Swansea University
Prifysgol Abertawe

Developing and implementing the Health and Wellbeing Mission and Supporting Innovation Delivery Plan for Wales Innovates; the Welsh Government's 2023 Innovation Strategy for Wales

A thesis submitted for the degree of

Doctor of Philosophy of Swansea University

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11th March 2026

Research supervisors: Dr Daniel Rees, Dr Roderick Thomas, Professor Denis Dennehy.

SUMMARY (ABSTRACT)

Innovation in and across healthcare is a significant challenge. The complexity of developed healthcare ecosystems, competing national priorities, funding challenges, changing social demographics, the impacts of both the COVID-19 pandemic and Brexit make the innovation ambitions of Welsh Government, NHS Wales, and public services challenging. Contextually, this study centres on the research aim:

"*In light of the challenges faced by Welsh healthcare organisations in taking a structured approach to innovation that can lead to increased healthcare value in a peri/post COVID-19 environment, how can Welsh healthcare strategy and policy create the optimal environment, infrastructure and conditions for innovation, through a portfolio wide Welsh Government strategy for innovation*?"

This study adopts an action research approach, reflecting on direct practitioner experience to identify key themes, frameworks and enablers that can support a more strategic and integrated approach to innovation across healthcare in Wales. A broad evidence base is developed, addressing policy gaps and addressing the need for an integrated, mission-oriented strategy. These insights inform the iterative design, development and implementation of the Health and Wellbeing mission chapter of *Wales Innovates*: the Welsh Government's 2023 Innovation Strategy for Wales. A supporting Innovation Delivery Plan is co-designed, launched and delivered through a range of healthcare, academic, Government and industry practitioners across the Welsh healthcare innovation ecosystem.

A mixed-methods design supports this research, combining qualitative and quantitative data collection with thematic analysis to capture diverse stakeholder perspectives and organisational experiences. A strategic framework and set of policy recommendations are developed, supporting implementation in practice through a range of technological, governance and value interventions across the Welsh healthcare ecosystem. A range of impact is realised across Government policy, national practice and a wide range of stakeholder groups.

By bridging academic theory with policy and practical application, this research contributes new knowledge to the field of health policy and innovation management. It provides a model for building integrated, mission-oriented system-wide innovation strategies and presents a transferable model for integrated healthcare innovation policy, that can be applied across similarly complex public service environments.

DECLARATION

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

Signed:  (candidate)

Date: 11th March 2026

STATEMENT 1

This thesis 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 a footnote(s).

Other sources are acknowledged by footnotes, giving explicit references. A bibliography is appended.

Signed:  (candidate)

Date: 11th March 2026

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed:  (candidate)

Date: 11th March 2026

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ACKNOWLEDGEMENTS

The process of undertaking my doctoral research and producing my thesis has been the most significant, demanding and rewarding learning and development opportunity of my 21-year career. The importance of my work as a civil servant in terms of making real change, based on meeting societal need and with the aim of impacting positively the lives of Welsh citizens, is the primary reason I come to work every day and why I chose a career within Government.

Combining Government strategy and policy development with robust academic theory and methodology is a powerful combination. Having spent more than a decade in leadership roles in the healthcare innovation sector, I have been fortunate to work with many clinical academics who are recognised as key opinion leaders in their fields of practice and research. Through this research, I hope to offer a new classification of thought and opinion leader – civil academics – those whose role within Government sanctions a national level of influence on their professional sector, but those have also combined their expertise with an academic rigour resulting in highly robust strategy and policy, which of course impacts on practice. This approach can nationally develop the capacity and capability of the whole sector, impacting positively on health, societal benefit and wealth; significant as every one of us is a citizen, patient and user of the healthcare system at some point in our lives.

Through the research for my Doctorate I have been able to test and challenge the policy work I have led for more than twenty years in Government in new and different ways. As a thought leader in public sector innovation in Wales, this aligns with my personal philosophy to challenge myself and explore new and creative solutions to meet the needs of the system, that ultimately results in improved value for Welsh citizens. I have been fortunate enough to present my research and policy work in a range of international settings and arenas, which has resulted in a much-broadened international network of peers and colleagues.

I have been fortunate that my work and expertise have been recognised externally. I was nominated as Co-Chair on the International Society for Professional Innovation Managers (ISPIM) Innovation in Healthcare Special Interest Group in April 2024, ISPIM being the largest innovation

practitioner network in the world. In addition, I became a committee member for the European Conference on Innovation and Entrepreneurship in 2023, accepted the role of Visiting Innovation Fellow with the University of South Wales in August 2024 and I reaccredited as a Chief Innovation Officer with the Global Innovation Institute in January 2025.

This research builds further upon an eleven-year relationship with Swansea University, from the early days of the Bevan Commission, partnerships with global industry partners, Welsh Health Hacks, co-developing and leading the Accelerate and AgorIP programmes, the NHS Wales Covid-19 Innovation Study and more latterly the Innovation and Transformation Intensive Learning Academy and amplifying the role of the NHS Wales Innovation Leads group. This relationship was developed initially with former Professor Gareth Davies, a long-standing colleague and friend, who helped me recognise the potential of my policy work in academic terms and expertly convinced me to undertake firstly a Master of Research in 2021. The MRes quickly evolved into a Doctorate, given the national significance of the innovation policy agenda, the breadth of evidence created and the pace at which I was able to evidence delivery, with full support of the Welsh Government Ministerial Cabinet.

Day to day, I have been expertly supported by Dr Dan Rees and Professor Roderick Thomas, as supervisory academics I firstly call friends, and who have consistently helped sponsor, motivate, amuse, influence and professionally challenge me since October 2021.

Personal thanks are also due to Professor Denis Dennehy, who despite joining my supervisory team later in my research journey, was able to advise and shape the content of my work into a credible academic thesis which, I firmly believe, demonstrates impact at a national policy and research level.

I would also like to thank my wife Eleanor for supporting me through this four-year Doctorate, effortlessly managing our household and children, her own challenging work and a degree during the time of my doctoral research, which included several international conferences.

During these years, my children Jack and Isabel have become adults and teenagers respectively – I sincerely hope I have maintained the right work, study and life balance to be the father you needed during these formative years.

Of course, my employer has professionally supported me to undertake this Doctorate. My thanks to the Welsh Government's Innovation, Technology and Partnerships team who have supported my time personally and professionally on this PhD journey, as part of developing *Wales Innovates* and the supporting Innovation Delivery Plan, during years one to four of the Sixth Senedd term of Welsh Government, between October 2021 and September 2025.

Diolch, pawb - Thank you, everyone.

Tom James, 29th September 2025.

List of Abbreviations

AB Connect – Aneurin Bevan Connect

ABUHB – Aneurin Bevan University Health Board

ADI – Assistant Director of Innovation

AI – Artificial Intelligence

AM – Assembly Member

ARCH – A Regional Collaboration for Health

BCUHB – Betsi Cadwaladr University Health Board

CVUHB – Cardiff and Vale University Health Board

CTMUHB – Cwm Taf Morgannwg University Health Board

HDUHB – Hywel Dda University Health Board

COVID-19 – Coronavirus Disease of 2019

EU – European Union

HoI – Head of Innovation

HSCEY – Health, Social Care and Early Years

HSCIW – Health and Social Care Innovation Wales

IDP – Innovation Delivery Plan

IIA – Integrated Impact Assessment

ILA – Intensive Learning Academy

IMTP – Integrated Medium-Term Plans

ISO – International Standards Organisation

ISW – Innovation Strategy for Wales

MRL – Market Readiness Level

MS – Member of the Senedd

NHS – National Health Service

PTHB – Powys Teaching Health Board

RIC Hubs – Regional Innovation Coordination Hubs

RIIV – Research, Innovation, Improvement and Value

SBUHB – Swansea Bay University Health Board

SME – Small-Medium sized Enterprise

SU – Swansea University

TRL – Technology Readiness Level

UK – United Kingdom

UWTSD – University of Wales Trinity Saint David

WG – Welsh Government

WHIASU – Wales Health Impact Assessment Support Unit

WIHI – World Index of Health Innovation

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List of external publications and contributions

A range of conference papers, journal articles, conference presentations and workshops were undertaken during this research. These external publications and contributions are representative of the evolving and iterative journey of this action research study, supporting the process from evidence into research, into policy and into subsequent application in national practice. The practitioner, conference papers and journal articles are referenced below and a summary included in the *Appendices* section. The presentations and conference contributions are summarised according to their Action Research phase in Section 3.11 and in Table 31 in Section 8.2.1.

James, T., Thomas, R., Rees, D., & Davies, G. (2022, September). The All-Wales Academy for Innovation in Health and Social Care. In *Proceedings of the 17th European Conference on Innovation and Entrepreneurship* (pp. 284–289). Academic Conferences International Limited. https://doi.org/10.34190/ecie.17.1.829. [See Conference Paper 1 in *Appendices.*]

Doneddu, D., Davies, G., Howson, T., Joyce, N., Rees, D., & James, T. (June 2023, June). Challenges, innovation opportunities, and lessons learned from a prolonged organizational crisis: A case exemplar of the National Health Service Wales. In P. Ordóñez de Pablos & X. Zhang (Eds.), *Accelerating strategic changes for digital transformation in the healthcare industry* (pp. 19–51). Academic Press. https://doi.org/10.1016/B978-0-443-15299-3.00017-8. [See Publication 1 in *Appendices*]

James, T., Rees, D., Thomas, R., Davies, G., Rinaldi, L., & Miller, E. (2023, June). Innovation in practice: Developing a coherent health and social care innovation ecosystem, as part of implementing an Innovation Strategy for Wales. (2023, June). *In Proceedings of the XXXIV ISPIM Innovation Conference, Ljubljana, Slovenia*. International Society for Professional Innovation Management (ISPIM). ISBN 978-952-65069-3-7. [See Conference Paper 2 in *Appendices*]

James, T., Rees, D., & Thomas, R. (2023, September 13–15). Using an action research approach to develop the health and social care component of an Innovation Strategy for Wales. In *2023 IEEE International Symposium on Technology and Society (ISTAS), Swansea, UK.* (pp. 11–12). [See Conference Paper 3 in *Appendices*]

James, T., Rees, D., Thomas, R., Davies, G., Rinaldi, L., & Miller, E. (2023, September). Developing a national research and evidence base for the health and wellbeing chapter of the Welsh Government's 2023 Innovation Strategy for Wales: A case study. In *Proceedings of the 18th European*

Conference on Innovation and Entrepreneurship, Porto, Portugal. (pp. 409–417). Academic Conferences International Limited. https://doi.org/10.34190/ecie.18.1.1810. [See Conference Paper 4 in *Appendices*]

James, T., Rees, D., Thomas, R., Davies, G., (2023, December). Developing an innovation action plan to implement the health and wellbeing chapter of the Welsh Government's 2023 innovation strategy for Wales. In *Proceedings of ISPIM Connects Salzburg – The Sound of Innovation*, Salzburg, Austria, ISBN 978-952-65069-4-4. [See Conference Paper 5 in *Appendices*]

Dennehy, D., James, T., Rees, D., Thomas, R. (2025, December) Building a digital health innovation ecosystem: Tech-push, demand-pull, and government policy. *Information Systems Journal.* Information Systems Journal https://onlinelibrary.wiley.com/doi/10.1111/isj.70024

Accepted for publication in October 2025.Published November 2025.Manuscript submitted following Round 3 revisions, October 2025. [See Publication 2 in *Appendices*].

Triantoro, T., Roderick, S. Nasr, B.I., Barakat, K.A., James, T. (2025, July). Artificial intelligence vs. MBA: Who wins the future of work? A panel report on the integration of AI in business and the evolving role of business education, La Rochelle, France. In *Proceedings of the Association for Information Systems Conference* (Paper No. PR-25-364). Communications of the Association for Information Systems. [See Publication 3 in *Appendices*]

CHAPTER 1: INTRODUCTION TO THE RESEARCH

1.1 Introduction to the chapter

This Chapter outlines the research study by introducing the research context, outlines the key research objectives and proposes a suitable methodological approach to the research to create the foundations for the next phases of this research study.

The research study is introduced (section 1.1) and the background and context to the research topic is set out (section 1.2). Wales Healthcare innovation ecosystem is described (section 1.3), and the subsequent research questions, aim and objectives are discussed (section 1.4). Following on from this, the research design and methodological approach is stated (section 1.5). The structure of the research is detailed (section 1.6), and a summary of the chapter is provided (section 1.7).

This study applies action research based academic methodology to a nationally significant and ministerial cabinet-led production and implementation of an Innovation Strategy for Wales (ISW), combining existing academic theory and literature on innovation, with a robust evidence base. This informs policy development which supports practice and application, resulting in a range of positive value and impact, right across the healthcare system in Wales.

1.2 Background to the Research

Developing capacity and capability for innovation in the Health and Social Care sectors in Wales has been a longstanding endeavour. This sits alongside efforts to revitalise Wales' economy and drive improved patient outcomes, patient experience and resource efficiency as part of a Value-Based healthcare approach as described in the 2018 Welsh Government long term strategy for Health and Social Care '*A Healthier Wales'* (Welsh Government, 2018).

Producing a new and relevant Innovation Strategy for Wales was a Labour Government manifesto commitment following their successful election to power at the beginning of the sixth Senedd term of Government in 2021. This would replace the previous and predominantly business and economy policy focused innovation strategy – *Innovation Wales* – produced and launched in 2013. (Welsh Government, 2013).

The Welsh Government's 2021 Programme for Government committed to embed innovation across all its devolved policy areas in Wales, leading to a specific commitment alongside Plaid Cymru to develop and launch a new, cross Government strategy for innovation. Any new Innovation Strategy for Wales must first and foremost recognise the significantly different policy context for innovation now, in both a post Brexit and post COVID-19 environment. A new Innovation Strategy for Wales must also recognises the need for a cross-Government portfolio approach to innovation that incorporates all the devolved areas of Welsh policy responsibility, which includes healthcare, education, the economy, and climate and nature.

Significantly, in the aftermath of the Covid-19 pandemic, governments around the world acknowledged the urgency of establishing and refocusing healthcare innovation ecosystems that can meet the changing and diverse needs of patients and wider society. At the same time, there is universal recognition that technological innovations are expected to enhance the design and delivery of healthcare services, in line with increasing patient expectations and awareness.

The focus of an innovation strategy would be to create the optimal conditions at a cross-Government policy level to support a thriving innovation environment in Wales. Specifically, to healthcare, any new strategy would need to support the objectives set out by *A Healthier Wales* (Welsh Government, 2018) and evolving needs of the healthcare system. Although this research study will focus on the development of the Health and Wellbeing mission chapter of an innovation strategy for Wales (which incorporates healthcare policy for the NHS in Wales), it forms part of a wider strategy covering all Welsh Government (WG) devolved policy areas, driving an integrated innovation agenda across sectors in Wales where the Government has policy responsibility.

Within the Welsh Government, the Health and Social Care and Early Years group (HSCEYG) is responsible for the strategic policy leadership and management of the NHS in Wales and for Social Services. This department is overseen by the Cabinet Secretary for Health, Social Care and Early Years Jeremy Miles MS (Member of Senedd) and supported by the Minister for Mental Health and Wellbeing, Sarah Murphy MS, as elected through the democratic processes of the Welsh Parliament (The Senedd).

HSCEYG sets all aspects of health and social care policy for Wales. The researcher's role is Head of Innovation Strategy and Policy within HSCEYG with a specific focus on NHS Wales, with a responsibility to develop national policy for innovation across NHS Wales organisations. Government policy must be founded on a strong evidence base, aligned to system needs and supporting the appropriate changes in practice. To implement this policy in a meaningful way, that results in healthcare, citizen, social and/or economic value, Government policy must inform practice and the actions of NHS

Wales organisations and their staff on the ground. Any research undertaken to develop a strategy must inform policy, which must in turn inform practice – applied in this case through a robustly developed delivery plan.

This research provides a unique opportunity to lead, coordinate, inform and deliver the Health and Wellbeing mission of the Innovation Strategy for Wales as our main policy platform to drive innovation across our healthcare system.

Considering this changing landscape, the Welsh Government required a new ISW. This study informs, shapes and delivers on a robustly scoped, developed and tested, launch Innovation Strategy for Wales, which is then implemented through an applied Innovation Delivery Plan.

1.3 Wales' Healthcare Innovation Ecosystem

The longstanding regional focus on Life Sciences and Healthcare sectors stretches back to the turn of the century when Cooke (2001a) noted a mini-agglomeration that UK government had also identified as an early-stage cluster (DTI, 2001). More recently, the cluster was recognised in the 'South Wales Crucible' audit of regional knowledge economy strengths (Swansea University, 2018b), though not featuring as strongly in other studies during the intervening period (McKinsey, 2014; SQW, 2014).

This regional cluster exists withing the Welsh Regional Innovation System, with Cooke (2001a) highlighting the opportunity of the National Health Service (NHS) in Wales being a major potential resource. NHS Wales is an integrated health system, with Local Health Boards providing a population-based approach for their area, which differs to the fragmented nature of the US system described by Herzlinger (2006), or even by comparison NHS England. It does however present barriers of substantial regulation, a rigid business model dominated by NHS Wales, (Hwang and Christensen, 2008), public procurement constraints and stringent regulation of patient data and information (Uyarra et al., 2014).

The importance of skills and innovation within health and systems to support innovation has been well-established (Bevan, 2010; Länsisalmi et al., 2006; Parmar et al., 2021) including the role of managers (Bevan, 2010), with focus on senior managers (Birken et al., 2012). However, while significant efforts have been made to develop R&D activity and associated infrastructure, there has been limited focus upon innovation. This is explored in the following section examining the landscape by which innovation policy can support an environment in which innovation across R&D, skills development and socioeconomic value can thrive.

1.4 Research Aim and Objectives of this Study

Given the main research aim "*In the face of the challenges faced by Welsh healthcare organisations in taking a consistent and structured approach to innovation that can lead to increased healthcare value in a peri/post COVID-19 environment, how can Welsh healthcare innovation strategy and policy create the optimal environment, supporting infrastructure and conditions for innovation, as part of a new, portfolio wide Welsh Government innovation strategy*?"

Five overarching research objectives (RO) have been set for this study and are outlined in Table 1 below, alongside their corresponding research chapter and associated research phase. As the study involves research led policy, which is implemented in practice; these ROs align the key stages of this iterative and practically applied innovation policy development work:

Table 1: Research objectives

Research Objective	Description	Alignment with research chapters	Associated Research Phase
RO1	Identify and consider Welsh innovation context; challenges, enablers and barriers, alongside personal experience, to support the development of an Innovation Strategy for Wales (ISW).	Chapters 2, 3, 4	1
RO2	Develop a broad and robust evidence base for healthcare innovation policy, to support the Health and Wellbeing mission of the ISW.	Chapter 4	1
RO3	Review and analyse the evidence to inform the development of the final ISW	Chapter 4	2
RO4	Develop, test and verify the ISW to allow for public launch by Welsh Government Ministers, alongside development of an underpinning Innovation Delivery Plan (IDP).	Chapter 5	3
RO5	Launch and implement a supporting Innovation Delivery plan (IDP), that realises the commitments made in the Health and Wellbeing mission of the ISW, reflecting on progress to end of Year 1 by end March 2025	Chapters 6,7,8	4

1.5 Research Design and Methodological Approach

Considering the complex and dynamic environment in which this research is being conducted, mixed-methodological action research-based approach is deployed to address the overarching Research Objectives outlined in section *1.4 Research Aim and Objectives*.

This includes the iterative development, design and applied implementation of the Health and Wellbeing mission component of the ISW. Learning and knowledge will be drawn from academic literature and be factored into a range of practitioner-government working documents. A range of relevant evidence sources will be developed to produce a conceptual strategy and policy framework to outline areas of priority, barriers and practically applied levers to stimulate the Welsh environment through an underpinning ecosystem that best support and enable innovation.

The framework will draw upon relevant theory, policy, knowledge and technology transfer and innovation management theories through review of relevant literature – see *Chapter 2: literature review*. The ISW will be released and tested as a draft for wider public consultation under statutory Government and Ministerial approval protocols.

At time of writing, existing data will be retrospectively analysed by thematic analysis to surface the key themes, levers, and barriers which should be recognised in a framework to support development of the ISW prior to a consultation period.

New data will be collected throughout the consultation period via range of fora including in-person and virtual interviews, meeting notes, expert focus groups across the life sciences sector through which the researcher has unique access. Stages in the consultation process will represent natural cyclic periods for data collection (via interviews, expert groups, surveys, meeting notes etc) and analysis and reflection prior to iterative modification of the conceptual framework and subsequent ISW for Welsh Government.

Final stages of the research will follow the application and implementation of the ISW by Welsh Government, through a supporting Innovation Delivery Plan. During this process we propose that the framework will be critiqued and reflected upon to surface areas for further consideration and contribution as the theoretical framework and strategy deployed in practise.

1.6 Structure of the thesis

The chapters of the thesis are structured as follows.

Chapter one has described the background and context for this study and the unique position of the researcher to be able to undertake this research.

Chapter two reviews existing literature on innovation and the Welsh policy context for healthcare and life sciences. This further considers current context, knowledge gaps, innovation frameworks and ecosystems and their relevance to this work.

Chapter three outlines the research questions, methodological underpinnings, data collection methods and discusses the use of action research as my chosen research method.

Chapter four details Research Phase 1, which reflects upon researcher experience gained as an innovation practitioner, as Head of Innovation and policy lead for innovation for the HSCEY Group and through a secondment to NHS Wales as an Assistant Director of Innovation, with lead responsibility for innovation for a £1.3bn organisation from 2019 - 2021. The chapter develops and analyses the three key sources of evidence that support ISW content. This evidence is then analysed to produce the key themes and recommendations that are used to create the draft ISW, which is then issued for statutory public consultation.

Chapter five details Research Phase 2, which issues the ISW draft for public consultation and provides a summary of the feedback and analysis of responses. This feedback is used to produce the final version of the ISW, which is then taken through the Government and Ministerial approval processes, which allows the ISW to be publicly announced and launched, with support of the Welsh Government Ministerial Cabinet.

Chapter six details Research Phase 3, where the Innovation Delivery Plan that supports ISW implementation is co-developed, alongside ‘innovation pull’ (NHS Wales) and ‘innovation push’ (Ecosystem delivery partners) actors from the sector, which will implement the recommendations made in the ISW.

Chapter seven details Research Phase 4, where 18 months are spent implementing the ISW and IDP, putting in place a range of national infrastructure and projects to support innovation. Progress is then reported on in March 2025, evidencing progress and impact at Government and Ministerial levels.

Chapter *eight* discusses the contributions of the research to the knowledge base and the practice of innovation management, summarises the key findings, discusses the limitations of the research study and sets out areas for potential future work.

A separate Appendices document is presented alongside this research. The nature of this research, as part of the Swansea University Innovation and Transformation Intensive Learning Academy, is highly applied – using literature, experience, evidence to create research that informs policy, which subsequently informs and directs both national and local healthcare innovation practice. As such, the *Appendices* document contains the summary of broad range of supporting practitioner papers, reports to senior Government and NHS Wales decision making groups, Ministerial statements, speeches, publicly issued strategies and plans, policy documents, interviews, conference papers and publications created during the four phases of this action research. Many of these *Appendices* section documents are presented at the highest decision-making levels of both the Welsh Government and NHS Wales.

The *Appendices* documents are included as evidence to tell the evolving story of the research, externally validating the work undertaken in support of answering the research objectives, during what was a highly iterative development process for the ISW and its subsequent implementation through the IDP. To include all the documents would far exceed 40,000 words, so the table on Page 3 summarises what was a highly iterative action research development process for the ISW and its subsequent implementation through the IDP, with accompanying screenshots of each paper.

Several Ministerial speeches and statements were also produced during the ISW and IDP development and implementation process. These are included in the *Appendices* as additional validation of this work, which was overseen and approved at Ministerial Cabinet level, during the Years 1 - 4 of the Sixth Senedd term of the Welsh Government, from 2021 – 2025.

1.7 Chapter Summary

Producing a new and relevant, cross portfolio Innovation Strategy for Wales was a Labour Government manifesto commitment following their election to govern Wales at the beginning of the Sixth Senedd term of Welsh Government in 2021. An innovation Strategy for Wales would replace the previous business focused strategy, *Innovation Wales,* produced in 2014, recognising the significantly different policy context for innovation now, in a post Brexit and post COVID-19 environment.

This work recognises the need for a cross-Government portfolio approach to innovation that incorporates all the devolved areas of Welsh policy responsibility, which includes healthcare, education, the economy, and climate and nature.

This research study applies a robust academic methodology to the development of a nationally significant and ministerial cabinet-led strategy, with a range of policy commitments, which is subsequently implemented. This research combines existing academic theory on innovation, with practical application at a national level, with the aim of achieving a range of significant policy and practitioner impacts, resulting in improved healthcare and economic value across the healthcare system in Wales.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction to the Chapter

This chapter presents a comprehensive literature review, structured in two key sections, to explore the theoretical and contextual frameworks surrounding innovation and its application in Wales.

The definitions and conceptualisations of innovation, innovation ecosystems, and healthcare innovation are considered (section 2.2). This begins by examining broad definitions of innovation, innovation within healthcare, the concept of innovation ecosystems which are then applied to healthcare as the primary sector upon which this research is focused. This section also considers innovation process models the extent to which national conditions foster innovation, followed by an exploration of innovation process models and innovation clusters within regional innovation systems. Key literature on ' innovation push' and ' innovation pull' concepts and ecosystem approaches are incorporated to provide a deeper understanding of these dynamics, which are ultimately applied in the discussion chapter and results

The focus is then shifted to the innovation policy context within Wales (section 2.3). The socio-economic performance of Wales, the political landscape and the implications of devolution are discussed, including the policies related to healthcare and life sciences. The role of the Welsh Government (WG) is explored in detail, including its policies on health and life sciences and the broader financial context. This section concludes with an analysis of the evolution of WG policy, examining how political and devolution strategies have shaped the development of health and care innovation policies and ecosystems in Wales. A summary of the chapter and component literature review sections are then provided (section 2.4).

2.2 Definitions of Innovation, Ecosystems and Frameworks

An innovation ecosystem is the nexus ‘where people, culture and technology form the essential building blocks to meet and interact to catalyse creativity, trigger invention and accelerate innovation across scientific and technological disciplines, public and private sectors (government, university, industry and non-governmental knowledge production, utilisation and renewal entities) and in a top-down, policy-driven as well as bottom-up, entrepreneurship-empowered fashion (Carayannis & Campbell, 2009, pp. 202–203).

> “An innovation ecosystem is the evolving set of actors, activities and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors.”
> (Granstrand & Holgersson, 2020, p1).

An innovation ecosystem approach emphasises the importance of building networks based on shared objectives that can serve as a powerful driver of innovation in healthcare, which is crucial in supporting the cultural and activity changes required to activate innovative practices (Wilson, 2021).

2.2.1 Defining Innovation

The definition of Innovation varies throughout policy, academic, practitioner grey and other literature. Throughout history innovation has been conceived, defined, interpreted and understood in different ways. Definitions of innovation vary according to a whole range of national and international publications. Below are a range of definitions of Innovation, considered as seminal in study of innovation, Schumpeter (1934) described innovation being:

- Introduction of a new good or a new quality of the good.
- Introduction of a new method of production.
- Opening of a new market.
- Conquest of a new source of supply.
- Carrying out of the new organisation of an industry.

The above definitions of innovation, considered in the modern paradigm remain valid, with services sitting alongside goods and products. More recent interpretations give greater consideration of innovation purpose. The International organisation for standardisation defines this innovation as: "*a new*

or changed entity realizing or redistributing value" in ISO TC 279 in the standard ISO 56000:2020, on innovation management (ISO, 2020). This reflects prior more detailed descriptions such as that of the Organisation of for Economic Cooperation and Development (OECD 2018), describing "*A new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)*".

The above OECD definition is helpful in describing innovation within a 'unit' rather than organisation. This recognises wider potential contexts for innovation, including in public and third (charity) sectors. Furthermore, and although context-specific and/or subjective, the *differs significantly* requirement provides a threshold that relates to levels from 'incremental' to 'radical' (Dewar and Dutton 1986). However, the OECD and above Schumpeter definitions lack the ISO focus on realising value. The motivation to undertake innovation can be considered at local regional or national levels. Challenging the status-quo involves inherent risk and uncertainty, and it is the potential reward or benefit that supports the endeavour (Schumpeter 1934). Improved productivity and competitiveness benefits resulting from innovation are well-established (Gunday et al. 2011; Hall 2011) as are regional and national level benefits (Cameron 1996; Porter 2000; Nelson & Rosenberg, 2004).

Complexity in the innovation process (see 2.2.6) makes attribution and integration difficult (Tidd 2001), particularly in the modern collaborative innovation paradigm, involving numerous stakeholders and phases of activity. The varied definitions of innovation outlined above illustrate the complexity and evolution of how innovation is understood across different contexts. While historical interpretations such as Schumpeter's foundational models focus on product, process, and market changes, more contemporary perspectives, such as those from the ISO and OECD, emphasize the realization and redistribution of value. These definitions underscore the multifaceted nature of innovation, which can be seen not only in the private sector but also in public and third-sector organisations.

2.2.2 Healthcare Innovation

Many countries and regions, including Wales, are experiencing demographic change of ageing populations and proportionally less workforce availability, combined with economic pressures (See Part 1). The unsustainability this presents for healthcare systems draws interest to innovation. However, both life sciences and healthcare innovation present a strictly regulated and complex innovation context (Cooksey, 2006). Despite the challenges, growing demand for innovation to address needs around the

world, present a major opportunity for the industry, with nations and regions keen to harness benefits for their citizens in terms of health and economically.

Healthcare innovation has been specifically noted as an important opportunity to help address the challenges faced in Wales, in the Parliamentary Review of Health and Social Care in Wales (PRHSCW, 2018). The review identified technological change as a driver to underpin a new model of service provision, with *A Healthier Wales* (Welsh Government, 2018) offering the subsequent policy response. The accompanying action plan then offered a National Transformation Programme proposing 'internal goals' of harnessing new tools and establishing a broader capacity for change.

The connection between health and wealth realised through innovation, is noted by Gulbranson and Audretch (2008) and Swift (2011). Academically, a range of various strategies and frameworks have been identified to promote innovation in healthcare, including the use of networking and collaboration among stakeholders (Fleuren et al., 2004), the identification of human, organisational, and technology-fit factors (Yusof et al., 2008), and the application of the NASSS (Non-adoption, Abandonment, Scale-up Spread and Sustainability) framework to analyse the role of complexity in technology programs (Greenhalgh et al., 2017). To address these challenges, WG has attempted changes and sustained effort to support an environment and ecosystem which is receptive to adapt and adopt successful innovations in healthcare.

The pursuit of innovation in healthcare at the national level has been a longstanding goal (Mossialos et al., 2018, Flessa & Huebner, 2018), with key stakeholders constantly facing challenges in overcoming the inertia and complexity of existing structures (Greenhalgh et al., 2017), limited opportunities for experimentation (Fleuren et al., 2004), and difficulties in disseminating successful ideas (Malcarney et al., 2017, Yusof et al., 2008).

Effective management, improvement and innovation are key components of successful organisations in healthcare. However, gaps between evidence and decision-making can occur at all levels of healthcare, making effective decision-making difficult. To address this issue, knowledge translation through a framework provides a strategic approach to promote the application of research and facilitate the process of decision-making, particularly for policymakers (Straus et al., 2009). An ecosystem approach which emphasizes the importance of building networks based on shared objectives can serve as a powerful driver of innovation in healthcare and the wider community in sustaining and developing innovation and providing better health outcomes (Sommers et al., 2018; Wilson, 2021).

Christensen et al (2009) state in their seminal healthcare innovation Harvard publication '*The Innovators Prescription'* that three key factors; technological enablers, business models, and value networks support and drive disruptive innovation in healthcare.

When examining the definitions of healthcare innovation, we can compare the NHS Wales and NHS England definitions. The 2021 NHS Wales planning framework defined innovation as:

> "[*Innovation means] a purposeful approach to finding and applying new and better ways of delivering health and care services. It follows research - translating new knowledge into better practice - and improvement, to exploit the value of new products, processes, and technologies. Some innovation will come from our own invention and application, but more will come from identifying good practice from elsewhere, if adopted at pace and at scale. Working with others, particularly universities and industry, must be a key part of our approach to innovation. It should be a distinguishing character of University Health Boards and will be a key part of how the NHS in Wales will contribute to the wellbeing of future generations*."
>
> *(Welsh Government, 2021)*

Whereas NHS England, in their seminal 2011 document 'Innovation Health and Wealth', define innovation as:

> "*[Innovation is] an idea, service or product, new to the NHS or applied in a way that is new to the NHS, which significantly improves the quality of health and care wherever it is applied*"
>
> *(NHS England, 2011)*

The term healthcare innovation is however a broad one, meaning different things to different people. Innovation can be presented as a 'spectrum of activity' in Figure 1 below, which sets out the range of health activity that is collectively referred to under the banner of healthcare innovation.

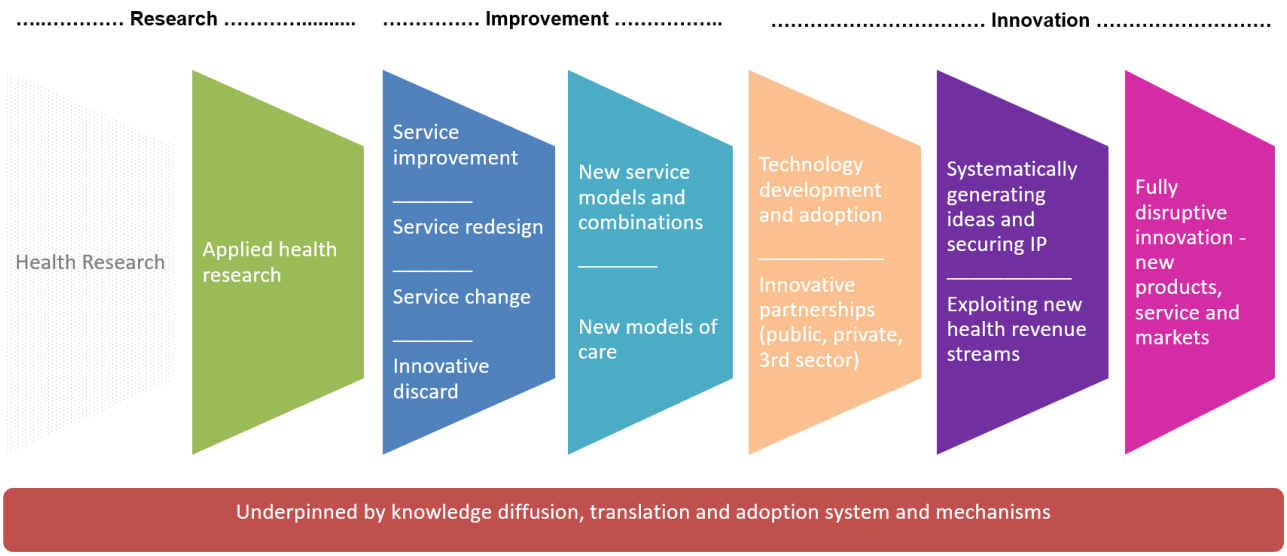

Figure 1: The healthcare innovation spectrum. Source: Author's own.

The Welsh Government has made significant investment in the innovation landscape to achieve the goals outlined in A Healthier Wales (Welsh Government, 2018). This includes a specific commitment in A Healthier Wales to create a network of Regional Innovation Coordination (RIC) Hubs in each of the 7 Regional Partnership Board areas of Wales and a specific commitment to establish the four Intensive Learning Academies Wales. In addition, ongoing investment has been made through the Innovation, Technology and Partnerships programme in the Contracts for Innovation (formerly Small Business Research Initiative Wales), Bevan Commission, Accelerate, AgorIP [now Agor Innovation] and the Life Sciences Hub Wales programmes.

Local Health Boards have also invested in employing Innovation teams, Innovation lead members of staff and a range of innovation projects. The innovation landscape is crucial in supporting the necessary cultural and activity changes required to activate essential innovative practices (Wilson, 2021). The innovation leads for every NHS Wales organisation have also organised themselves as a group, meeting fortnightly since 2021, supported by targeted WG funding.

2.2.3 Clustering and Regional Innovation Systems

Cluster theory, particularly since the concept was pioneered by Porter (1998), has drawn significant interest from policy makers (DTI, 2001; European Commission, 2010; BEIS, 2017) with the attraction of potential for sustained high value employment (McKinsey, 2014), productivity, firm growth (Delgado et al., 2010; Porter, 2000), and increased innovation (Baptista and Swann, 1998).

There has been longstanding debate regarding government ability to 'programme' cluster development (Chiaroni and Chiesa, 2006; Menzel and Fornahl, 2009; Porter, 2000), while the

effectiveness of programmed cluster development is challenged (Brakman & van Marrewijk, 2013; Swords, 2013), with efforts required to provide deeper understanding of the concept (Ketels, 2013). Embedded in much of this discussion is the role of universities as sources of knowledge and skills, particularly regarding knowledge-based technology-focused sectors (Cooke, 2001a; McKinsey, 2014; Porter, 2000). The cluster concept aligns with the Innovation Systems concept introduced by Lundvall (1992) and Nelson (1993) and developed at a regional level (RIS) by researchers including specifically in the context of Wales (Cooke, 2001b; Heidenreich et al., 1998).

A 'nascent' life sciences cluster of biotechnology companies was identified by UK Government in 2001 across Cardiff and Swansea (DTI, 2001). Subsequently described by Cooke (2001b) as 'mini agglomerations', these had a focus on medical devices, and their subsequent development has been described by Davies et al. (2018). The cluster exists within the wider Welsh life sciences sector employing roughly 10,000 people and contributing ~£2bn GVA to the economy. However, this linear perspective reflects that historically drawn from other innovation contexts, such as technology transfer from academia. While the activity exists in a much broader context of University-Industry Interaction as described by D'Este and Patel (2007), it provides a mechanism to consider innovation from idea/discovery through to 'commercialisation'.

Consideration of Wales's Health and Life Science sectors through RIS, leads to the more recent concept of Smart Specialisation (Foray et al., 2009). However, as noted in the previous section, it is the private sector that is perhaps more engaged in "an entrepreneurial process of discovery" although their interest in continued digitalisation and pursuit of Artificial Intelligence offers a development space for such "General Purpose Technology". This reflects an approach which Henderson (2000) described as a long-standing 'experimental' approach in Wales to economic development, aligned to the more recent interventionist WG. Building on identified industrial and wider regional strengths, such as those described by EU Commission, (2017) and SIA (2015) offers a reflection of Smart Specialisation working.

Noting the potential synergy of the cluster existing within the Welsh Regional Innovation System, Cooke (2001b) highlighted the opportunity of the National Health Service (NHS) in Wales being a major potential economic and innovation resource. Unlike the more fragmented health systems such as in the US is described by Herzlinger (2006), where NHS Wales is an integrated system, even by comparison to neighbouring NHS England. Despite this, it does retain significant barriers of substantial regulation, a rigid business model (dominated by NHS) (Hwang and Christensen, 2008), public procurement constraints, and stringent regulation of patient information (Uyara et al., 2014).

The idea of innovation systems has been used routinely in the field of innovation studies, and it is commonly accompanied by various descriptors, such as national innovation systems (Lundvall, 1992) or sectoral innovation systems (Breschi & Malerba, 1997). There has been much debate surrounding the consensus for definition of an 'Innovation Ecosystem' following the publication of a definition by Adner (2006) in a Harvard Business Review article, defining an innovation ecosystem as "the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution" (Adner, 2006).

Efforts have been made by Welsh Government to mobilise academia and industry to support this emphasis on innovation (Welsh Government, 2014; Welsh Assembly Government, 2003), particularly in targeted sectors such as the previous, business focused, innovation strategy published in 2013, *Innovation Wales* (Welsh Government, 2013).

This ambition links with the concept of Territorial Innovation Systems, described initially at a national level by Lundvall (1992) and Nelson (1993), with subsequent consideration at regional level (RIS) (Cooke, 2001b), including specifically the case of Wales. In parallel, it has worked to overcome population health challenges exacerbated recently by the Covid-19 pandemic, including existing and long-standing health inequalities (Brunt et al., 2017).

2.2.4 Innovation Process

As introduced in section 2.1.1 the definition of innovation and associated activities from the OECD (2021) presents a range of measures for consideration at the firm (unit), regional and national levels. Similarly, indices such as the Global Innovation Index from the World Intellectual Property Organisation (involve measurement of inputs, outputs and conditions that relate to a regional or national innovation performance (Dutta et al., 2023). These indices inform policymakers by identifying areas of strength and weakness, as well as providing a basis for academic enquiry (Bate et al., 2023; Crespo & Fernandes, 2016; Sohn et al., 2016). Progressing from inputs through to outputs and their benefits was considered a linear process. A starting point of discovery, either of an idea or market opportunity was considered (Rothwell, 1994). Table 2 below sets out an evolution of different generations of innovation process models.

Table 2: Evolution of Innovation Process Models (du Preez & Louw 2008).

Model:	Generation:	Characteristics:
Technology Push	*First*	Simple linear sequential process, emphasis of R&D and Science.
Market Pull	*Second*	Simple linear sequential process, emphasis on marketing, the market is the source of the new ideas for R&D.
Coupling	*Third*	Recognizing interaction between different elements and feedback loops between them, emphasis on integrating R&D and marketing.
Interactive	*Fourth*	Combination of push and pull models, integration within firm, emphasis on external linkages.
Networked	*Fifth*	Emphasis on knowledge accumulation and external linkages, systems integration and extensive networking.
Open Innovation	*Sixth*	Internal and external ideas as well as internal and external paths to market can be combined to advance the development of new technologies.

Technology transfer was historically considered as unidirectional and linear (D'Este and Patel, 2007), as presented in the model originally described by Siegel et al. (2004), in Figure 2 below.

