken into consideration.

This research has shown that the number of changes seen in the delivery mechanisms for business support relevant to HVM in Wales since the UK's EU exit has been at unprecedented levels.

In addition to the current commitments to innovation support from the Welsh Government, the UK Government, Innovate UK and their respective associates, the activities of universities, the UKIPO, Research and Technology Organisations, National Laboratories and even HMRC in it's work to administer the R&D Tax credit system, Mid Wales also has the Growing Mid Wales Partnership which is readying itself to deliver a 10 to 15 year growth deal programme.

The Mid Wales Growth Deal

Since the formation of the Growing Mid Wales Partnership by Powys and Ceredigion County Councils back in 2015, its biggest single activity has been to formulate and coordinate the Mid Wales Growth Deal. With a Heads of Terms agreement signed in December 2020, the final Deal Agreement was signed in January 2022 with a funding allocation of £110M; £55M from both the UK and Welsh governments.

Whilst envisaged as having a 15-year life, the UK Government has since stated it wants to see it delivered over 10 years. This means that the objectives for the deal currently have a shared target end date of 2032. In summary these objectives are:

- To create between 1,100 and 1,400 new jobs in Mid Wales.
- To support a net additional GVA uplift of between £570 and £700 million.
- To deliver a total investment of £280 to £400 million (therefore a minimum of £170 million in private sector investment).

(Growing Mid Wales, 2022, p.23)

As of February 2023, the Tranche 1 portfolio contains proposals for 2 Programmes and 9 projects. All of which are still in various stages of development. All have alignment to one or more of the Growing Mid Wales Strategic Growth Priorities as set out in the figure below:



Fig 7: Growing Mid Wales – Strategic Growth Priorities.

(Growing Mid Wales, 2020, p.22)

Of relevance to HVMs in Mid Wales will be the business cases under construction for the following projects and programmes:

- Applied Research & Innovation:
 - Innovation Park
 - Mid Wales Advanced Manufacturing Campus
- Agriculture, Food & Drink:
 - Food Manufacturing Innovation Centre
- Digital Programme
- Mid Wales Sites and Premises Programme

Details at this stage are limited but as all but one of the above represents a potential expansion of physical assets in which HVM activities could be supported, this portfolio represents a significant opportunity to add to the regions manufacturing capacity and compliment the activities proposed by this study.

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Conclusions

Having a clear rationale and options developed for defining which companies are HVMs will provide an interesting discussion point - not only for those with an interest in Mid Wales but others wanting to explore how to build support mechanisms that resonate with cohorts in other parts of Wales and beyond. It will be interesting to see if there is a shift in the language used to describe companies that create the largest societal value. Will they be the esteemed HVMs of the future?

It has been understood for a long time by those with a keen interest in the region that manufacturing matters much more to Powys than it does to Ceredigion. What this study provides is a clear picture of how very different the HVM profile in Powys is to that of Ceredigion; it is proportionally much bigger and much more diverse.

Mid Wales HVM companies have a good record of taking advantage of the public sector support for Research, Development and Innovation on offer to Welsh business. A smaller number have explored and been successful at the UK level accessing support for the UKIPO Audit Plus and Access scheme follow-on, KTPs, and Innovate UK competitively won collaborative R&D projects. The public sector needs to work harder in its support of HVMs in Mid Wales accessing this UK level support.

There is a gulf between what the IPCC says is required in terms of the 2030 target and what HVMs are providing as evidence to suggest they will be making their contribution in a timely fashion.

Manufacturers probably have the biggest set of challenges of any business type due to the fact they need an amount of fresh raw materials to exist. Even if we had limitless, always-on renewable energy and the best circular business practices, zero emission manufacturing remains a theoretical concept. As many manufacturers are essential to providing even the most basic of modern-day lifestyles, it is hard to argue that at some point, support for them to innovate their way to a Net Zero future will be an imperative. Choosing when that point is will be critical to their future. At global level these decisions could be critical to sustaining humanity as we know it.

The public sector and the delivery partners and staff it selects to deliver publicly funded innovation and technology adoption support in the next decade should be asked to prove their credentials in the most disruptive technologies and contemporary ways of working. We need to raise the bar.

We must start a systematic journey toward a truly sustainable world and what better time to do it than now.