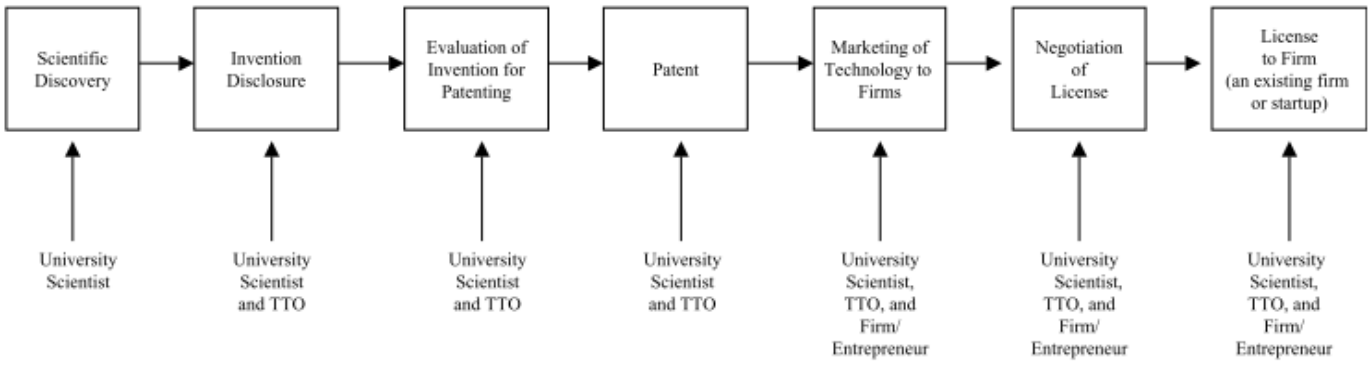

Figure 2: Linear Technology Transfer Process (Siegel et al., 2004).

However, reality reflects a greater level of complexity including multiple potential transfer pathways. For example, activity undertaken outside of formal channels are a limitation of the linear model. This may include broader University-Industry relationships, distinct from Technology Transfer (Perkmann and Walsh 2007), which may be inherently interconnected (Dechenaux et al. 2011). However, both linear and more complex perspectives can reflect Open Innovation (Chesbrough, 2003), recognising how relationships between organisations add a further dimension to sourcing and realisation of opportunities. This has subsequently been reflected in a discussion of a proposed Alternative Technology Transfer Model by Bradley (2013), essentially embracing innovation as a more complex and iterative activity.

Despite the well-noted limitations, linear models remain in use, including within health and life sciences. For example, the 2006 Cooksey review of UK health research funding shows two clear translation gaps, as shown in Figure 3 below.

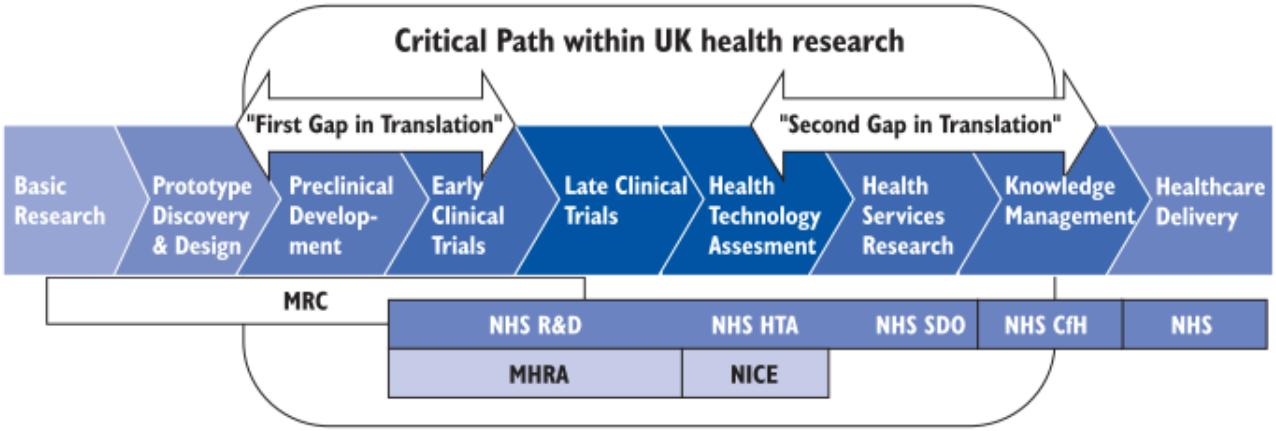

Figure 3: Health Research Translation Pathway (Cooksey, 2006).

The Cooksey review identified two gaps in the translation of biomedical science to healthcare: The first gap arises in the translation of basic and clinical research into ideas and products. The second gap relates to introducing those ideas and products into clinical practice. In layman's terms, the basic principle of the health translation pathway is taking scientific findings from a laboratory setting and translating them as therapeutic patient treatments in a clinical setting – often referred to as the 'bench-to-bedside' process. The implications of this translation gap are wasted time, effort and money. If applied to drug discovery for example, this can mean 9/10 of new drugs fail at the pre-clinical stage.

The US National Centre for Advancing Translational Sciences (NCATS, 2021) suggests seven scientific and operational principles, which can be used to guide researchers and drug developers who are working to improve translatability.

1. Prioritize initiatives the address unmet needs.
2. Produce crosscutting solutions for common and persistent challenges.
3. Emphasize creativity and innovation.
4. Leverage cross-disciplinary team science.
5. Enhance the efficiency and speed of translational research.
6. Utilize boundary-crossing partnerships.
7. Use bold and rigorous research approaches.

More recent models, exhibiting 'coupled' or 'networked' dynamics may present less direct pathways, but still represent a progression from opportunity (market and/or technology) to sought

benefit. Such models reflect the complexity, though as noted by du Preez and Louw (2008), still reflect this journey of opportunities from concept to reality.

2.2.5 Technology Readiness Levels

Technology readiness levels (TRLs) are a method for estimating the maturity of technologies during the acquisition phase of a programme. TRLs enable consistent and uniform discussions of technical maturity across different types of technology. TRL is determined during a technology readiness assessment (TRA) that examines programme concepts, technology requirements, and demonstrated technology capabilities. TRLs are based on a scale from 1 to 9 with 9 being the most mature technology and are described in Figure 4 below.

Figure 4: Technology Readiness Levels (TWI Global, 2023).

2.2.6 TRL origins and application

TRLs are a methodology for understanding the technical maturity of a technology during its development and acquisition phases. TRLs allow practitioners to have a consistent point of reference for understanding technology inception, development and application, regardless of their technical background. TRLs are designated through Technology Readiness Assessments (TRA), which examines the technology's concepts, requirements, and capabilities. The TRL concept was developed by NASA during the 1970s and the US Department of Defence has used the scale for procurement since the early 2000s. The European Commission advised that EU-funded research and innovation projects should adopt the TRL scale in 2010, previously used in the European Union Horizon 2020 Research and Innovation funding programme. In 2013, the TRL scale was also further adopted internationally by the International Organization for Standardization (ISO) with the publication of their ISO 16290:2013 standard.

2.2.7 ISO56001 – International Standard on Innovation Management systems

The development of ISO 56001 as the International Standard on Innovation Management systems (International Standards Organisation, September 2024) marks an important milestone in formalising evidence-based standardization of terminology, tools and methods and interactions between relevant parties to enable innovation. The IS056001 standard provides requirements and guidance for establishing, implementing, maintaining, and improving an innovation management system. This standard aims to enhance an organisation's ability to innovate consistently and successfully. It applies to all types of organizations regardless of type, size, or the products and services they provide, offering a systematic approach to fostering and managing innovation. Applying the ISO56001 standard within a healthcare context is important in building evidence-based foundation for innovation infrastructure and to support accredited innovation training and capability development for the wider workforce.

2.2.8 Demand (need) pull vs discovery (technology or innovation) push models

In the 1960s and 1970s, academics and practitioners from a range of fields began considering innovation from a demand rather than a supply perspective, arguing that the most critical in innovation is need pull forces (opportunities based or 'pulled' from market or organisational needs) rather than by push or supply forces (opportunities pushing forward from scientific or technological discoveries). Mowery and Rosenberg (1979) stated that demand-pull and technology-push are necessary, but not

sufficient, as for innovation to result; both must exist simultaneously.

Benoit Godin's paper on the Intellectual History of Innovation (Working Paper No. 13, Godin, 2013) discusses the two separate models, the name of which came from the seminal paper *Wealth from Knowledge* by researchers from the University of Manchester, which discussed the two opposite hypotheses: the linear or "discovery-push" model, and the "need-pull" model (Langrish et al., 1972: 72-73).

In 1982, researchers at the Science Policy Research Unit in Sussex University developed a diagram comparing the two "models" and is shown below in Figure 5. (Freeman, 1982; Freeman et al. 1982; Rothwell and Zegveld, 1985; Coombs et al., 1987; Freeman, 1996)

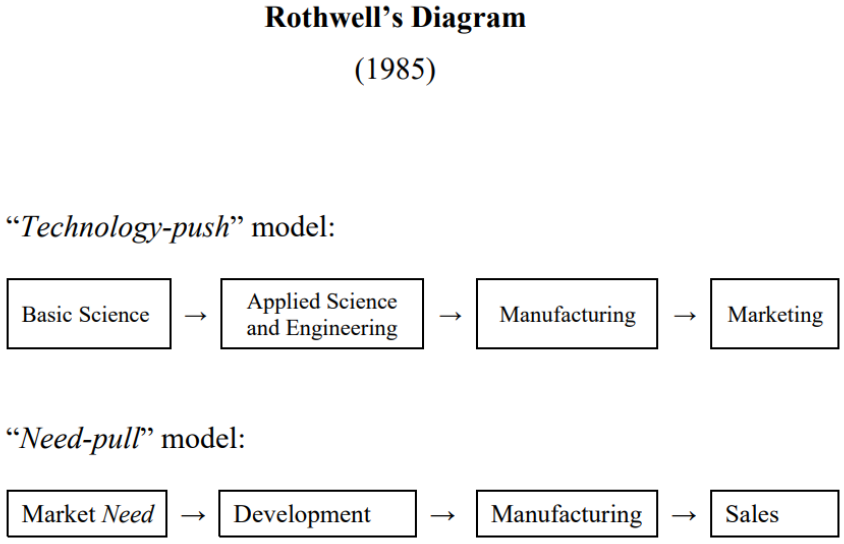

Figure 5: Rothwell's Technology push and Need pull comparison (Rothwell, 1985)

The concept of 'technology push' and 'demand / need pull' are discussed and applied to a healthcare context further on in this research, where technology push is replaced with 'innovation push' and demand / need pull is replaced with 'innovation pull'.

2.2.9 Innovation Push and Innovation Pull

The models describing 'innovation push' and 'innovation pull' dynamics between organisations have been studied for decades (Godin & Lane, 2013). But more recent studies explore the dynamics of innovation push and innovation pull in the context of innovation ecosystems. These studies provide insight into the specific features of an innovation ecosystem, such as the diversity of actors, the

type of collaborations and relationships between those actors and how the actors integrate with the ecosystem across the innovation 'pull–push' nexus (Boyer & Kokosy, 2022).

Contemporary research on innovation ecosystems explores the dynamics of innovation / demand-pull (i.e., identifying customers' most pressing problems and then figuring out how the company's technological innovation solution can solve them) and innovation / technology-push' (i.e., developing technological innovations and then identifying a market or customer), (Pisano, 2015). Such research focuses on features such as the diversity of actors, the type of collaborations and relationships between those actors and how they integrate with the ecosystem across the innovation demand-pull nexus (Boyer & Kokosy, 2022).

The demand-pull nexus is an important principle guiding government decisions, as policy can stimulate investment in technologies through the creation of new or enlarged markets for them (Nemet, 2009). Effective policymaking, however, requires an understanding of how technology-push and demand-pull interact and differ by impact (Hötte, 2023) which is an important concept of this research study.

2.3 Wales Innovation Policy Context

2.3.1 Socio-economic Performance

Wales has a population of approximately 3.1 million people, across rural areas such as North Wales, though mainly concentrated in urban conurbations such as Cardiff, Newport, Swansea and Neath Port Talbot in Southeast and Southwest Wales. Though with notable communities spreading westwards into the more rural counties of Carmarthenshire and Pembrokeshire.

The current socio-economic situation in Wales is much the result of its history, particularly since the Industrial Revolution. Wales literally powered the industrial revolution (Mathias, 2013), however the 1920s saw the onset of decline within the coal and steel sectors that by the 1970s/80s were significantly reduced (Morgan, 2001).

Prior to devolution, economic policy relating to Wales had been directed by UK Government in Westminster. Welsh Gross Domestic Product had been following the broader UK performance since the 1970s, though lagging more 'productive' regions such as the Southeast of England. Such variation also featured across Wales, with economic activity concentrated in its own southeast (Morgan, 2006). In response, UK Government established the Welsh Development Agency (WDA) in 1976 (UK Gov,

1975). During the 1980s to mid-90s Wales had significant success in attracting overseas manufacturing inward investment, notably from the US and Japan (Heidenreich et al., 1998). Wales secured over two thousand inward-investment projects between 1983-2000 (Salvador & Harding, 2006), with the ~5% UK population benefitting from 15-20% of UK inward-investment (Cooke et al., 2004). However, Wales has since lost much of this investment and employment to 'cheaper' destinations around the world (Chen, 1996), reflecting a lack of 'embeddedness' of such activities.

Wales has over recent decades been undergoing the transition to a post-industrial knowledge economy. Efforts have been made by Welsh Government to mobilise academia and industry to support this transition with emphasis on innovation (see following section), (Welsh Government, 2014; Welsh Assembly Government, 2003), particularly in targeted high-technology and growth sectors (Welsh Government, 2013). In parallel, it has worked to overcome population health challenges exacerbated recently by the Covid-19 pandemic, including existing engrained health inequalities (Brunt et al., 2017).

Over recent years, growing global knowledge-based sectors have been targeted as an opportunity to harness regional strengths (Welsh Assembly Government, 2004; Welsh Government, 2013).

Between 2007 and 2020, Wales registered the largest drawdown of European Structural and Investment Funds (ESIF) per capita across all regions of the UK, see Figure 6 below. During this period Wales relied of EU funds to invest in cutting-edge research and development projects in a wide range of areas, including health and medicine, renewable energy, advanced manufacturing, and digital technology. This financial support played a crucial role in enabling Welsh researchers, entrepreneurs, and businesses to develop new products and services, create jobs, and drive economic growth.

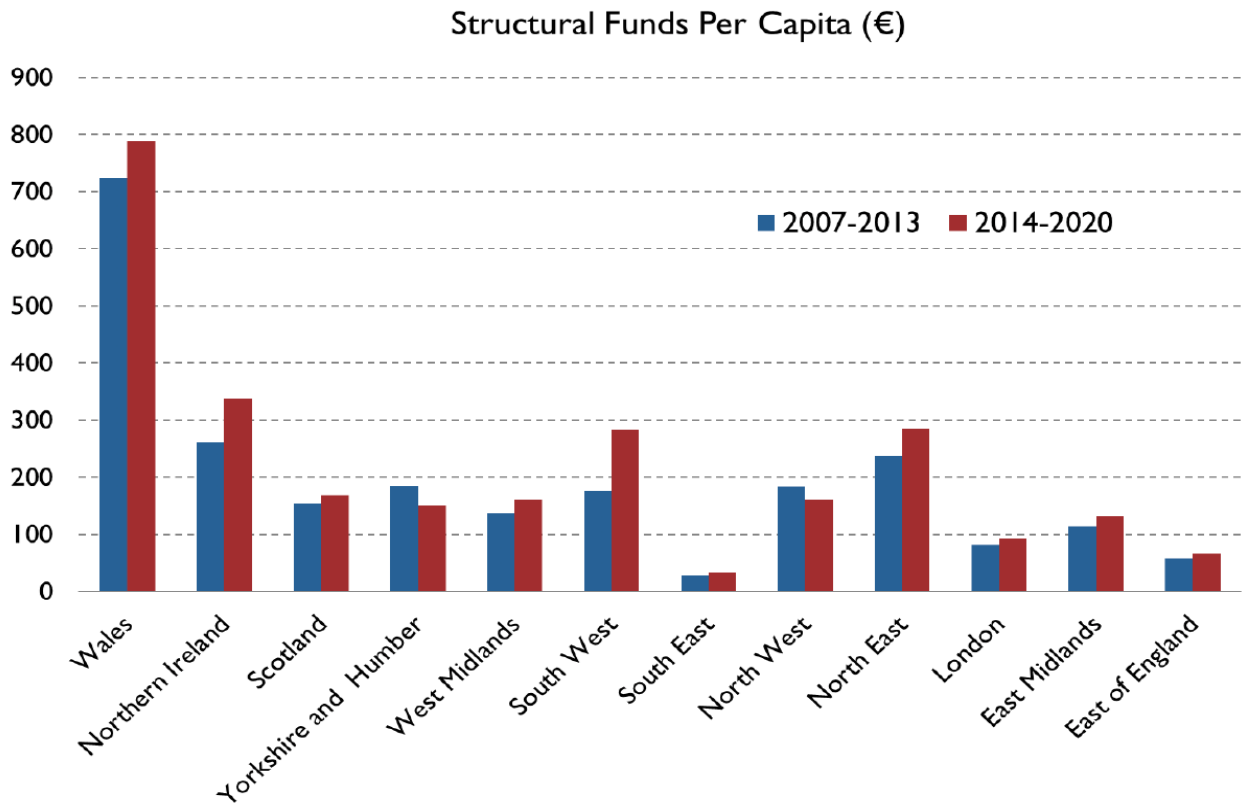

Figure 6: Drawdown of EU Structural Funds per Capita

Source: Welsh Government, Economy Innovation team.

Moreover, Wales has received amongst the lowest proportion of total Innovate UK funding since 2010, as outlined in Table 3 below (Welsh Government, 2023a). Wales received approximately 2.8% (£363,078,634) of total Innovate UK funding in comparison with 1.3% (£171,818,512) for Northern Ireland, 7% (£906,015,297) for Scotland and 88.6% (£11,485,468,383) in England. A historical perspective of Innovative UK funding since 2004 - 2023 can be found on the UKRI website (UKRI, 2025).

Table 3: Total Innovate UK funding, split by nation - 2010 to 2023.

Region	*£ as a % of UK Total*	*No of projects as a % of UK total*
England	£11,485,468,383 - 88.6%	38,539 - 86.4%
Wales	£363,078,634 - 2.8%	1,479 - 3.3%
Scotland	£906,015,297 - 7%	3,388 - 7.6%
Northern Ireland	£171,818,512 - 1.3%	762 - 1.7%
Outside UK	£41,121,794 - 0.3%	389 - 0.9%

Total	£12,967,502,619	44,560

Sourced from Welsh Government, Economy Innovation team

In 2020, the United Kingdom officially left the European Union. Since then, the UK and Welsh Governments have acknowledged the growing demands placed on NHS organizations. To address these challenges, both governments have released strategy publications such as A Healthier Wales and the updated UK Government's Life Sciences Industry Strategy (UK Government, 2021; Welsh Government, 2018). These policies support the close alignment of innovation actors across the NHS and the wider life sciences sector. To further promote innovation and advance the healthcare industry, an Innovation Strategy and Implementation Action Plan is being developed. Welsh Government intends to enhance collaboration between industry and healthcare providers, stimulate investment in healthcare innovation, and accelerate the adoption of innovative technologies in the NHS (Welsh Government, 2018).

The decline of ESIF to support RD&I across all sectors has necessitated the development of a new Health and Wellbeing chapter of the ISW to meet challenges and demands posed by rising public expectations, demographic and epidemiology changes, limitations of workforce capacity for education and training, and healthcare system performance. Figure 6 illustrates the extent of the problem, as Wales and the rest of the UK no longer have access to those funds. This leaves Wales in a precarious position going forward with the prospect of a substantial decrease in funding.

Wales is now in a new era post Brexit, where ESIF funds are no longer available, so brings greater focus for the Welsh Government's ISW to be responsive to the needs of the population and consider alignment with the UK Government's plans for the UK Shared Prosperity Fund (UKSPF). It is the UKSPF which aims to replace the European Regional Development Fund (ERDF) and European Social Fund (ESF) (UK Government, 2023). The UKSPF represents a cut in the overall funding equating to approximately £10 million shortfall per year for Wales, representing £450,000 per local authority. These challenging circumstances coincide with a period of managing a path towards recovery from the COVID-19 pandemic (Welsh Government, 2021c). Both UK and Welsh Government strategies (UK Government 2021 & Welsh Government, 2018a) support greater collaboration between health and social care, industry, academia and the third sector to deliver greater impact and value (Davies et al., 2021) by developing, sharing and adopting innovative practice, leadership and skills development and supporting new technology development (Welsh Government, 2018a).

The Welsh health and social care innovation ecosystem has previously drawn significantly from ERDF and Welsh Government supported life sciences sector innovation accelerators, such as Accelerate and AGOR-IP. It has also provided both collaborative platforms for managing life sciences sector

innovation in Wales and relationship brokerage of key public and private sector ecosystem stakeholders locally, nationally, and internationally (Donne et al., 2021). In an era of receding EU funds, Welsh Government faces the challenge of replacing the EU funding environment in Wales, to continue to stimulate job creation, skills and training provision, Research & Development, Innovation and commercialisation activities.

2.3.2 Political Context and devolution

Wales, as part of the United Kingdom has historically had its affairs managed by UK Government in Westminster. A referendum held in 1997 resulted in a devolution of a range of policy responsibilities and formation of the Senedd (now Welsh Parliament) and Welsh Assembly Government (now Welsh Government or WG) in 1999.

Devolved powers, including wider primary legislation were extended in 2011. WG has responsibility for making decisions, policies and law for health and social services, alongside several other policy areas which include health and social care, education, the environment and the economy (Welsh Government, 2018).

As noted in the prior section, the economic performance of Wales has lagged the UK, as it has struggled to transition from an economy dominated by coal and steel industries which have been in decline for over a century. Therefore, WG received a challenging inheritance, coupled with ongoing global competition exacerbated by recent difficulties from Brexit and the Covid-19 pandemic. WG actions in response to this have involved a range of strategies and actions plans (Welsh Assembly Government, 2005; 2001; Welsh Government, 2013), with a vibrant policy debate amongst political and academic observers (Bailey & Budd, 2017; Bristow 2001; Pike et al., 2012; Sensier & Artis, 2014). Cooke & Clifton (2005) provided discussion of how Wales's early years of devolution, as presenting precautionary behaviour, lacking the bolder ambitions of their Scottish counterparts. Subsequent actions, including nationalisation of transport infrastructure and investment funds suggest some shift towards a bolder more interventionist approach (Williams 2022). In terms of economy, devolution has not been accompanied by improved economic performance (Pike et al., 2012), however it is argued that its impact has been more in relation to social model and justice (Williams, 2022).

2.3.3 Healthcare policy and financial context

The UK's National Health Service (NHS) is the dominant player in healthcare delivery, offering service free at the point of care as a cornerstone of both societal and political offers. It has been recognised as offering best in class quality across a range of international delivery measures including care processes, equity and overall performance (Schneider et al., 2017).

Healthcare is delivered by the NHS in Wales, receiving Welsh Government block funding of c. £9,233m in 23/24 (Stats Wales, 2024) for seven local health boards (which provide population health services for their seven geographical areas of Wales) and three all Wales NHS trusts. NHS Wales delivers services though health boards and trusts, based on geographic and national services respectively.

The policy to drive healthcare innovation is set by HSCEYG and is aligned to other innovation teams and other policy areas across Welsh Government, which includes a separate policy team managing a Social Care Innovation Programme through Social Care Wales as part of Ymlaen, their 2024-2029 Research and Innovation Strategy (Social Care Wales, 2024).

The Healthcare sector is significant across Wales, with NHS Wales the largest employer in Wales through Local Health Boards and National Health Trusts (i.e. the major parts of the NHS systems). Welsh statistics show that Wales employ approximately 97,000 staff (Stats Wales, 2023) across the entire NHS in Wales. NHS Wales organisations comprise of Aneurin Bevan University Health Board (ABUHB), Betsi Cadwaladr University Health Board (BCUHB), Cardiff and Vale University Health Board (CVUHB), Cwm Taf Morgannwg University Health Board (CTMUHB), Hywel Dda University Health Board (HDUHB), Swansea Bay University Health Board (SBUHB) and Powys Teaching Health Board (PTHB). Each health board is divided by distinct geographical boundaries, as shown in Figure 7 below.

Three National Health Service Trusts include Public Health Wales (PHW), the Welsh Ambulance Service University National Health Service Trust (WASUNHT) and Velindre University National Health Service Trust.

In addition, two new special health authorities have been established in recent years to carry out national digital architecture and education/improvement functions on behalf of NHS Wales, Digital Health and Care Wales (DHCW) and Health Education Improvement Wales (HEIW).

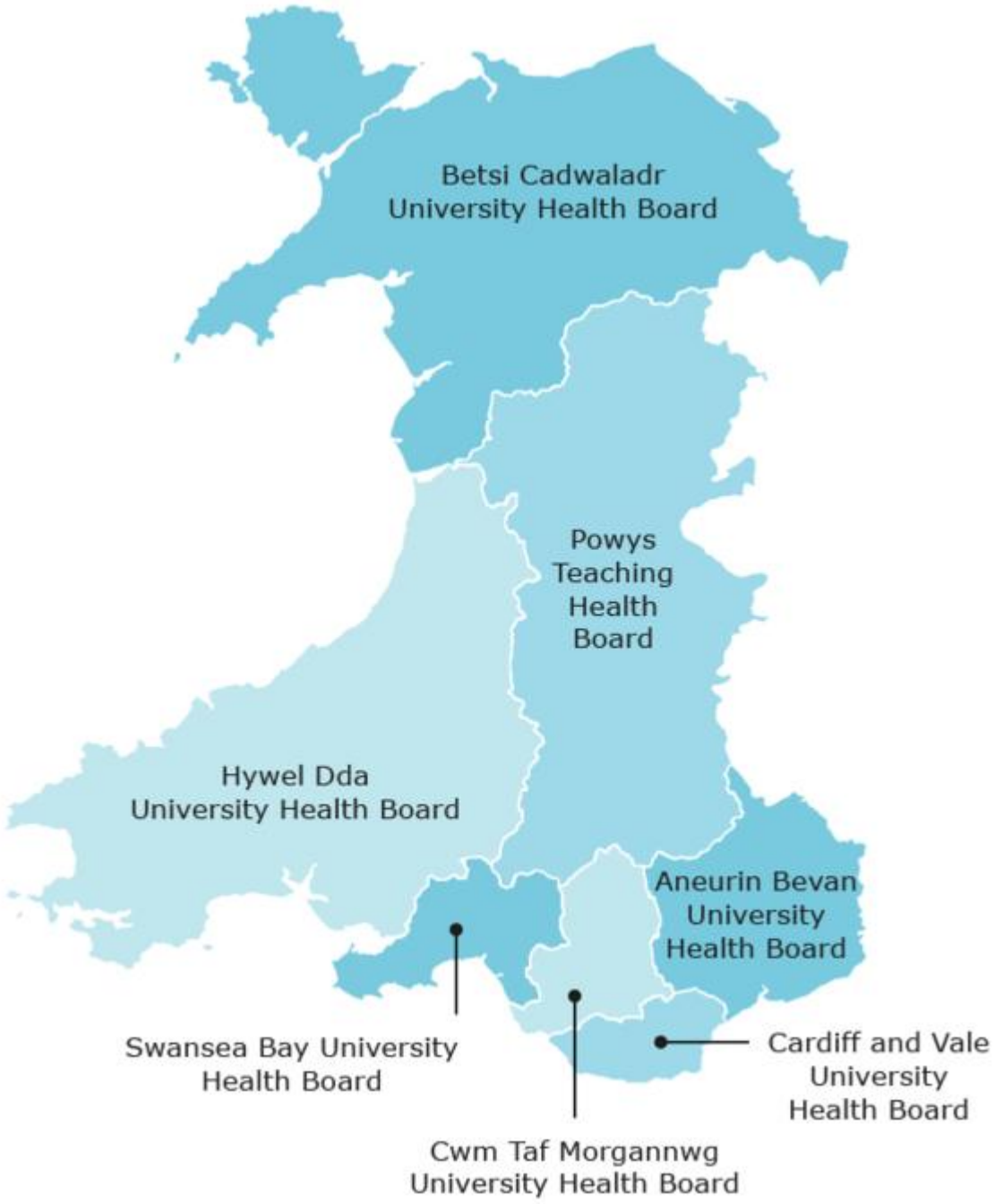

Figure 7: Geographical map of Local Health Boards in Wales

However, NHS Wales performance in Wales has been adversely affected over the last decade, through a range of factors such as a legacy of deindustrialisation, an ageing population and austerity imposed from the Conservative Party and UK-government funding settlements between 2010 and 2024. In addition, the Covid-19 pandemic costs and disruption have severely increased waiting lists, further exacerbating service pressures. Healthcare, being the largest area of WG expenditure, faces ongoing

challenges as the growing needs, expectations and health complications of the Welsh population continue to increase.

However, healthcare, delivered through the NHS is a significant employer and economic actor. Table 4 below presents both direct and induced impacts for the system, together with my former employer; Aneurin Bevan University Health Board, used for context. Type 1 multipliers include the impact on production of a change in final use (direct impact) and the supply chain impacts stemming from the initial change in final use (indirect impact), (Source ONS, 2025). Type 2 effects and multipliers include direct, indirect and induced impacts. Induced impacts cover changes to households' spending from employment changes linked to a change in final use. (Source ONS, 2025)

Table 4: NHS Wales budget and staff, with Expenditure and Employment Multipliers applied Source: Chief Statistician, WG.

	Multiplier – Expenditure		**Multiplier - Employment**	
THEME	Type I	Type II	Type I	Type II
NHS Wales expenditure **£9.233 Billion** (Welsh Government, 2023b)	Multiplier x 1.41= **£13.01B impact**	Multiplier x 1.68 = **£15.51B impact**		
ABUHB annual budget **£1.7 Billion** (ABUHB, 2024)	x 1.41 = £2.397 B **impact**	x 1.68 = £2.856 B **impact**		
NHS Wales Employment **31st December 2023 – 97,000** (Stats Wales, 2023)			Multiplier x1.35 = **130,950 jobs supported**	Multiplier x1.57 = **152,290 jobs supported**
ABUHB employment **End March 2024 – 13082 FTE** **Source – ABUHB Annual Accounts 2023/24** (ABUHB, 2024)			x1.35 = **17,660 jobs supported**	X1.57 = **20538 jobs supported**

NHS Wales is also inclusive of three all Wales NHS trusts; Public Health Wales (PHW), Velindre University NHS Trust, and the Welsh Ambulance Services University NHS Trust (WASUHT) (NHS Wales, 2019). WASTUHT was the most recent NHS Wales organisation to achieve University Health Trust status in 2024, in a process overseen by the researcher. University Health Board and Trust criteria are set by Welsh Government (Welsh Government, 2021) 'University' status for Health Boards and Trusts, relates to activity against the three criteria of 'Research and Development', 'Teaching and Education' and 'Innovation'. The innovation criteria states that innovation activity should be applied beyond the training and education and research and development activity undertaken within the organisation, to include managing an active portfolio of innovation activity, managing innovation assets including data and intellectual property, realising value through joint working or commercialisation and developing innovation leadership, skills, and support mechanisms.

2.3.4 Financial conditions for innovation across Wales and the UK

The 2018 Reid Review of Research & Innovation highlighted UK gross domestic expenditure on Research & Innovation (£34.8 billion) as a percentage of GDP UK average of % of R&I spend = 1.69%. The business sector spent £23.7 billion on R&I, accounting for 68% of total (Reid Review, 2018)

The UK spent £527 on R&I per head of population in 2017, with England spending £554, Scotland £466, Northern Ireland £371, and Wales £238.

The Reid Review (2018) also stated Welsh underfunding, demonstrating that Wales share of R&I funding equates to c. 3.2% of total UK R&I funding, despite Wales having 4.9% of population. Historically as a nation we have not drawn down a Barnett formula share of UK R&I funding. Scotland for example draws down 14% of UK funding, based on c.9% of population. However, Research and Innovation funding growth rates in Wales have had the second biggest percentage increase in recent years, second only to London.

2.3.5 Role of Welsh Government policy and interventions

Wales has benefitted from both pan-Wales and regional initiatives to support innovation, both generally and in targeted sectors including Life Sciences and Health with support of devolved Welsh Government Innovation Strategy (Welsh Government, 2018b). An historic summary of a range of initiatives is included in A sub-regional innovation ecosystem? Life sciences and health in the Swansea Bay City Region (*International Journal of Innovation and Regional Development* Davies et al., (2018) (table 5 below), with many either established by or with support from WG.

Table 5: Wales Life Science & Health cluster-development initiatives, from Davies et al. (2018).

Initiative	Description	Intended Cluster/Ecosystem Contribution
Sector-specific		
Institute of Life Science	Research and innovation infrastructure for academic research and industrial collaboration	To provide research output and collaboration facilities, along with incubation/business space.
Bevan Commission	Independent think tank, providing advice and innovation project support on health and care in Wales	To provide advice, interaction, lobbying and learning opportunities across the national sector
MediWales	Independent Membership-based Pan-Wales sector forum / network	To provide interaction, communication, promotion, lobbying and learning opportunities nationally and internationally
Life Sciences Hub Wales	Arms-length WG sponsored body providing innovation support, meeting venues, business support, networking opportunities and events for Health and Life Sciences sectors in Wales	To host Welsh Government life sciences and innovation support and initiatives. To provide learning and interaction opportunities through events
Arthurian Fund	Welsh Government co-investment fund to attract venture capital for support of indigenous firms and inward investment in the Life Sciences sector	To provide co-investment for major opportunities, and create deal-flow/critical mass for investment
Agor Innovation (formerly AgorIP)	Technology transfer initiative to support commercialisation of academic and health system research output	To enhance economic opportunity extracted from other investments into HE and health system
Cross-sector		
Technium	Former pan-Wales network of business innovation/incubation sectors, which now operate independently, supporting companies within Life Sciences, Health and other sectors	To provide facilities, both generic and sector-specific for incubation and inward-investing innovation activities. Specific roles in start-up/spin-out support and local regeneration
SMART / A4B	Welsh Government/EU-supported programmes to support SME/MNE innovation across Technology Readiness Levels. Facilitation of academic-industrial engagement and technology transfer	To deliver innovation projects / programmes within firms / collaboration with academia, and development of absorptive capacity
Knowledge Economy Skills Scholarships	Industry/EU co-sponsored research degrees (MSc. PhD.) programme.	To develop new knowledge and skills, enhancing absorptive capacity within partner firms

Interventions including property initiatives, such as Technium echoed the previous WDA approach of speculative facilities. These efforts enjoyed mixed success and became subject of much policy debate (Abbey et al. 2007; Cooke 2004; Davies et al. 2018; Huggins & Kitagawa, 2012).

However, efforts such as the Arthurian Fun included government involvement in the riskier part of life sciences innovation, investing in individual firms identified as having high-growth potential. This again had mixed fortunes, with some investments proving successful while overall performance was questioned.

Much of this activity has been centred around the Life Sciences Hub Wales (LSHW), which opened in 2014 as an arm's length body of WG and a central coordinating Hub for the life sciences and healthcare sector. LSHW hosted initiatives including the Arthurian Fund (LSHW, 2015) the Digital Health Ecosystem Wales (2016) and the multi-university Accelerate innovation programme (2018). Wholly owned by WG, the role of LSHW was revised to include focus on nurturing opportunities for the Welsh health system (LSHW, 2018).

2.3.6 Health and Life Sciences policy in Wales

The global life sciences and health sector has been noted over several years as a major driver and growth opportunity for UK productivity and export activity (Bell, 2017). It is characterised by the challenge and opportunity of disruptive forces including worldwide demographic change and pressures upon public health systems, including as noted in the Wales context.

In parallel, while the value of sales of pharmaceuticals and medical technology are projected to grow strongly the market structure is evolving with reduced role for blockbuster drugs, a paradigm change in technology such as IoT and AI have been disrupting the sector (Deloitte, 2018; Marjanovic et al. 2020;). In this respect WG have been trying to harness economic and health benefits of this shift, rather than competing within a zero-sum game (Welsh Government, 2018b; Welsh Government 2015). As effectively described by NESTA (Hutton and Schneider, 2008), and explored in the next section, the nature of innovation brings inherent uncertainty and with that imperfect allocation of resources into the unknown. It also presents a question as to how the uncertain returns and benefits of innovation align with the immediate requirements of a challenged health system.

2.3.7 Evolution of WG Policy and Strategy

WG economic development strategy became more sector focused, aimed towards nine key sectors, including Life Sciences, noting particular importance for potential additional health and broader societal benefits;

> "*The Life Sciences sector is an important driver of economic growth and improved wellbeing. It serves large global markets which are growing quickly, driven especially by population growth, changing demographics and increasing expectations from medicine and therapy*"

(Innovation Wales, Welsh Government 2013) p.18

The sector had been a focus in earlier policy, albeit described differently in the Welsh Assembly Government Economic Development Strategy, A Winning Wales (Welsh Assembly Government, 2004a). This referred to 'pharmaceuticals/bio-chemicals' as being important for future economic growth (Welsh Assembly Government, 2005). During the subsequent periods, the sector enjoyed growth in Gross Value Added (GVA) of circa 13% per annum despite the chronic broader economic conditions (table six). Over 80% of sector employment is within medium/large enterprises. However, the Welsh 'ecosystem' also comprises scores of smaller companies and sole traders, many of whom are also globally active. Comparatively, while the Southeast of England accounts for the largest share of the sector there are strengths across the UK, including within Wales a significant proportion of medical technology activity (Table 6). The comparative strength of this sub-sector is highlighted when compared in more detail against other UK regions, see Figure 8 below.

Table 6: Life Sciences Enterprises by Subsector.

Active Enterprises by Priority Sub-Sector - Life Sciences[1,2,3]

	2005	2006	2007	2008	2009	2010	2011	2012	2013	% of 2013 total	Change 2005 - 2013	Change 2012 - 2013
Wales:												
Industrial Biotechnology	35	35	35	40	35	30	25	25	20	7.3%	-38.9%	-12.0%
Medical Biotechnology	95	100	105	150	130	120	120	110	110	40.0%	13.7%	-1.8%
Medical Technology	115	110	110	110	110	110	95	100	100	36.4%	-12.9%	0.0%
Others (inc Pharmaceuticals)	25	25	25	25	30	30	30	40	45	16.4%	80.4%	12.5%
Total Life Sciences	**270**	**270**	**275**	**325**	**305**	**285**	**270**	**275**	**275**	100.0%	**1.6%**	**0.0%**
UK:												
Industrial Biotechnology	460	450	460	435	400	360	335	330	345	5.2%	-25.0%	4.2%
Medical Biotechnology	2,490	2,605	2,690	3,300	3,175	3,090	3,015	2,980	2,955	44.3%	18.7%	-0.8%
Medical Technology	2,405	2,380	2,380	2,180	2,385	2,320	2,300	2,305	2,345	35.2%	-2.6%	1.6%
Others (inc Pharmaceuticals)	540	545	550	490	625	675	755	895	1,020	15.3%	89.3%	13.8%
Total Life Sciences	**5,895**	**5,975**	**6,080**	**6,405**	**6,585**	**6,450**	**6,410**	**6,515**	**6,665**	100.0%	**13.1%**	**2.3%**

Source: Inter-Departmental Business Register, Office for National Statistics

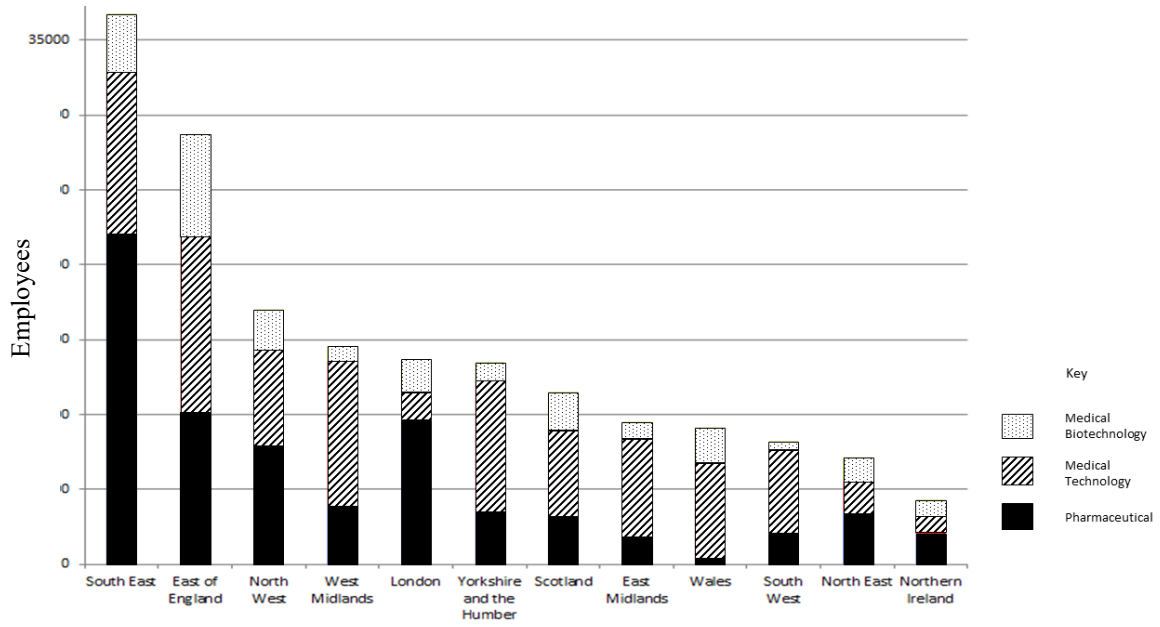

Figure 8: Sub-sector employment by region (Welsh Government, 2014).

This regional breakdown suggests a difference from the originally targeted 'pharmaceuticals/bio-chemicals', and instead a more diverse ecosystem, with greater strength in technology and devices. The geographic breakdown of this activity across Wales also offers insight to the sector, with concentration along the M4 and A55 south and north thoroughfares around the main population centres of Cardiff and Swansea. As detailed in the MediWales 2024 Impact report (2024, MediWales), the Welsh Life Sciences sector is made up of 288 companies who employ over 12,000 employees, with a turnover of £2.62 billion, as illustrated in Figure 9 below.

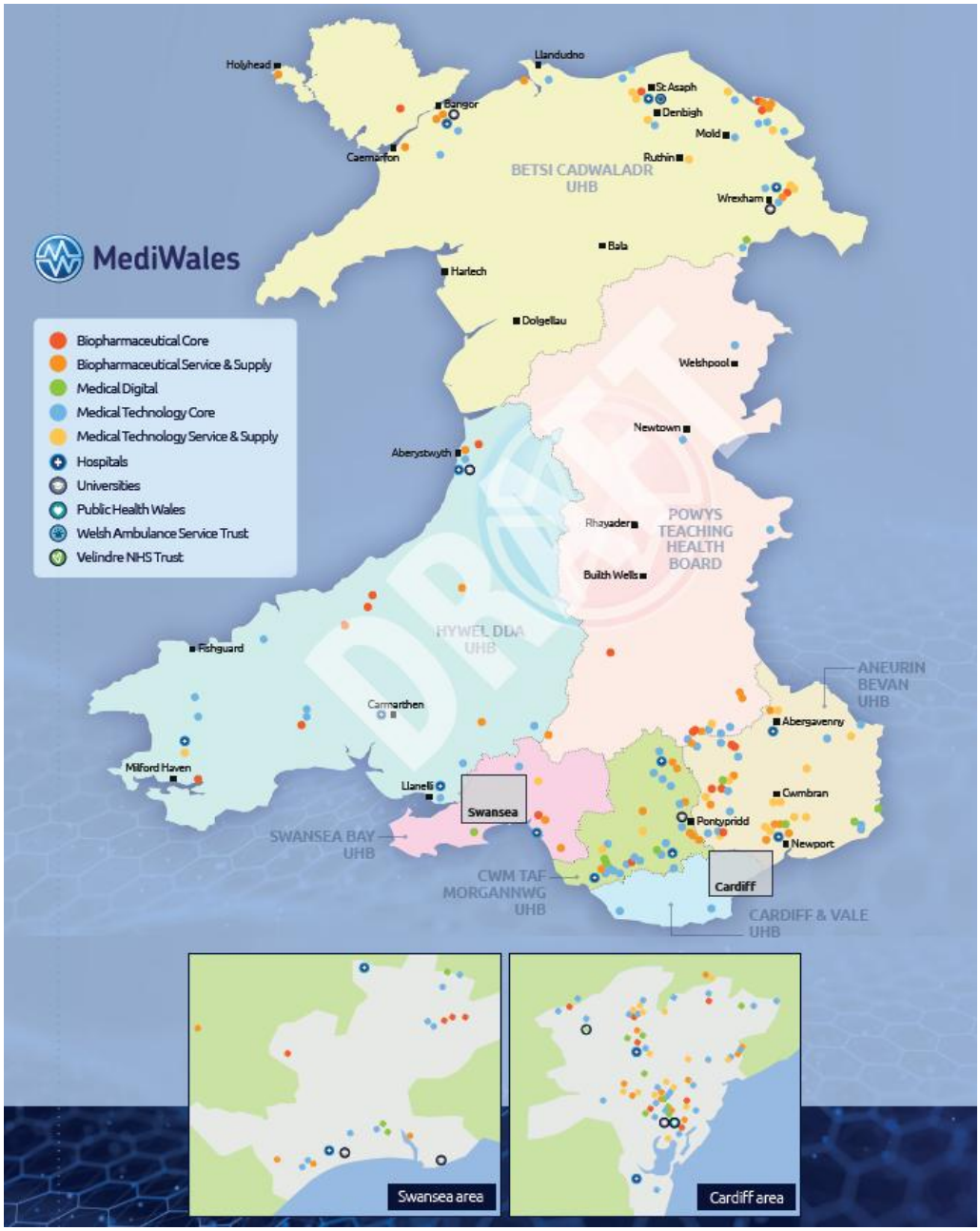

Figure 9: Geographical Distribution of the Welsh Life Science Sector (MediWales, 2024)

2.3.8 Current context

Wales finds itself in the mid-2020s grappling with many of the same challenges it faced at the advent of devolution, though compounded by yet greater international competition, reduced investment potential (both public and private), and chronic issues across the population including weak skills base and poor population health in many areas, alongside an ageing population and its complexities brought by multiple co-morbidities.

Wales, along with many other countries across the world, faces social and economic challenges from both a decade of economic austerity. Considering its widely recognised ability to drive benefits at

an organisational and national level, alongside creating wider societal value, innovation must form a central component of many national recovery packages (OECD, 2012). This has never been more current considering the more recent impacts of the COVID-19 pandemic.

Welsh Government published a business innovation strategy, *Innovation Wales*, in 2014 (Welsh Government, 2014); and although it has been successful in stimulating innovation delivery and support across Wales, the innovation landscape has changed considerably in the past nine years, and this strategy is no longer current. *Innovation Wales* is primarily a business and focused strategy; it predates the Well-being of Future Generations (Welsh Government, 2015) Act and contains no commitments to the Act as part of the legislative framework for Wales. *Innovation Wales* does not also incorporate innovation approaches across other devolved policy areas (e.g. Health and Social Care and Early Years, Education and Climate Change). *Innovation Wales* also predates the UK's exit from the EU and therefore does not consider the loss of European Regional Development Fund (ERDF) (Welsh Government, 2014). Much of the recent support for research and innovation activity is delivered using ERDF, this includes programmes delivered externally to Welsh Government.

Innovation Wales also predates the Covid-19 pandemic and its impact on the Welsh economy and job market, health care in Wales and the viability of research institutions and finally does not take account of the 2021 Programme for Government that followed a new term of Government. Wales is therefore facing a future that is both precarious and full of opportunity, but without a transformational innovation strategy to guide government, businesses and academia (Doneddu et al., 2021). To ensure currency and a more integrated approach to innovation across Welsh government portfolios, Cabinet signed up to develop a new ISW for Wales as part of their government manifesto in early 2021, of which healthcare will occupy a main chapter, as the largest policy and budget area of the devolved responsibility.

2.3.9 The development of a healthcare innovation policy and ecosystem in Wales

Over the last decade we have seen a significant development of the healthcare innovation ecosystem in Wales, through a range of policy development activity, provision of funding and supporting infrastructure (Welsh Government, 2018a; 2014; 2013). Since 2014, Health and Social Services Group of Welsh Government has had a targeted approach to innovation activity that has focussed on developing and stimulating an external innovation ecosystem that can collaborate with NHS Wales to create a conducive environment for innovation. Structurally, a Welsh Government HSCEY group Technology and Innovation Division was established in 2014, with a range of new innovation roles, teams and programmes subsequently established across NHS Wales and Social Care organisations, including A Regional Collaboration for Health in West Wales, the TriTech Institute in Hywel Dda University Health

Board, iCTM in Cwm Taf Morgannwg University Health Board and a range of additional Regional Innovation Coordination Hubs across Wales.

In policy terms, innovation has been recognised in the 2016 NHS Wales Planning Framework and was a central theme of '*A Healthier Wales'* (Welsh Government, 2018), the Welsh Government's long-term plan for Health and Social Care in 2018. This long-term plan introduced an emphasis on local innovation that could be scaled up to provide new, national models of seamless health and social care. This renewed focus has been driven at pace pan-Wales to improve how the Government leads, supports and embeds transformation, innovation and delivery within health and care settings – linked to system priorities and needs. This stronger national leadership has enabled the adoption of new technologies, development of new products and services, and industry partnerships that have been tested by the pandemic.

Since 2015, approximately £70m of Welsh Government investment has been provided for a range of innovation programmes, platforms, organisations, accelerators, hacks, intervention, teams, roles and networks through the Innovation, Technology and Partnerships programme (previously the Efficiency through Technology Programme). This funding has encouraged and supported NHS Wales and Social care partners in practice to increase levels of innovation and technology activity and to increase its engagement with external partners – particularly industry and universities. This programme has also secured significant additional match-funding and support from a wide range of Welsh, UK and EU sources. Examples include the Accelerate and AgorIP programmes, with combined project values of approximately £40m, which have secured industry, academic and EU match funding alongside that provided by WG. Programmes like the Bevan Commission's Innovation Exemplars, have supported more than 400 projects, leveraging NHS Wales staff resource and University Health Board and Trust funding.

A national policy review of Innovation was launched by the Welsh Government in Spring 2021, this review is scoping what innovation policy should look like given the new operating environment of the Senedd's sixth term, NHS recovery after COVID-19 pandemic, Climate Change and Brexit. This builds upon recommendations in the 2018 Reid Review of Innovation which highlights a gap in Wales' relative share of UK Research and Innovation funding, showing a 3.2% drawdown of total funding, instead of what should be a 5% aim, based on the Barnett Formula population share. Innovation is an underpinning theme within 'A Healthier Wales' (Welsh Government, 2018), the Welsh Government's plan for Health and Social Care and supported by Transformation funding through Regional Innovation Coordination Hubs. A Healthier Wales develops its quadruple aim, building upon the triple aim of

Berwick, Nolan, & Whittington (2008), making the emphasis upon the organisation to innovate of yet greater importance.

Innovation is now one of the three criteria for University Health Board and Trust status in Wales, with all Health Boards expected to report to Welsh Government annually on their innovation (Welsh Government, 2021). In 2021 the University Designation criteria was updated and supporting guidance issued to Health Boards and Trusts that remained focussed on the three themes of Innovation, Training and Education and Research and Development.

In July 2021, a Written Statement on health and care Innovation was issued by the former Minister for Health and Social Services, Vaughan Gething (Welsh Government, 2021). This written statement committed to consolidate existing health and social care innovation funding and activities into a single programme, and to engage with key partners and stakeholders on the new programme and future opportunities, including how the new programme will form part of the future Innovation Strategy for Wales. This innovation approach had a policy aim to bring a tighter focus to existing innovation activities, strengthen national direction, and lock in positive changes we have seen in response to the pandemic, helping to maintain the pace and scale of change in health and social care.

The push and pull innovation nexus of the system need shows both push and pull dynamics between actors (i.e., individuals and organisations) in the Welsh innovation ecosystem. Understanding the landscape of the innovation ecosystem helps to explain how the complex interactions among actors, in this case the healthcare innovation, can stimulate creative ideas and implement both new technology-push and market-pull strategies (Boyer & Kokosy, 2022).

2.3.10 The Welsh innovation ecosystem

Wales is home to a rich life sciences innovation ecosystem which boasts a wealth of diverse organisations, including small and medium-sized enterprises (SMEs), multinational enterprises (MNEs), academic institutions, research centres, healthcare providers, social care providers, third-sector organisations and others (Welsh Government, 2018). Each of these entities contributes to the multifaceted innovation ecosystem in its unique way. To better understand the dynamics at play, the relevant organisations and actors can be characterised according to their role in either an innovation "push" or an innovation "pull" approach, which will be linked to the literature in Section 2.2.8 and 2.2.9.

An innovation ecosystem approach emphasises the importance of building networks based on shared objectives that can serve as a powerful driver of innovation in healthcare, which is crucial in supporting the cultural and activity changes required to activate innovative practices (Wilson, 2021).

Reflecting on the context of this study, the Welsh Government had already made a committed significant investment in the establishment of an innovation ecosystem to achieve the goals outlined in A Healthier Wales (Welsh Government, 2018) through their £12.6m Innovation, Technology and Partnerships programme. This ecosystem includes supporting 10 regional Research and Innovation Coordination Hubs across NHS Wales organisations, the Bevan Commission, Health Technology Wales, the SBRI Centre of Excellence Wales and the Life Sciences Hub Wales. A Healthier Wales committed to adopt and scale local innovation to new, more seamless models of care across system, whilst recognising new approaches were required to enable this adoption.

Wales has benefitted from both pan-Wales and regional initiatives to support innovation, both generally and in targeted sectors including Life Sciences and Health with support of devolved Welsh Government Innovation Strategy (Welsh Assembly Government, 2018). Notable recent major initiatives within the region operate around the focus of the Institute of Life Sciences (ILS) attached to Swansea University's Medical School. It is being joined by ambitions for further major infrastructure in the form of the Campuses and Villages City Deal projects supported through the joint UK/Welsh Governments' City Deal portfolio (Swansea University, 2017).

Recently, efforts have extended to expanding the scale of innovation activity, notably through identifying and supporting project opportunities. Within SBCR, an 'Innovation Forum' has been created by ARCH to connect challenges and ideas across the clinical and wider innovation community. Integration of pan-Wales initiatives such as Accelerate (through the local Healthcare Technology Centre) provide connection with the national ecosystem. However, beyond these, there has been limited activity to address the translational skills deficit noted more widely in *A Healthier Wales* (Welsh Government, 2018). This presents the question as to how these initiatives within the ecosystem may relate to policy goals presented in the next section along with an introduction to the ILA. Notably, this relates to the challenges of interdependency described by Marjanovic (2020) as to how "effective leadership and skills and capability-building go hand in hand". Pan-Wales and regional programmes have historically been supported by the Welsh Government Innovation strategy and agenda.

2.4 Chapter summary

In Chapter 2, a broad spectrum of existing literature on innovation was reviewed, both in a general national context and specifically as it applies to Wales. It explored various academic definitions of innovation and incorporated widely accepted definitions from national healthcare policy. A number of evolving definitions of innovation (system need) pull and innovation (technology or system offer) push are examined,to be applied later on in this research. The Welsh innovation landscape is considered, including the healthcare innovation policy context, and introduced the concept of an Innovation Ecosystem, applying it to the Welsh healthcare setting. The role of government in creating an environment conducive to innovation was also discussed, providing a strong case for the establishment of an Innovation Strategy for Wales (ISW) as a government-led intervention considering the current policy landscape.

By integrating academic literature with the specific context of Wales, this chapter outlines the policy, political, economic, healthcare and social conditions that make a compelling argument for an Innovation Strategy for Wales. This aligns with the Welsh Government's 2021 manifesto commitment, setting the stage for the development and implementation of such a strategy.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction to the chapter

This chapter presents the research methodology developed and applied to ensure the academic rigour of the research study, which in turn supports policy development and practical application. The primary research question and research sub-questions are presented (section 3.2) and aligned with the Action Research Phases, which provides framing for the action phased/cyclic action research approach utilised in the context of this research. The methodological underpinnings are explained (section 3.3) including the ontological, and epistemological positions taken by the researcher undertaking the research journey, considering the approaches of other key studies (section 3.4). The research perspective and stance are considered (section 3.5) including the data collection methodologies (section 3.6) and types of data analysis used within this research (section 3.7). Furthermore, this chapter presents the chosen research methodology used to examine the development and implementation of the Innovation Strategy for Wales (ISW) (section 3.8). The chosen research design and phased approach taken is set out (section 3.9) alongside the chosen data collection methods from each research phase (section 3.10). A breakdown of the inputs, outputs, influences and impact on policy from each of the four action research phases is fully detailed (section 3.11) the Analysis methods are discussed (section 3.12), as are ethical considerations (section 3.13), limitations (section 3.14) A chapter summary is provided (section 3.15).

3.2 Primary Research Question (PRQ)

To address the Research aim and objectives in Section 1.4, the Primary Research Question (PRQ) for this research is as follows:

> *"How can Welsh healthcare innovation strategy and policy create the optimal environment, supporting infrastructure and conditions for innovation, as part of a new, portfolio wide Welsh Government innovation strategy?*

This PRQ encompasses the full scope of the research, covering the context definition, practitioner reflections, literature review, evidence collection and analysis, stakeholder engagement, development, testing, launch, implementation, and assessment phases of the ISW. It allows for exploration of the processes, challenges, and outcomes related to creating sustainable innovation infrastructure, conditions

and frameworks within a public sector context. The PRQ develops an understanding of the entire innovation strategy policy and delivery lifecycle for healthcare in Wales, from inception, to implementation, and to impact. In this study, the researcher is in a unique position to explore the PRQ, ROs and each sub-question (SQ). Each sub-question (SQ1 through SQ5) is explored in specific research phases, to ensure that the research is systematically aligned with each phase of the ISW's development and allowing for in-depth examination of key elements such as needs assessment, stakeholder engagement, model effectiveness, and measurable outcomes. The set of sub-questions also facilitate an analysis of both process and outcome, which is essential for understanding the role of action research in public policy innovation.

3.2.1. Research Sub-Questions (SQs) corresponding to to Research Objectives (ROs)

Research sub-questions for this research are linked to the Research Objectives and stated below. In addition, brief descriptions with respect to relevant across research cycles/phases are also provided.

RO1. Identify and consider Welsh innovation context; challenges, enablers and barriers, alongside personal experience, to support the development of an Innovation Strategy for Wales (ISW).

SQ1. What is the current Welsh healthcare innovation context, including the challenges, enablers and barriers that should be addressed in developing an effective innovation strategy for Wales' healthcare sector?

This sub-question is explored in *Phase 1* of the action research cycle approach by exploring the initial evidence gathering, stakeholder needs assessment, and thematic identification activities that informed the ISW's early design.

RO2. Develop a broad and robust evidence base for healthcare innovation policy, to support the Health and Wellbeing mission of the ISW.

SQ2. What evidence sources should be explored to develop a broad and robust evidence base that will support the Health and Wellbeing mission of the ISW?

RO3. Review and analyse the evidence to inform the development of the final 2023 Innovation Strategy for Wales.

SQ3. What key themes and recommendations come out of the analysis of the ISW evidence base, leading to development of a Health and Wellbeing Mission of the ISW? This sub-question also relates to Phase 2 of the action research cycle approach and aims to focus and develop an understanding of the

structure and function of the proposed push-pull innovation model developed during the strategy's refinement.

These sub-questions are explored in Phase 2 of the action research cycle approach, which involves testing and refining the ISW based on feedback from studies, stakeholder consultations, workshops, evidence requests and expert panels. It addresses the influence of thematic analysis in ISW development and refinement, allowing for the ISW's public launch.

RO4. Test and verify the Innovation Strategy for Wales to allow for public launch by Welsh Government Ministers, alongside development of an underpinning Innovation Delivery Plan.

SQ4. How can we test and verify and launch the Health and Wellbeing Mission of the ISW, to support the development of an underpinning Innovation Delivery Plan?

This research sub-question is explored through *Phase 3* of the action research cycle approach and examines the practical aspects of applying, implementing and sustaining the new ISW through an underpinning Innovation Delivery Plan (IDP). It explores factors and practical actions that will support success (including specific enablers), such as stakeholder alignment, resource allocation, practical actions and developing national platforms.

RO5. Launch and implement a supporting Innovation Delivery plan (IDP), that realises the commitments made in the Health and Wellbeing mission of the ISW, reflecting on progress to end of Year 1 by end March 2025).

SQ5. How can we develop, launch, implement and measure the progress of a supporting Innovation Delivery plan (IDP), that contains commitments made in the Health and Wellbeing mission of the ISW? (To end of ISW Year 1, with progress report at end of March 2025).

This sub-question is explored in *Phase 4* of the action research cycle approach, specifically the post-implementation impact assessment. It focused on applying the practical, policy-based actions from the ISW and IDP - evaluating the subsequent delivery and outcomes, assessing their contributions to innovation within Wales.

A summary of RQs and SQ related to Action Research Phases are noted in Table 7 below.

Table 7: Summary of Research Questions (RQs) and Sub-Questions (SQs) related to Action Research Phases.

	PRQ: "How can Welsh healthcare innovation strategy and policy create the optimal environment, supporting infrastructure and conditions for innovation, as part of a new, portfolio wide Welsh Government innovation strategy?	
SQ Themes – linked to the ISW / IDP	**Sub-Questions**	**Action Research Phase focus**
1. Innovation context, challenges, enablers and barriers.	SQ1. What is the current Welsh healthcare innovation context, including the challenges, enablers and barriers that should be addressed in developing an effective innovation strategy for Wales' healthcare sector?	**Phase 1**: Literature review, practitioner reflections, evidence gathering.
2. Evidence source development and analysis	SQ2. What sources can be explored to develop a broad and robust evidence base that will support the Health and Wellbeing mission of the ISW?	**Phase 1**: Analysis, drafting, Testing and refining the ISW through thematic analysis.
3. ISW Themes and recommendations from the evidence	SQ3. What key themes and recommendations come out of the analysis of the ISW evidence base, leading to development of a Health and Wellbeing Mission of the ISW?	**Phase 2**: Development and testing of key themes and recommendations with key stakeholders, as part of verifying the push-pull innovation model for ISW.
4. ISW and IDP Testing and verification	SQ4. How can we test and verify and launch the Health and Wellbeing Mission of the ISW, to support the development of an underpinning Innovation Delivery Plan?	**Phase 3**: Practical aspects of launching implementing and sustaining the ISW through development of an IDP.
5. Implementing the IDP	SQ5. How can we implement and measure the progress of a supporting Innovation Delivery plan (IDP), that contains commitments made in the Health and Wellbeing mission of the ISW? (To ISW Year 1, end of March 2025).	**Phase 4:** Impact assessment and measurement of ISW's contributions to innovation.

3.3 Methodological Underpinnings: Philosophical and Epistemological Positioning

Understanding the philosophical foundations of this study is essential for establishing its methodological rigor. This section outlines the epistemological and ontological positions that shape the research approach and provide a foundation for addressing the research questions.

3.3.1 Epistemology

Epistemology, or the study of knowledge, examines what is considered valid knowledge within a specific academic context and how such knowledge can be communicated (Burrell & Morgan, 2017). Miller et al. (2008) emphasise that epistemological perspectives "shape how researchers answer questions regarding the validity of knowledge and the assumptions inherent in particular conceptualisations of the object of study and certain methodologies." Thus, the epistemological stance chosen here directly influences the data analysis approach and the ways in which research questions are addressed.

Below is a summary of key epistemological perspectives considered:

Positivism – In line with the natural sciences, positivism assumes that reality is objective and observable, allowing for knowledge to be measured in a value-neutral manner (Remenyi et al., 1998). Positivist research often employs highly structured methodologies that enable replication and generalisation (Gill & Johnson, 2002).

Realism – Realism posits that reality exists independently of human perception, though it is shaped by individual perspectives. This stance suggests that while objective truth can be pursued, personal insights can also contribute to a richer understanding of data (Saunders et al., 2007; Scotland, 2012;).

Interpretivism – Often employed in the social sciences, interpretivism emphasises the subjective meaning of social phenomena rather than quantitative measurement (Collis & Hussey, 2003). This approach involves studying subjects within their real-world context to gain insight into their perspectives, often through qualitative methods like observations, interviews, and focus groups (Chowdhury, 2014).

Pragmatism – Pragmatism focuses on action and change, integrating both knowledge generation and practical application (Goldkuhl, 2012). Pragmatists believe that the nature of truth is context-dependent, meaning there is no single "best" way to acquire knowledge; rather, multiple approaches can be valid (Rorty, 1982).

Given the practical focus of this research and its direct relevance to policy development in the Welsh Government, a *pragmatic epistemology* was adopted. This approach acknowledges that complex real-world problems, such as developing an innovation strategy for the public sector, often require

flexible, multi-faceted solutions. Knowledge is generated both through literature review and through the active engagement of key stakeholders involved in the development of the Innovation Strategy for Wales.

3.3.2 Ontology

Ontology, or the study of reality, examines the assumptions researchers hold about how the world operates, and the commitments individuals have to specific viewpoints (Saunders et al., 2007). Matthews & Ross (2010) identify three primary ontological positions relevant to social research:

Objectivism – This position assumes that reality is external to the individual and can be measured independently of human interpretation (Matthews & Ross, 2010). Objectivists view reality as stable and quantifiable.

Subjectivism – In contrast to objectivism, subjectivism posits that reality is constructed by individuals based on their perceptions, making it inherently subjective and unique to each individual (Matthews & Ross, 2010).

Realism – Realism strikes a balance between objectivism and subjectivism, acknowledging that reality exists independently but is perceived through individual perspectives, shaped by one's experiences and insights (Matthews & Ross, 2010).

The ontological stance adopted in this study is *realism,* consistent with the pragmatic paradigm. This position allows for both objective measurements and subjective interpretations, which is essential given the participatory nature of this research. Realism enables the researcher to gather objective data while also incorporating personal insights from stakeholders, which provides a more nuanced understanding of the healthcare innovation landscape in Wales. This balance aligns with the study's methodological choice of using interviews and consultations to address the primary research question and sub-questions effectively. A comparison table of ontological and epistemological paradigms against research methods is set out below.

Table 8: Comparison of paradigms by ontology, epistemology and research methods (from Klenke, 2008).

Paradigm	Ontology	Epistemology	Research Methods
Constructivism	Relativistic – reality is socially and	Knowledge consists of mental constructions	Case studies, interviews

	experientially constructed, specific to local contexts.	formed through shared understanding and consensus.	
Interpretivism	Reality and the researcher are inseparable, with findings emerging from lived experiences.	Knowledge is based on abstract meanings and is constituted through individuals' personal experiences.	Case studies, interviews, phenomenology, ethnography, ethnomethodology
Symbolic Interactionism	Reality is socially constructed and intertwined with the researcher's perspectives.	Knowledge arises from social interactions and the meanings derived from them.	Grounded Theory
Pragmatism	Reality is equivocal and context-dependent, influenced by language, history, and culture.	Knowledge is acquired through practical experience, integrating subjective interpretation with objective observation.	Interviews, case studies, surveys
Positivism	Reality is objective and exists independently of human perception, making it observable and measurable.	Knowledge acquisition is value-neutral, aiming for replicable, generalisable findings devoid of researcher bias.	Surveys, experiments, quasi-experiments

3.4 The Research Perspective

The context of this study, as described in Chapter 1, along with the applied focus of the research question and objectives, supports a pragmatic ontological and epistemological stance. This research has adopted a realist ontology, recognising that while an external reality exists independently of our perceptions, our understanding of it is inevitably shaped by social, political, economic, technological and contextual factors. A critical realist stance is particularly appropriate for insider, action-oriented research within complex systems such as healthcare and government, as it enables the exploration of underlying mechanisms and structures that influence observable outcomes and impact.

3.4.1 Action research framework and phasing

Situated within an action research framework, this study acknowledged the researcher's dual role as a senior practitioner and investigator, using iterative cycles of reflection and action to generate contextually grounded insights that drives robust strategy and policy. The full breakdown of all the action research phases is provided in Section 3.4, Table 11. While the research values experiential knowledge

and stakeholder perspectives, it does not adopt a fully constructivist or interpretivist position. Instead, it aligns with realism, which allows for both the recognition of subjective experiences and the search for patterns and causal explanations across them.

3.4.2 Pragmatism as part of the research methodology

Elements of pragmatism also inform the methodological approach, particularly in the selection of tools and methods that are most effective for addressing the research question and generating actionable outcomes. Interviews, workshops and stakeholder engagement are used not only to gather rich, qualitative data, but also to inform the co-development of a practical, evidence-based innovation strategy. This combined philosophical and methodological stance enables the study to bridge theory and practice in a way that is relevant to real-world policymaking, which in turn results in impact. In line with a pragmatic approach, the researcher's own values and beliefs are acknowledged as factors that may shape data interpretation, particularly in an action research setting. This approach allows for knowledge acquisition through direct experiences and iterative cycles of reflection and action, making it well-suited for investigating questions about how organisational change can be effectively fostered within the ISW framework.

3.4.3 Justifying the chosen research strategy and methodology

The following sections will outline and justify the chosen research strategy and methodology for this study, detailing how these approaches support the development of a responsive, evidence-based innovation strategy for Wales. The ontological position adopted for this research is an objective stance, consistent with the pragmatic paradigm (Klenke, 2008). This approach allows for objective observation and measurement of reality (Matthews & Ross, 2010) and aligns well with the use of interviews to gather the data needed to address the main research question and sub-questions.

This research is situated within an interpretive paradigm and guided by a constructivist epistemology, which aligns well with the action research nature of this study; acknowledging that knowledge is not passively received but actively constructed (Mogashoa, 2014) and iteratively improved through processes like assimilation, accommodation, and reflection. The constructivist approach is particularly fitting given the researcher's dual role as both practitioner and investigator, which allows for co-creation of knowledge alongside stakeholders. This epistemological stance acknowledges that knowledge is socially constructed, and it is through active engagement with stakeholders that a comprehensive understanding of the innovation landscape in Wales can be developed. Furthermore, the

interpretive paradigm is appropriate for understanding complex social phenomena, such as the development of public policy in real time. This perspective aligns with action research's emphasis on cyclical reflection, enabling the researcher to adaptively respond to feedback and evolving insights from policy stakeholders throughout the study.

3.5 Data Collection methodologies

This section details the data collection methods used to support the development of the Innovation Strategy for Wales (ISW). The sponsorship of this research provided the researcher with unique access to key stakeholders involved in the project, necessitating a combination of appropriate primary and secondary data collection methods.

3.5.1 Primary Data

Primary data was essential to directly address the specific research questions of this study. According to Hox and Boeije (2005), primary data collection involves gathering original data specifically designed to fit the unique objectives of the research. In this study, two main types of primary data collection methods were used: quantitative and qualitative, as shown in Table 9 below, which is adapted from Hox and Boeije (2005).

Table 9: Types of Primary data collection methods used.

Type	Solicited	Spontaneous
Quantitative	Surveys, scoring of pre-developed interview questions.	Observation, Monitoring
Qualitative	Open interviews, National studies, Focus Groups, collation of studies, Evidence requests, targeted surveys, Workshops.	Participant Observation, Existing Records

3.6.2 Quantitative Research

Quantitative data analysis is based on a positivist approach, which emphasises objective measurement and statistical analysis (Bell et al., 2018). In quantitative research, data is often analysed deductively, testing pre-determined hypotheses (Gallaire et al., 1989; Manna & Waldinger, 1980). This

research utilises quantitative methods to collect structured data from a large sample size, enabling statistical analysis (Park & Park, 2016).

Quantitative methods, however, have been critiqued for providing only "thin" descriptions that lack the richness often found in qualitative data (Brekhus et al., 2005). For this study, quantitative data was used to support the findings, providing measurable insights into trends related to innovation in the Welsh public sector.

3.6.3 Qualitative Research

In contrast to quantitative methods, qualitative data captures meanings derived from words, images, and in-depth descriptions (Howe, 1988). Sandelowski (2004) describes qualitative research as knowledge grounded in human experience, frequently associated with interpretivist philosophy. The subjective nature of qualitative research allows for exploration of socially constructed meanings (Saunders et al., 2007).

Qualitative research in this study was used to understand complex social issues and gather insights directly from stakeholders involved in the ISW. This approach supports the exploration of "why" and "how" questions (Marshall, 1996), which are critical to understanding the motivations, perceptions, and experiences of those driving or affected by innovation within the public sector.

3.6.4 Quantitative vs. Qualitative Research

Quantitative and qualitative research represent two distinct methodologies, each with unique strengths. While quantitative methods are typically associated with hypothesis testing and statistical validity, qualitative methods are inductive, focusing on rich, contextual understanding. Table 10 below provides a summary of these two methodologies, highlighting the contrasting philosophical foundations, aims, study designs, and criteria for assessing results (Marshall, 1996).

Table 10: Quantitative vs Qualitative methodologies

Aspect	Quantitative	Qualitative
Philosophical Foundation	Deductive, Reductionist	Inductive, Holistic
Aim	To test pre-set hypotheses	To explore complex human issues
Study Plan	Stepwise, predetermined	Iterative, flexible
Position of Researcher	Detached, objective	Integral part of the research process

Assessing Quality	Validity and reliability through statistics	Trustworthiness, credibility
Measures of Utility	Generalisability	Transferability

3.6.5 Mixed-Methods Research

Mixed-methods research, which combines both quantitative and qualitative approaches, offers a comprehensive perspective by leveraging the strengths of each method. Bouchard Jr. (1976) suggests that findings derived from multiple methods increase the credibility of results. Mixed-methods research, often referred to as the "third methodological paradigm" (Johnson et al., 2007), has gained popularity for its ability to produce well-rounded insights. While some argue against mixing quantitative and qualitative methods (Howe, 1988), studies in innovation research (e.g., Hong et al., 2012; Park & Park, 2016) support the complementary value of both approaches. Given the complex nature of developing a cross Government, national innovation strategy, a mixed-methods approach was selected to capture both measurable outcomes and rich qualitative insights from a broad range of key stakeholders. This approach provides a more nuanced understanding of the processes and impacts of the ISW.

3.6.6 Secondary Data Collection

Secondary data was a key component of this study, specifically in Research phase 1 (see Table 11), providing both a contextual foundation and valuable insights to support primary data collection. Secondary data analysis involved examining pre-existing data from various sources, including research studies, organisational reports, and case studies (Johnston, 2017). While secondary data can sometimes offer only partial perspectives on the primary context (Church, 2002), it was particularly useful in this study for understanding the broader landscape of innovation within the Welsh healthcare sector and informing the development of the Innovation Strategy for Wales (ISW).

Sources that directly informed the ISW included a paper prepared by the researcher on Developing an Innovation approach for Aneurin Bevan University Health Board (ABUHB) and approved by the ABUHB Executive Board in March 2021, which established a structured innovation approach and programme plan, based around a model of organising Research, Improvement, Innovation and Value functions around 'Innovation Push' and 'Innovation Pull' activities. This early 'innovation push and pull' model was developed and embedded successfully within Aneurin Bevan University Health Board, a local NHS Wales organisation in a previous role of the researcher. This 'innovation pull and push' model, which is based on a range of academic research (see Section served as a pre cursor for

the wider national ISW model. A comprehensive *literature review* also contributed to building an understanding of relevant healthcare innovation frameworks, grounding the strategy in well-researched perspectives.

Evidence source 1: *The NHS Wales Covid-19 Innovation and Transformation Study* was a national study, which coordinated a range of detailed data from multiple local and regional sources of Covid-19 learning work. This study was hosted on the NHS Confederation's website and included collating findings from a range of internal NHS Wales and unpublished studies; an internal ABUHB Innovation Study, based on 273 participant responses from across ABUHB during 2020; the Healthcare Science Programme Survey, which gathered data from 129 respondents in 2020; and the Bevan Commission Covid-19 Practitioner Experience Study, which included two phases of study across their networks, with a total of 454 respondents in 2020. An additional component of the *NHS Wales Covid-19 Innovation and Transformation Study* was a selection of *Case studies*, chosen based on survey data analysis and validated through a focus group (37 case studies and a 15-member expert panel).

Further insights were gathered through Evidence source 2: *Key Opinion Leader Study* conducted by Cardiff Business School, which included stakeholder interviews with 30 participants from NHS Wales, the Welsh Government, and academic representatives. These interviews provided a comprehensive view of the healthcare innovation landscape in Wales.

Evidence source 3: *The NHS Wales request for evidence* was also sent to every NHS Wales organisation and affiliated organisations, with 12 highly detailed organisational submissions received, which contributed to defining national innovation needs for the ISW; and emerging pre-consultation themes identified specifically for the ISW's initial version, issued for consultation in July 2022. These sources provided a foundational understanding of key themes in Welsh healthcare innovation, which helped shape the strategic priorities of the ISW.

Together, these secondary sources, encompassing quantitative and qualitative data collected through a mixed-methods approach, offered a rich and broad understanding of the organisational and policy contexts essential for shaping the ISW.

3.7 Data Analysis

This section outlines the data analysis methods used in this study. Given the qualitative nature of the research, thematic and content analysis techniques were employed to interpret the data gathered in phases two and three. Each approach offered a systematic way to extract and organise meaning from extensive qualitative datasets.

3.7.1 Thematic Analysis

Thematic analysis was the primary method used to analyse the evidence sources set out in Phase 1 of the action research cycle. As defined by Braun and Clarke (2012), thematic analysis is a method "for systematically identifying, organising, and offering insight into patterns of meaning (themes) across a data set." Thematic analysis is particularly well-suited to the vast volume of qualitative data generated in this study, allowing complex data to be coded into manageable themes and broadening the accessibility of findings. TA involves

Saks and Allsop (2019) … Thematic content thematic analysis involves identifying recurring themes within the data, exploring typologies of these themes, and looking at variations in relationships between, and within, themes. Analysis is an iterative process that begins with the first data collected and continues into the writing up of the project. It involves moving between the data and theory in a way that helps to make sense of the data and aids discussion within the research team about 'what is going on here'. This is not just a technical exercise in coding extracts of talk,

This informed the use of Thematic Analysis as the primary method used to analyse the evidence gained in source 2 (30 key opinion leader interviews) and source 3 (evidence requests to all NHS Wales organisations). Using Braun and Clarke's approach to Thematic Analysis (2006, 2021), the analysis aimed to develop rich and nuanced interpretations of meaning across the dataset, attending to patterns that spoke directly to the research aims. TA is particularly well-suited to this study's context, allowing for flexibility in exploring complex, context-dependent understandings of innovation policy and practice.

Thematic analysis takes an inductive, data-driven approach, where insights emerge directly from the data rather than being pre-imposed (Braun & Clarke, 2012). Following the guidelines provided by Javadi and Zarea (2016), the analysis process began with identifying initial codes across the dataset, ensuring that each piece of data was given equal consideration (Boyatzis, 1998). As raw data was

reviewed, various codes were developed to reflect recurring ideas, which were then grouped into overarching themes, as described in Table 11 below. Once the initial themes were established, they underwent a review and refinement process to ensure accuracy and relevance, during which sub-themes were also identified where appropriate.

Table 11: The Braun & Clarke Thematic Analysis Process (2012)

Phase	Description
1. Engaging with the Data	Begin by transcribing any audio material and immersing yourself in the content. This includes repeatedly reading through transcripts, listening carefully, and taking notes to gain a deep sense of the material as a whole.
2. Generating Initial Codes	Systematically work through the dataset to highlight important features. Codes can be created either deductively (from existing theory or concepts) or inductively (emerging directly from the data itself).
3. Searching for Themes	Group related codes together to form potential themes. At this point, you are moving beyond individual codes to see broader patterns and repeated ideas across the dataset.
4. Reviewing Themes	Re-examine and refine the themes by checking if they accurately represent the coded extracts and the dataset as a whole. This may involve merging, splitting, or discarding themes. Tools such as thematic maps can be helpful here.
5. Defining and Naming Themes	Once the themes are clear, provide precise definitions and concise names for each. This stage also involves writing a detailed explanation of how each theme connects to the research questions and overall narrative.
6. Writing the Report	The final stage involves presenting the analysis in a coherent and compelling way. This includes weaving together themes, supporting them with extracts from the data, and linking back to the wider literature and research objectives.

Thematic analysis proved useful in reaching theoretical saturation, defined as the point at which no new codes, themes, or insights emerge from the data (Braun & Clarke, 2021). This saturation is crucial to ensure a comprehensive understanding of the data (Ekins & Newman, 1970).

This research adopted an inductive orientation, meaning the coding and theme development were grounded in the data rather than shaped by pre-existing theoretical frameworks. Themes were not simply discovered but actively constructed through the researcher's interpretive engagement with the data. Initial coding involved detailed, line-by-line engagement with transcripts, followed by iterative cycles of theme development, refinement, and sense-checking in relation to the dataset and research questions.

3.7.2 Content Analysis

In addition to thematic analysis, content analysis was used in Phase three to complement the interpretation of qualitative data. Originating as early as the 18th century, content analysis provides a structured approach to quantify qualitative data (Berelson, 1952), offering a "systematic and rigorous" method for examining textual data (White & Marsh, 2006). While content analysis shares similarities with thematic analysis in identifying themes, it goes further by quantifying the presence of specific categories or themes within the dataset, allowing researchers to measure the frequency of particular patterns (Vaismoradi et al., 2013).

In this study, content analysis enabled a more nuanced interpretation of the themes identified during thematic analysis by examining their prevalence and distribution within the data. This dual approach ensured a robust and comprehensive understanding of the qualitative findings, facilitating insights that could inform the development of the Innovation Strategy for Wales.

3.7.3 Qualitative Comparative Analysis

Qualitative Comparative Analysis (QCA) is a method used in qualitative research to identify the conditions that lead to specific outcomes across multiple cases. It is designed to analyse the interplay of qualitative factors that influence these outcomes, providing a systematic approach to understanding causal complexity within a given dataset (Schneider & Wagemann, 2012).

QCA functions by combining mathematical methodologies from quantitative research with the inductive and comparative techniques that are characteristic of qualitative case-based analysis. This

synthesis enables researchers to explore relationships between different conditions and their effects on outcomes, while preserving the depth and richness of case-specific details.

The application of QCA is particularly relevant when seeking to explain why change occurs in certain instances and fails to manifest in others. This approach is most appropriate when addressing questions of causal complexity, where outcomes are influenced by the interaction of multiple factors and conditions. By focusing on such cases, QCA offers a robust means of drawing comparisons, identifying patterns, and ultimately deriving insights into the causal mechanisms at play within diverse research settings.

3.7.4 Sampling

Sampling refers to selecting a subset (or subsets) of individuals from a larger population to collect data from. This helps draw valid conclusions from the results and the sample must be representative of the population. (Wu & Thompson, 2020). Sampling approaches considered were:

Purposive – also referred to as selective or judgmental sampling, is a non-probability sampling technique where researchers select participants based on relevance, knowledge or expertise in relation to the research topic. This method is mainly used in qualitative research where specific information or characteristics are sought to focus on specific research objectives. Given the applied nature of the research and objectives, a purposive sampling approach was used for this research study.

Convenience – A non-probability sampling technique, the convenience sampling method is a way of selecting participants from the target population based on ease of access. This method helps to add robustness to the representativeness of a sample and generalisability of the research results.

Snowball – a non-probability sampling method where current research participants are used to support conscription of future study or research participants. This sampling technique is utilised in qualitative research where research participants are difficult to access or the topic is restricted, confidential or potentially problematic.

Theoretical – a qualitative process of data collection whereby the researcher jointly collects codes and analyses data - deciding what data to collect next and where to find it, to inform the development of a theory, as it emerges.

Regarding sampling methods, there are two main categories:

- Probability sampling: where each member of the population has a known chance of being selected.
- Non-probability sampling: where the researcher selects members of the population based on their judgement, convenience or other criteria, allowing data to be collected more easily.

Non-probability sampling is easier to access, but it has a higher risk of sampling bias. It can mean the conclusions made about the population are weaker than with probability samples and conclusions may be more limited. If using a non-probability sample, the aim should be to make it as representative of the population as possible.