Recommendations and Further Work

With the imminent publication of the Welsh Government's new Innovation Strategy for Wales, now is a good time to be taking a fresh look at how best to support the innovation activities of the region's HVMs. With the planned co-creation of the Innovation Strategy's delivery plans, it is hoped that this study and the following recommendations will be considered in the evaluation of what should remain in the combined offer to the innovators in Wales, what should be modified, what could be added and importantly - what could be removed from the "menu" of public sector support to reduce overlaps and duplication with other accessible schemes.

It is also important to now recognise that there are a number of support structures and intervention programmes relevant to HVMs in Mid Wales already in varying degrees of design and evaluation. Many of these will be UK wide, some will be Wales wide, and several will be specific to region through the Mid Wales Regional Investment Plan for the UK Shared Prosperity Fund - April 2022 - March 25. (Growing Mid Wales, 2022a). This is the UK Government's successor to EU structural funds, with Mid Wales allocated £42.4M of the 3 year £2.6 billion UK Shared Prosperity Fund. Supporting local businesses is allocated £14M over the 3 years. People and skills (all sectors) have been allocated £7M over the same period.

The remainder of the recommendations are split into those for further study and those that are proposed actions.

Recommendations for Further Study

Benchmarking the Quality of Advice and Guidance

Conduct a benchmarking exercise of the current quality of advice and guidance being provided by publicly funded initiatives in the region with that of other parts of the UK and further afield.

Conduct Comparison Study into Advanced Manufacturing Centre for Mid Wales

Whilst there was an early exploration into the demand and impact of a proposed physical advanced manufacturing centre for Mid Wales (commissioned by Powys County Council in 2022 on behalf of the Mid Wales Growth Deal and conducted by Industry Wales), that work did not go far enough or deep enough to understand what it would cost, who would fund it and most importantly the likely impact it may or may not have. In January 2023, Powys County Council awards a tender for the development of a formal Strategic Outline Business Case with the intention of submitting that to the Mid Wales Growth Deal as a Tranche 1 project proposal. A review of that business case would be an interesting comparison with the findings of this study on who they believe from the HVM community in Mid Wales would be the sustaining customers for such a centre or campus and what the activities of the centre or campus would be.

A Study into a Virtual Equivalent of the Advanced Manufacturing Centre for Mid Wales

A study that compares the proposal for a new centre or campus with a virtual equivalent that leverages in the resources and services residing in existing centres around Wales and the UK for which companies in Mid Wales have as much right to access as anyone else would be a worthwhile comparator study.

A Paper Documenting the history of Manufacturing in Mid Wales

A by-product of this study has been the accumulation of a large amount of archive material and first-hand accounts detailing the history of manufacturing and innovation in Mid Wales. This material would make for an interesting and worthwhile standalone piece of work.

Recommendations for Potential Actions

A Study Workshop with a newly merged Welsh Government Division

In early 2023, the Welsh Government's Foundational Economy team was merged with its Industrial Transformation Division in which the Head of HVM for Welsh Government currently sits. This provides a great opportunity to share the outcomes of this regionally focused study due to the number of the Mid Wales companies being classified as HVMs. Under the proposed new HVM definition there are several that are in the food and drink, timber and textiles sectors who are also classified as key actors in the Foundational Economy. (Foundational Economy, 2022).

Events

Considering all the recent structural changes to the ways in which public sector support for businesses is communicated and delivered, there is a clear need for all stakeholders with a role to play in the convening, connecting, and support of manufacturing entities to clearly understand the emerging landscape. This report therefore makes the recommendation to design and deliver a "Supporting the Future of Manufacturing in Mid Wales" event in which the following topics are agenda candidates:

- Where have we come from? A look back at the past 50 years of manufacturing in the region.
- What have we learned along the way?
- The support landscape – Past present and future.
- Our common challenges of today: Human Capital, Financial Capital, and many more.
- Our likely challenges of tomorrow: Net Zero, resource availability, clean energy, raw materials etc.
- Our opportunities: Industrial symbiosis*, Getting to "Industry 5.0".
- A who's who of the network of people who want to help.

*Example of Mid Wales Industrial Symbiosis: Waste from the food preparation and manufacturing processes at a local producer is transported to GP Biotec in nearby Talgarth as feedstock for its anaerobic digestion plant producing high quality biofertilizer and biogas which is used to generate 1MW of grid-connected electricity and heat for the site. (GP Biotec, 2023).