Non-probability sampling techniques were used for this research whilst working mainly with qualitative research, where the aim was not to test a broad hypothesis about a large population, but to develop an understanding of a specific population that has expert knowledge of their sector – in this case, specific to healthcare innovation stakeholders.

3.8 Chosen Research Methodology: Action Research

3.8.1 Overview of Action Research

The applied nature of the research, with application directly into policy and practice under the professional context of the candidate, presents for a pragmatic, ontological, epistemological and methodological approach. Routed in the pragmatist paradigm, the works reflect 'solving practical problems in the real world' (Feilzer, 2010) in supporting the translation of policy into programmes and projects through Government intervention and public investment.

This, together with the rich context-specific nature of the work lends itself to Action Research (Stringer, 2013), with the research embedded in the environment with continuous access to data and participants. The methodology is grounded in an Action Research (AR) framework, chosen for its suitability to the researcher's unique position within the Welsh Government and the broad, participatory and applied nature of the ISW. Action research enables a reflective, iterative process that aligns with the phased approach taken in the ISW's development. This chapter details the methodological framework, philosophical positioning, research design, data collection methods, and analytical approach used across four action research cycles, each supporting distinct stages in the ISW's evolution.

An action research approach was adopted for this study as its methodological strength enables (i) a collaborative approach between researchers and practitioners to address complex real-life problem situations while simultaneously contributing to knowledge (Davison et al., 2004), (ii) synergy between research and practice, so research informs practice and vice versa (Avison et al., 2018), and (iii) harmonious intertwining of impact and relevance of the research (Davison et al., 2021).

"*Action research is about taking action, for improving practices*."

(McNiff, 2013)

My action research combines theory and practice (and researchers and practitioners) through change and reflection in an immediate problematic situation within a mutually acceptable ethical framework. Action research is an iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning.

"In action research, the emphasis is more on what practitioners do than on what they say they do"

(David Avison, Francis Lau, Michael Myers, Peter Axel Nielsen, 1999)

Action research (AR) was selected as the primary methodological framework for this study due to its compatibility with practice-based, iterative inquiry. Defined by its cyclical nature, AR involves continuous phases of planning, action, observation, and reflection. This methodology is particularly valuable when the researcher is an embedded practitioner, as is the case here, allowing for the integration of practical and theoretical insights throughout the research process. This study comprises four primary action research phases:

Phase 1: Initial reflections and evidence gathering to support the case for the ISW.

Phase 2: Drafting, testing, and revising the ISW through stakeholder engagement and feedback.

Phase 3: Public launch and assessment of the ISW, culminating in the development of the Innovation Delivery Plan (IDP).

Phase 4: Implementation of the IDP, with a one year on progress review and announcement by Ministers.

Each phase incorporates structured data collection, ongoing engagement with stakeholders, and iterative refinement of the ISW and its supporting framework.

3.9 Chosen Research Design

3.9.1 Phased Approach to Action Research

The research design is structured around four interconnected Action Research (AR) phase. Each of these AR phase contributes to the development of the ISW. The activity of the action research phases is described below:

Action Research Phase 1 took place between October 2019 and March 2022, focusing primarily on the literature review, gathering evidence from three distinct sources and undertaking thematic analysis of all the qualitative and quantitative data. The researcher drew initial insights from personal reflections on eight years of experience in an innovation leadership role, which were further enriched by data collected during the NHS Wales Covid-19 Innovation Study, the Cardiff Business School key opinion leader study and through a bespoke NHS Wales evidence request. This combination of reflective practice and external input enabled the identification of key themes that were critical for shaping the Innovation Strategy for Wales (ISW).

Action Research Phase 2 spanned from October 2021 to February 2023 and thematically analysed the evidence from each of the three evidence sources. This developed the key themes and recommendations and engaged stakeholders in a consultative process to develop and test the draft of the ISW. This took place through a series of workshops, panel discussions, meetings and presentations which facilitated comprehensive feedback from NHS Wales leaders, innovation experts, and other key stakeholders. This included a public consultation The input gathered during this phase proved essential in refining the ISW draft and contributed to the development of a responsive innovation model, one that is attuned to the specific needs and challenges of the Welsh healthcare innovation ecosystem. The ISW was then finalised publicly launched.

Action Research Phase 3 extended from October 2022 to October 2023. This phase focused on the development of an underpinning Innovation Delivery Plan (IDP) to focus implementation of the ISW, establishing a strategic roadmap for future innovation within the Welsh healthcare sector. This phase included publishing the statutory impact assessment required for all new WG strategy and policy.

Alongside the launch of the ISW, this stage also involved working with WG and NHS Wales leadership, practitioners and stakeholders to develop and create buy in for the IDP.

Action Research Phase 4 focused on 18 months of IDP implementation from October 2023 to end March 2025. This included the establishment of a national innovation programme, the creation of a a range of innovation infrastructure, a national innovation framework and a range of projects based on more specific commitments made in the ISW. This also involved launching a range of national digital innovation infrastructure platforms and resources, communicating Ministerial efforts on innovation policy and IDP progress.

3.10 Chosen Data Collection Methods

Given the complex and participatory nature of this study, a mixed-methods approach was employed to collect a rich dataset, comprising both qualitative and quantitative data. Each AR phase (cycle) involved distinct data collection methods tailored to the specific aims and needs of that phase.

3.10.1 Research Phase 1 Data Collection

In the initial phase, data collection focused on gathering evidence and reflections to inform the ISW's foundations:

Personal Reflection and Documentation: Drawing on ten years of experience in healthcare innovation leadership, including a two-year secondment into NHS Wales as the researcher engaged in a structured reflection process. I reflect on the summary findings of an 18-month process to develop an innovation approach and supporting programme which was approved by; the ABUHB Executive Board in March 2021. This local development of innovation approach within one NHS Wales organisation created a range of personal and organisational insights relevant to the strategic goals of the ISW, serving as a microcosm of the overall, national ISW.

The NHS Wales Covid-19 Innovation and Transformation Study (Evidence source 1 – Section 4.4): Data was gathered from over 1000 respondents across multiple local and regional sources using a national survey designed by the researcher, which included the Healthcare Science Programme Survey and a Bevan Commission Practitioners Experience study. This data served as a critical input,

highlighting innovation learning, experiences needs and priorities during the Covid-19 pandemic. The evidence breakdown is described fully in Chapter 4.3.1.

Key Opinion Leader study (Evidence source 2 – Section 4.5): A study was designed on proposed ISW content and delivered through Cardiff Business School. A total of 30 semi-structured interviews were conducted with key opinion leaders by CARBS on the researcher's behalf, including NHS Wales representatives and academics, to assess the healthcare innovation landscape in Wales. These insights were crucial in developing an understanding of the ecosystem and identifying initial themes for the ISW. This primary and secondary research project generated evidence in support of the Welsh Government's work to develop the Health and Social Services component of a new ISW. The evidence gathered in research used a set of questions set out by the researcher in his role as Head of Innovation and Technology for conducting the survey.

This research report implements a questionnaire survey of key opinion leaders within the health and care innovation landscape in Wales at two levels; the first section seeks respondents' opinions on health and care innovation at the national level (Wales), and the second section focuses on innovation at participants' organisational level. Questionnaire surveys are considered a vital tool for capturing information on individual perspectives in a larger cohort and hence allowing large populations to be assessed with relative ease (Baxter et al. 2013).

This research report implements a questionnaire survey of key opinion leaders within the health and care innovation landscape in Wales at two levels; the first section seeks respondents' opinions on health and care innovation at the national level (Wales), and the second section focuses on innovation at participants' organisational level.

Evidence requests to all NHS Wales and affiliated organisations (Evidence Source 3 - section 4.6): A commissioning letter with an accompanying evidence request letter from my lead WG Director to all NHS Wales CEOs entitled '*Request for health and care evidence to support the new Welsh Government ISW'.* The request asked for the following:

To support healthcare components of the Innovation Strategy, evidence, views and comments were requested from all NHS Wales and affiliated organisations and Social Care Wales, as set out in Table 11 below.

Table 12: Insights requested from Evidence Source 3

THEME	VIEWS REQUESTED
Strengths and Weaknesses of the innovation landscape.	Views on the existing health and social care innovation landscape, for example through a high-level SWOT analysis.
Innovation Policy Framework	Views on what should be included in a national health and care innovation policy framework, with reference to specific tools, resources and guidance.
Support for innovation.	Views on how best to structure and organise support for innovation, at both national and regional levels.
Targeted investment for innovation.	Views on where new innovation investment should be prioritised to address system needs, challenges and opportunities.
Promoting and Rewarding Innovation.	Views on ways to promote & reward innovation, through financial and non-financial interventions.
Innovation Skills and Capacity	Views on how to develop innovation skills, leadership and capability at all levels of the health and care system
Working in Partnership.	How best to support new national and regional collaborations between health and care organisations with industry, academia and the third sector.
Further perspectives.	Any further perspective your organisation feels to be relevant to the Innovation Strategy, we encourage you to think as broadly as possible.

This evidence request resulted in 12 highly detailed, qualitative responses from 10 NHS Wales organisations, the Bevan Commission and Health Technology Wales, which is set out in Chapter 4.

3.10.2 Research Phase 2 Data Collection

The second phase focused on gathering feedback to refine the ISW draft:

Stakeholder Consultations and Public Feedback: The draft ISW was presented to a wide range of stakeholders through a health led online consultation event with 22 practitioners from across the health

and care landscape, a presentation and feedback event at a WG arranged consultation event to 43 practitioners at Swansea University and structured presentations to the NHS Wales leadership board – attended by all NHS Wales CEOs and Welsh Government HSCEY Directors.

Statutory public consultation: the ISW is issued for public consultation between July and September 2022, in line with the Welsh Government's statutory duty to consult the public widely when issuing new national policy that will inform future decisions.

Workshops and Conferences: Data were collected through workshops with NHS Wales Innovation Leads and at international conferences, where the researcher presented the ISW and gathered feedback. This input was invaluable for testing the feasibility and applicability of the proposed strategy and refining the model based on feedback.

3.10.3 Research Phase 3 Data Collection

In this phase, data collection focused on finalising the IDP:

Workshops for IDP Development: A series of three workshops held in early 2023 allowed stakeholders to contribute to the development of the IDP and provided feedback on the action plan's design and priorities. I presented feedback to NHS Wales Leadership Board to gain the approval of NHS Wales CEOs and WG Directors.

Expert Panels and Conferences: Feedback from international expert panels and a range of international innovation conferences (International Society for Professional Innovation Managers and European Conference for Innovation and Entrepreneurship – see publication list on Page 19) further validated the ISW framework across academic peer networks, ensuring its alignment with global innovation approaches, theory and standards.

3.10.4 Research Phase 4 Data Collection

In this phase, data collection focused on evaluating the ISW and IDP implementation.

Production, Coordination and collation of internal data sources – I coordinated the progress from a range of HSCEY colleagues in relation to their policy area's progress as linked to the ISW and IDP.

Production of internal reports for senior leaders and Ministers – I used the internal data to produce reports for senior leaders, and this informed the public presentation of this data by WG Ministers to make announcements on progress.

Expert Panels, publications and Conferences: I presented and validated my research findings through a range of keynote presentations at conferences, participation in expert panels and external publications.

3.11 Action Research Phases

Table 12 below sets out a summary of action research phases used in this research, cross referenced against the relevant inputs, outputs and interfaces – with the resulting influence on policy and impacts set out. The papers and publications, attached in the *Appendices* section, created during this research are referenced at the point of their production.

Table 13: Summary of Action Research Phases.

Research Phase	Inputs	Outputs	Interfaces	Influence on policy / Impact
1. Reflecting on knowledge gaps to inform ISW evidence collection and analysis. *Reflections on practitioner experience in innovation leadership roles.* *Evidence collection to support case for ISW.* *Thematic analysis of evidence to develop the ISW.* *This activity was undertaken between October 2019 and March 2022.*	Reflections on innovation leadership role. AB Innovation approach as approved by ABUHB Board, based on a 'innovation pull and push model'. AB innovation approach – based on innovation push and pull' Ministerial commitment in 2021 to publish an Innovation Strategy for Wales.	Evidence Source 1: NHS Wales Covid-19 Innovation Study (May 2020 - March 2021) Evidence Source 2: Designed Cardiff Business School (CARBS) key opinion leader study (October – December 2021) *Evidence Source 3 / Paper 1*: NHS Wales evidence requests in support ISW development. (December 2022 to February 2022)	Evidence produced: NHS Wales Covid-19 Innovation Study source 1: NHS Wales Innovation Study (*n*=273 respondents) NHS Wales Covid-19 Innovation Study source 2: Health Science Programme Survey (*n*=129 respondents) NHS Wales Covid-19 Innovation Study source 3: Bevan Commission Practitioner experience study data 2 Phases (*n*=454 respondents) NHS Wales Covid-19 Innovation Study source 4: Case Studies selected based on the analysis of survey data with focus group validation (*n*=37 case studies; plus 15 expert panel)	Creation of full evidence base in support of an ISW. Key ISW themes and recommendations as ISW 'skeleton'. WG approval to utilise the evidence base, key themes and recommendations to produce a draft ISW.

Research Phase	Inputs	Outputs	Interfaces	Influence on policy / Impact
	Welsh innovation context analysis, through literature review.		CARBS key opinion leader study to understand the healthcare innovation landscape in Wales – stakeholder interviews (*n*=30 case NHS Wales, Government, Academic practitioners) NHS Wales evidence responses to support ISW development *n*=12 Qualitative and Quantitative data – gathered through mixed methods.	
2. Production of the draft Innovation Strategy for Wales (ISW) for public consultation, finalisation and launch. *This activity was undertaken between October 2021 and February 2023*	ISW Approach, key themes and recommendations. *Paper 2* - WG HSCEY Policy Forum to agree draft ISW for consultation. June 2022. Public consultation feedback informs final version of ISW. Analysis and testing of proposed ISW and innovation model. Analysis supporting the WG Integrated impact assessment.	Draft ISW document issued for consultation agreed by HSCEY Policy Forum in July 2022. *Paper 3* – ISW paper and presentation to NHS Wales leadership board. October 2022 *Paper 4* - Final ISW version approved by WG HSCEY Executive Directors Team (EDT) and Ministerial Cabinet in January 2023. *Paper 5* - ISW Integrated Impact assessment, produced January 2023.	Thematic analysis of all outputs. WG public consultation (*n*=179 responses). *Conference Paper 1* and Presentation on ISW and proposed Innovation Push/Pull model through ILA support at ECIE Annual conference, Pafos, Cyprus in September 2022. (*n*=25 attendees)	New policy model for innovation push and pull developed for Welsh Healthcare ecosystem. ISW and commitments agreed by NHS Wales CEO and WG Directors. (n= 30 attendees) ISW agreed and launched by WG Ministerial Cabinet.

Research Phase	Inputs	Outputs	Interfaces	Influence on policy / Impact
3. Development, production and launch of the ISW and development of the supporting Innovation Delivery Plan (IDP) *This activity was undertaken between October 2022 and October 2023*	ISW consultation themes and feedback. EDT paper (*Paper 4*) in January 2023 – final version of ISW. *Papers 6,7,8*- Workshops for testing action plan (3 workshops January, February and March 2023) *Paper 9* - NHS Wales Leadership Board paper in April 2023	Innovation Delivery Plan commitments developed and consulted upon March – June 2023. Priorities established with NHS Wales Leadership Board to guide a new Innovation Delivery Plan (IDP) in March 2023. Launch of Ministerially approved Innovation Delivery Plan in October 2023. *Publication 1* – Case Exemplar of the NHS Wales and ISW. June 2023.	Consolidating and analysing of themes emerging from workshops and expert panels. Elan Valley NHS Wales Innovation Leads workshop expert panel October 2022 (*n*=25 attendees) Innovation Pull workshop, Jan 2023 (*n=39* attendees) Innovation Push workshop, March 2023 (*n=35* attendees) Push-pull Workshop March 2023 [(*n*=58 attendees) *Conference Paper 2* and International Innovation Expert Panel at ISPIM Conference in June 2023, Ljubljana - Ran two expert workshops (*n*=40 total) *Conference Paper 3* and presentation at ECIE annual conference in Porto September 2023 (*n*=35 attendees) *Conference Paper 4* and presentation at the ISTAS conference in Swansea, Innovation Strategy development track, September 2023. (*n*=30 attendees)	ISW launched by WG and Cabinet Ministers in February 2023. *Paper A* – Speech on ISW launch by Minister and Social Services, Eluned Morgan AM. March 2023 Health and Wellbeing section of IDP approved by WG HSCEY Group in partnership with NHS Wales CEOs and Innovation Leads in March 2023. IDP approved by WG Cabinet – July 2023. IDP formally published by WG in October 2023. *Paper B* - Written Statement by Vaughan Gething AM, Minister for the Economy to publish the Welsh Government's Innovation Delivery Plan, October 2023

Research Phase	Inputs	Outputs	Interfaces	Influence on policy / Impact
4. Innovation Delivery Plan Implementation *This activity took place from October 2023 and the end of March 2025.*	Information from IDP workshops support refinement approval of IDP and supporting innovation programme. NHS Wales Innovation Leads workshop on IDP in October 2023. (n=28 attendees). *Paper 10* – Implementing the Innovation Delivery Plan policy paper. Chief Digital and Innovation Officer. December 2023	*Paper 11* - Interview with Judith Paget OBE, CEO NHS Wales / DG HSS one year after ISW strategy launch - June 2024. *Paper 12* - NHS Wales Leadership Board on approach and IDP progress - May 2024. *Paper 13* – 1 Year internal WG update on ISW and IDP implementation. September 2024.	IDP approach and progress presented to a range of expert practitioners: *Conference Paper 5* and presentation on IDP at ISPIM Salzburg Austria, December 2023. (*n*=20 attendees). Presentation on IDP at ISPIM Connects Porto Alegre conference April 2024. (*n*=30 attendees). Presentation / workshop at ISPIM Tallinn conference, June 2024 on national innovation programme. (*n*=40 attendees). Chaired Special Interest Group on Innovation in Healthcare at ISPIM Bergen annual conference, June 2025 (*n=38* attendees) Keynote presentation on 'Developing and Implementing the 2023 ISW' International Conference on Technologies & Organization, La Rochelle, France June 2025 (*n*=50 attendees). *Publication 2* - Information Systems Journal – accepted October 2025, published November 2025. *Publication 3* - AI at International Conference on Technologies & Organization, La Rochelle, June 2025	Health and Care Innovation Wales programme and infrastructure endorsed by all WG Directors and NHS Wales CEOSs at their May 2024 Leadership Board meeting. (*n*=30 attendees) *Paper C* - Oral statement on Innovation in Healthcare by Minister for Mental Health and Wellbeing – December 2024. *Paper 14* - Health and Care Innovation Wales programme and supporting infrastructure projects established and launched on 12th March 2025 www.hsciw.wales *Paper D* - Written Statement on ISW and IDP progress by the Welsh Government, March 2025. Launch workshop for www.hsciw.wales resources on 27th March 2025

3.12 Data Analysis

Data captured from each phase of the action research was analysed using both *thematic analysis* and *content analysis*, followed by feedback loops.

Thematic Analysis: Thematic analysis was conducted after each data collection phase, allowing for the identification of key themes and insights relevant to the innovation landscape in Wales. This approach ensured that emerging themes were continually integrated into the ISW's evolving framework.

Content Analysis: Content analysis across cycles enabled the identification of consistencies and variations in stakeholder feedback. This method allowed for iterative refinement of the ISW, ensuring that the strategy remained responsive to stakeholder needs while maintaining alignment with overarching policy goals.

Feedback Loops: The AR cycles incorporated feedback loops, where findings from each cycle informed the development of the next. This iterative process allowed for continuous improvements to the ISW, drawing on real-world insights and stakeholder contributions to refine the strategy.

3.13 Ethical Considerations

Ethical considerations were central to this study. All data were collected with the informed consent of participants, and confidentiality was strictly maintained, especially given the sensitive nature of policy and innovation-related data.

The researcher's dual role as a government official and civil servant required careful attention to the Civil Service Code (Civil Service Commission, 2025), which sets out the standards of behaviour expected of Civil Servants. Civil Servants are expected to make sure that they do not bring the Civil Service into disrepute either while carrying out their role or in their private life.

The Civil Service Code is based on four core values:

- Integrity
- Honesty
- Objectivity
- Impartiality

These core values support good government and ensure the achievement of the highest possible standards in all that the Civil Service does. This in turn helps the Civil Service to gain and retain the respect of ministers, Senedd Cymru, the public and its customers.

The principle of objectivity was particularly important – ensuring all research was based purely on evidence and facts, without influence by personal feelings or opinions, with reflexive practices adopted to allow for self-examination and critical thinking to mitigate any potential biases.

Regular ethical reviews were conducted during academic supervision, to ensure that all activities adhered to the guidelines established by the researcher's institution. Ethics was approved by School of Management Research Ethics Committee.

3.14 Limitations

Whilst the action research approach provided in-depth, practice-based insights, it also introduced certain limitations. The iterative, context-dependent nature of action research can pose challenges for direct comparability, as each cycle adapts to real-time changes. Additionally, the researcher's dual role in the policy development and subsequent implementation process may introduce biases, despite reflexive efforts to mitigate these. Finally, the stakeholder-driven approach, while valuable for contextual relevance, may limit the generalisability of findings to broader contexts outside Wales.

Both qualitative and quantitative data was used, to balance the limitations of both types. Qualitative data was more prevalent in this research and provided a breadth of opinions and feedback, but was more time consuming to collect, could be more difficult to gain access to, more

time consuming to analyse. In addition, it was sometimes more difficult to guarantee anonymity and confidentiality, the quality of the data gathered can often be more subjective.

Limitations of quantitative data were that it did not capture the complexity and richness of human experience, opinions, or behaviour in what is a subjective and specialist policy area, quantitative data did not allow for follow-up questions or probing to gather more insights ton inform policy and it required more resources, time, and skills to collect and analyse the data.

3.15 Chapter summary

Chapter 3 has outlined the methodological framework and approaches employed throughout this research study. A qualitative, action research approach was adopted for data collection, supplemented by secondary data to enrich and validate findings. In addition to outlining methodological approach, this chapter has described the research methodology used to investigate the development and implementation of the Innovation Strategy for Wales (ISW).

An action research framework was adopted, allowing for continuous engagement and adaptation throughout the study's four phases (see section 3.11). By incorporating insights from a diverse range of stakeholders and adopting an iterative, reflective approach, the methodology facilitated the co-creation of a strategy responsive to Wales' unique healthcare innovation landscape. Chapter 4 then presents the findings from each evidence phase.

The chapters 5 and 6 then respectively discuss findings of research cycle and discuss the impact of the iterative refinement process on the final ISW and Innovation Delivery Plan (IDP). Table 11 below illustrated the phases of research, including data input and results/findings (outputs) across the longitudinal function of the study ranging from October 2019 to July 2023.

CHAPTER 4: RESEARCH PHASE 1 - PRACTITIONER REFLECTIONS AND THE DEVELOPMENT OF AN EVIDENCE BASE TO SUPPORT AN ISW

4.1 Introduction to the chapter

This chapter, through Phase 1 of the action research cycle, presents a range of evidence and data sources (section 4.2), including practitioner reflections and insights gained from professional innovation leadership experience within NHS Wales (sections 4.3). The empirical findings from the three main evidence sources used to develop the Health and Wellbeing mission of an Innovation Strategy for Wales (ISW) are set out (sections 4.4, 4.5, 4.6 respectively) These sections detail systematically gathered data through mixed-methods research, including stakeholder interviews, expert panels, surveys, and commissioned reports. Collective analysis and emerging themes arise from the thematic analysis (section 4.7), which are then strucutred into five key recommendations (section 4.8). A summary of the chapter is provided (section 4.9) with a discussion and final remarks and findings (section 4.10). Final remarks are then detailed at the end of the chapter (section 4.11).

Table 14 below sets out a summary of Action Research Phase 1, cross referenced against the relevant inputs, outputs and interfaces – with the resulting impact and influence on policy.

Table 14: Research Phase 1 summary

Table 13: Summary of Action Research Phases.

Research Phase	Inputs	Outputs	Interfaces	Impact/Influence on policy
1. Reflecting on knowledge gaps to inform ISW evidence collection and analysis. *Reflections on practitioner experience in innovation leadership roles.* *Evidence collection to support case for ISW.* *Thematic analysis of evidence to develop the ISW.* *This activity was undertaken between October 2019 and March 2022.*	Reflections on innovation leadership role. AB Innovation approach as approved by ABUHB Board, based on a 'innovation pull and push model'. AB innovation approach – based on innovation push and pull' Ministerial commitment in 2021 to publish an Innovation Strategy for Wales.	Evidence Source 1: NHS Wales Covid-19 Innovation Study (May 2020 - March 2021) Evidence Source 2: Designed Cardiff Business School (CARBS) key opinion leader study (October – December 2021) *Evidence Source 3 / Paper 1:* NHS Wales evidence request in support ISW development. (December 2022 to February 2022)	Evidence produced: NHS Wales Covid-19 Innovation Study source 1: NHS Wales Innovation Study (n=273 respondents) NHS Wales Covid-19 Innovation Study source 2: Health Science Programme Survey (n=129 respondents) NHS Wales Covid-19 Innovation Study source 3: Bevan Commission Practitioner experience study data 2 Phases (n=454 respondents) NHS Wales Covid-19 Innovation Study source 4: Case Studies selected based on the analysis of survey data with focus group validation (n=37 case studies; plus 15 expert panel)	Creation of full evidence base in support of an ISW. Key ISW themes and recommendations as ISW 'skeleton'. WG approval to utilise the evidence base, key themes and recommendations to produce a draft ISW.

	Welsh innovation context analysis, through literature review.		CARBS key opinion leader study to understand the healthcare innovation landscape in Wales – stakeholder interviews (n=30 case NHS Wales, Government, Academic practitioners) NHS Wales evidence responses to support ISW development n=12 Qualitative and Quantitative data – gathered through mixed methods.	

4.2 Evidence and Data Sources

The evidence synthesis presented in this chapter draws from a multi-layered and methodologically rigorous approach to understanding healthcare innovation within NHS Wales. The integration of practitioner reflections, empirical studies, and strategic evidence-gathering efforts provides a holistic foundation for the proposed Innovation Strategy for Wales (ISW). The findings underscore the necessity of a structured innovation framework that aligns organisational strategy, policy development, and practical implementation. Practitioner reflections offer a unique perspective on the evolution of innovation governance, highlighting key enablers and barriers to systemic transformation.

The NHS Wales COVID-19 Innovation and Transformation Study provides critical empirical data on pandemic-driven adaptations, demonstrating the value of rapid decision-making, digital technology uptake, and cross-sector collaboration. Complementing this, the Key Opinion Leader Study captures diverse expert stakeholder perspectives, identifying inconsistencies in innovation maturity across health boards and reinforcing the need for a centralised national framework.

Further, the Welsh Government's NHS Wales evidence request generates qualitative insights into the infrastructure, funding, and governance models needed to support and sustain long-term innovation efforts. The incorporation of financial analysis and international benchmarking adds depth to the strategic recommendations, ensuring they are grounded in both local context and global best practices. Taken together, these data sources form a robust empirical foundation that not only validates the proposed strategy but also provides a roadmap for embedding innovation within NHS Wales as a core organisational capability. Evidence and data results chapter are drawn from several sources and are summarised below:

4.2.1 Practitioner Reflections

Insights from the author's tenure as Head of Innovation (HoI) for the Health, Social Care, Children and Early Years (HSCEY) Group within Welsh Government, and as Assistant Director of

Innovation (ADI) for Aneurin Bevan University Health Board (ABUHB). This includes internal organisational reports, strategic plans, data from ABUHB's internal financial reports, budget allocations for innovation, and an internal staff innovation survey capturing 219 responses on organisational readiness and capability. These sources fed into a March 2021 paper to the ABUHB Executive Board on developing an innovation approach for the organisation.

4.2.2 Three primary evidence sources

The development of the ISW was informed by three primary evidence sources: (1) the NHS Wales COVID-19 Innovation and Transformation Study, (2) a key opinion leader study designed by the researcher and conducted by Cardiff Business School, and (3) an NHS Wales evidence request commissioned by Welsh Government. These sources provided a robust empirical foundation for defining innovation priorities and strategic interventions.

4.2.3 Evidence Source 1 - NHS Wales COVID-19 Innovation and Transformation Study

A national study capturing learning and adaptation across NHS Wales during the pandemic, based on over 1,000 survey responses, case studies, and interviews with healthcare professionals. The breakdown of evidence bases used within this study is shown in Figure 10 below.

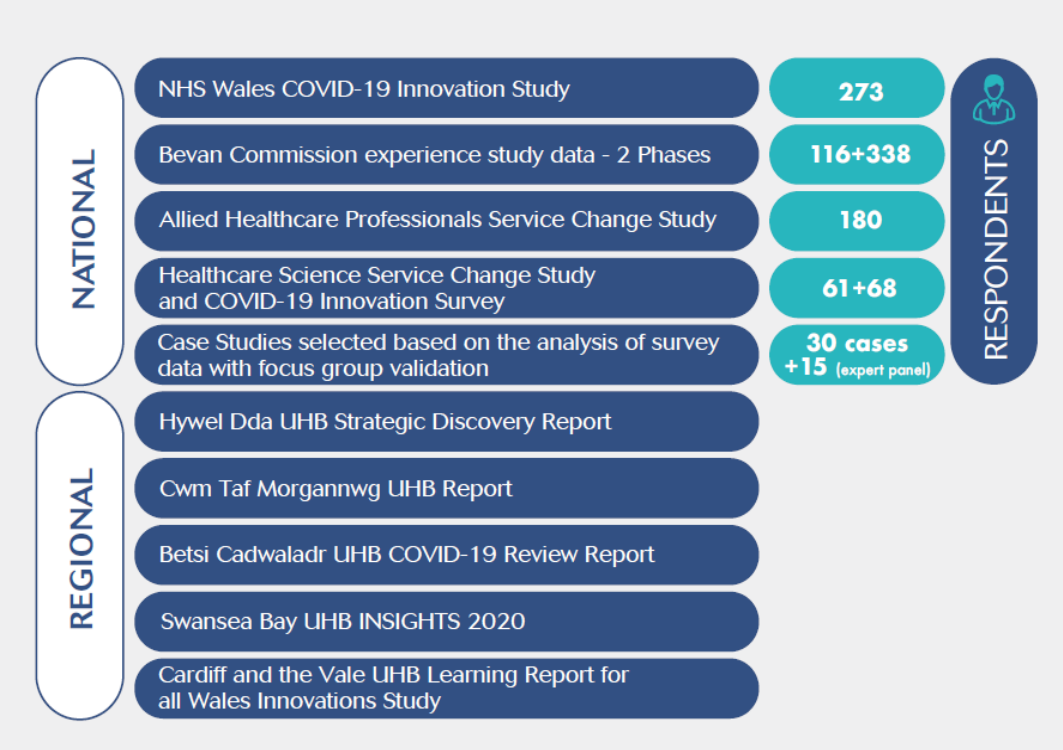

Figure 10:NHS Wales COVID-19 Innovation and Transformation Study evidence breakdown

4.2.4 Evidence Source 2 - Key Opinion Leader Study

A series of 30 semi-structured interviews was undertaken with healthcare innovation key opinion leaders. This included NHS Wales innovation leads, government officials, academic experts and industry stakeholders. A set of semi-structured questions informed the interview, using format set out by the researcher and designed to seek opinions from experts to form a comprehensive view of the healthcare innovation landscape in Wales, including strategy, effectiveness, common innovation processes, alignment with research, system needs, the maturity of organisational innovation approaches and challenges facing the healthcare innovation landscape.

4.2.5 Evidence Source 3 - Welsh Government National Evidence Request to all NHS Wales and affilitated organisations

A national request for evidence from Welsh Government was issuedto all NHS Wales organisations, the Bevan Commission, and Health Technology Wales, commissioning qualitative responses on systemic innovation needs, infrastructure gaps, and strategic priorities.

4.3 Practitioner Reflections on Innovation Leadership in NHS Wales

This section reflects on professional experiences in innovation leadership roles, particularly within NHS Wales, that contextualise the development of a more strategic approach to innovation. The reflections span the period from 2014 to 2021, covering roles such as Head of Innovation (HoI) for the Health, Social Care, Children and Early Years Group (HSCEY) within Welsh Government and as Assistant Director of Innovation (ADI) for Aneurin Bevan University Health Board (ABUHB).

During the HoI tenure, responsibilities included overseeing NHS Wales' innovation policy, securing funding for various projects, and fostering strategic partnerships with research institutions, industry, and government bodies. The role involved shaping NHS Wales' innovation infrastructure by integrating improvement, research, and Value-Based healthcare into a cohesive strategic approach. The complexity of managing innovation within a large-scale public healthcare system was evident, requiring both top-down strategic direction and grassroots engagement with healthcare professionals.

During the ADI tenure, ABUHB committed the role to develop an organisational approach to innovation, with the overarching aim to bring a structure and coherence to its existing innovation activity, whilst generating a range of additional opportunities for the organisation to think and work in new and different ways, ultimately leading to improved and increased healthcare value.

Within the IMTP Innovation was defined as 'Doing new and different things' – new and different activity that tests and demonstrates additional value, which is not routinely undertaken by the organisation.

ABUHB already had well established individual, but separate infrastructure for Research, Improvement, Value Based Healthcare, so an innovation approach must align and complement rather than duplicate the existing structures and programmes in place, shown below in Figure 11. Work to align these functions was outlined in the 2020/2021 ABUHB Integrated Medium-Term Plan, under the common thread of supporting the Health Board to 'think and work differently'.

Figure 11: ABUHB 2021 Integrated Medium Term Plan infographic describing the relationship between Research, Improvement, Innovation and Value Based Healthcare.

4.3.1 Rationale for an ABUHB Organisational Innovation Approach

Healthcare systems globally face increasing pressures due to demographic changes, financial constraints, and the impact of COVID-19. Innovation within NHS Wales has been identified as a crucial mechanism for addressing these challenges by supporting new and different ways of working that enhance efficiency, improve patient outcomes, support economic development and foster more sustainable healthcare models. In 2021, analysis of five years of NHS Wales annual plans, using the Innovation enabler from the 2020 – 2023 NHS Wales planning framework (Welsh Government, 2019) and assessed by Welsh Government, revealed significant inconsistencies in organisational approaches to innovation, underscoring the need for a more strategic, structured and supported approach.

Findings from IMTPs highlighted varying levels of commitment to innovation and barriers to innovation and adoption, including a lack of dedicated innovation infrastructure at both national and local levels, inconsistent investment levels across health boards, and difficulty in assessing the impact and value of innovation initiatives. The analysis underscored the necessity of an innovation strategy that ensures that all NHS Wales organisations operate under a unified innovation framework, based on evidence and learning, that supports sustainable and scalable innovation.

4.3.2 Development of an Organisational Innovation Strategy

During the ADI tenure at ABUHB, a structured innovation approach was designed that integrated innovation with Research, Improvement and Value-Based Healthcare (AB Connect – see section 4.4.3). The approach emphasised the integration of Research, Improvement, and Value-Based healthcare as interconnected components under a unified innovation strategy, thereby fostering a culture of evidence-based decision-making. This was supported by a late 2019 / early 2020 (pre-Covid-19) organisational survey on innovation, capturing the perspectives of 219 staff members, alongside structured engagements with key stakeholders, including executive leadership, clinical teams, and innovation networks.

Further, a financial analysis revealed that in 2019 (see Table 15 below), ABUHB had allocated a £3.294m, or approximately 0.234% of its overall 2019 budget of £1.49bn, to Research, Improvement, Innovation, and Value-Based healthcare. This indicated the need for more substantial and collaborative investment in innovation to drive transformation through new and different ways of working.

Table 15: ABUHB spend on Improvement, Innovation, R&D and Value Based Healthcare in 2019.

	Income	Pay	Non-Pay	Total
ABCi (Improvement team)	-161,993	757,042	109,796	704,845
Value-Based healthcare team	-44,578	488,127	469,894	913,443
Research and development team	-584,167	1,782,572	402,143	1,600,548
Innovation team		£75,914		£75,914
Total				**£3,294,750**

4.3.3 The AB Connect model for Research, Innovation, Improvement & Value

From the analysis of the evidence above, several common needs emerged. A new approach to join up Research, Innovation, Improvement and Value (RIIV) was needed across the organisation - as a single function to support the organisation to work and think differently in the face of existing and new challenges. A simple and non-linear innovation model was required to be able to easily explain how we were organising our internal work across the four functions with our externally focused work. Through WG policy development work, the 'innovation pull' and 'innovation push' model had been encountered in a range of academic and industry settings. Given that ABUHB as an NHS Wales organisation, had many real customer problem/needs, many of which required external solutions, then the AB Connect function would be the focal point of the 'innovation pull' activity – to bring external solutions in (the Research and Development teams and Innovation teams in particular). But given that the AB Connect function also had a range of existing organisational expertise and solutions that it could provide/push to the organisation where needed (Improvement and Value teams in particular) then the AB Connect function would also be focused on 'Innovation push'.

This model would be named AB Connect as an RIIV Centre of Excellence, which aligns the organisation's 'push' activity (defined as internal solution based work focused on internal priority and need under the RIIV headings, that supports ABUHB to think and work differently) focused on to align with 'pull' activity (defined as external focused platforms, that can support ABUHB's internal RIIV activity and functions). The AB Connect model for Research, Innovation, Improvement, and Value (RIIV) is shown at Figure 12.

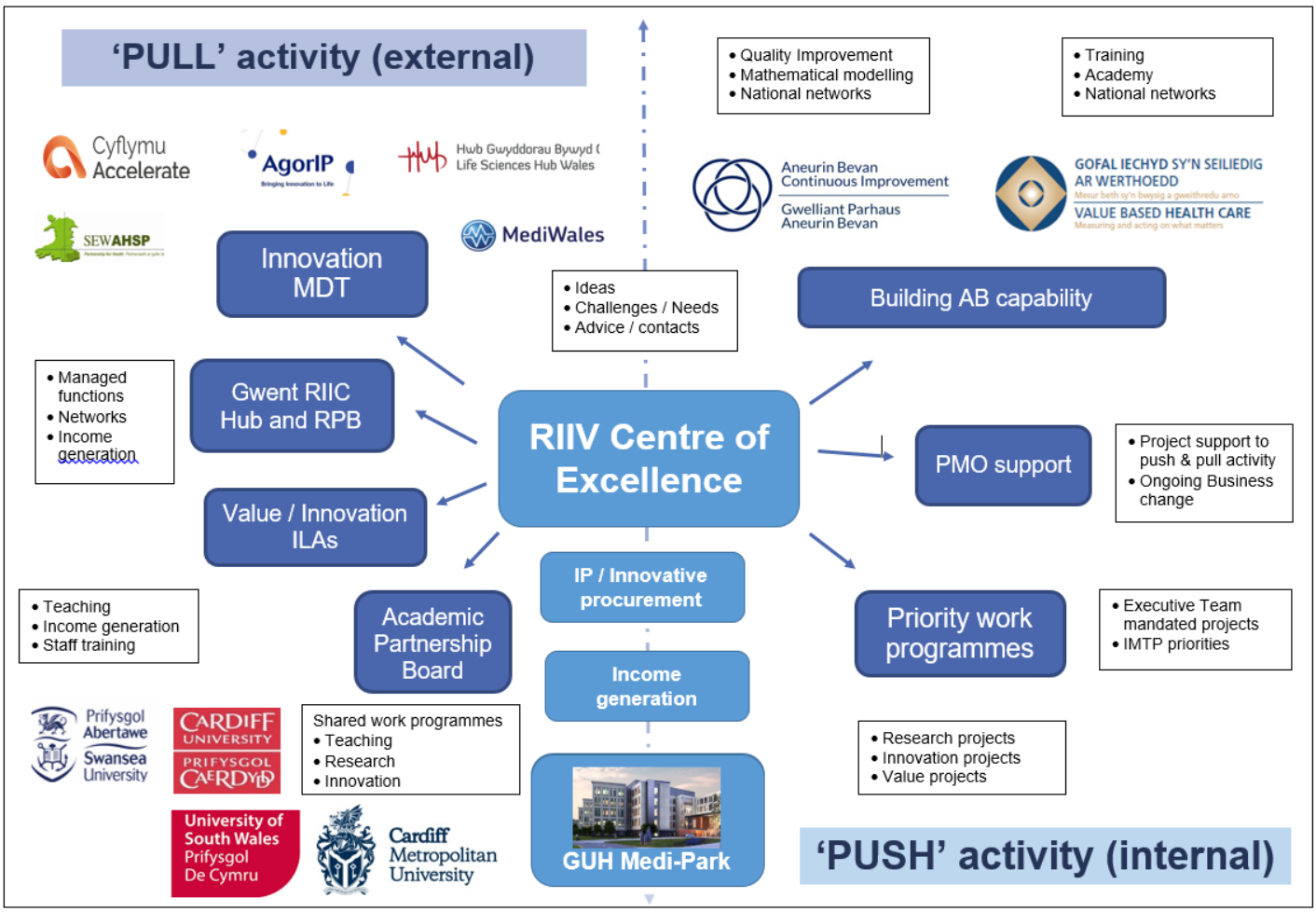

Figure 12: AB Connect RIIV – 'innovation pull and push' model (Authors own)

This model integrated the four RIIV functions into a cohesive system, designed to enable the organisation to work and think differently when addressing both existing and emerging challenges.

The model illustrates AB Connect as a Centre of Excellence, aligning internal organisational capabilities (the 'push' mechanism) with external innovation platforms (the 'pull' mechanism) – with both aligned to meeting organisation priorities. By bridging internal and external innovation efforts, the RIIV model fosters a dynamic, system-wide approach to innovation that is both responsive and sustainable.

The AB Connect (RIIV) innovation approach was presented for approval at the ABUHB Executive Team Board in March 2021, with the resulting outcome that the approach was embedded across the organisation. ABUHB would align and embed our Research, Improvement, Innovation and Value Based Healthcare functions – AB Connect – against our organisational priorities.

This model, based on innovation push and innovation pull, was well received and approved by the ABUHB Executive Board as it simplified a complex, often competing set of organisational functions. The model was also replicable and its positive reception locally, informed the future thinking at a national level for the ISW. This model was hailed as good practice across the sector and informed future strategic thinking as a robust model for local innovation that could inform national scale, as suggested within *A Healthier Wales*.