As for timing, with the publication of the new Innovation Strategy for Wales and a revision of the Manufacturing Action Plan both due from Welsh Government in the first half of 2023, this event could take advantage of these two HVM sector-relevant documents being available so timing should be soon after the availability of both. These together with the sector specific plans of the Growing Mid Wales partnership and the UK Government's delivery plan for its various national programmes of research and innovation support for businesses would attempt to paint a complete picture of the current state and provide insight into what to expect over the next 5 to 10 years.

The recommended entities who have a potential role to play include the following:

Mid Wales Manufacturing Group
Growing Mid Wales Partnership
Powys County Council
Ceredigion County Council
Innovate UK – KTN (Louise Jones, Mick Card and/or Rob Rolley).
Innovate UK Edge Wales (BIC Innovation)
Innovate UK – Wales (David Cunah)
Industry Wales
Welsh Automotive Forum
Technology Connected
Neath Port Talbot College
Chair of the Secondary Heads of High Schools – Powys
Chair of the Secondary Heads of High Schools – Ceredigion
Aberystwyth University / AberInnovation
UWTSD – MADE Cymru and SMART Digital Accelerator delivery team
Swansea University - ASTUTE
AMRC Cymru (Advance Manufacturing Research Centre)
DMIW (Digital Manufacturing Innovation hub Wales)
MediWales
Business Wales
Welsh Government Innovation Team
Welsh Government Regional Team for Mid Wales
Welsh Government International Trade Team
Welsh Government Food and Drink Team
Make UK
Federation of Small Businesses
CBI (Confederation of British Industry)
IoD (Institute of Directors)
Manufacturing Wales
Development Bank of Wales

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Glossary of Terms

AIEC – Aberystwyth Innovation and Enterprise Campus

CCUS - Carbon Capture, Utilisation and Storage

EPR – Extended Producer Responsibility

ERDF – European Regional Development Fund

EW – East Wales

FMCG – Fast Moving Consumer Goods

HVM – High Value Manufacturing/Manufacturer

IP – Intellectual Property

IPCC - Intergovernmental Panel on Climate Change

IPO – Intellectual Property Office

KTP – Knowledge Transfer Partnership

RD&I – Research, Development, and Innovation

SECR Streamlined Energy & Carbon Reporting

SBRI – Small Business Research Initiative

WRAP – Waste and Resource Action Programme

WW&V – West Wales and the Valleys

UWTSD – University of Wales Trinity Saint David

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Appendices

Appendix 1 – ISIC Rev 4 - Sectors and statistical Codes:

ISIC Rev 4*								
Section		Division	Description	Section		Division	Description	
Low/medium-tech manufacturing	C	10–12	Food products, beverages and tobacco	Knowledge services	J	58–63	Information and communication	
	C	13–15	Textiles, wearing apparel, leather and related products		K	64–66	Financial and insurance activities	
	C	16–18	Wood and paper products, and printing		M	69–82	Professional, scientific and technical activities	
	C	22–23	Rubber and plastics products, and other non-metallic mineral products		P	85	Education	
	C	24–25	Basic metals and fabricated metal products, except machinery and equipment	G	45–47	Wholesale and retail trade, repair of motor vehicles and motorcycles		
Medium/high-tech manufacturing	C	31–33	Furniture; other manufacturing; repair and installation of machinery and equipment	H	49–53	Transportation and storage		
	C	19	Coke and refined petroleum products	Other services	I	55–56	Accommodation and food service activities	
	C	20	Chemicals and chemical products		L	68	Real-estate activities	
	C	21	Basic pharmaceutical products and pharmaceutical preparations		N	77–82	Administrative and support service activities	
	C	26	Computer, electronic and optical products		O	84	Public administration and defence; compulsory social security	
	C	27	Electrical equipment		Q	86–88	Human health and social-work activities	
	C	28	Machinery and equipment n.e.c.		R	90–93	Arts, entertainment and recreation	
	C	29	Motor vehicles, trailers and semi-trailers		S	94–96	Other service activities	
	C	30	Other transport equipment		T	97–98	Activities of households as employers; undifferentiated activities of households for own use	
	Other production	A	01–03		Agriculture, hunting, forestry and fishing			
B		05–09	Mining and quarrying					
D		35	Electricity, gas, steam and air conditioning supply					
E		36–39	Water supply; sewerage, waste management and remediation activities					
F		41–43	Construction					

As per International Standard Industrial Classification of All Economic Activities, Revision 4.

(Source: Policy Links, IfM)