4.4 Evidence Source 1: NHS Wales COVID-19 Innovation and Transformation Study

4.4.1 Background to the Study

This national study, conducted between 2020 and 2021, was developed to capture organisational learning for innovation, derived from NHS Wales' pandemic response. This demonstrated a range of applied innovation learning, based on meeting system need through rapid learning and iteration during NHS Wales national response to the pandemic. In this way, the Study was highly applicable to this research through strong underpinning links to action research, that informed policy and practice. The study was published on the Welsh NHS Confederation website in June 2021 and had an Annex of 35 case studies, which demonstrated a range of applied learning in practice, against several clinical themes (Welsh NHS Confederation, 2021).

Through mixed-methods research, including over 1,000 survey responses and 35 case studies, the study identified seven key themes shaping the future of healthcare innovation which include (1) Accelerated decision-making; (2) Staff well-being; (3) Collaborative working models; (4) Agile resource allocation; (5) Sustaining innovation momentum; (6) Digital access and confidence; and (7) Technology integration.

This was the first research and innovation study of its kind, commissioned by the researcher and co-funded and supported by NHS Wales, WG, Health Education Improvement Wales, Bevan Commission, SU, ARCH partnership and the Welsh NHS Confederation. This significant buy-in immediately levered a wide range of organisational investment of time and expertise beyond the financial support. Figure 13 below demonstrates the branding used for the Study when presented to a range of audiences.

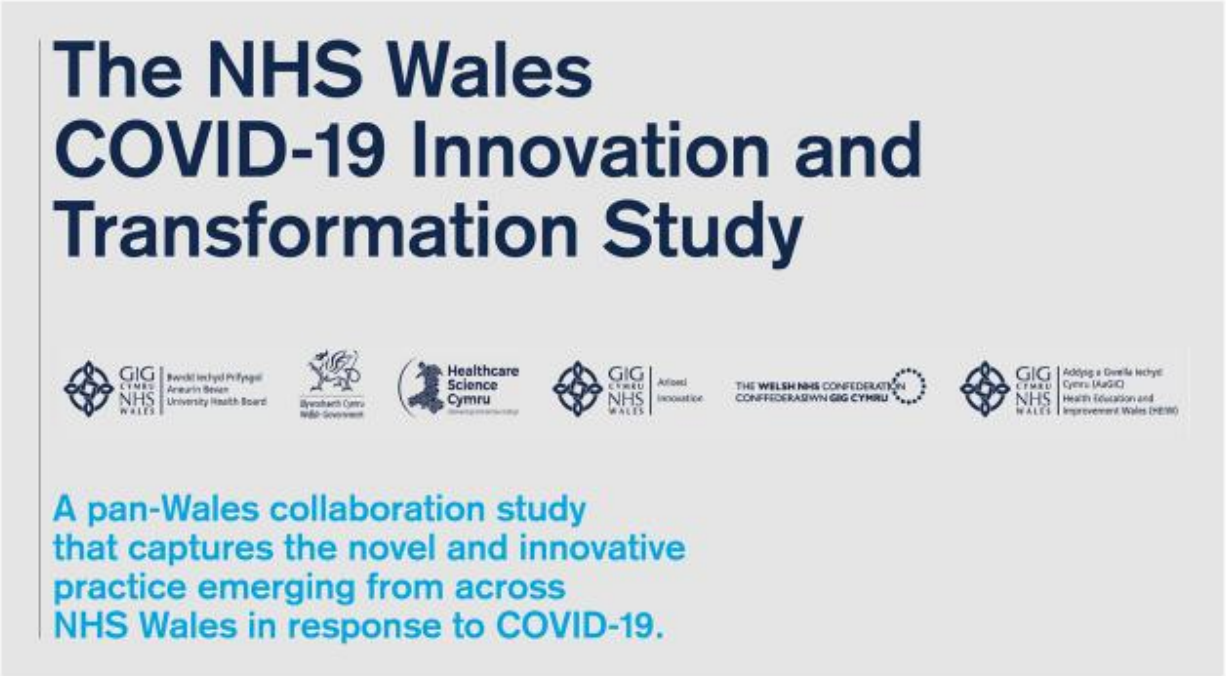

Figure 13: The COVID-19 Innovation and Transformation Study logo.

4.4.2 Emerging Strategic Themes and insights from the COVID-19 Study Data

The emerging strategic themes and key insights from this evidence source are set out below and summarised and applied in Section 4.7.

4.4.2.1 Accelerated Decision-Making

The study findings revealed that revised governance structures during the COVID-19 pandemic facilitated more rapid decision-making processes. Traditional bureaucratic barriers were reduced, enabling frontline staff to implement innovative practices quickly, based on knowledge, experience and instinct. Participants noted that these changes empowered healthcare professionals and led to more effective service delivery. However, concerns were raised regarding sustaining this momentum post-pandemic.

4.4.2.2 Staff Well-Being

The data highlighted the significant impact of innovation on staff well-being, which was particularly important given the pressures on NHS Wales staff because of the pandemic Many new initiatives, including remote working models and digital health solutions, helped reduce staff burnout and improve work-life balance. Respondents suggested that continued investment in staff support mechanisms and well-being programs, with specific workforce representative organisations, would be critical for maintaining an engaged and healthy workforce.

4.4.2.3 Collaborative Working Models

A key theme emerging from the evidence was the role of multi-disciplinary collaboration in driving successful innovation. The study identified numerous examples of cross-sector partnerships between NHS organisations, academia, and industry, demonstrating the value of knowledge-sharing networks in fostering innovation. Continuing the use of these MDT type approaches was felt to be essential in supporting innovation going forward, to continue to mix skill sets and experience.

4.4.2.4 Agile Resource Allocation

Innovation efforts during the pandemic necessitated flexible resource reallocation, according to changing priorities. The ability to rapidly shift resources, including staff and funding, allowed NHS Wales to respond effectively to a range of emergent healthcare challenges. Future strategies, including prioritisation and workforce strategies, should institutionalize this adaptability within long-term planning frameworks.

4.4.2.5 Sustaining Innovation Momentum

Positive feedback was given regarding the ability to try new things and provide services in new ways. One of the major challenges identified was sustaining the pace of innovation beyond the crisis period and not reverting to pre-pandemic structures and approaches. Respondents emphasized the need for permanent innovation governance structures, dedicated funding streams, and policy support to maintain the gains made during the pandemic.

4.4.2.6 Digital Access and Confidence

The widespread adoption of digital technologies – including Microsoft Teams as a meeting tool – reduced the need to travel, improved access to healthcare services and streamlined administrative processes – proving to be critical in responding to the pandemic. Disparities in digital literacy were highlighted among staff and patients, which presented barriers to full digital adoption, highlighting the need for further digital skills assessment and development.

4.4.2.7 Technology Integration

The study underscored the role of emerging technologies in transforming healthcare service delivery. Virtual meeting software, Artificial Intelligence, remote monitoring machine learning, and telehealth platforms were identified as key enablers of efficient and effective patient care, warranting

further investment and integration into NHS Wales operations. The study underscored the necessity of embedding innovation within NHS Wales structures to sustain the positive transformations catalysed by the pandemic. It further demonstrated significant cost savings, including £780,000 in staff travel reductions within ABUHB alone following the introduction of Microsoft Teams as a meeting tool which scaled up across Wales, would translate into substantial national savings. The findings provided critical insights into how innovation could be leveraged for long-term healthcare sustainability.

4.5 Evidence Source 2: Key Opinion Leader Study (Cardiff Business School)

This study involved semi-structured interviews with 30 key stakeholders across NHS Wales, government, academia, and industry from October to December 2021. The findings examined innovation maturity across health boards, highlighting the need for a standardised national innovation approach and framework. The study also emphasised the importance of dedicated funding mechanisms, executive leadership support, and structured collaboration with external partners.

Analysis of NHS Wales innovation maturity and challenges was conducted through n=30 semi-structured stakeholder interviews with key opinion leaders. The results identified disparities in innovation maturity across health boards, need for standardised national framework.

4.5.1 Findings from semi-structured Interviews & Questionnaires

This section of research described the findings to the responses from the questionnaire survey (see Section 3 on methodology) in regarding the participants' responses. Each sub-heading in the findings section below reports the answers to the questions asked in the questionnaire survey. Innovation at a national level (Wales) This segment from the questionnaire survey answers seven questions regarding respondents' opinions on health and care innovation at the national level (Wales).

4.5.2 Ranking of NHS Wales organisations in maturity levels of innovation

In the Study (see Figure 14 below), 33% of respondents considered the maturity level of NHS Wales organisations to be "Below Average", highlighting the problems around insufficient funds and improper innovation infrastructure. Considering the willingness and initiatives of some NHS Wales health boards and individuals to innovate, 37% of respondents considered the maturity of NHS Wales to be "Average" while the remaining 30% voted for NHS Wales being "Above Average".

What do you feel is the overall innovation maturity level of NHS Wales organisations in Wales?

Ranking	Votes
1 (Low)	
2	
3	3
4	7
5 (Average)	11
6	6
7	2
8	
9	
10 (High)	
Can't Say	1

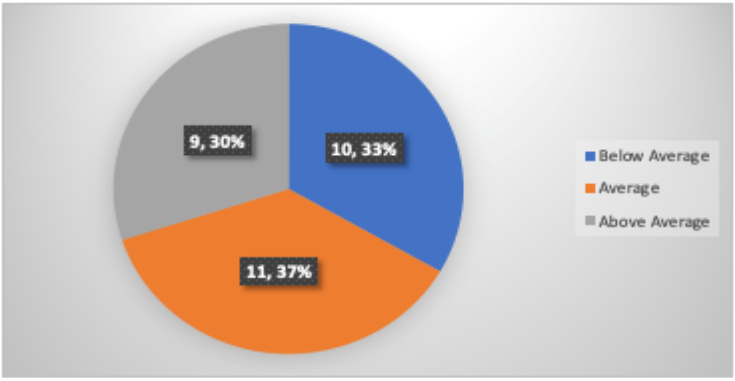

Figure 14: Survey result - Innovation maturity level of NHS Wales organisations in Wales.

When interviewed for selection of the most to the least innovative NHS Wales organisations, Cardiff & Vale University Health Board (CAVUHB) was ranked first with 11 interviewees' votes for its appreciation towards clinical innovation, see Figure 15 below. The Wound Healing Research Unit of CAVUHB working in association with Cardiff University focusses on developing world-class clinical, and scientific wound healing resources by carrying out clinical trials on humans with acute and chronic wounds under-recognised Good Clinical Practice and International Council on Harmonisation guidelines (CAVUHB, 2021).

Which NHS Wales organisation(s) do you feel are most mature and why? Select one or more.

Health Boards	Sum of Votes
Cardiff & Vale University Health Board	11
Aneurin Bevan Health Board	10
Cwm Taf Morgannwg Health Board	9
Hywel Dda Health Board	9
Betsi Cadwaladr University Health Board	7
Velindre NHS Trust	3
Swansea Bay University Health Board	3
Powys Teaching Health Board	2
Welsh Ambulance Services NHS Trust	1
Public Health Wales	1
Grand Total	**56**

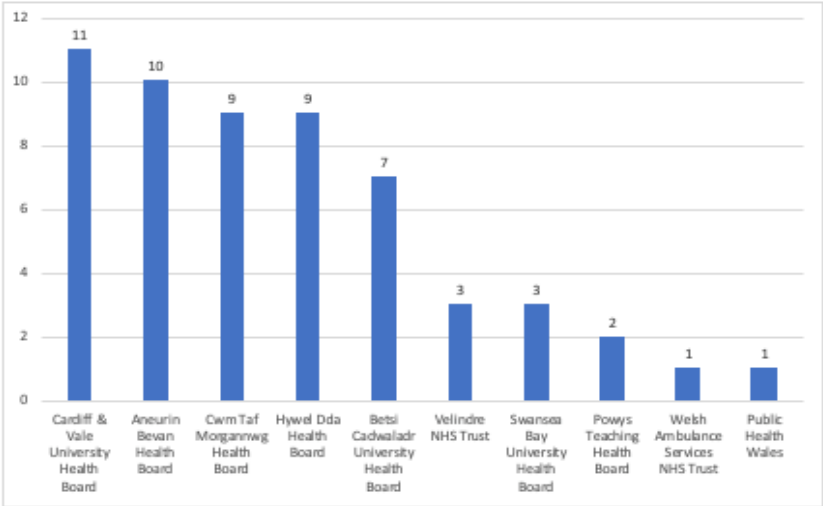

Figure 15: Survey result - Most to the least innovative NHS Wales organisation(s)

Aneurin Bevan University Health Board (ABUHB) was ranked second on the list with 10 votes for its AB Connect approach and digital innovation strategy, although vacancies in their innovation team and no plans to fill these vacancies were risks. The ABUHB designed Digital Architecture which promotes thought to use predictive analysis technologies such as artificial intelligence, business intelligence, and robotics in telehealth, telecare, and telemedicine for making man less informed clinical decisions (ABUHB 2019).

There was a tie between Cwm Taf Morgannwg Health Board (CTMUHB) (recognised for its product development initiatives) and Hywel Dda University Health Board for the third position (with its TriTech initiative) with both receiving 9 votes each.

Betsi Cadwaladr University Health Board received 7 votes, both Velindre NHS Trust and Swansea Bay University Health Board were voted by 3 interviewees each.

Powys Teaching Health Board, Welsh Ambulance Services NHS Trust, and Public Health Wales received 2, 1, and 1 vote respectively making them rank the lowest in the list of innovative NHS Wales organisations.

4.5.3 Responses to Good Innovation Practice Questions

Participants when questioned to mention best innovation good practices, responses in survey primarily highlighted the following innovation practice; dedicated focus on the *Healthier Wales* agenda, establishment of innovation teams within NHS Wales organisations, willingness to innovate, awareness regarding innovation initiatives, and expanding partnerships and collaborations.

4.5.4 Responses to National policy Framework and Health-care Innovation in Wales Questions

In the survey, Figure 16 below, 37% of respondents who considered the national policy framework to be "Below Average" in supporting innovation across Wales stated national policy framework in Wales to be broad, non-coherent, and ineffectual when catering to ground-level innovation aspirations.

Hence, emphasising the absence of a dedicated innovation strategy. 23% of respondents considered it to be "Average", 33% voted for the national policy framework being "Above Average" supportive while the remaining 7% were unaware of the national policy framework.

To what level is national policy framework is supportive of innovation on a scale of 1-10?

Ranking	Votes
1 (Low)	
2	2
3	3
4	6
5 (Average)	7
6	6
7	3
8	1
9	
10 (High)	
No Idea	2

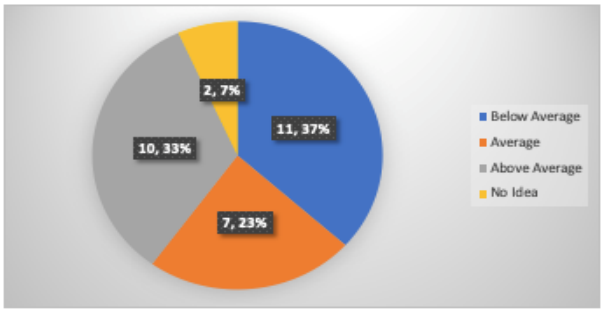

Figure 16: Survey result - Level of support in National policy framework for innovation.

4.5.5 A common defined process for healthcare innovation projects across NHS Wales

The process as a management concept can be accused of stifling innovation, hence sharing a mixed reputation among innovators. However, the goal should not be to get rid of the process altogether but to design better and more responsive processes (Viki 2018).

The results from the survey also reflected in Figure 17 showed 20 participants who voted "Yes" considered having a common guideline to assess the viability of an innovation project for NHS Wales will make it less bureaucratic.

However, 10 participants who voted with a firm "No" held similar beliefs of innovations' creativity getting compromised while trying to fit into a pre-defined process. Also, few respondents considered having a single process to accommodate a broad range of 9 innovations such as service, governance, collaboration, and product innovation might make the innovation work process cumbersome and ineffective.

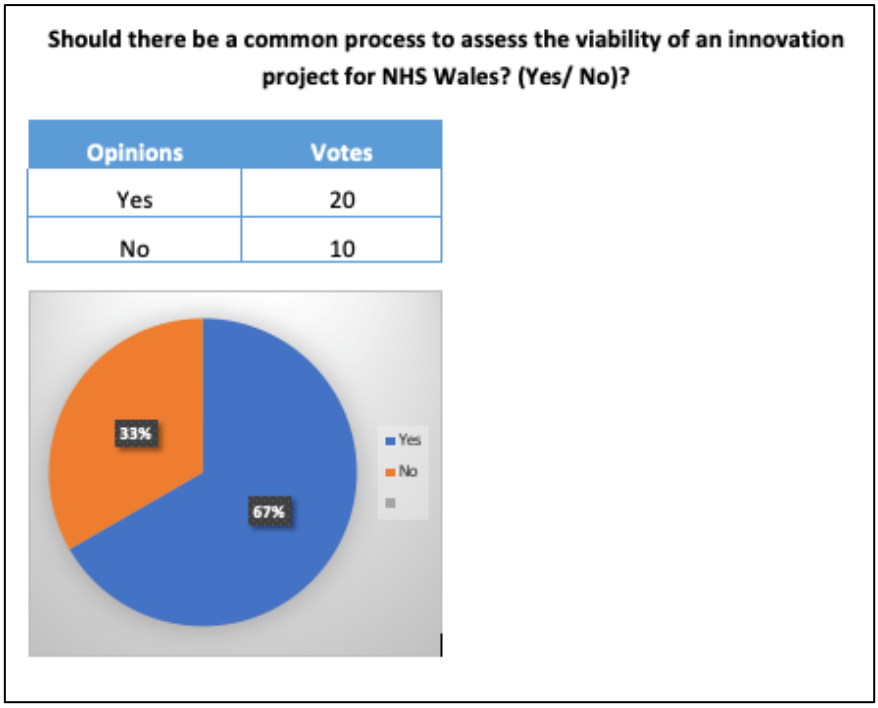

Figure 17: Survey result - Opinion on designing common process for viability assessment of an NHS Wales innovation project.

4.5.6 Results from the innovation support questions

23 participants who voted "Yes" agreed to seek innovation support through project management practices, increased risk appetite within their present organisation, interaction with private sectors, and dedicated funding and infrastructure for innovation practices.

But 7 participants who voted with a "No" considered presently offered support to be working efficiently, see Figure 18 below. Presently, an innovation zone is designed by the Welsh government to extend support to businesses based in Wales (eligibility criteria apply) by offering services for financial assistance and aid for research and development and expertise guidance from universities and colleges (Business Wales 2021).

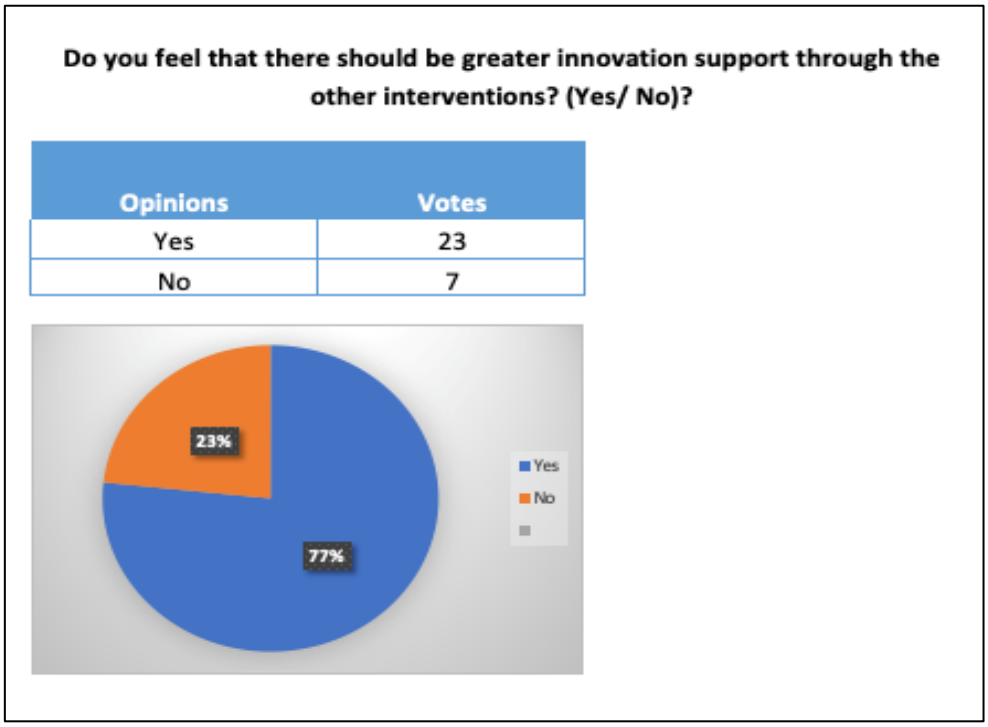

Figure 18: Survey result - Opinion on seeking innovation support.

4.5.7 Results to questions on Should we be working with others on bespoke innovation programs

In the survey, see Figure 19, 25 participants who voted "Yes" stated working with other teams for establishing bespoke innovation programs across specific themes in health and care - for example, digital health, artificial intelligence and primary care would support a greater spread of innovation capability across 'core' policy areas. This would also contribute to reaching out and serving larger audiences with more efficiency and speed.

However, the remaining 5 participants who voted with a "No" held an opinion that we should be tackling basic shortcomings within NHS Wales first before embedding innovation programmes into wider health areas of digital, primary care etc.

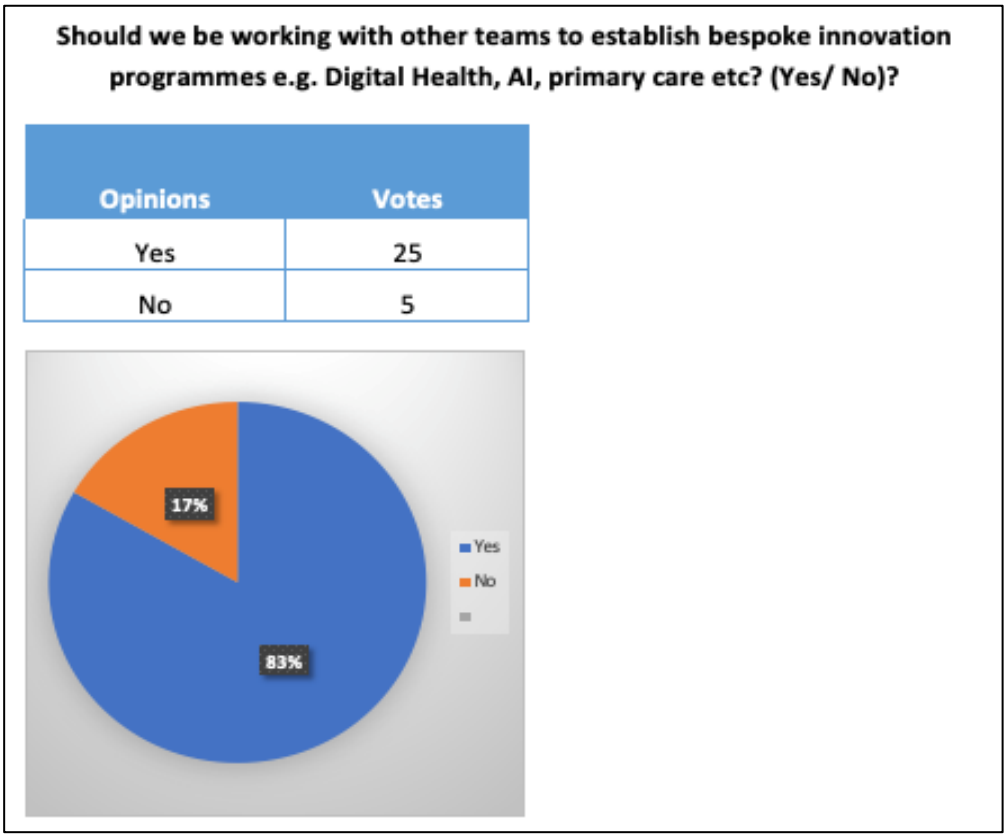

Figure 19: Survey result - Opinions on establishing bespoke innovation programmes.

Previous research concluded innovations' by-products often produce ethical dilemmas and social transformations. So, digitally enabled healthcare implementation requires the application of responsible innovation (RI) principles which promote reflection on the potential ethical and societal implications for a proposed innovation project (Alexander et al. 2017; UKRI 2021).

4.5.8 Results of Innovation at an Organisational Level Questions

This section seeks responses on four questions from the survey focused on questioning interviewees around innovation within their own organisations. Defining innovation within participants own organisations in the survey, all the respondents claimed to have scattered definitions of innovation within their organisation. From individualistic perceptions' majority defined innovation to be a unique new product, process, or service offering patient and social benefits along with generating environmental value. Few considered implementation of in-use processes and technology in a completely new form to be the idea of innovation. While others underlined the continuous confusion of innovation with invention, research and improvement. Programmes of work to drive key elements of successful innovation programmes included dedicated innovation teams, Executive and cultural support, interfaces with external organisations, idea sharing platforms, screening procedures for innovative ideas, funding and resource support, space for collaborative experimentation and communication.

4.5.9 Innovation - alignment with research and improvement

In the survey, shown at Figure 20, 67% of respondents rated the alignment of innovation with research and improvement to fully exploit the potential value of new products, processes, and technologies within their organisation to be “Below Average”, 23% considered it to be “Average”, and 7% considered the alignment of innovation with research and improvement to be “Above Average” while remaining 3% choose not to respond.

To what extend is innovation aligned with research and improvement to fully exploit the potential value of new products, processes and technologies within your organisation on a scale of 1-10?

Ranking	Votes
1 (Low)	
2	5
3	7
4	8
5 (Average)	7
6	1
7	1
8	
9	
10 (High)	
No Idea	1

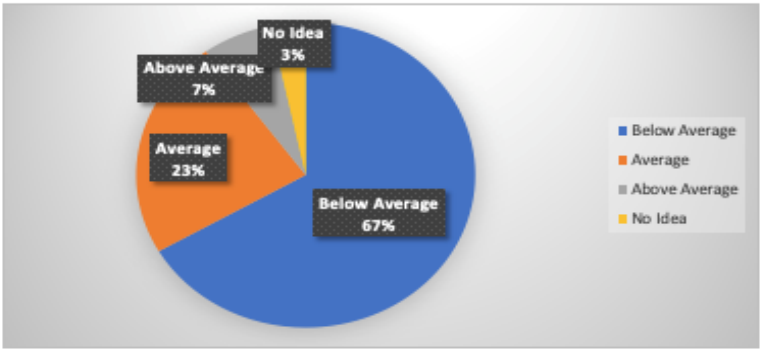

Figure 20: Survey result - Degree of innovation aligned with research and improvement.

4.5.10 Results from Effectiveness of innovation programs questions

When questioned regarding the effectiveness of the participants own organisational innovation programs, 67% of respondents felt the effectiveness of innovation programs initiatives to be “Average”, 20% considered programs to be “Above Average”, 13% were during their initial phase of implementing programs hence choose not to comment. While none of the respondents considered their organisational innovative programs to be “Less than average”. See Figure 21 below for detailed results. 67% of respondents who considered the effectiveness of innovation programs initiatives to be “Average” mentioned lack of appropriate awareness and missing evaluation feedback for innovative practices to be the contributors for underperformance.

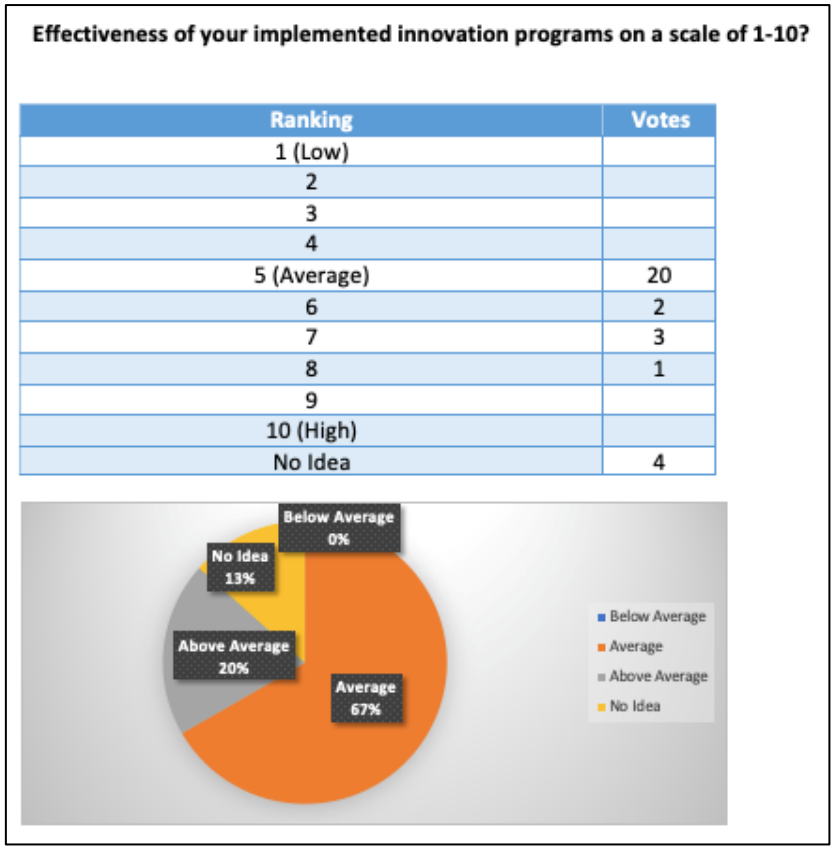

Figure 21: Survey result - Level of effectiveness of participant's organisational innovation programmes.

4.5.11 Results from Measurement Matrix for Innovation questions

Innovation idea screening and evaluation procedures form a critical part of the innovation idea-to-implementation cycle (Emerald Publishing Limited 2021). The opinions from participants in the survey revealed a scattered and inconsistent approach around metrics for calculating and analysing the impact of the innovation activities and initiatives within their respective organisations. The majority of the NHS Wales health boards relied on narrative synthesis, regular questionnaires, and budget impact analysis for understanding the impact of any new innovation proposal. Few of them considered user journey mapping as a way to accurately analyse implemented healthcare innovation projects. Whereas, Accelerate Wales led by Life Sciences Hub Wales, in partnership with Cardiff University (CU), Swansea University (SU), and University of Wales Trinity Saint David (UWTSD) which offer academic expertise uses Innovation Analytic Tool to understand the potential impact of proposed innovation project from start to end (Life Sciences Hub Wales, 2021).

4.5.12 Results from Executive and Cultural Support for Innovation Questions

The promotion of an innovative culture within an organisation is hugely dependent on innovation leaders and their allowance to innovators to bypass barriers and hierarchies that often sap creativity (Ishak, 2017). When participants from various NHS Wales health boards were asked to mention the extent to which they feel executively and culturally supported for innovation the results were fairly unpleasant. 70% of respondents felt lack of executive and cultural support to be "Below Average" within their organisation towards innovative approach, 10% considered it to be "Average", while minority with 13% considered the executive and cultural support within their organisation towards innovative ideas and practices to be "Above Average". The remaining 7% worked independently hence choose not to answer as shown in Figure 22 below.

Do you feel there is appropriate executive / cultural support for innovation within your organisation. What is support like on a scale of 1-10?

Ranking	Votes
1 (Low)	
2	1
3	9
4	11
5 (Average)	3
6	1
7	2
8	1
9	
10 (High)	
No Idea	2

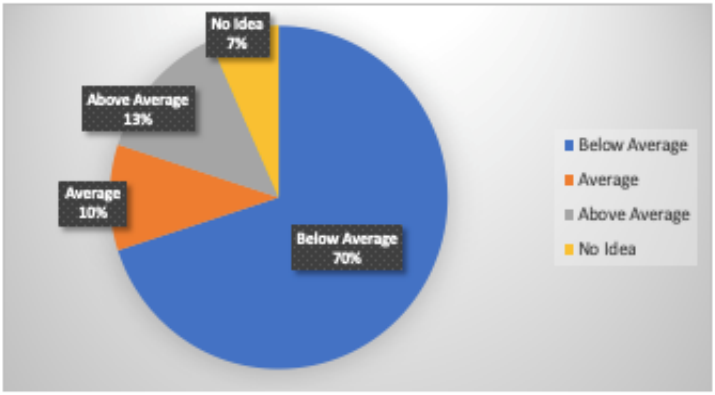

Figure 22: Survey result- Level of executive / cultural support for innovation.

4.5.13 Rating the level of structured and effective relationships with their external innovation partners

Similarly, as illustrated in Figure 23, when respondents were questioned to rate the level of structure and relationships with their external innovation partners the results were still on the negative side. 67% of respondents considered relationships around external innovation partners to be "Below Average", they reported a concern of frequent changes in staff members across innovation hubs which often decreases delivery efficiency. 30% considered relationships to be "Average" while the remaining 3% voted for relationships around external innovation partners to be "Above Average". The innovation maturity level of organisation

Do you have structured and effective relationships with external innovation partners? Such as universities, the Life Sciences Hub Wales, industry partners and innovation programmes such as Accelerate, AgorIP etc. Rate on a scale of 1-10?

Ranking	Votes
1 (Low)	
2	3
3	8
4	9
5 (Average)	9
6	1
7	
8	
9	
10 (High)	
No Idea	

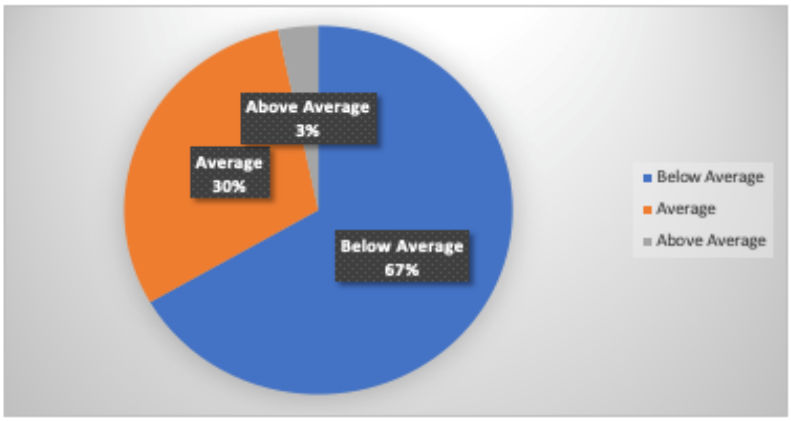

Figure 23: Survey result - Level of effective relationships with external partners.

The discontentment was also reflected in the results when participants were asked to rate the innovation maturity level of their own organisation (see Figure 24). 77% of respondents considered the maturity level of their organisations to be "Below Average", 13% considered it to be "Average" while the remaining 10% considered their organisation's maturity to be "Above Average".

What do you feel is the innovation maturity level of your own organisation on a scale of 1-10?

Ranking	Votes
1 (Low)	
2	2
3	8
4	13
5 (Average)	4
6	1
7	1
8	1
9	
10 (High)	
No Idea	

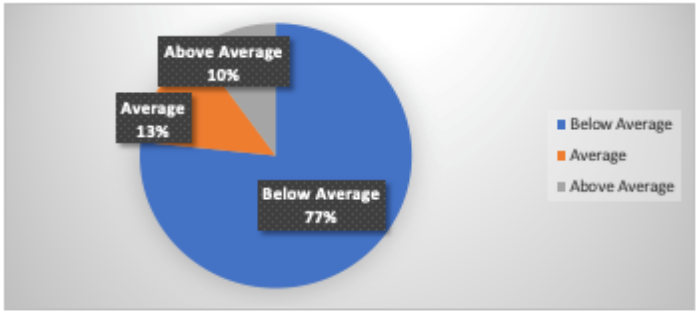

Figure 24: Survey result - Participants' organisation's maturity in innovation.

4.5.14 Recommendations proposed from Evidence Source 2 data

A thematic analysis of the results of this study was undertaken, focusing on negative patterns of responses which can be defined as policy needs or gaps in the system. Recommendations were formed based on the key insights gained, based on meeting the perceived gaps and needs through new interventions. These insights and recommendations are summarised and applied in Section 4.7.

Recommendation 1

Welsh Government needs to clearly define what it considers to be heath and care innovation in Wales to avoid confusion between research, invention, improvement and innovation terminologies which are often interchangeably used within NHS organisations as pronounced by survey respondents.

Recommendation 2

Introduce an all-Wales innovation strategy and policy for healthcare in Wales - with one definition of healthcare innovation. Currently, the NHS Wales planning framework focuses on the broader '*A Healthier Wales'* strategy with a quadruple aim promoting improved, accessible, valued, and sustainable health facilities with embedded elements of innovation (Welsh Government, 2018a) – however this is too high level to be truly specific for innovation.

Recommendation 3

Create a standardised innovation framework for NHS Wales. The use of a common standardised innovation framework if promoted within health boards can help to determine the feasibility, probability and adequacy of proposed innovations, supporting practitioners at each stage. The guideline can be designed by incorporating concepts from pre-existing lean six sigma concepts within NHS to collectively focus on enhancing the speed and effectiveness of deliverables (Bevan et al. 2020). Innovation is not restricted to products rather the concept of innovation can be applied to services, procedures, or programs. Hence trying to design a single matrix for analysing the effectiveness of every innovation project can be an impossible task to achieve.

Recommendation 4

A priority list for innovation is required for Wales. If included in a national policy framework, it will aid NHS Wales organisations to plan, classify, promote, and implement innovative ideas and projects which are in alignment with the mentioned needs within their respective organisations. This will solve the problems in a systematic and efficient manner within the healthcare sector.

Adding a proposed (innovation definition and/or priority list) element to the pre-existing framework or introducing a new dedicated innovation healthcare policy will go through above mentioned governmental procedures causing an uncertain turnaround-wait for the response.

Recommendation 5

Support inter-health boards innovation relationships e.g. through formal support to an NHS Wales Innovation Leads group. The innovation performances of every health board vary enormously from one another as reflected in our survey. This performance gap needs to be bridged between NHS organisations by collaboration, cooperation, and communication. The process of knowledge transfer can be adapted among innovative teams across NHS organisations.

Table 16 below sets out the interview participants from Evidence Source 2 and their roles.

Table 16: Interview Participants and roles within their organisation (incumbent during October to December 2021)

Job Title	**Organisation**
Head of Innovation & Industry Engagement	Welsh Government
Deputy Director | Transformation Health & Social Care	Welsh Government
Head of Innovation | Economy Skills & Natural Resources	Welsh Government
Director	Bevan Commission
Innovation Lead	Bevan Commission
National Head of Business Development & Industry Engagement	Aneurin Bevan University Health Board
Head of Informatics Directorate	Aneurin Bevan University Health Board
Deputy Director of Planning	Aneurin Bevan University Health Board
Assistant Director Value Based Healthcare	Aneurin Bevan University Health Board
Assistant Director	Aneurin Bevan University Health Board
Informatics Lead	Aneurin Bevan University Health board
Grant and Innovation Manager	Aneurin Bevan University Health Board
Consultant Clinical Scientist & Head of Clinical Engineering	Aneurin Bevan University Health Board
Head of Strategy & Service Planning	Swansea Bay University Health Board
Service Planning Manager	Swansea Bay University Health Board
Assistant Director of Innovation	Cardiff & Vale University Health Board
Director | Y Lab	Cardiff University

Dean of Clinical Innovation	Cardiff University
Innovation Specialist & Project Manager	Cardiff University
Clinical Innovation Hub Manager	Cardiff University
Assistant Director R&D	Betsi Cadwaladr University Health Board
Director | Health Technology Wales	Velindre University Health Trust
Head of Innovation	Velindre University Health Trust
Innovation Manager	Cwm Taf Morgannwg University Health Board
Director of Improvement & Innovation	Cwm Taf Morgannwg University Health Board
Chief Executive	NHS Innovations South-East
Chief Operating Officer	Welsh Wound Innovation Centre
Director	Hudson Coaching and Consultancy Ltd.
Head of Economy & Skills	Torfaen County Borough Council

4.6 Evidence Source 3 - National Evidence Request to all NHS Wales and affiliated organisations (Welsh Government commission)

A formal national request for evidence was developed and issued to all NHS Wales organisations and affiliated bodies (the Bevan Commission and Health Technology Wales) as a letter from the WG HSCEY responsible Director. This request aimed to generated qualitative data on the innovation needs of the Welsh healthcare system as part of developing a new ISW, with a specific ask to set out Strengths, Weaknesses, Opportunities and Threats. This would allow examination of what the system needs and opportunities were for innovation and how interventions could be designed to meet those needs through the ISW. Following the collection/receipt of National Evidence Request data (See *Appendix Summary Table - Paper 1*) the qualitative data was compiled information was undertaken. Thematic analysis of responses identified the following five (5) key priorities, with key insights summarised and applied in Section 4.7:

4.6.1 Establishment of more coherent innovation infrastructure

A key finding from the evidence sources was the necessity for a more strategic approach to innovation, with better structured and system-wide innovation infrastructure to support NHS Wales. The responses identified a fragmented approach to innovation, with a range of innovation initiatives, operating both across health boards and the wider healthcare innovation ecosystem. A more integrated,

coherent infrastructure would streamline innovation processes, link system offer with healthcare system need, enhance collaboration between research, improvement, and clinical teams, and provide a sustainable mechanism for scaling successful innovations across the system.

"We need to ensure that any Strategy for Innovation in Wales is useful i.e. it supports clear impact and value - for both society and our university."

Dean of Clinical Innovation – Cardiff University

4.6.2 Development of a common Innovation Framework

Respondents highlighted the need for a common innovation framework and set of evaluation criteria to assess the viability, impact, and scalability of innovation projects. Currently, NHS Wales lacks a uniform innovation framework, leading to inconsistencies in how innovation is approached by staff and how success is measured. A standardised approach, aligned with Value-Based healthcare principles, would ensure that innovation initiatives are rigorously assessed for clinical, financial, and operational effectiveness.

"We need a new innovation strategy and policy framework to inform and guide our work, allowing the best ideas to flourish and resulting in useable products and services that are linked to real clinical, and in-use need."

Director of Improvement & Innovation - Cwm Taf Morgannwg University Health Board

4.6.3 Alignment of Innovation Initiatives with System-Wide Strategic Priorities

Thematic analysis indicated that many innovation projects operate in isolation, without clear alignment to overarching NHS Wales strategic goals. Stakeholders emphasized the importance of embedding innovation into key policy areas such as digital health, workforce development, and service transformation. Establishing a centralised governance structure would facilitate better coordination and ensure that innovation efforts contribute directly to national healthcare priorities.

"We need to be able to apply innovation to real, in use cases, not just in general policy terms but in specific disease areas such as wound care. Failing to apply it specifically can lead to a lack of attributable or useful impact."

Chief Operating Officer - Welsh Wound Innovation Centre

4.6.4 Dedicated funding models to support long-term Innovation sustainability

A significant barrier to sustained innovation was the short-term and ad-hoc nature of funding. Many innovation initiatives relied on temporary grants or discretionary budgets, limiting their long-term viability. Stakeholders advocated for the development of a dedicated innovation funding model, like research funding structures, to provide stable financial support for high-impact projects.

"Coming from the private and procurement sector into health, the transfer of expertise is important, Health can be insular, other sectors have lots to offer, particularly where the motivations to innovate are different."

Assistant Director Value Based Healthcare - Aneurin Bevan University Health Board

4.6.5 Strengthening of Intellectual Property Management and Commercialisation Strategies

Evidence responses underscored the need for NHS Wales to adopt a more strategic approach to Intellectual Property (IP) management and commercialising innovation. NHS Wales organisations often lacked the necessary expertise and frameworks to effectively leverage IP or commercially viable assets, leading to missed opportunities for revenue generation knowledge transfer – reinvesting income into developing their innovation service more sustainably without the need for Government funding. A clearer policy on innovation and IP ownership, commercialisation and income generation partnerships would enhance the financial sustainability of innovation efforts.

"Innovating in the NHS can feel like a lottery, there is nothing that sets out in detail or in a consistent way, a rule book or process for innovation and commercialisation, it can feel very haphazard."

Head of Innovation – Velindre University NHS Trust

The full table of respondents to the request for evidence letter is shown below in Table 17.

Table 17: Table of respondents to the request for Evidence letter

NHS Wales Organisation	Respondent	Date of response
Aneurin Bevan University Health Board	Chief Executive Officer	27th of January 2022
Betsi Cadwalader University Health Board	Associate Director, Research and Development	28th of January 2022
Bevan Commission	Director	27th of January 2022
Cwm Taf Morgannwg University Health Board	Chief Executive Officer	25th of January 2022
Cardiff and Vale University Health Board	Interim Chief Executive Officer and Executive Director of Planning	28th of January 2022
Hywel Dda University Health Board	Chief Executive Officer	7th of February 2022
Health Technology Wales (HTW)	HTW Director and, Chairman	21st of February 2022
Public Health Wales	National Director of NHS Quality Improvement and Patient Safety/Director Improvement Cymru	28th of January 2022
Powys Teaching Health Board	Chief Executive, Powys Teaching Health Board.	1st of February 2022

Swansea Bay University Health Board	Chief Executive Officer	10th of February 2022
Social Care Wales	Chief Executive Officer	28th of January 2022
Welsh Ambulance Services Trust	Executive Medical Director	27th of January 2022

4.7 Critical analysis and application of insights from all three evidence sources

The practitioner reflections and three evidence sources applied and created in this chapter generated a number of insights and recommendations from a significant amount of qualitative data. A critical analysis of these collective insights was undertaken, using thematic analysis as the process of identifying patterns or themes of need within this qualitative data. (Braun & Clarke, 2006). Table 18 summarises the data sources used and a summary of the insights and findings from each source.

Table 18: Summary of Data Sources Used in this Chapter

Data Source	Description	Methodology	Key insights and findings
Practitioner Reflections	Insights from NHS Wales innovation leadership (2014 –2021)	Organisational reports, strategic plans, and personal experiences	Identified key enablers and barriers from practice, applied the first innovation 'pull / push' model for innovation governance
NHS Wales COVID-19 Innovation and Transformation Study	National study capturing pandemic-driven adaptations	Mixed methods: over 1,000 survey responses, case studies, interviews	Highlighted benefits of digital adoption, agile decision-making, and cross-sector collaboration. Publicised need for a new Innovation Strategy and policy.
Key Opinion Leader Study (Cardiff Business School)	Analysis of NHS Wales innovation maturity and challenges	30 semi-structured stakeholder interviews, questionnaires and desk-based research	Identified disparities in innovation maturity across health boards, need for standardised national frameworks, networks, common programmes across Wales.
Welsh Government NHS Wales Evidence Request	Call for qualitative input from NHS Wales organisations	Official evidence submission process	Revealed innovation infrastructure gaps, funding barriers, and system needs and support for commercialisation, funding, intellectual property.
Financial Analysis & Organisational Surveys	Internal ABUHB budget allocations and	Financial reports, survey of 219 staff members	Identified low investment in innovation (0.234% of total budget) and greater infrastructure support, need for dedicated funding models and access.

	staff survey responses		

4.7.1 Narrative of Key themes emerging from the evidence

Much of the evidence recognised that there are significantly more innovation networks, teams, programmes, funding, projects in place than there was 10 years ago and we must capture and pool that collective expertise and learning.

Broad agreement was given on the proposed themes in the health and care innovation programme, including the need for an innovation policy framework, with supporting tools and guidance.

Strong views that we must build on the successes that healthcare innovation funding and programmes have brought, this learning must be aligned with other existing policy areas such as social care, primary care, mental health, workforce, digital health, data, A.I. etc to drive innovation through established work areas.

Innovation needs a balance of supporting 'new and different' functions vs alignment with 'supporting system priorities', a clear link to Covid-19 Recovery and sustainability plans, linked to the strategy for 'A Healthier Wales'… caveat on care that this doesn't duplicate existing 'transformation' activity.

Longer term and more strategic innovation approach to innovation funding like research and improvement, instead of current annual rolling or discrete monies – this will allow longer term innovation planning/delivery, create job security and maintain organisational capabilities once developed.

4.7.2 Theme 1 - Innovation Infrastructure

Greater coordination of existing innovation initiatives and platforms is required, with a 'crowded pitch' observation coming up again and again. The innovation ecosystem requires increased awareness and top-down leadership, with central supporting infrastructure to better coordinate activity, networks, funding, programmes, events, capability building and knowledge assets…. To provide a clear system offer, with clear roles and specialisms. This infrastructure should build upon the recognition and successes of the existing research and improvement infrastructure.

Also, to fully address the issue of scaling innovation, national infrastructure must address scaling, based on evidence and robust assessment against set/agreed criteria, to add credibility and national buy in.

Infrastructure must include horizon scanning functions to look at wider innovation, technology approaches and ways of working that can be considered and adopted consistently opposed to a case-by-case or organisation by organisation basis.

4.7.3 Theme 2 - Innovation Frameworks

Many calls for one agreed innovation development, evaluation and implementation framework based on standard processes and criteria, linked to Value Based Healthcare metrics to assess performance.

Sharing and communicating innovation activity and best practice through national infrastructure – making it real as part of people's day jobs.

Expand support to the NHS Wales Innovation leads group, to build upon the successful 'co-funded, jointly agreed, need based' national projects – Innovation ILA, COVID-19 Innovation Study, Commercialising innovation (Grant Thornton), Common IP Policy and processes.

4.7.4 Theme 3 - Innovation linked to system priorities

Consider a national innovation priority setting exercise and agreed / publish annual WG priority innovation areas. not used anywhere near enough to support innovation, using the experience of the system and its pros and cons.

NHS Wales organisations should set out innovation priority lists – as a 'shopping list' to work with innovation ecosystem, industry and academia – area for targeted investment.

4.7.5 Theme 4 - Innovation capacity, tools and resources

Ecosystem support is reliant on capacity/capability of the innovation function/resource within Health Boards – improved but still ad-hoc and RIC hubs have a number of broad and multi layered priorities.

Establish a portfolio of innovation tools and resources accessible via one point. Includes creative thinking and ideation routes, a common framework for assessing innovation projects, a common IP framework, models to commercialise innovation, Joint Working Agreement templates, industry engagement guides, innovative procurement models, standardised tools and guidance and route maps for specific innovation processes e.g. new product development, working with industry, intellectual property, commercialisation and income generation.

Establish a common definition knowledge base and training programme for innovation – including the rationale for innovation, core concepts, creative thinking and ideation routes, assumption

challenging, raise awareness of existing initiatives, directory of support tools and sector map of initiatives (building upon the Innovation Intensive Learning Academy tools and resources).

4.7.6 Theme 5 – Thematic actions

Produce new Intellectual Property (IP) guidance for NHS Wales to ensure consistency and encourage commercial direction.

Set a clear commercial direction to encourage and support commercialisation of innovation through income generation, financial and governance support, to include flexibility on financial carry over, linked to new IP guidance

One portal to access for innovation funding (e.g. Sport Wales) and a mechanism for innovative procurement, to include working with UK Life Sciences sector and Welsh companies.

Explore how health and care innovation capability can be applied to support and learn from other sectors e.g. Social Care, Local Authorities, Education.

Develop and fund a Social Care Innovation programme that builds on learning in Health, expanding over time.

A once for Wales policy on secondments into academia and industry to cross pollinate skill sets.

Explore routes to support innovative procurement.

4.8 Recommendations emerging from the key themes:

The strategic themes were summarised into a set of five key recommendations.

1. Develop innovation infrastructure, frameworks, tools and resources to better support the system to innovate, under a unified definition of innovation.
2. Develop an Innovation ecosystem governance model that aligns with NHS Wales system priorities.
3. Create a standardised innovation policy, evaluation and implementation framework
4. Build innovation capability and capacity across the system, through structured knowledge sharing mechanisms that support upscale and adoption.
5. Set a clearer, more strategic direction in regard to specific themes; innovation funding and access, intellectual property, commercialization, Social Care innovation and innovative procurement.

4.8.1 Discussion of recommendations

These recommendations are set out in greater detail below.

Recommendation 1 - Develop national innovation infrastructure, tools, and resources under a unified definition of healthcare innovation.

One of the primary findings from the thematic analysis was the need for clear, national-level innovation infrastructure, that aligns the best of the learning from the last decade, under a unified definition of healthcare innovation. Currently, NHS Wales lacks a standardised approach to defining innovation, leading to inconsistencies across organisations. Some institutions focus primarily on technological advancements, while others emphasise research, clinical trials, service improvement, workforce development, or patient-centred care. This unified definition would be put into the ISW, the NHS Wales Planning Framework and NHS Wales University Health Board/Trust criteria as national policy documents on innovation.

Innovation infrastructure development would learn from the experiences of creating national infrastructure for Research and Development (Health and Care Research Wales), Improvement (Improvement Cymru) and Value Based Healthcare (Value in Health Centre).

Recommendation 2 - Develop an Innovation Ecosystem Governance Model that Aligns with NHS Wales Priorities

The study identified gaps in delivery and governance structures between NHS Wales organisations and the external support programmes, which hinders the effective implementation of innovation initiatives across NHS Wales. While individual health boards and organisations have established innovation units, there is limited coordination at the national level. This system fragmentation and lack of overall awareness of who does what, leads to duplication of effort, inefficiencies, and missed opportunities for collaboration.

A national innovation ecosystem delivery model should be established to provide oversight and strategic direction for innovation initiatives. This model should align system need (‘innovation pull’) in NHS Wales with system offer (innovation ‘push’) from the range of external support organisations and programmes that are in place to support innovation, often funded by Government. This will better coordinate innovation activities, allocate resources, and set strategic priorities. It should also ensure that innovation efforts align with the broader objectives of NHS Wales, such as improving patient outcomes, enhancing workforce efficiency, and promoting digital transformation.

Recommendation 3 - Create a standardised innovation policy, evaluation and implementation Framework

A recurring theme in the analysis was the lack of a uniform policy, evaluation and implementation framework for assessing healthcare innovation projects. Currently, health boards use varied metrics to measure the success and impact of innovation initiatives, making it difficult to compare outcomes and identify best practices. A national policy framework, based on the best learning from the last decade, would ensure that all innovation; from early-stage ideation, to developing and testing, to national spread and adoption align with a common set of principles, objectives, and evaluation criteria. This framework should incorporate international best practices such as ISO56000 as the International Standard on Innovation Management, ensuring that NHS Wales remains competitive in healthcare innovation. Additionally, the policy framework should be linked to the support mechanisms that exists externally and will include a range of existing tools and resources that can support.

A standardised evaluation framework should be developed to assess the feasibility, scalability, and sustainability of innovation projects. This framework should be aligned with Value-Based healthcare principles, ensuring that innovation efforts contribute to measurable improvements in patient care, cost efficiency, and system-wide performance. Key components of the framework should include:

i. Clear criteria for assessing the viability and potential impact of innovation projects.
ii. A structured process for piloting and scaling successful initiatives.
iii. Mechanisms for capturing and sharing lessons learned across the system.
iv. Integration with existing healthcare performance measurement tools.

By implementing a standardised evaluation framework, NHS Wales can foster a culture of continuous learning and improvement, ensuring that innovation becomes an integral part of healthcare service delivery.

Recommendation 4 – Build national innovation capacity and capability through structured knowledge-sharing mechanisms that support upscale and adoption.

The study highlighted the importance of building innovation capacity and capability across the system, collaboration in driving healthcare innovation. While individual health boards and research institutions have made significant progress in developing new technologies and service models, there is further scope to improve innovation knowledge-sharing and capability between organisations. This will

combine innovation efforts, where knowledge and successful projects can scale across NHS Wales beyond, beyond specific institutions.

To address this, a structured knowledge-sharing mechanism should be established, facilitating collaboration between health boards, academia, industry, and government agencies. This could take the form of:

i. A single national digital platform to host innovation resources insights, case studies, and best practices.
ii. Support and amplify the national network of NHS Wales innovation leads, meeting regularly through workshops, conferences, and networking events to promote national and international cross-sector engagement.
iii. Commission accredited innovation training for the NHS Wales innovation workforce.

By fostering a culture of collaboration, NHS Wales can maximise the impact of innovation efforts and ensure that successful models are rapidly adopted and scaled across the system.

<u>Recommendation 5 – Set a clearer, more strategic direction in regard to innovation funding, intellectual property, commercialisation and procurement.</u>

A barrier to sustained innovation in NHS Wales is the lack of long-term, dedicated funding for innovation initiatives. Unlike research and improvement structures, which benefit from more stable financial support, innovation projects often rely on short-term grants and ad-hoc funding streams. This limits the ability of organisations to plan, implement, and scale transformative initiatives. In addition, the collation of funding sources across the UK in one place, would support the system to access funding

To ensure the sustainability of healthcare innovation, a dedicated long-term funding model should be established. This model should:

i. Provide multi-year funding for high-impact innovation projects, reducing reliance on short-term grants.
ii. Align innovation funding with strategic healthcare priorities, ensuring that financial resources are directed toward areas with the greatest potential for impact.
iii. Provide an online funding directory, that details all sources of Welsh, UK and international healthcare innovation funding currently available.

iv. Support collaborative funding opportunities that encourage joint innovation projects between different health boards and research institutions.
v. Encourage co-funding and partnership opportunities with industry and academic institutions to leverage additional financial support.
vi. Establish clear reporting and accountability mechanisms to track the effectiveness and return on investment of innovation funding.

4.9 Chapter summary

This chapter has presented a structured account of practitioner reflections, empirical findings, and the development of an evidence base to support the 'Healthier Chapter' of an Innovation Strategy for Wales (ISW). It described the synthesis and insights gained from professional experience in innovation leadership within NHS Wales, combined with systematically gathered data through mixed-methodological research, including stakeholder interviews, expert panels, surveys, and commissioned reports. The chapter is structured into distinct phases, detailing the methodological approach, thematic findings, and their implications for policy and practice.

The research underpinning this chapter stemmed from the necessity to create an innovation strategy and framework that addresses the challenges facing NHS Wales, included funding constraints, demographic shifts, and the need for systemic transformation post-COVID-19 - necessitating a structured approach to healthcare innovation, that also aligns research, improvement, and Value-Based healthcare. By leveraging the practitioner reflections and empirical data, this chapter provided a comprehensive understanding of the innovation landscape within NHS Wales and identifies pathways for future development. The evidence from my three sources was synthesised into a set of strategic themes and five key recommendations that underpin the ISW.

1. Develop innovation infrastructure, frameworks, tools and resources to better support the system to innovate, under a unified definition of innovation.
2. Develop an Innovation ecosystem governance model that aligns with NHS Wales system priorities.
3. Create a standardised innovation policy, evaluation and implementation framework
4. Build innovation capability and capacity across the system, through structured knowledge sharing mechanisms that support upscale and adoption.

5. Set a clearer, more strategic direction regarding innovation funding, intellectual property, commercialization and procurement.

Table 19 below compares the five key ISW recommendations with the corresponding evidence sources.

Table 19: Comparison of Recommendations and the corresponding evidence

	Evidence Source 1	**Evidence Source 2**	**Evidence Source 3**
Recommendation 1 (Innovation infrastructure)	X	X	X
Recommendation 2 (Ecosystem model based on priorities)		X	X
Recommendation 3 (Standardised innovation framework)		X	X
Recommendation 4 (Build capability and capacity through knowledge sharing)	X		X
Recommendation 5 (Clearer direction on innovation funding)	X	X	X

4.10 Chapter Discussion and final remarks

4.10.1 Discussion of insights and finding

This chapter has outlined the evolution of an evidence-based innovation strategy for NHS Wales, drawing upon practitioner insights and empirical research. By integrating reflections from professional innovation leadership roles with a structured analysis of empirical data, this chapter has provided a comprehensive examination of the current innovation landscape in NHS Wales. The findings highlight critical systemic gaps, including the lack of a unified policy framework, inconsistent evaluation methodologies, and fragmented governance structures, which pose significant barriers to sustainable healthcare innovation. This chapter has also outlined the evolution of an evidence-based innovation strategy for NHS Wales, drawing upon practitioner insights and empirical research. The findings

reinforce the necessity of a structured, well-integrated innovation framework to enhance healthcare outcomes and operational efficiency.

The chapter has also demonstrated the necessity for a coherent, long-term funding model to support innovation initiatives, ensuring that successful projects can be scaled across NHS Wales rather than remaining isolated within individual organisations. Furthermore, it underscores the importance of inter-organisational collaboration and structured knowledge-sharing mechanisms to foster a culture of continuous learning and improvement.

The development of the 'Healthier chapter' of the Innovation Strategy for Wales (ISW) presents a unique opportunity to address these challenges systematically. By establishing the right supporting infrastructure, a clear governance model, a standardised innovation framework, building system capability and establishing a more strategic funding model, NHS Wales can drive meaningful innovation that improves patient outcomes, enhances system efficiency, and contributes to long-term healthcare sustainability.

4.10.2 Findings with broader implications for ISW implementation

The findings presented in this chapter raise several key discussion points that have broader implications for the successful implementation of an innovation strategy in NHS Wales. These discussion points include:

4.10.3 The Role of Leadership in Innovation

Effective leadership is a fundamental enabler of innovation within healthcare systems. The evidence suggests that senior leadership commitment is critical for fostering an organisational culture that values and prioritises innovation. Leadership engagement varies across health boards, impacting the adoption and sustainability of innovation initiatives. Future strategies must emphasise leadership development programs that equip senior decision-makers with the necessary skills and knowledge to drive systemic innovation.

4.10.4 Balancing Local Autonomy with Centralised Governance

One of the tensions identified in this study is the need to balance local autonomy with centralised governance. While health boards require flexibility to tailor innovation initiatives to their specific needs, the absence of a coordinated national approach has led to inefficiencies and duplication of efforts. A hybrid governance model that allows for localised innovation within a structured national framework may offer a pragmatic solution.

4.10.5 Measuring the Impact of Innovation

A recurring theme in the analysis is the challenge of measuring the impact of innovation. Without a robust evaluation framework, it is difficult to determine which initiatives are delivering tangible benefits and warrant further investment. Standardised metrics that assess clinical, financial, and operational outcomes should be integrated into the ISW to ensure that innovation efforts are evidence-based and outcome-driven.

4.10.6 Addressing Resistance to Change

Resistance to change remains a significant barrier to innovation within healthcare settings. Some staff perceive innovation as disruptive or resource-intensive, leading to reluctance in adopting new approaches. Change management strategies, including targeted training programs, clear communication, and stakeholder engagement, will be essential for overcoming resistance and fostering a culture of continuous improvement.

4.10.7 The Importance of Cross-Sector Collaboration

The findings indicate that collaboration with industry, academia, and government agencies can enhance innovation capacity and resource availability. Successful healthcare innovation often emerges at the intersection of different disciplines, making cross-sector partnerships a critical component of the ISW. Formalising these collaborations through structured agreements and joint funding opportunities can accelerate the development and implementation of high-impact innovations.

4.11 Final Remarks

This chapter outlines the inherent complexity of embedding innovation within a large-scale healthcare system from the range of evidence produced. While significant progress has been made in identifying key priorities and challenges, the successful implementation of the ISW will require ongoing adaptation, collaboration, and strategic investment. The research underpinning this chapter stems from the necessity to create an innovation strategy and framework that aligns research, improvement, and Value-Based healthcare, reflecting the needs and challenges facing NHS Wales, including funding constraints, demographic shifts, and the need for systemic transformation post-COVID-19. All of these components, plus the wider political drive to publish a new, cross Government ISW, necessitate development of a more coherent and structured approach to healthcare innovation. By leveraging

practitioner reflections and empirical data, this chapter provides a comprehensive understanding of the innovation landscape within NHS Wales and identifies pathways for future development.

The next chapter will explore the policy implications of these findings and present a structured roadmap for embedding innovation as a core capability within NHS Wales. The subsequent chapter will discuss the implications of these findings for policy development and propose a strategic roadmap for implementing the ISW.

CHAPTER 5: RESEARCH PHASE 2 – PRODUCTION OF THE DRAFT INNOVATION STRATEGY FOR WALES FOR PUBLIC CONSULTATION, FINALISATION AND LAUNCH.

5.1 Introduction to the chapter

This chapter presents the second phase of the research, which focused on the practical development, public testing, and formal consultation of a draft version of the Innovation Strategy for Wales (ISW). Building upon the key findings, themes and recommendations generated during Research Phase 1, this stage involved translating evidence-based insights into a draft ISW that could be subjected to internal WG approval and then statutory public consultation. The consultation process, carried out in accordance with Welsh Government requirements, provided a critical opportunity to test the assumptions, structure, and proposed actions contained in the draft ISW.

The content of the initial ISW ‘Healthier’ chapter is internally approved through WG processes and issued for public consultation in July 2022 (section 5.2). A summary of responses from the public

consultation is provided (section 5.3) and key findings of the consultation report are examined (section 5.4). The key changes then made to the final ISW version are set out (section 5.5) which includes the approval process by WG leadership and WG Ministers. The launch of the final version of the ISW is described (section 5.6) with the key ISW themes extracted and explored (section 5.7). The statutory WG Integrated Impact Assessment (IIA) process undertaken to assess the wider social, economic, and environmental effects of the ISW is summarised (section 5.8). The chapter is then summarised (section 5.10).

Table 20 below sets out a summary of Action Research Phase 2, cross referenced against the relevant inputs, outputs and interfaces – with the resulting impact and influence on policy.

Table 20: Research Phase 2 Summary

Research Phase	Inputs	Outputs	Interfaces	Impact/Influence on policy
2. Production of the draft Innovation Strategy for Wales (ISW) for public consultation, finalisation and launch. *This activity was undertaken between October 2021 and February 2023*	ISW Approach, key themes and recommendations. *Paper 2* - WG Health Policy Forum to agree draft ISW for consultation. June 2022. Public consultation feedback informs final version of ISW. Analysis and testing of proposed ISW and innovation model. Analysis supporting the WG Integrated impact assessment.	Draft ISW document issued for consultation agreed by HSCEY Policy Forum in July 2022. *Paper 3* – ISW paper and presentation to NHS Wales leadership board. October 2022 *Paper 4* - Final ISW version approved by WG HSCEY Executive Directors Team and Ministerial Cabinet in January 2023. *Paper 5* - ISW Integrated Impact assessment, produced January 2023.	Thematic analysis of all outputs. WG public consultation (*n*=179 responses). *Conference Paper 1* and Presentation on ISW and proposed Innovation Push/Pull model through ILA support at ECIE Annual conference, Pafos, Cyprus in September 2022. (*n*=25 attendees)	New policy model for innovation push and pull developed for Welsh Healthcare ecosystem. ISW and commitments agreed by NHS Wales CEO and WG Directors. (n= 30 attendees) ISW agreed and launched by WG Ministerial Cabinet.

5.2 'Healthier' Chapter of the ISW –Internally approval and issue for statutory Welsh Government consultation

5.2.1 Internal approval of key themes and recommendations

The thematic analysis and integration of findings from the practitioner reflections and three evidence sources led to the formulation of core strategic themes and key recommendations for the ISW (set out in 4.7 and 4.8). These were subsequently presented to the Welsh Government's Healthcare Innovation Programme Board (the Board) – which has representation from all Research, Innovation,

Improvement and Value Based Healthcare Directors in Welsh Government on 2nd March 2022. This Board would then approve the pre-consultation version which would then be presented to the Executive Director Team for sign off on behalf of the overall HSCEY Group to be issued for consultation.

The Board discussed and accepted these strategic themes, which resonated with the views of senior Board members. The Board set out the aim for the ISW was to establish a coherent, sustainable, and system-wide approach to innovation within NHS Wales, which aligns with national healthcare priorities (system need) with the initiatives already established to support the system (system offer). At the Board meeting, the members accepted the methodology used, the emerging themes and all of the proposed recommendations which would form the basis of the initial version of the ISW. The Board also accepted the key recommendations from the evidence, which were identified as the foundations for the development of the 'Healthier chapter' of the Innovation Strategy for Wales, which would be further tested internally, by presentation of the draft ISW at the Health and Social Care and Early Years Group Policy Forum in June 2022 (*paper and contribution to ROs summarised in Appendix 1*). The outcome of this paper was that the draft 'Healthier chapter' of the ISW was approved for public consultation, as part of the wider WG ISW. The ISW was then put out to public consultation in July 2022.

In addition, a paper would be put to NHS Wales Leadership Board on the ISW and what a potential IDP would cover in October 2022 (*paper and contribution to ROs summarised in Appendix 1).*

Following approval of the key themes and recommendations The draft version of the 'Healthier' chapter of the ISW was produced, based around the key themes and recommendations set out in Chapters 4.7 and 4.8. This draft version was then presented for internal approval at the WG Health Policy Forum in June 2022. The Policy Forum has a formal remit to consider ALL new WG policies in Health before they are taken forward, this ensures that all policy leads are able to comment on new policies, adding assurance, challenge, advice, joined up thinking and transparency. The researcher presented the paper on 6th June, in advance of issuing for the WG public consultation on 20th July. (See *Appendix Summary Table - Paper 2)*

The paper, with the draft 'Healthier' chapter of the ISW was approved given the breadth of the of evidence and the significant expert stakeholder engagement – with Policy Forum agreeing the need to test this with the general public now. The draft 'Healthier' chapter of the ISW was submitted to the internal ISW working group (made-up from key officials leading on aspects of the strategy from across the key Welsh Government policy areas of Health, Economy, Education, Environment) who would issue it as part of the overall ISW, for consultation on behalf of WG.

5.2.2 ISW issue for public consultation

The draft ISW was subsequently issued for an 8-week statutory public consultation on 20th July 2022 until 28th September 2022. The link to the statutory consultation document is available at https://www.gov.wales/draft-innovation-strategy-wales. The webpage is shown below in Figure 25.

Figure 25: Welsh Government website consultation page

5.2.1 Approach taken to the consultation analysis

In total there were 153 Innovation Strategy consultation responses submitted by the public, across a range of sectors. A decision was taken by the internal ISW working group to procure and outsource the analysis of the consultation to produce key findings to ensure independence from policy teams and because of resource constraints.

This analysis was undertaken externally for WG by Miller Research between October and late November 2022, as part of an openly advertised procurement, reporting to the central Economy team in Welsh Government. As part of the wider WG working group, Miller Research provided the ISW working group with provided with an overall consultation response, which had specific responses against each of the four mission areas. The summary of the consultation report which is set out in section 5.3 below.

5.3 Innovation Strategy for Wales Consultation – Summary of responses

In total there were 153 Innovation Strategy consultation responses submitted by the public, Table 21 shows a breakdown for response, by stakeholder type, with the majority of responses coming from the public, private and academic sectors which seemed to be the most engaged groups. 32 respondents did not disclose their sector by choice.

Table 21: Breakdown of ISW consultation responses.

Stakeholder type	Number of responses
Mixed	2
Other	7
Citizen	9
Third sector	11
Research Organisations/ Academic Institutions	21
Private Sector	25
Public Sector	46
Undisclosed	32
Total	**153**

5.4 Key findings of the ISW consultation report

5.4.1 Summary themes of feedback

The key structural piece of feedback from nearly half (47%) of the consultees across all sectors, was that the ISW should adopt a 'mission based' approach instead – i.e. based on measurable, ambitious, and time-bound objectives that have the potential to help enable transformative change that ensure Welsh Government's role in convening and coordinating stakeholders around complex, cross-sectoral issues that cannot be solved by individual actors alone. With a mission approach, activity is linked to key priorities, maintaining transparency and to be realistic in terms of available resources. Four specific

missions were subsequently proposed to rename the four chapters and better frame the ISW in section 5.5.

Secondly, around 40% of consultees stated that the ISW must outline a timeframe and priorities framework with joined-up strategic actions as part of a supporting 'Delivery Plan', specifying key objectives and measures, making clear what the added value that the strategy is seeking to achieve.

Thirdly, around 35% of consultee feedback stated that the ISW should clearly define the scope of innovation: what activity is included and excluded. The ISW should also aim to create pan-Wales expertise – bringing together partners across Wales to build a strong global platform of expertise.

5.4.2 Barriers to Innovation

These were noted as a lack of digital skills, risk aversion, a lack of appropriate government policy and funding support, bureaucratic barriers in the public sector and organisations constraints around resources, procurement rules, and political cycles. Lack of innovation skillsets were a barrier, with the solution driven through capability development.

5.4.3 Collaboration

The ISW should provide opportunities for more collaboration between Welsh public sector bodies such as NHS Wales organisations, Local Authorities and Welsh Universities and the external ecosystem. This will identify local strengths across Wales, not only regional or national ones, and provide opportunities for collaboration based on meeting system need with system offer.

5.4.4 Specific feedback for Health

For the Health and Wellbeing mission (previously the 'Healthier Chapter'), it is important that innovation enables responding to the Covid-19 pandemic challenges – supporting staff to innovate, supporting people to access treatment and to support citizens to be healthy at home for longer. It is also felt to be important for healthcare innovation to be based on matching 'system need' with an existing 'ecosystem offer', which includes a focus on social care innovation as well as healthcare (NHS). Innovation priorities need to reflect areas of current strength but also horizon scanning to adapt to future demands. Some (n=6) respondents noted the need to ensure an innovation capability building strategy is linked in with the ISW.

From a Health and Wellbeing mission perspective, the ISW needed to focus on bringing coherency to the innovation ecosystem - structuring the Health and Wellbeing mission around an innovation push/pull approach, such as that used in the development of the ABUHB AB Connect approach (see section 4.3.3) This would link system need (pull) within the NHS with the system offer (push); WG funded programmes, industry, and academia. There was general agreement on the common themes extracted from the evidence in Research Phase 1 in Section 4.7, which formed the recommendations in section 4.8.

5.5 Key changes to the ISW following the consultation analysis

The key pieces of overall feedback provided from the consultation were integrated into the development of the new ISW version.

Firstly, the ISW would take a mission based approach to structure going forward.

- The ‘Healthier chapter’ became the Health and Well-being mission.
- The ‘Prosperous’ chapter became the Economy mission.
- The ‘Education’ chapter became the Education mission.
- The ‘Environment’ chapter became the Climate and Nature mission.

The four mission based approach taken wass represented visually in the final version of the ISW in Figure 26 below.

Secondly, an Innovation Delivery Plan would be produced to deliver each ISW mission area, with integrated and strategic actions for each policy area, in collaboration with others. A measurement framework would then be produced, that would allow the tracking of outcomes and impact.

Thirdly, the scope of innovation would be clearly defined and set out, detailing who was resonsible for doing what, to include also what was not in scope.

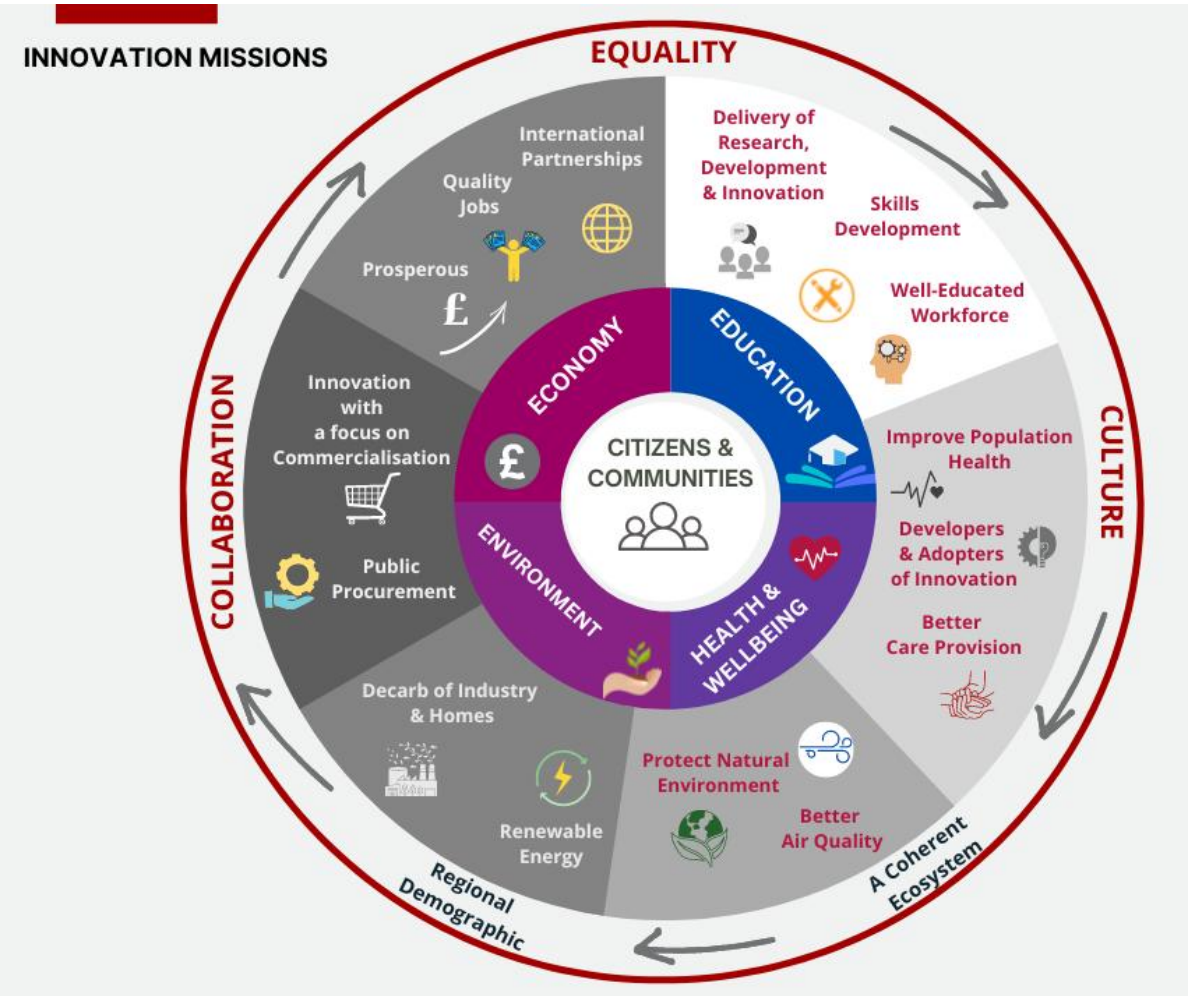

Figure 26: The four ISW Innovation missions, from the post consultation version of the ISW (Welsh Government, 2023)

5.5.1 Producing the final ISW for Director and Ministerial clearance.

A deadline of issuing the final version of the ISW for publication was set at end of February 2023. This meant working quickly to embed the feedback from both a health perspective and a wider government perspective. To do this:

a) All feedback considered for the Health and Wellbeing mission area was integrated into a final draft version as part of a cross WG working group. For HSCEY this would be presented as a paper to the Executive Directors Team (EDT) meeting in early January 2023 for approval. EDT is made up of all the Executive Directors for the HSCEY Group and is the final decision-making group before the HSCEY Minister. (See *Appendix Summary Table - Paper 4*)

b) All final changes to the Health and Wellbeing mission area would come back to the Welsh Government internal innovation strategy working group to publicise finalised the final ISW document.

c) The final ISW version would then be sent up to the Welsh Government ministerial cabinet for approval before launch.

5.5.2 Health and Social Service Group Executive Directors Team (EDT) meeting

The final version of the ISW was presented to the HSCEY Group Executive Directors Team meeting on 11th January 2023.

5.5.3 Outcome of EDT and next steps

Given the robust approach demonstrated through a range of evidence development, iterative testing, extensive stakeholder consultation and production following a range of testing internally, the paper was approved by EDT with no amendments. This approval allowed submission of the final version to the HSCEY Minister for the Welsh Government Ministerial Cabinet meeting on 13th February 2023. Briefing was produced for (then) HSCEY Minister, Eluned Morgan AM for the Health and Wellbeing Mission of the ISW for which she held portfolio responsibility, to support her in securing approval for ISW from her Ministerial Cabinet colleagues.

5.5.4 Welsh Government Cabinet meeting 13th February 2023 – Briefing provided to the Minister for Health, Social Care and Early Years

At the Welsh Government Cabinet meeting to provide final approval of the ISW, a Ministerial Briefing and Lines to Take were provided for former Health, Social Care and Early Years Minister, Eluned Morgan AM, to allow for a Cabinet Decision to be made to approve the ISW and launch on final public version on 27th February 2023.

A ministerial briefing and lines to take the usual methods to brief a minister for a cabinet meeting. The briefing provided the full background and detail on ISW development, specific details on the Health and Wellbeing mission and how officials proposed to develop an innovation delivery plan to implement the ISW once launched. The Lines to take are the salient points of the briefing, summarised into several lines that the minister can quickly refer to during a meeting or when pressed to speak on their particular area of responsibility.

<u>Briefing: 'The Innovation Strategy for Wales'</u>

- The Innovation Strategy for Wales (ISW) presents a significant opportunity to integrate our innovation approach across Welsh Government policy areas, particularly in a post EU funding environment.

- The ISW will set an innovation vision, providing a framework for local innovation policy, guide citizens, business, research organisations and all other stakeholders.
- The ISW will be developed and implemented across Welsh Government to guide our actions to deliver impact on the priorities of the Programme for Government, against four 'missions'

    1. A stronger and more resilient economy; the Economy Mission.
    2. Effective and sustainable healthcare; the Health and Wellbeing Mission.
    3. Higher educational standards, particularly in tertiary education and research; the Education mission.
    4. Respond to the climate and nature emergency in everything we do, the Climate and Nature Mission.

- The ISW has undergone a robust development process, with a significant evidence base developed in support across all devolved policy areas, through a range of public consultation.
- The ISW has been developed in full alignment with the Labour / Plaid Cymru Sixth Senedd Term Co-operation Agreement.
- Political interest and expectations are high, so it is crucial to 'bring the ISW to life' through an integrated implementation plan across Welsh Government portfolio areas.
- It will be important to be able to measure the impact of the ISW through a range of agreed metrics.
- Our main delivery mechanism for this is the Innovation, Technology and Partnerships programme – which was extended to the end of our current financial settlement with the UK Government in December 2022.
- Officials recommend that the HSCEY Minister approves the new Innovation Strategy for Wales for launch on 27th February 2023.

Lines to take – 'The Health and Wellbeing mission of the ISW'

- Lots of evidence supports the Health and Wellbeing mission of the ISW, developed through 18 months of stakeholder engagement, including NHS Wales, Social Care, academia, and industry.
- Internal and external scrutiny has been comprehensive - In Health and Social Services the ISW was presented to and agreed by; the HSCEY Group Policy Forum (June 2022), NHS Wales CEO

group (September 2022), NHS Wales Leadership Board (October 2022) and HSS Executive Directors Team (January 2023)

- An Innovation delivery plan is already in development across government, alongside key stakeholders. The health and well-being mission will have its own section of that delivery plan.
- Metrics for Health and Wellbeing mission will include Value Based Healthcare (patient outcomes, patient experience, resource efficiency) alongside wider ISW measures of economic impact and securing new innovation funding sources.

Lines to take: 'Implementing the ISW through an Innovation Delivery Plan'

- The ISW Innovation Delivery Plan will be the mechanism to support the will require cross Departmental buy in and resource provision, given political interest so far.
- The appropriate resources and structures must also be put in place to implement the ISW.
- Key internal learning from the development of the ISW is that a cross-portfolio group of innovation officials working together brings benefit and collaboration. This group should be formalised, strengthened, and championed by Ministerial and Director General leadership.
- HSCEY officials recommend that Cabinet endorse and support further joint working between Officials to develop the action plan.
- The Cabinet paper also states an intention to coordinate Strategy activity and progress across Welsh Government departments through an internal working group, supported by the Innovation Team based in ETC Group, and all other stakeholders".
- Cabinet should note other well developed Welsh Government innovation teams, budgets, and programmes (for example the Life Sciences and Innovation division in Health, Social Care and Early Years Group) which have developed their own approaches, successes, expertise and learning.
- So, a hybrid model of both 'centralised and de-centralised' innovation coordination should support ISW implementation across Welsh Government – with any coordination of activity aligned across Welsh Government in the same way that the development of a delivery plan must.

Given the comprehensive development process, the broad evidence base, the wide-ranging stakeholder engagement, public consultation and quality of the subsequent advice provided to Ministers by officials, the ISW was agreed at this Ministerial Cabinet meeting for a public launch on February

27th, 2023. The Ministerial Cabinet also agreed to proceed with the development of a cross-government innovation delivery plan, which would be structured around the four mission areas. Officials were instructed to begin developing this Innovation Delivery Plan.

5.6 Launch of the ISW

The Innovation Strategy Launch Event took place on February 27th, 2023, between 11.30 – 13.30pm at Renishaw Offices, Miskin Business Park, Miskin, Vale of Glamorgan, CF72 8XY. Renishaw offices were chosen as a central location, close to the M4 and a nationally recognised site of a large, innovative private sector organisation, based in Wales.

Around 100 VIP attendees were invited to the in-person event cross the public, private, academic and Government sectors., approximately 160 people viewed the event online on Microsoft Teams. The launch event included speeches from the lead WG Minister for the ISW, with (then) leader of Plaid Cymru under the terms of the sixth Senedd Cooperation agreement between Labour and Plaid Cymru.

5.7 Final ISW version and key themes from the Health and Wellbeing mission

Wales Innovates: The Innovation Strategy for Wales (Welsh Government, 2023) was launched on February 27th, 2023, and set a strategic, cross government vision to create the optimal conditions for innovation across all of Wales's devolved policy areas. For the health and well-being mission, this includes creating a coherent health, social care and life sciences innovation ecosystem to deliver a range of economic, environmental and health impacts. The key themes from the Health and Wellbeing mission of the ISW are:

1. Bring greater coherency and alignment to existing health and social care innovation infrastructure: The ISW recognises that there are already many innovative programmes, projects, initiatives and interventions in place in Wales, but they lack coherency. The ISW will bring these initiatives together to create a more coherent and collaborative innovation infrastructure. This will involve creation of an innovation road map that catalogues all initiatives, in addition to more structured partnerships between existing organisations and networks to maximize their resources and expertise. The ISW will also encourage cross-sector collaboration, including academic and industry partnerships,

to drive innovation and create more integrated solutions that address the complex health and social care challenges in Wales.

2. Demonstrate strategic leadership, to support innovation at all levels: The ISW recognises the importance of leadership in promoting and supporting innovation. It will provide strategic leadership at all levels of the health and social care system, from government officials to frontline staff, to promote a culture of innovation. The ISW will support the development of leadership skills and competencies and establish leadership roles and networks that will enable innovation to thrive. The All-Wales Intensive Learning Academy for Innovation in Health and Social Care provides a successful existing platform upon which to build to drive this ambition.

3. Innovation must scale better across the system, through supporting infrastructure: The ISW must acknowledge that scaling innovation across the health and social care system is critical to delivering benefits to patients and improving health outcomes. The strategy should support the development of infrastructure, including digital tools and platforms, that can facilitate the spread and adoption of innovative solutions. To achieve the above, the ISW should look to support the development of innovation clusters and networks, which will connect innovators with potential partners, investors, and collaborators, to help bring their ideas to market.

4. Take a more strategic approach to innovation funding: The ISW recognises that funding is a key driver of innovation. The ISW will take a more strategic approach to funding innovation by identifying priority areas where investment can have the greatest impact. This has scope to work with partners to develop funding models that incentivize innovation and provide support throughout the innovation process, from ideation to commercialisation.

5. Build capacity for innovation at all levels of the workforce and system: The ISW recognises the need to build capacity for innovation at all levels of the health and social care system. This should involve provision of training and development opportunities, equipping staff with the skills and knowledge they need to innovate. This could be achieved through the continued support of the development of innovation hubs, which will provide space and resources for staff to collaborate, experiment, develop and implement new ideas.

6. Integrate innovation approaches through other policy areas and delivery mechanisms: The ISW recognises that innovation cannot be limited to the health and social care sector alone. The strategy

should seek to integrate innovation approaches across other policy areas, including education, economic development and digital infrastructure, to create a more integrated and sustainable innovation ecosystem. The ISW should also promote innovation in service delivery mechanisms, such as procurement and commissioning, to drive greater efficiency and effectiveness.

7. Innovation must add demonstrable value to the lives and health outcomes of Welsh patients across health and social care: the ISW recognises that innovation must deliver tangible benefits to patients and the wider community. The ISW must focus on developing innovative solutions that address the complex health and social care challenges faced by Welsh patients. As such, it should prioritise the evaluation and measurement of the impact of innovation, to ensure that it is delivering real healthcare value and making a meaningful difference to the health and wellbeing of all Welsh citizens.

5.8 Welsh Government Integrated Impact Assessment (IIA)

Alongside working to finalise the ISW, the health component of a cross Government full impact assessment was developed between October 2022 to January 2023, part of Welsh Government statutory duties when developing new Strategy and Policies.

Successful policies, programmes, investments, and legislation must have been properly assessed for their impact in the round before they are implemented. From the earliest stages, they will be developed with a view to maximising economic, social, cultural, and environmental well-being - not just now, but for the long term. Impact assessment helps to target increasingly scarce resources on actions which will have maximum impact on well-being. A good impact assessment involves listening to stakeholders and citizens - demonstrating clearly that they have been heard. Impact assessments enable maximise the effectiveness of policy, helps to identify and avoid, remedy or mitigate any negative impacts of WG policy and decisions.

The IIA supports a rounded assessment of the impact of a proposed action, including considering social, economic, cultural and environmental effects and the following statutory considerations:

- Strategy contribution to the Wellbeing of Future Generations (Wales) Act 2015.
- Welsh Language.

- Equality.
- Healthcare.
- Sustainable Development.
- United Nations Convention on the Rights of the Child.
- Digital and technological ways of working.
- Socio economic impacts.

A Health Impact Assessment (HIA) considers how the health and well-being of a population may be affected by a proposed action, be it a policy, programme, plan, project, or a change to the organisation or delivery of a public service. The Welsh Government also uses HIA as a key part of considering and improving health and reducing inequalities. Undertaking a HIA is part of best international practice, so an HIA exercise was completed in line with the guidance, specifically as the ISW considered a range of policy areas and needed to consider the health and well-being impacts of the cross Government ISW work.

The Wales Health Impact Assessment Support Unit (WHIASU) of Public Health Wales were a key collaborator on this. WHIASU provided a resource to those currently practicing HIA, policy makers and those who are new to the process and who are looking for information and evidence https://phwwhocc.co.uk/whiasu/. Based on the WHIASU screening tool and the broad evidence based used for the ISW, a rapid HIA was decided upon instead of a comprehensive HIA or a lighter touch desktop HIA. The reasoning for this was that the ISW has taken more than 18 months to develop and has included the establishment of a broad internal working group, a broad range of specialist presentations to specialist audiences, and a range of both public and expert stakeholder workshops. In addition, an investigation of health impacts, a broad literature review, a broad range of underpinning of quantitative and qualitative evidence and collection knowledge and evidence from a number of local and national stakeholders had taken place. The Integrated Impact Assessment for the Health and Wellbeing Mission of the ISW is summarised in *Appendix Summary Table - Paper 5*.

Because of the comprehensive development process, significant evidence based, broad public and stakeholder engagement, the HIA did not develop any further aspects, themes, recommendations or additions to the ISW. Undertaking the HIA is a mandatory, statutory process for all policy and strategy development in Welsh Government. The additional benefit of undertaking the HIA was that it provided a level of external, independent credibility to the ISW, which is important for a cross-government strategy that affects a wide range of public and stakeholders. The HIA needed to be cleared by the appropriate minister, in this case the former Health and Social Services minister Eluned Morgan MS.

The full Health Impact Assessment (HIA) for the 'Health and Wellbeing mission of the ISW' was developed between October 2022 and approved in January 2023

5.9 Chapter summary

In this chapter the evidence is tested through the production of a draft ISW by issuing it for statutory public consultation. Feedback gained from 153 public responses to the consultation is used to embed a mission-based approach and rename and adapt the original 'Healthier chapter' into the 'Health and Wellbeing mission of the ISW. A range of other feedback is used, to produce the final version of the ISW.

The final draft of the ISW was assured and approved for public launch through a range of internal WG decision-making governance structures, with additional testing undertaken through the development of an integrated impact assessment, as part of our statutory Government duties when making new strategy and policy that affects a broad cross section of Wales. This satisfied all internal and statutory guidance on new Government Strategy and policy, which was all the more important given that the sixth Senedd term was a coalition Government between Labour and Plaid Cymru.

This enables production the final version of the ISW, taking it through internal and Ministerial Welsh Government decision making processes. The final version of the ISW is then presented to NHS Wales Leadership Board before a public, Ministerial launch made jointly by both governing political parties on February 27th, 2023.

CHAPTER 6: RESEARCH PHASE 3 – DEVELOPMENT, TESTING AND LAUNCH OF THE ISW INNOVATION DELIVERY PLAN (IDP).

6.1 Introduction to the chapter

This chapter outlines the third research phase: the development, testing, and formal launch of the Innovation Delivery Plan (IDP) supporting delivery of the ISW. In this phase, the key themes developed by research and policy in Phases 1 and 2 inform the development of Innovation Delivery Plan (IDP) which is then rigorously tested through a set of senior stakeholder workshops and papers to NHS Wales Leadership Board, before the IDP is publicly launched.

Firstly, a draft IDP (derived from the ISW themes set out in section 5.7) is tested firstly with the Innovation Leads group (section 6.2), with feedback summarised (section 6.3). A paper is developed on the feedback, presented to NHS Wales Leadership Board (section 6.4). The core themes (section 6.5), with tailoring of the subsequent IDP communications set out, according to the audience (section 6.6). A draft Innovation Delivery Plan is set out as an Annex to the Letter (section 6.7) which is then tested through three focused workshops with a range of innovation push and pull attendees (sections 6.8 to 6.11) with summary feedback on each workshop captured. This feedback informs a subsequent NHS Wales Leadership Board paper which presents the final version of the IDP for WG / NHS Wales CEO approval (section 6.12) and the outcome of this meeting set out (section 6.13). The final development process of the IDP leading up to launch is summarised (section 6.14). A Written Statement is made by the Welsh Government to publicly launch the IDP by then lead Minister Vaughan Gething AM (section 6.15). The immediate activity undertaken following the IDP launch is summarised (section 6.16) the IDP commitments relevant to delivering the Health and Wellbeing mission of the ISW are set out (section 6.17) and the chapter is then summarised (section 6.18).

The process of IDP development was iterative and highly consultative. The IDP and involved structured engagement with key stakeholders, including senior leadership within NHS Wales and the Welsh Government, as well as internal and external innovation experts. Key inputs, outputs, interfaces, and anticipated impacts from Research Phase 3 are summarised in Table 22**.**

Table 22: Research Phase 3 summary

Research Phase	Inputs	Outputs	Interfaces	Impact/Influence on policy
3. Development, production and launch of the ISW and development of the supporting Innovation Delivery Plan (IDP) *This activity was undertaken between October 2022 and October 2023*	ISW consultation themes and feedback. EDT paper in January 2023 – final version of ISW. *Papers 6,7,8*- Workshops for testing action plan (3 workshops January, February and March 2023) *Paper 9* - NHS Wales Leadership Board paper in April 2023	Innovation Delivery Plan commitments developed and consulted upon March – June 2023. Priorities established with NHS Wales Leadership Board to guide a new Innovation Delivery Plan (IDP) in March 2023. Launch of Ministerially approved Innovation Delivery Plan in October 2023. *Publication 1* – Case Exemplar of the NHS Wales and ISW. June 2023.	Consolidating and analysing of themes emerging from workshops and expert panels. Elan Valley NHS Wales Innovation Leads workshop expert panel October 2022 (*n*=25 attendees) Innovation Pull workshop, Jan 2023 (*n=39* attendees) Innovation Push workshop, March 2023 (*n=35* attendees) Push-pull Workshop March 2023 [(*n*=58 attendees) *Conference Paper 2* and International Innovation Expert Panel at ISPIM Conference in June 2023, Ljubljana - Ran two expert workshops (*n*=40 total) *Conference Paper 3* and presentation at ECIE annual conference in Porto September 2023 (*n*=35 attendees) *Conference Paper 4* and presentation at the ISTAS conference in Swansea, Innovation Strategy development track, September 2023. (*n*=30 attendees)	ISW launched by WG and Cabinet Ministers in February 2023. *Paper A* – Speech on ISW launch by Minister and Social Services, Eluned Morgan AM. March 2023 Health and Wellbeing section of IDP approved by WG HSCEY Group in partnership with NHS Wales CEOs and Innovation Leads in March 2023. IDP approved by WG Cabinet – July 2023. IDP formally published by WG in October 2023. *Paper B* - Written Statement by Vaughan Gething AM, Minister for the Economy to publish the Welsh Government's Innovation Delivery Plan, October 2023

6.2 Presentation of a draft IDP to NHS Wales Innovation Leads group on 13th October 2022, in readiness for an NHS Wales leadership Board paper.

The initial draft of the Innovation Delivery Plan was developed in direct response to practically apply the themes and recommendations in the final version of the ISW. To ensure the plan's alignment with the operational realities of NHS Wales practitioners responsible for IDP use and delivery, the draft IDP was shared with the NHS Wales Innovation Leads group at a dedicated workshop held during the Elan Valley Intensive Learning Academy on 13 October 2022. This meeting was scheduled to precede submission of a formal paper to the NHS Wales Leadership Board, the highest-level strategic decision-making forum in NHS Wales, composed of Chief Executives and senior Welsh Government officials.

The NHS Wales Innovation Leads group are the executives and practitioners employed to lead and practice innovation, with representation from every NHS Wales organisation (set out fully in column 2 on Table 25, in section 6.8.2). The group often includes members of the innovation push community (see Column 1 on Table 25 in section 6.8.2) and has a broad depth and breadth of expertise, from within the NHS, from across the public sector more broadly and with experience of both the academic and

industry sectors. This offers the group a broad range of perspectives, supporting policy and practice development.

The aim of this engagement was twofold: **(1)** to validate the draft proposals and **(2)** to secure early buy-in from the innovation community at practitioner and leadership levels. On Friday 13th October 2022, this Elan Valley Intensive Learning Academy Event workshop included a structured presentation of proposed actions and priorities, followed by a facilitated feedback session. Participant responses were recorded and later analysed using thematic and content analysis, as outlined previously in the data collection methodology (Section 3.6). The workshop resulted in the draft action plan for NHS Wales leadership Board, including input from all NHS Wales Innovation leads. A range of feedback was captured from the innovation leads group on the draft content of the NHS Wales Leadership Board paper.

6.3 Summarised feedback from all NHS Wales innovation leads, under three key priority areas.

The feedback provided by the Innovation Leads was synthesised into three overarching themes, each reflecting a strategic area of focus for the Innovation Delivery Plan. These are detailed below.

Theme 1 - Create coherency across the innovation ecosystem

Participants again reflected the key themes of the ISW and emphasised the need to establish a coherent and integrated innovation ecosystem across health and care in Wales. Specific recommendations included:

- Establish and build national infrastructure for innovation, learning from Research, Improvement and Value approaches, to support others.
- A national innovation programme team must add capacity to Innovation Leads. The team must also develop and set one approach and one framework – operating at national scale.
- Mainstream innovation as a culture, with robust systems to cope with innovation, based on the supporting infrastructure with clear references to health and social care working together.
- Showcase University led support programs like AgorIP, Accelerate, Aber Innovation, Swansea Health Technology Centre, Swansea University i-Lab and Nesta.
- Responsibility of NHS Wales organisation to detail how they will establish and resource their innovation teams. This should include models, goals and programmes.
- Set out an innovation framework, process for decision-making and support tools.

- Evaluate where health and care research Wales, improvement, and other national programmes have worked well to support developing innovation infrastructure.
- We must continue to link innovation activity to planning activity, to ensure we hardwire references to the integrated medium-term plans, to avoid innovation being marginalised.
- Bring a consistency to innovation approach across all organisations and ecosystem.
- The new ecosystem should consider which All Wales projects should be supported e.g. development/linkage of a national system of science and innovation Parks.
- We must evaluate innovation systems outside of Wales as part of embedding this approach.
- We must consider the rationalisation of Push orgs/programmes, linked to supporting Pull
- Innovation programme team must issue good, regular comms – curate best practice.

Theme 2 - Focus innovation activity on organisational priorities and need – generating Innovation 'Pull'

A second theme highlighted the importance of aligning innovation activity with organisational and system-level priorities, thereby generating a structured 'pull' from within health and care services:

- Generating organisational pull should be based on organisational priorities and need, needs to be balanced against innovation needs in the system.
- Regional and national need assessment provides the Basis for bigger funding bids, points towards consortia of organisations.
- Consider a Wales wide innovation approach, where the national innovation programme team coordinates local, regional and national messaging.

This theme reflects a shift from opportunistic innovation to strategically aligned activity, rooted in real-world challenges and organisational demand.

Theme 3 - Support adoption ready innovation, at scale

The third theme related to the operationalisation of innovation and ensuring that proven, evidence-based initiatives can be adopted and adapted at scale:

- The need to distinguish between 'adoption-ready' and 'adaptation-ready' innovations, acknowledging that implementation varies across organisational contexts.
- Addressing cultural resistance to innovation, including the 'not made here' mindset, which can inhibit external idea uptake.

- Development of a comprehensive commercialisation strategy to support a spectrum of activities, from intellectual property (IP) management to public-private partnerships.
- Establishing funding models to support commercialisation and value creation, thereby protecting public investment and stimulating revenue generation.
- Understanding innovation finance mechanisms such as a specific finance model, to include use of NHS charitable funds.
- Consideration of outcomes-based contracting, particularly for pharmaceutical and medical technologies, supported by models such as Value Academies.
- Drawing on learning from national innovation adoption initiatives, to inform scale-up strategies.

6.3.1 Collation of feedback and informing IDP next steps

Collectively, these points emphasised the importance of building system-wide infrastructure and capabilities for implementing, scaling, and deriving value from innovation. This feedback supported further refinement of the Innovation Delivery Plan and its alignment with both national priorities and frontline operational needs. The insights from this session were consolidated into a paper presented to the NHS Wales Leadership Board (NHSWLB) on 18th October 2022 (See *Appendix Summary Table - Paper 3*) This paper contained the draft IDP.

6.4 October 2022 NHSWLB meeting – presenting the draft IDP and implications

The paper was presented to the NHSWLB, which comprises all NHS Wales Chief Executives and senior Welsh Government HSCEY Directors. NHSWLB reviewed the paper on the ISW approach and the proposed IDP following the public consultation and feedback received from NHS Wales innovation leads.

NHSWLB agreed:

- To implement the strategic approach and key themes set out in the ISW.
- The proposed content of the IDP, which would be communicated to all NHS Wales organisations.

At the meeting, Judith Paget CBE, Director General for Health and Social Services and NHS Wales Chief Executive, agreed to confirm this commitment in writing to all NHS Wales Chief

Executives and innovation leads as the 'innovation pull' partners i.e., healthcare system-driven demand for innovation within NHS Wales. Judith Paget would also write to 'innovation push' community i.e., external delivery partners working in WG funded Innovation, Technology and Partnerships (ITP) programme, academia, commercial or industry, and third-sector partners. This letter would confirm a coordinated approach based on aligning 'innovation pull' with 'innovation push' as a model for the innovation ecosystem, in the context of implementing the broader ISW, due for launch in February 2023.

6.5 Core Themes of the Innovation Delivery Plan and priority actions

The strategic model endorsed by NHSWLB is structured around the alignment of internal system priorities with external innovation opportunities. This approach seeks to bring greater clarity and coherence to the Welsh health and care innovation ecosystem. Three overarching themes were identified as guiding pillars of the IDP:

1. *Creating Coherency Across the Innovation Ecosystem*
   Establishing a clear, shared understanding among partners of their respective roles and responsibilities within the ecosystem.
2. *Focusing Innovation on Organisational Priorities ('Innovation Pull')*
   Supporting NHS organisations to articulate internal priorities, enabling innovation to be directed toward meeting real-world operational and clinical needs.
3. *Supporting Adoption-Ready Innovation at Scale ('Innovation Push')*
   Facilitating the introduction of externally developed evidence-based innovations into NHS Wales through structured adoption pathways.

A visual representation of this model—termed the 'Innovation Push and Pull' framework—was presented as part of the Board paper in Figure 27.

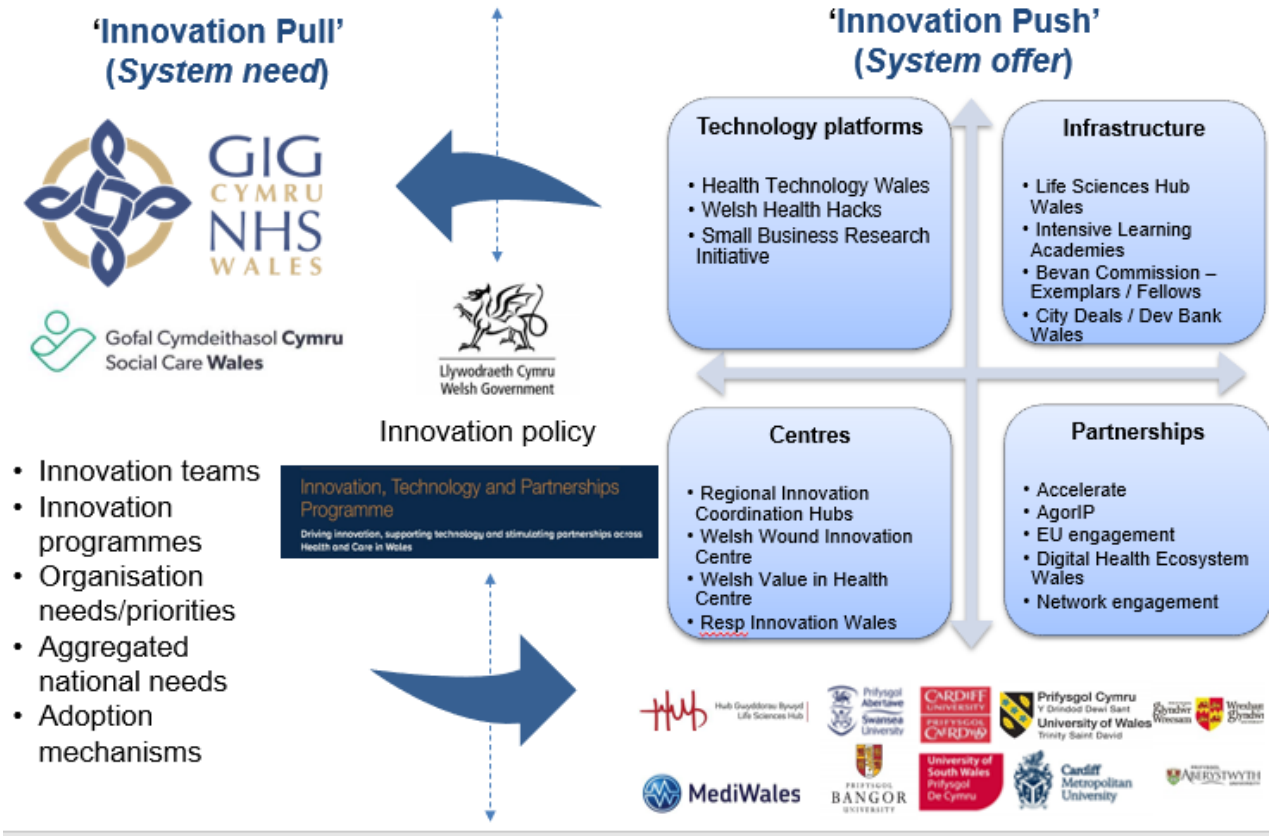

Figure 27: 'Innovation Push and Pull' framework

Whilst the ISW's launch was being finalised, a series of priority actions were outlined to begin initiating the supporting IDP. These actions were designed to mobilise all actors within the innovation ecosystem, including NHS Wales organisations (innovation pull) and external innovation partners (innovation push). These activities and their timelines are summarised in Table 23.

Table 23: Priority Actions to initiate this work

Actor	Actions	Deadline
Welsh Government	Issue a system-wide policy statement articulating a coherent vision for the ecosystem based on the innovation 'push and pull' model.	Mid-November 2022
NHS Wales Organisations (innovation pull)	Map and submit details of innovation teams, infrastructure, budget, and local priority need areas.	End November 2022

External Ecosystem Partners (innovation push)	Collectively map 'innovation pull' priorities against 'innovation push' system offer, aligning adoption ready innovation against national and local priorities & needs	End November 2022
All Parties	Jointly map priorities and align external offers with NHS Wales needs. Scope out adoption-ready projects. Attend Push / Pull workshops	By Christmas 2022

6.6 Tailoring of communications: differentiated letter 'asks' according to audience

The letter sent by the Director General included tailored requests depending on whether the recipients were from NHS Wales ('innovation pull' organisations) or from the external innovation ecosystem ('innovation push' organisations and programmes). The differentiated requests are outlined below:

6.6.1 IDP requests for NHS Wales ('Innovation Pull') Organisations

NHS Wales organisations were asked to collate:

- The name and contact details of the executive lead for innovation.
- A summary of the organisation's current innovation infrastructure (to include strategy, teams, resources, partnerships).
- A list of organisational innovation priorities and needs.
- Bring this information to attend:
    - An NHS Innovation 'Pull' Workshop (January 2023).
    - A Joint 'Pull and Push' Workshop (March 2023).

6.6.2 IDP request for External ('Innovation Push') Organisations and Programmes:

External organisations and programmes as 'Innovation Push' partners to NHS Wales were asked to collate:

- A description of the organisation's innovation offer to NHS Wales, including support services, programmes, and resources.
- A list of any adoption-ready innovations, tools, guidance, or partnerships.
- Views on how innovation adoption mechanisms can be improved system wide.
- Details of a nominated innovation lead to act as a liaison for future governance and collaboration efforts.

6.7 Testing the development of the IDP through a series of stakeholder workshops

To validate the design and development of the IDP, a series of structured workshops were held between January and March 2023.

These sessions were co-designed by the Welsh Government innovation team in collaboration with NHS Wales Innovation Leads. The workshop goals were to convene both 'pull' and 'push' stakeholders from the innovation ecosystem, support a greater understanding of each other's roles and contributions.

The workshops also aimed to test the practical alignment of the IDP with the push–pull framework and to gain collective agreement on its direction and delivery mechanisms.

6.7.1 IDP Workshop Structure and objectives

Three separate workshops were convened: each tailored to a specific segment of the innovation ecosystem:

- **Workshop 1: Innovation Pull Community**
  Attended by NHS innovation executives and leads, representing healthcare system needs and priorities.
- **Workshop 2: Innovation Push Community**
  Involving external innovation delivery leads representing the system offer.
- **Workshop 3: Innovation Pull and Push Communities**
  Bringing together both groups to facilitate co-design, shared understanding, and alignment of mutual goals.

The objectives of the workshops were to:

1 Strengthen collaboration and mutual understanding across the ecosystem.
2 Refine the practical implementation of the IDP's three priority areas.
3 Secure stakeholder endorsement for the final strategy.
4 Establish shared ownership of the innovation delivery approach

These sessions were instrumental in enhancing buy-in, clarifying roles, and stress-testing the proposed governance and implementation structures ahead of the final ISW launch. Details of each workshop follow in the sections below.

6.7.2 IDP Workshop participant organisations

Table 24 below provides an overview of the organisations participating in the innovation ecosystem workshops, organised under innovation pull and innovation push headings.

Table 24: Innovation 'Push' and Innovation 'Pull' Ecosystem organisations in Wales (author's own).

'Innovation Push' Organisations (publicly funded, delivery focused)	***'Innovation Pull' Organisations (NHS Wales)***
Accelerate, AgorIP, Celtic Advanced Life Sciences Network (CALIN), Life Sciences Hub Wales, Swansea University, Cardiff University, Bangor University, Aberystwyth University, University of Wales Trinity St David (UWTSD), Small Business Research Initiative, Health Technology Wales, Regional Innovation Coordination Hubs, Digital Health Ecosystem Wales, Value in Health Programme, Bevan Commission, Intensive Learning Academies for: Innovation and Transformation, Value Based Healthcare, Digital Health and Preventative Health.	Aneurin Bevan University Health Board, Betsi Cadwaladr University Health Board, Cardiff and Vale University Health Board, Cwm Taf Morgannwg University Health Board, Health Education Improvement Wales, Hywel Dda University Health Board, Powys Teaching Health Board, Swansea Bay University Health Board, Public Health Wales, Digital Health and Care Wales, Public Health Wales, Velindre NHS University Health Trust, Welsh Ambulance Services NHS University Health Trust.

From January to March 2023, these ecosystem organisations were brought together separately and as a network to discuss the implementation of the three priority areas outlined by the NHS Wales Leadership Board and to co-design an innovation delivery plan to implement the ISW.

In addition, we set out a revised vision for health and social care innovation and secure collective ownership of the proposed innovation delivery plan based on the best value linkage of 'innovation pull' and 'innovation push'.

6.8 IDP Workshop 1 – Innovation Pull leads

As a core component of the Innovation Delivery Plan (IDP) development process, a targeted stakeholder engagement event was held with representatives from the 'innovation pull' community—defined as NHS Wales organisational leaders either overseeing or directly responsible for implementing innovation within their organisations. Workshop 1, held on Friday 27th January 2023 at the Life Sciences Hub Wales (Agenda attached at *Appendix Summary Table and Paper 6*), convened 39 participants, including Executive Directors and practitioner-level innovation leads, with participation from every NHS Wales organisation and Welsh Government.

6.8.1 IDP Workshop 1 approach

The session opened with a presentation of the revised vision for the Welsh health and care innovation ecosystem, as outlined in the Innovation Strategy for Wales (ISW). This was delivered by the researcher and Paul Mears, Chief Executive Officer of Cwm Taf Morgannwg University Health Board (CTMUHB) and lead CEO for innovation within NHS Wales.

Following the introductory session, the workshop adopted a 'World Café' model to facilitate peer-to-peer knowledge exchange. Each organisation shared its internal innovation structures, key strategic priorities, and examples of adoption infrastructure. This method allowed participants to gain insight into the breadth and variability of innovation capacity across NHS Wales, supporting the creation of a national network of practice.

To guide structured feedback and support co-development of the IDP, participants responded to three core questions aligned to the ISW themes that would help co-develop the IDP. Responses were submitted via Mentimeter, an interactive digital platform that allowed for real-time feedback capture and thematic analysis.

Next, the three questions posed at workshop 1 are stated and the resulting feedback from workshop attendees are summarised.

6.8.2 Summary feedback on Workshop 1 Questions

Feedback for each question was captured and summarised into Table 25 below.

Table 25: Summary Feedback from Workshop 1 - Innovation Pull

How do we create greater coherency across the innovation ecosystem, so everyone has a clear role?	**What do Innovation 'pull' leads want from the 'Push' ecosystem**	**How do we coordinate adoption ready innovation from the external ecosystem (the 'innovation push' offer) into health and care more effectively?**
Strategic national innovation vision and purpose but with local delivery.	Clear offers of support, linked to priorities.	Differentiate between Innovation and Innovation Adoption.
Link innovation to ministerial priorities	Supporting networks and communication between organisations.	Embed innovation into NHS Wales planning guidance / IMTP.
Rationalise the current innovation ecosystem according to push and pull	Scaling some of the innovations we know are working (smaller more focused push system?).	Innovation Framework needed for NHS Wales - once for Wales approach.
Embed innovation in the planning framework	Supporting innovation delivery and processes.	Fund 'capacity' for innovation - it can be more challenging to set up innovation functions than R&D, which has stronger infrastructure
Learn from the infrastructure established for Research & Development, Value Based Healthcare and Improvement Cymru		Focus on implementation of a small number of impactful adoptions with all Wales business case which CEOs sign up to – accountability needed.
Set out clearly what each organisation is delivering		Create a central repository of adoption ready solutions across Wales cut by priority themes.
Hold regular events like this – to bring the pull ecosystem together and learn from each other.		

All of the feedback from each question was subsequently fed into the IDP development process. In addition, Workshop 1 contributed directly to the refinement of the IDP and built the collective commitment across NHS Wales 'pull' organisations to collectively deliver against its priorities.

6.9 IDP Workshop 2 – Innovation Push delivery leads

Workshop 2 was designed to engage the 'innovation push' community—publicly funded organisations and initiatives (e.g. universities, national innovation programmes) that develop and offer health and care innovations. Workshop 2 was held on Friday 3rd March 2023 at the Life Sciences Hub Wales (Agenda attached at *Appendix Summary Table and Paper 7*), this workshop brought together n=35 innovation "push" leaders and representatives from across the Welsh innovation ecosystem. Including publicly funded organisations and initiatives such as Universities and innovation programmes (see Figure 33 and Table 25) that support aspects of healthcare innovation as targeted per the variation to the CEO IDP letter in Section 6.6.

The purpose of the session was to align the external ecosystem's innovation offer with the priority needs identified by NHS Wales organisations. The session was introduced with an overview of the ISW and the IDP, delivered again by Paul Mears (CEO, CTMUHB & Lead NHS Wales CEO for Innovation), reinforcing the push–pull model of system alignment.

6.9.2 Workshop 2 approach

To ensure consistency with Workshop 1, the event started with presentations and network forming before the workshop moved into a World Café format. Participants from 'push' organisations shared their institutional innovation offers, programmes, and capabilities.

During the workshop each 'push' organisational lead set out their organisation's innovation purpose and function and innovation 'offer' to the ecosystem through a World Café approach of rotating presentations. This demonstrated the breadth of the push community activity, allowing contacts to be made and allowing the dissemination of practice and learning.

To ensure consistency of approach, the same three discussion questions from Workshop 1 were posed, recognising the difference in audience and responses were captured and collated using Mentimeter. This allowed for real-time data collection and analysis, including the generation graphics to visualise thematic density., linked to key themes in the ISW, that would help co-develop the IDP. Feedback was captured via Mentimeter – an online feedback system where attendees used their phone to enter responses to allow for easier capture by the researcher and supporting facilitators.

6.9.3 Ministerial Address to Workshop 2

To demonstrate Welsh Government's political commitment to the innovation agenda, a pre-recorded keynote address was delivered by Eluned Morgan AM as (former) Minister for Health and

Social Services, affirmed the role of innovation in delivering Programme for Government commitments across the Economy, Education, Health and Wellbeing, and Climate and Nature missions.

The Minister emphasised the importance of aligning innovation system offers (pull) to system need (push), particularly in a post-EU funding context. The Minister also highlighted six Ministerial priorities for NHS Wales organisations (see transcript below), quoting Health Technology Wales offering to align its topic calls to priorities as an example of aligning innovation pull and push.

The Minister reinforced that successful implementation of the ISW would require partnership, co-production, and collective accountability. The full the Ministerial address is available at *Appendix Paper A).*

6.9.3 Summary Feedback on Workshop 2 Questions

The three questions posed at workshop 2 and the resulting feedback from workshop attendees are summarised in Table 26 below.

Table 26: Summary feedback from Workshop 2 - Innovation Push

How do we create greater coherency across the innovation ecosystem, so everyone has a clear role?	**How can the 'Innovation Push' ecosystem support innovation pull across Health and Social Care?**	**How do we coordinate adoption ready innovation into health and care more effectively?**
Clear organisation of innovation push and pull organisations.	Clearly defined NHS Wales innovation priorities.	Infrastructure, funding and strategy required for adoption.
Development of innovation infrastructure and	WG support to promote greater collaboration between push and pull partners.	Link adoption support to the Innovation Framework.
a single portal for accessing innovation funding.	Enhanced communication between innovation push and pull partners, including events.	Recognition adoption is a different skill to innovation and requires a different support.
An innovation framework to guide system-wide innovation activity.		Define what adoption ready means nationally through NHS Wales planning framework, then implement it.
A national directory of innovation stakeholders.		Create mechanisms to support procurement of new innovation
Investment in innovation training, leadership and capacity-building.		

The collective insights gathered through Workshop 2 supported further refining of the Innovation Delivery Plan. Stakeholder feedback underscored the importance of system alignment, simplified governance, and practical enablers of adoption. Importantly, the workshops secured broad-based support and co-ownership of the IDP, reinforced the need for a co-produced delivery framework for health and care innovation in Wales.

6.10 IDP Workshop 3 - Innovation Pull AND Push leads

The final stakeholder engagement workshop to inform the development of the Innovation Delivery Plan (IDP) was held on Friday 31st March 2023 at the Life Sciences Hub Wales, Cardiff Bay. This event, referred to as Workshop 3 (Agenda at *Appendix Summary Paper 8*), convened 58 senior representatives from both the 'innovation pull' (NHS Wales organisations) and 'innovation push' (external innovation partners) communities, as set out in the CEO IDP letter in Section 6.5. These participants had previously engaged in Workshops 1 and 2, respectively.

The objective of this final workshop was to bring together both parts of the innovation ecosystem to jointly consider system need and system offer, and to support the co-creation and endorsement of the final IDP. The consolidated vision for the health and care innovation ecosystem in Wales was reiterated, with core themes of the Innovation Strategy for Wales (ISW) presented by Paul Mears, CEO of Cwm Taf Morgannwg University Health Board and NHS Wales' lead Chief Executive for innovation.

6.10.1 Workshop 3 Approach

The workshop followed a two-phase agenda to facilitate reciprocal understanding and alignment:

- **Phase 1**: NHS Wales executives and innovation leads (innovation pull) presented their respective organisational structures, innovation priorities, and system needs. The goal was to articulate clearly defined 'pull' areas and foster targeted engagement with push partners.
- **Phase 2**: External innovation delivery partners (innovation push) then presented their offers, capabilities, and support mechanisms to the NHS audience. This reversal of roles enabled attendees to explore how external system offers could be matched to specific organisational priorities.

Following these interactions, a draft of the Innovation Delivery Plan was presented to all attendees. Structured feedback was sought on the practical actions that could underpin the three key IDP themes identified in the NHS Wales CEO letter and used as questions in Workshops 1 and 2. Responses

were again collected via Mentimeter for consistency, enabling real-time capture and subsequent thematic analysis.

6.10.2 Summary Feedback on Thematic actions

The three questions posed at workshop 3 and the resulting feedback from workshop attendees are summarised in Table 27 below.

Table 27: Summary feedback from Workshop 3 - Push and Pull

Improving coherence within the Welsh innovation ecosystem	**Matching innovation pull (system need) with innovation pull (system offer)**	**Adopting and embedding innovation at scale**
Establishment of a national innovation framework as a policy document.	Inclusion of (pull) innovation priorities within NHS Wales annual plans, as a method to inform push partners of priority areas.	Establishment of structured internal adoption mechanisms within NHS organisations.
Develop a comprehensive and regularly updated map of the innovation ecosystem in Wales, including key contacts, system roles, and institutional skill sets.	Establishment of national innovation groups as platforms to facilitate alignment of push and pull partners.	Explore work with the UK Government to share evidence-based approaches and criteria for adopting innovation across the four UK NHS systems.
Develop a shared digital platform to host all relevant innovation resources, partners on	Creation of an innovation assessment and adoption tool, linked to the Framework, co-developed with both pull and push partners, that provides a list of relevant questions to consider when developing an innovation project, including cost, clinical need, feasibility, technological requirements, market assessment etc.	
Capacity-building initiatives to develop innovation and change management skills at all levels.	Hosting regular events that highlight both system offers (push) and NHS priorities (pull).	
A common approach to IP for NHS Wales organisations.	Establish a clear route for NHS commercialisation, alongside relevant support (push) partners.	

6.11 Outcome of the workshops

In the three workshops, we gained consensus on the three key themes proposed in the strategy, which alongside a range of underpinning actions, would form the basis of a full Innovation Delivery Plan. Creating greater coherence across the ecosystem was agreed to be a priority, to ensure all partners were clear on their role.

All organisations felt priority areas should be set out by Welsh Government and NHS Wales, to crystallise 'system need'. Using the six Ministerial priorities set out in the 2023 NHS Wales planning framework, an 'Innovation Pull' priority list was produced, as set out in Table 25 below.

Table 25 – 'Innovation pull' priority list

	WG Priorities	**Draft innovation challenge statement**
1	Developing a closer relationship with local government to tackle the issue of delayed transfers of care	Identify innovative solutions to enable people to stay in their own homes safely for longer & reduce the time to discharge to home / care. Reliability, availability and sharing of data across health & care organisations to improve care, treatment and reduce unnecessary delays in transfer.
2	Primary and Community Care	Primary care innovation that enables diagnostics / treatment to prevent referral into secondary care. Community Care innovation to enable people to stay in their own homes safely for longer through their recovery.
3	Urgent and Emergency Care	Innovation that reduces demand on urgent and emergency care by reducing preventable attendances (e.g., community acquired pressure damage & falls). Innovation to improve flows of data and patients within the system, reducing delays to handovers and system transfers throughout the system.
4	Planned Care and Recovery	Innovation to enable treatment through less invasive or alternative procedures and support improved speed of recovery at home. Innovation to increase capacity and quality within planned care.
5	Cancer	Innovation which increases the access to, and speed of, cancer diagnostics and improved treatment outcomes.
6	Mental Health and CAMH Services	Identify innovations which improve access and availability to mental health resources and services. Developments which support early intervention and prevention.
	Cross cutting – preventative health through technology.	Innovation using of data and technology which focuses on preventative health interventions and enables healthier communities (weight management, diabetes, smoking cessation, substance misuse) improving people's ability to live well for longer, outside of the healthcare system.

	Cross cutting – screening and diagnostics.	Innovations which delver improvements to availability and capacity of screening and early identification / diagnostic of health issues and disease.
	Cross cutting – sustainability of workforce and environment.	Innovation to ensure the sustainability of the workforce (through staff attraction, staff retention, increased morale/motivation) and environmental sustainability where our impacts on natural resources are reduced.

The workshops concluded with agreement to finalise the IDP based on these strategic pillars, with a national innovation programme set up to deliver it. This would include a shared directory of innovation teams and leads, with innovation 'push delivery leads' - to better understand 'who does what'. 'Push' organisations welcomed the opportunity to link their 'system offer' with the NHS Wales 'system need'.

Bespoke innovation webpages on the NHS Wales website would be created, to host a national innovation policy framework and supporting tools such as an innovation assessment tool, an innovation adoption tool and an innovation adoption mechanism, to support ease of access.

A slot to feedback these actions to NHS Wales Leadership Board was agreed for 19th April 2023, with a summary paper to be produced to set out the proposed key IDP commitments, securing NHS Wales CEO approval in advance of the launch of an IDP.

6.12 NHS Wales Leadership Board paper on the proposed content of the IDP – post ISW launch – 19th April 2023

Using the three themes and underpinning actions from the workshops, a formal paper was presented to the NHS Wales Leadership Board on 19 April 2023. The purpose of the paper was to present the finalised Innovation Delivery Plan (IDP) - including themes and priorities - to secure Chief Executive-level commitment for national implementation. The contents reflected the outputs of the three co-design workshops and were submitted in preparation for subsequent Ministerial Cabinet approval. The NHS Wales Leadership Board paper is summarised in the Table in *Appendix and Paper 9*.

6.13 Implications of the April 2023 Leadership Board meeting

NHS Wales Leadership Board reached the following conclusions:

1. Noted the progress made in developing the Innovation Delivery Plan.
2. Approved the six Ministerial priorities as the strategic focus for innovation activity across NHS Wales.
3. Endorsed the creation of a national innovation programme to coordinate implementation of priority innovation projects.
4. Agreed that an update on progress would be provided within 12 months, in May 2024.

It was additionally confirmed that innovation policy related to the social care sector would be managed by a separate policy team within Welsh Government, recognising the distinct structures and needs of that sector. Consideration was also given to issuing a formal Ministerial Written Statement to accompany the publication of the IDP.

6.14 Final development of the IDP – May to October 2023

Between May and October 2023, the Innovation Delivery Plan was finalised through a Welsh Government-led, cross-departmental coordination process. The final drafting involved translating the three strategic themes and associated actions into a coherent set of national commitments.

Following Cabinet-level approval in September 2023, the IDP was officially published in October 2023 as part of a Written Statement issued by Vaughan Gething AM, Minister for the Economy. This publication formally marked the conclusion of Research Phase 3 and the transition to IDP implementation and delivery.

6.15 Written Statement by Vaughan Gething AM, Minister for the Economy to launch the Welsh Government Innovation Delivery Plan.

The launch of the IDP on 17th October 2023 by Vaughan Gething AM, former Minister for the Economy, marked its endorsement and approval by the full Welsh Government Ministerial Cabinet. Its

launch, supported by both the Welsh Labour Government and Plaid Cymru as part of their Co-operation Agreement, reflects a cross-party commitment to embedding innovation within all areas of devolved policy responsibility in Wales. The full Written Statement is attached at *Appendix Paper B*.

6.16 Final Health and Wellbeing Innovation Delivery plan of *Wales Innovates*

The final Health and Wellbeing component of the IDP was launched on 17th October 2023, published at Innovation strategy for Wales: delivery plan | GOV.WALES and is set out at Table 28 below.

Table 28: Final Health and Wellbeing Innovation Delivery plan of Wales Innovates

Health and Wellbeing Mission

A coherent innovation ecosystem, where the health and social care sector collaborates with industry, academia and the third sector to deliver greater value and impact for citizens, the economy, and the environment.

Goal	Action	Milestone	Measure
Increase Health and Social Care Research, Development and Innovation support and investment against the six areas of ministerial priority published in the NHS Wales planning framework 2022-25.	Align health and social care Innovation activity and investment to support delivery and progress against the six Ministerial priorities. This includes the assessment of Integrated Medium Term Plans (IMTP) and delivery of the Innovation Technology and Partnerships Programme. Welsh Government and Health and Care Research Wales[2] will implement the plan for Health and Care Research activity in Wales. An annual budget of £47m has been ringfenced (any budget figures subject to current review).	Q4 2023 Q4 2024 2022-23 2023-24 2024-25	£ invested in health and care related innovation activities £ investment in health and care research by public/government funders (% increase) £ investment in health and care research by industry/commercial research funders (% increase) Numbers employed in the health and care research workforce (% increase) Public participation in health and social care research (% increase)

Goal	Action	Milestone	Measure
Increase innovation activity and funding awards to the health and social care system, and the Life Sciences sector. Creating the right environment for industry to collaborate with the NHS in Wales.	We will explore the availability and development of a funding portal to access innovation funding, which will include grant and innovative procurement mechanisms. Develop a Life Sciences Policy Statement with clear actions to support the development of the sector in Wales to support health and wellbeing, economy, education and climate and nature missions. Work with the Life Sciences Hub Wales Ltd to identify opportunities to build strategic partnerships with industry focussed on innovation to deliver better outcomes for patients, and economic impact. Deliver financial support for innovation through the Innovation, Technology and Partnerships funding programme. We will commission the Value Based Healthcare Programme to develop a suite of innovation measures linked to resource efficiency, patient outcomes (PROMs) and patient experience (PREMs).	2023-24 £12.8m	£ invested in health, care and life sciences innovation activities (internal to organisation, Welsh Government, UKG/International) Number and value (£) of strategic partnerships between industry and NHS Wales Impact measurement of funding awards: Value based healthcare measures – Patient outcomes and experience, resource usage across relevant clinical areas Referral to Treatment Time (RTT) in clinical areas developing, testing and deploying innovation
Develop and implement a Social Care Innovation Support Programme.	Welsh Government will fund Social Care Wales to develop and support the Social Care Innovation Support Programme.	2023-24 £1.2m	Social Care Wales will begin work to develop an outcomes framework in September 2023
Increased innovation activity across NHS Wales, to include the development, protection and commercialisation of intellectual property.	Develop and implement a policy framework, working with NHS Wales organisations, to enable innovation activity within NHS Wales. This includes: • A roadmap and directory of the health and care organisations within the innovation ecosystem • A common innovation assessment tool, to consistently assess innovation opportunities • A common approach to the creation, protection and management of intellectual property created by NHS Wales staff and organisations • A clear route to commercialisation and income generation for further investment in innovation	Q1 2024	Intellectual Property – Patents, Trademarks etc. registered and granted Number of Intellectual Property sharing agreements in place across organisations Income generated Income from innovation activity re-invested in Innovation

Goal	Action	Milestone	Measure
Increase adoption and scale of '*Adoption and Adaption ready innovation*' across the health and social care system.	Establish the Innovation and Value function of the NHS Wales Executive.	Q1 2025	Health Technology Wales Adoption Audit
	Develop a list of '*Adoption and Adaption ready innovation*' aligned to Welsh NHS and Social Care needs and priorities – working with Health Technology Wales, the Regional Innovation Co-ordination Hubs Network.	Q4 2023	NHS Wales Procurement data Value based healthcare innovation metrics

6.17 Activity following the launch of the IDP

The Written Statement provided a platform for WG to begin implementing the actions outlined in the IDP. WG teams used publicly announced Ministerial approval to integrate the IDP actions into their quarterly and annual team, divisional and departmental business plans, aligned to each of the respective ISW missions. WG officials then wrote the specific IDP actions relevant to their work areas into their job descriptions and workplans, would be assessed quarterly as part of performance management.

Within HSCEY Group and in alignment to the ISW 'Health and Wellbeing mission' the innovation team scoped the required resources for a programme team, that would work with the NHS Wales innovation leads group on a national innovation programme of work. This programme of work would implement the IDP commitments that had been developed with and communicated to NHS Wales organisations during the earlier stages of Research Phase 3.

6.18 Chapter Summary

This chapter has documented Research Phase 3—which focused on the development, validation, and formal launch of the Innovation Delivery Plan (IDP) as the implementation vehicle for the Health and Wellbeing mission of the Innovation Strategy for Wales (ISW). The chapter has illustrated how an evidence-based policy initiative transitioned from strategic vision to a delivery framework, underpinned by robust stakeholder engagement, national governance, and political endorsement. This provided the platform for the IDP to inform healthcare innovation practice across NHS Wales innovation community.

The IDP was co-developed collaboratively by the WG Departments, including HSCEY Group, NHS Wales, and key innovation stakeholders, including representatives from the life sciences sector and national innovation programmes. These stakeholders—many of whom will be directly responsible for delivery—played a critical role in shaping the plan's content, structure, and operational mechanisms. This inclusive approach ensured that the IDP would be both practically grounded and system relevant.

Central to the IDP is the alignment of 'innovation pull' (system-identified priorities and needs within NHS Wales) with 'innovation push' (offers and capabilities of external innovation partners). This conceptual model provided the basis for structuring the IDP's three strategic pillars: ecosystem coherence, prioritisation of system needs, and mechanisms to support adoption-ready innovation at scale. These pillars are reflected in a suite of actionable commitments, to be delivered through a national innovation work programme.

The development process for the IDP was both iterative and participatory. It involved structured consultation through a series of three national workshops, each convening key representatives from the pull and push communities. Feedback from these events was analysed and integrated into successive iterations of the plan. Final endorsement was secured through formal submission to the NHS Wales Leadership Board, whose approval reflected system-wide alignment on the IDP's strategic direction.

The ISW and IDP were subsequently presented for peer review in academic and policy forums, including international conferences, workshops, and publications. This process not only provided external validation but also situated the work within the broader academic discourse on healthcare innovation policy and delivery.

In summary, this chapter has provided a comprehensive account of the mechanisms by which the policy commitments made an innovation strategy have been operationalised through a national delivery plan that informs practice. It offers a replicable model for evidence-led policy implementation that connects high-level strategic intent with practical system delivery.

CHAPTER 7: RESEARCH PHASE 4 – INNOVATION DELIVERY PLAN IMPLEMENTATION.

7.1 Introduction to the Chapter

In this final fourth phase, the ISW is implemented through the IDP. A range of significant, papers, interviews, Ministerial statements and public launches of innovation infrastructure between October 2023 and end of March 2025 demonstrate both the national profile of this work and its application and impact on both national and local practice.

To implement the IDP, senior buy in and resources are secured via a policy paper to senior leadership, this establishes a national innovation programme and delivery team, which are tasked towards delivering the IDP commitments through a multifaceted national work programme (section 7.2). The approach and underpinning research are tested through an interview with the Welsh Government Director General / NHS Wales Chief Executive Officer (Section 7.3) which provides additional direction and consensual support to the IDP. A subsequent update paper on IDP implementation is taken to NHS Wales Leadership Board in May 2024 (section 7.4) where six principal actions are confirmed to steer and direct progress. Implementation continues and an internal IDP progress report is produced in September 2024 (section 7.5) which summarises progress and stimulates further Ministerial interest in the ISW and IDP agenda. This interest in the IDP leads to an Oral Statement being made by the Minister for Mental Health and Wellbeing on innovation in Healthcare in December 2024 (section 7.6) which summarises key IDP progress and demonstrates Ministerial commitment (section 7.7). Using the public interest generated, the launch of the key IDP innovation infrastructure 'Health and Social Care Innovation Wales' takes place and is described in mid-March 2025 (section 7.8), with its implications for practice set out. A WG Written Statement reports on the progress made by the ISW and IDP is then made at the end of March 2025 (section 7.9) which summarises a range of policy and practice impacts. A summary of the chapter is provided (section 7.10).

Key inputs, outputs, interfaces, and anticipated impacts from Research Phase 4 are summarised in Table 29 below.

Table 29: Research Phase 4 Summary

Research Phase	Inputs	Outputs	Interfaces	Impact/Influence on policy
4. Innovation Delivery Plan Implementation *This activity took place from October 2023 and the end of March 2025.*	Information from IDP workshops support refinement approval of IDP and supporting innovation programme. NHS Wales Innovation Leads workshop on IDP in October 2023. (n=28 attendees). *Paper 10* – Implementing the Innovation Delivery Plan policy paper. Chief Digital and Innovation Officer. December 2023	*Paper 11* - Interview with Judith Paget OBE, CEO NHS Wales / DG HSS one year after ISW strategy launch - June 2024. *Paper 12* - NHS Wales Leadership Board on approach and IDP progress - May 2024. *Paper 13* – 1 Year internal WG update on ISW and IDP implementation. September 2024.	IDP approach and progress presented to a range of expert practitioners: *Conference Paper 5* and presentation on IDP at ISPIM Salzburg Austria, December 2023. (*n*=20 attendees). Presentation on IDP at ISPIM Connects Porto Alegre conference April 2024. (*n*=30 attendees). Presentation / workshop at ISPIM Tallinn conference, June 2024 on national innovation programme. (*n*=40 attendees). Chaired Special Interest Group on Innovation in Healthcare at ISPIM Bergen annual conference, June 2025 (*n=38* attendees) Keynote presentation on 'Developing and Implementing the 2023 ISW' at the International Conference on Technologies & Organization, La Rochelle, France in June 2025 (*n*=50 attendees). *Publication 2* - Information Systems Journal – submitted August 2025. *Publication 3* - AI at International Conference on Technologies & Organization, La Rochelle, June 2025	Health and Care Innovation Wales programme and infrastructure endorsed by all WG Directors and NHS Wales CEOSs at their May 2024 Leadership Board meeting. (*n*=30 attendees) *Paper C* - Oral statement on Innovation in Healthcare by Minister for Mental Health and Wellbeing – December 2024. *Paper 14* - Health and Care Innovation Wales programme and supporting infrastructure projects established and launched on 12th March 2025 www.hsciw.wales *Paper D* - Written Statement on ISW and IDP progress by the Welsh Government, March 2025. Launch workshop for www.hsciw.wales resources on 27th March 2025

7.2 December 2023 IDP Policy Paper – Implementing the Innovation Delivery Plan

Following the launch of the IDP in October 2023, a plan was developed to set out what activity would be undertaken, with what resources, to deliver the IDP commitments. A national innovation programme team needed to be established to implement the IDP alongside the NHS Wales innovation community. To gain approval for this plan and to mobilise the resources required, a policy summary paper was produced to be presented to WG HSCEY Group Digital and Innovation Directorate senior management team in December 2023. In addition, the paper demonstrated its strategic alignment with complimentary programmes of work such as the establishment of the Digital, Technology, Innovation and Value function of the NHS Executive. (NHS Executive, 2024)

This policy paper was presented to the Welsh Government Chief Digital and Innovation Officer (CDIO) and his senior leadership team on 21 December 2023. *The paper is available in the Summary Table and Appendix Paper 10.*

7.2.1 Summary of the IDP policy paper

The IDP policy paper outlined seven key proposed activities, as plan and mechanisms for delivery of IDP commitments, based upon the broad range of feedback and stakeholder insights gained in Chapter 6. The seven key activities are summarised below:

Establishment of a national innovation programme team – A national innovation programme team would be created and funded, with a WG policy lead, NHS Wales programme manager and innovation and communication specialists from across the NHS Wales Innovation leads group, with a supporting £300k annual budget from the Innovation Technology and Partnerships programme.

Structured engagement with the NHS Wales innovation community – A strong innovation community contribution has supported ISW development to date and would continue to support IDP implementation work, share knowledge and distribute expertise to enable the wider system to innovate. This approach is supported by NHS Wales Innovation Leads and Innovation Executive Leads groups – both groups have been supportive and useful as national steering and reference groups.

Leveraging existing relationships and networks to respond to financial state – Responding to the current pressured financial state, the innovation programme team are levering existing relationships, networks, and expertise to deliver this work on the principle 'we all have a role to play in supporting the development of the Welsh innovation ecosystem'. In practice this meant that every NHS Wales Innovation lead supported at least one IDP commitment.

Centralised hosting of innovation resources – All innovation resources will be hosted centrally on specific NHS Wales website pages for innovation. This will include links to all relevant organisations and programmes, with information on their 'NHS Wales offer' and contact details for their innovation leads and teams.

National branding under "Health and Social Care Innovation Wales" – The NHS Wales Innovation Leads group agreed on the Health and Social Care Innovation Wales name and umbrella branding for this infrastructure. This infrastructure builds on the success of national teams for Value Based Healthcare, Health and Care Research Wales and Improvement Cymru.

Development of a National Innovation framework – An Innovation Framework, will be developed by the NHS Wales Innovation Leads group, and set out all stages of the innovation development process from 'idea' to 'development' to 'widespread adoption and deployment'. This framework provides structure, support and advice to health and care practitioners, at all stage of innovation development.

Future alignment with NHS Executive functions – The future alignment of this national innovation infrastructure to become part of the NHS Executive function for Digital, Innovation and Value function in the future, in keeping with the national function approach mirrored by both Digital and Value – further work is required to scope this out in full.

7.2.2 Implications of the IDP policy paper

The Welsh Government CDIO and senior leadership team approved both the proposed budget and the establishment of the national innovation programme team. This approval provided the mandate and resources to move forward with IDP implementation, including the development of supporting innovation infrastructure and processes. Specific actions agreed included:

- Continuing with IDP implementation, with a formal progress report as a review point scheduled for NHS Wales Leadership Board in May 2024.
- Delivering the national innovation projects under the IDP framework.
- Continuation of the alignment of innovation programme with the Digital, Innovation and Value function of the NHS Executive.
- Developing and launching the new HSCIW innovation infrastructure and framework through both national and local networks and mechanisms. Develop over 2024 and launch in Spring 2025.
- Maintaining support, engagement and challenge with the NHS Wales CEOs, innovation executive leads and innovation lead teams.
- Road testing the infrastructure, innovation framework, resources and tools with local teams.
- Maintaining alignment with the with the Social Care Innovation programme.
- Develop an innovation training offer - exploring alignment with ISO56000 – International standard on Innovation Management Systems.

These actions marked a transition from policy formulation to system-wide implementation and operationalisation, positioning the IDP as a central mechanism for embedding innovation into NHS Wales practice.

7.3 Interview with Judith Paget CBE – Director General, Health and Social Services Group, Welsh Government / Chief Executive, NHS Wales

To gain buy in and secure further insights into the future direction of the ISW and IDP, a semi-structured interview was conducted with Judith Paget CBE, Director General of the Health and Social Services Group within Welsh Government and Chief Executive of NHS Wales. As the most senior policy and system leader responsible for health and care innovation in Wales, her reflections provided valuable insights into both the strategic importance of innovation and the practical challenges of embedding it at scale across NHS Wales.

Judith Paget is the Director General, Health and Social Services Group, Welsh Government / Chief Executive Officer responsible for NHS Wales and as the ultimate decision maker for innovation policy related to healthcare, both within HSCEY Group and across NHS Wales. Judith's thoughts and reflections on innovation to date within her career were sought, as were her views on the ISW and IDP to review and determine their impact to date. Insights were sought on else we may need to consider in future iterations of the ISW and IDP, including what success would look like in 5 years' time.

The interview was undertaken virtually via Microsoft Teams at 12:00pm on Tuesday 26 March 2024. Questions were provided in advance to allow for Judith's consideration, using a range of semi-Semi-structured interview questions were developed based on the three strategic priorities set out in the ISW. Full approval was sought and given by Judith Paget to use the transcript, quotes, validation of research findings and summary of the interview for this research. (See *Appendix Summary Table - Paper 11)*

The semi-structured interview was organised around five thematic areas that directly reflected the research objectives. Firstly, Judith Paget was invited to reflect on her career experiences of innovation, both as a Health Board Chief Executive and in her role as NHS Wales Chief Executive and Director General for Health and Social Services, identifying successes as well as areas for improvement. Second, the discussion focused on the importance of an Innovation Strategy for Health and Social Care, exploring why such a strategy is necessary and what value it offers to system actors. Third, the interview

examined the three strategic priorities articulated within the Innovation Strategy for Wales: (i) creating greater coherence across the innovation ecosystem; (ii) focusing NHS Wales innovation activity on organisational priorities in order to generate "innovation pull"; and (iii) supporting adoption-ready innovation at scale from the external ecosystem, or "innovation push." Fourth, Paget was asked to reflect on whether there were omissions or gaps within the current Innovation Strategy that required further consideration. Finally, the interview explored her vision of success in five years' time, specifically what measurable achievements would indicate that the ISW and IDP had delivered their intended impact. This interview therefore provided a valuable opportunity to triangulate the findings from documentary analysis and stakeholder workshops with senior leadership perspectives, thereby strengthening the overall validity of the research.

7.3.1 Interview questions

Q1. Please provide your career reflections on innovation both as a Health Board CEO and NHS Wales CEO / Director General for Health and Social Services.

- What has worked well?
- What could be improved?

Q2. Why do you think an Innovation Strategy is important for Health and Social Care?

Q3. The three priorities set out in the Innovation Strategy are:

1. Creating greater coherency across the innovation ecosystem – where every partner understands their role. How should we do this?
2. Focusing NHS Wales innovation activity more on organisational priorities and need – generating an 'Innovation Pull' to the wider ecosystem. How should we best organise this?
3. Support adoption ready innovation from the wider ecosystem into NHS Wales at scale – creating an 'Innovation Push' offer. What system infrastructure is needed to allow this?

Q4. Do you think there are issues that we have missed from the Innovation Strategy?

Q5. In five years', time, what would success look like as a result of the Innovation Strategy?

7.3.2 Summary feedback, key themes and quotes from the interview

Judith's responses to the questions focused on three key themes, which aligned well and validated the commitments and themes set out in the ISW and IDP. Quotes from the transcript that support these three themes are provided below.

Theme 1 - Ecosystem organisation and governance

Judith discussed that innovation has had varying take up over different NHS Wales organisations over the last 10 years, so in that regard a new innovation strategy is needed to bring consistency to this agenda. Whilst WG have taken great steps to develop the innovation ecosystem to support NHS Wales, it isn't quite all pulling in the same direction that allows real impact to be made against ministerial priorities and system needs. Governance needs to be clearer, to create a pipeline of opportunities that comes into that structure. These will be assessed consistently then taken forward through organisational plans - ideally linked to system priorities that the Minister has set out. Health Technology Wales for example, have linked to all of their topic calls to ministerial priorities. The priorities can be used further to issue calls to work with industry partners to work with on diabetes care or cancer care.

> *"We have a huge amount more innovation infrastructure than we did 10 years ago, but it now feels cluttered. On the other hand, it's a good problem to have, with such a number of these innovation interventions in place..., how do we get those things working together in a more coherent way?"*

Theme 2 - Innovation adoption

A second theme centred on the challenge of innovation adoption. Paget acknowledged that while numerous successful innovations exist across NHS Wales, their consistent uptake and spread remain problematic. She called for a nationally coordinated, evidence-based adoption framework to ensure that proven innovations are systematically embedded across all organisations, thereby maximising system-level impact.

She highlighted the comparative absence of adoption structures in Wales, contrasting the situation with England's Accelerated Access Collaborative and Scotland's Accelerated National Innovation Adoption pathway. In her view, Wales needed to establish a similar mechanism, potentially mandating adoption through the Integrated Medium-Term Planning (IMTP) system and embedding innovation in the objectives of NHS Chief Executives and Chairs.

Judith described how having a more evidence-based approach to innovation adoption was needed, given there is so many good examples of innovation, however consistent uptake across the system is difficult, we need to take the best of innovation learning from across the system over the last 10 years and puts it in one place to allow the whole Health and Social Care system to access it. Judith felt we could look at this from an inter-ministerial approach, for each of the four UK Ministers with responsibility for Health and health innovation sharing information on the approach each administration is taking on innovation and innovation adoption.

> *"I'd like to see an NHS Wales evidence-based approach to innovation adoption that we nationally subscribe to, where we award an 'NHS Wales Kitemark' - in the same way as the National Institute for Clinical Excellence says 'this medicine is now approved on the basis of clinical safety and efficacy' for medicines - where Welsh system leadership directs all NHS Wales organisations to implement that innovation."*

This perspective underscored the importance of moving beyond piloting and local experimentation, towards a nationally mandated system for adoption and scale.

Theme 3 - Innovation skillsets and capability building

The third theme focused on workforce capability. Paget identified gaps in innovation-related skills across NHS Wales, stressing the need for systematic capacity building. She supported the development of a new national innovation framework and advocated for accredited training programmes to embed innovation within workforce culture. This, she argued, would help normalise innovation practice, strengthen organisational resilience, and ensure that approaches were transparent, tested, and transferable.

Judith described that there are gaps in the national NHS Wales staff skill set around innovation with a need for a new innovation framework to support capability, particularly through interventions like an accredited innovation training programme, to ensure that innovation is part of workforce culture and demonstrate innovation approaches have been tested, are clear and visible.

She noted:

> *"…I would like to see specific skillsets for innovation that we can offer out to a wider section of our workforce, that we should embed through staff training and leadership programmes."*

Paget's reflections reinforced the need for innovation capability building and training, situating staff and workforce development as central to embedding innovation as a routine function within NHS Wales.

7.3.3 Implications of the interview on the IDP

The three themes noted from the interview supported our IDP approach and the proposed projects. Judith's feedback reinforced that our efforts around having better ecosystem organisation and governance through developing innovation infrastructure, providing better clarity on who is doing what and ensuring that innovation resources are centralised into one place for the whole system to access - were being seen by senior leaders as the right things for the system.

On theme 2, Judith supported our efforts to support the system level need of innovation adoption through the development of an innovation framework that would bring consistency to the stages of healthcare innovation, from ideation to development to system scale and adoption. Having all the available resources in one place to support adoption, bringing greater coherence to the ecosystem, would enable greater support to a much greater cross section of healthcare staff.

Regarding theme 3, Paget's reflections demonstrated a need for strengthened emphasis on innovation capability building and training within the IDP, to support the development of staff and workforce innovation capability across NHS Wales. To address this need, two levels of intervention were identified. The first offer would be a general, mandatory training module on key innovation principles, which would direct all 90000 NHS Wales staff to the innovation infrastructure and resources being created via the NHS Wales Electronic Staff record. This would have significant reach across NHS Wales. The second training offer would then be targeted and externally accredited innovation training for the NHS Wales Innovation Leads group, which would be based on ISO56001 as the international standard on Innovation Management.

All this feedback was embedded within the planning and implementation of the IDP by the innovation programme team, leading up to a planned progress update to NHS Wales Leadership Board in May 2024.

7.4 Progress update to NHS Wales Leadership Board – May 2024

In line with the commitments made in the December 2023 policy paper, and taking into consideration the feedback and direction from Paget's interview, a progress update on implementing the IDP was presented to the NHS Wales Leadership Board in May 2024. (See *Appendix Summary Table - Paper 12*)

7.4.1 Implications of our progress update to NHS Wales Leadership Board

This paper served both as a mechanism for sustaining senior-level buy-in, strategic direction on progress and as a milestone, one year on from the initial Leadership Board engagement. It was important to secure NHS Wales Leadership Board agreement, and the following six principal actions gained consensus:

1. Support an all-Wales approach to innovation, through a range of infrastructure and informing the work being undertaken as part of the implementation of the ISW.
2. Support the ongoing activities for the national innovation infrastructure, resources and tools that can be used by health and care staff in NHS Wales with the pro-active involvement of Innovation Leads.
3. Formal recognition and support to communicate and embed the Innovation Framework to guide the work taking place in NHS Wales organisations, with a Board level sponsor.
4. Use of the Innovation Framework to identify and better support innovations at all stages, increasing the pace at which innovation can be developed and subsequently used to improve value and outcomes.
5. Closer alignment with Ymlaen: The Social Care Wales research, innovation and improvement strategy as the implementation plan is developed.
6. Intensive work with key partners working in the innovation ecosystem to raise awareness of the National Innovation Framework and the guiding principles to ensure that there is coherency as Wales moves as one on delivering on innovation in health and care.

In addition to the six principal actions, nine key projects were highlighted to NHS Wales leadership board that formed part of the national innovation infrastructure. Table 30 below provides a description of projects delivered under the developing national innovation infrastructure and includes key delivery partners from the innovation ecosystem.

Table 30: Key projects delivered as part of developing national innovation infrastructure

Title	Description	Supporting Delivery Partner	Delivered by
Develop a national framework, web pages and branding for the national innovation infrastructure	Health and Social Care Innovation Wales will be launched with its own web pages, based around an innovation **Online Innovation Directory** framework.	NHS Wales innovation leads group	March 2025
Directory of innovation organisations	A repository of organisations who are part of the innovation ecosystem including for research and development, legal and other support. This is more focussed on the life sciences and can be used by innovators, adopters broadly and by health and care organisations.	Life Sciences Hub Wales, working with Innovation Leads	Completed
Mapping the Welsh innovation support ecosystem	This will enable NHS Wales organisations to access support outside of their immediate internal structures, according to which stage of the Innovation Framework they are working within. For leaders, facilitators and staff to access and provided by all innovation organisations, actors, platforms, programmes, networks, and teams.	Swansea University	Winter 2024
Baseline mapping and tracking innovation projects	Establish a baseline what innovation projects are being undertaking within Wales and test opportunities for shared reporting on innovation activities.	Innovation Leads	Winter 2024

Evidence informed tool(s) to support innovation assessment and adoption	To support assessments and decision making on next steps for innovation to move to spread and scale against a set of common criteria and as appropriate to the complexity and value of the innovation	Welsh Government	Winter 2025
Innovation pathway and accredited training for NHS Wales staff	A general innovation training module is being developed to help build innovation capabilities for the health and care workforce, directing them to system resources, to be hosted on the Electronic Staff Record and available to all 90000 NHS Wales staff. Accredited training programme using the ISO56001 Innovation Management standard will be procured for NHS Wales Innovation Leads.	Innovation Leads, Swansea University and Cardiff University	Summer 2025 Winter 2025
Intellectual Property (IP) Policy guidance	Development of one agreed approach to Intellectual Property management with an updated policy and step by step guidance to support NHS Wales organisations. This will include a range of templates such as IP agreements, royalty sharing, licences etc. This will now be complete alongside the UK review of IP guidance	Innovation Leads and Welsh Government, UK Government.	Winter 2025
NHS Wales commercialisation model	Development of an agreed model that will support NHS Wales organisations and innovation teams to generate income (for the purposes of re-investment) from internally created /	Innovation Leads and Welsh Government	Spring 2026

	co-created products and services that have commercial value.		
Guidance on pre-procurement and procurement of innovation and innovative solutions	Supporting pro-innovation investment with alignment to procurement and maximise the opportunity for innovative procurement as part of the new Health Services (Provider Selection Regime) (Wales) Regulations (which is under development)	Welsh Government working with key stakeholders	Spring 2026

7.5 Internal WG IDP Progress update – September 2024

Using the approval and support from NHS Wales Leadership Board, in September 2024 and in the lead up to a year of implementation of the IDP, an internal Year 1 progress update was commissioned across Welsh Government and the Health, Social Care and Early Years group and collated responses from Innovation team, Value team, R&D team and Social Care teams. This update was considered by the Innovation Advisory Council for Wales in October 2024 and was used for WG teams to detail progress made since the launch of the IDP commitments, in advance of a full Ministerial Written Statement in early 2025. The full update, as presented internally (See *Appendix Summary Table - Paper 13*) showcased a broad range of progress against the IDP commitments made for Health and Wellbeing, which included the national innovation programme and projects.

This progress stimulated a range of interest from new and incoming Ministers following Eluned Morgan's election as First Minister in July 2024. The subsequent Cabinet reshuffle brought Jeremy Miles MS in as the new Cabinet Secretary for Health and Social Services and Sarah Murphy MS in as a new portfolio role as Minister for Mental Health and Wellbeing.

7.5.1 Implications of the IDP progress update

The internal Year 1 IDP progress update was circulated to all new WG Ministers in September 2024, generating significant political interest and motivated the new Minister for Mental Health and Well-being (Sarah Murphy MS) to make an oral Cabinet statement on innovation in healthcare at the Senedd (Welsh Parliament) Plenary on Tuesday 3rd December 2024.

Cabinet statements are used to communicate important launches, announcements, policy decisions, positive progress updates, issues that require transparency and events to Members of the Senedd and other external parties, particularly the media. There are two types of Cabinet statement:

Oral Statements are delivered verbally in the Senedd to make the most important announcements.

Written Statements are emailed to Members of the Senedd.

Both types of Cabinet statements are issued publicly on the WG website and communication channels.

7.6 Oral Statement by the Minister for Mental Health and Wellbeing – Innovation in Healthcare.

Partly the purpose of this Oral Statement was to provide a range of positive updates, both politically and publicly, at a time when NHS Wales was under significant pressure and facing a range of challenges, particularly during winter pressures. The Oral statement was also an opportunity for the Minister to raise her profile as a newly confirmed Cabinet Minister, having assumed office in July 2024 as part of the new ministerial cabinet established under the new first Minister, Eluned Morgan (formerly Minister for health, social care and early years).

The production of the oral statement was based on ISW and IDP progress updates, from across the HSCEY group. This was an excellent opportunity to also produce a broad briefing to support the Minister and highlight the additional work taking place as part of the implementation of the IDP.

The Oral statement was noted as the seventh item on the Senedd Plenary agenda on the afternoon of Tuesday 3rd December.

7.6.1 Summary of the Oral Statement

The Oral Statement reconfirmed the importance of innovation in creating our modern healthcare system, strategically framing our approach to healthcare innovation through the Health and Wellbeing mission of the ISW and IDP. To support the system to innovate, the Oral Statement referenced how WG were building a range of national innovation infrastructure, based around an NHS Wales innovation framework – which will support NHS Wales staff to develop new ideas, turn them into reality and share and adopt new ways of working.

The Oral Statement then set out the range of innovative programmes and projects from across WG HSCEY policy areas that the ISW and IDP had enabled, such as digital platforms, innovative technologies, Artificial Intelligence, cancer innovation, new diagnostic tests, data linkage and industry engagement. The Oral Statement highlighted the importance of developing and embedding a culture of constant innovation across our vital healthcare system, underpinned through our strategic ISW approach.

The Oral Statement is attached in full at *Appendix – Paper C*.

7.6.2 Implications of the Oral Statement

The Oral Statement was well received, with the Minister fielding a range of positively focused questions from primarily opposition members of the Senedd from 17:48pm to 18:18pm, these members were:

- Sam Rowlands MS, Senedd Regional Constituency Member for Welsh Conservatives (North Wales)
- Mabon ap Gwynfor MS, Senedd Constituency Member for Plaid Cymru (Dwyfor Meirionnydd)
- Jenny Rathbone MS, Senedd Constituency Member for Labour (Cardiff Central)
- Gareth Davies MS, Senedd Constituency Member for Welsh Conservative Party (Vale of Clwyd)

Members of differing political parties expressing excitement at the range of examples of innovation that were showcased, with questions mainly focused on more details in terms of roll-out, instead of political points scoring or negative scrutiny.

Items mentioned included:

- Championing the use of artificial intelligence in healthcare
- Ensuring the right digital technology was made available to healthcare professionals
- Importance of economic benefits of health care innovation, as well as the health benefits
- Ensuring clinical trials support with health priorities
- Linking datasets across housing and health, to ensure the most vulnerable people live in the most insulated homes
- Ensuring the rollout of e-prescriptions across Wales, not just in selected areas

The full record of the oral statement is available on Senedd TV at: https://record.senedd.wales/Plenary/14207?lang=en-GB#A92572

More importantly, the Oral Statement provided an opportunity to brief the Minister on delivery of the national innovation programme. Making a successful Oral Statement on innovation provided continuing Ministerial buy in and interest to the work to implement the ISW and IDP at the highest levels of Government, stimulating sector interest and providing a strong platform to launch our new innovation infrastructure Health and Social Care Innovation Wales (HSCIW), in the Spring of 2025. This launch would precede a wider WG Written Statement on progress to deliver the IDP across all four ISW Mission areas.

7.7 Launch of the Health and Social Care Innovation Wales infrastructure and resources – March 2025

The national innovation programme work continued at pace during Spring 2025, with momentum provided following the Oral Statement. One of the key strategic pieces of this programme was delivering innovation infrastructure. To this end, Health and Social Care Innovation Wales (HSCIW) was the title given to the overall innovation infrastructure developed by the national innovation programme team, as one of the key deliverables of the ISW, that brough together all the projects put in place to support the health and care system to innovate. Health and Social Care Innovation Wales (HSCIW) was developed by leaders across the health and social care community in Wales and funded by Welsh Government. HSCIW aimed to provide a platform for people, networks and resources from across the innovation ecosystem in one place, enabling NHS Wales and Social Care staff to find the support they need to develop and implement innovation in priority areas, helping to improve patient outcomes and deliver better value. A press release on the HSCIW launch was issued on 12th March 2025 and is provided in full at *Appendix 13*.

The Innovation Framework

At the centre of the HSCIW infrastructure is the Innovation Framework, developed as a specific commitment made in Wales Innovates: the Welsh Government's 2023 Innovation Strategy for Wales.

Shaped by the experience of NHS Wales innovation teams over the past decade, the framework draws on international best practice, including the ISO56000: International Standard on Innovation Management, technology readiness levels, and design thinking. The framework provides a structured approach to innovation, offering clear guidance on developing, testing, and scaling innovative ideas,

products, practice and services - providing relevant tools, advice, and connections at each framework stage.

Connecting Innovators to the right support

The central network supporting HSCIW is the NHS Wales Innovation Leads Group, which brings together innovation teams and lead from across NHS Wales, Social Care Wales Academia and Government.

These experts provide strategic advice and connections while maintaining strong links with partners across Wales, the UK, and internationally. HSCIW is aligned with Life Sciences Hub Wales, the Bevan Commission and the Innovation and Transformation Intensive Learning Academy amongst many others, ensuring key partners are engaged at the right stage of the framework.

HSCIW resources also complement Ymlaen: The Social Care Wales Research, Innovation and Improvement strategy, whilst recognising there are some important differences between how NHS Wales and Social Care staff will use the Innovation Framework and HSCIW resources.

Building a sustainable innovation culture across health and social care

Developed in response to the evolving needs of the sector, HSCIW was included in the December 2025 - 2028 NHS Wales Technical Planning Guidance (WG, 2025). This guidance endorsed HSCIW as government policy that directs its use by all NHS Wales organisations in the planning and implementation of their services.

An online workshop using MS Teams showcasing the HSCIW resources was hosted by the NHS Wales Innovation Leads group, at 1pm on Thursday 27th March 2025 and over 130 practitioners registered.

7.7.1 Implications of the launch of Health and Social Care Innovation Wales (HSCIW)

The launch of HSCIW publicly introduced new innovation infrastructure to support NHS Wales staff to innovate, as one of the key components of the IDP. This brought together a range of innovation resources in one place, which had been fully developed and was ‘owned’ by both WG and the NHS Wales innovation community. This was a first for practice in Wales and demonstrated the progress made

since the launch of the ISW in 2023 and the IDP. The Innovation Framework was fully interactive, linking each framework stage with all the available programmes, networks, and contacts relevant at that point in time. Additionally, HSCIW had been embedded into formal NHS Wales planning policy, with a requirement on every NHS Wales organisation to refer to HSCIW when considering their innovation activity.

Further work was planned for the HSCIW resources, with additional tools and content to be added in the next Financial Year (2025/26) once additional staff and financial resources had been made available. The launch, which demonstrated the most significant step taken to support healthcare innovation infrastructure in Wales, informed the wider WG written statement on the progress of the IDP, later in March 2025.

7.8 Written statement - Wales Innovates: ISW Delivery Plan

On 19th March 2025, a Written Statement was issued by Rebecca Evans Cabinet Secretary for Economy, Energy and Planning, on behalf of the Welsh Government Ministerial Cabinet. This Written Statement reported progress across all four ISW mission areas since the IDP launch in October 2023. The Health and Wellbeing mission was well represented and a range of progress delivered against the IDP. The WG Written Statement is attached in full at *Appendix Summary Table - Paper D.*

7.8.1 Implications of the Written Statement

The Written Statement demonstrated continuing WG buy in to delivering the commitments made for Wales in the ISW and IDP. A range of progress across all four mission areas demonstrated the ISW's significant ongoing impact to create more supportive national policy conditions for innovation.

From a Health and Wellbeing perspective, the launch of HSCIW was declared publicly by WG, as part of the wider delivery of the ITP programme. But more widely, evidence of innovation delivery was demonstrated under the IDP against the policy areas of Life Sciences, Research, Artificial Intelligence, Digital, Pharmacy, industry engagement, healthcare science, genomics, social care, and innovation adoption. This demonstrated the significant and broad impact that the ISW supported from early evidence and research, which has strategically informed and shaped the direction of national Government policy. The combination of academic methodology to inform public policy that had in turn impacted practice across a range of new support infrastructure and interventions across the health and

social care innovation ecosystem. This demonstrates real success for this research and real impact for the WG, the NHS Wales Innovation Leads group, the national innovation programme team, and Swansea University.

The publication of the Written Statement was the point at which the IDP and ISW had achieved a major milestone in delivery across a range of policy areas and commitments covered by the Health and Wellbeing mission. Whilst the ISW and IDP are in effect 5-year documents (from 2023 – 2028), the publication of the Written Statement was the end point for this research study. Given that the ISW and IDP are valid WG strategy and implementation for another 3 years, with the caveat of Welsh elections in Spring 2026, a broad range of further research remains very viable. The opportunities for further research are discussed in section 8.7.

7.9 Chapter summary

In this chapter a range of activity was undertaken to implement the IDP. This process began through a proposed approach to deliver the IDP as set out in a policy paper presented to the Welsh Government's Chief Digital and Innovation officer for Health and Social Care in December 2023, which secured senior buy in and the right resources to lead and underpin the IDP work.

A national innovation programme team is set up, working through the NHS Wales innovation leads group to develop an NHS Wales innovation framework, which we present to the NHS Wales leadership board in May 2024.The IDP is then implemented, presenting the approach and innovation delivery plan to a range of internal and external academic audiences as part of continuing peer review.

An interview is undertaken with Judith Paget OBE as the joint Director General for the Health Social Care and Early Years group in Welsh Government and the Chief Executive of NHS Wales, securing her views on innovation and how the ISW has been received and implemented. This helped shape the work and continue to secure buy in for this work.

Recognition is gained for the researcher through the awarding of an academic role with ISPIM as Co-Chair of the healthcare special interest group in April 2024 and as a visiting innovation fellow with the University of South Wales in August 2024.

Based on this research and delivery of the ISW and IDP, the researcher achieves reaccreditation as a Chief Innovation Officer with the Global Innovation Institute in November 2024.

A successful progress update on Year 1 implementation of the IDP is produced, demonstrating a range of impact and delivery. This generates interest for an oral statement to be commissioned and made by Sarah Murphy, as Minister for Mental Health and Well-being on innovation in healthcare in December 2024, showcasing a range of achievements publicly on innovation delivery.

Health and Social Care Innovation Wales – new national infrastructure to support health and social care staff to innovate, hosted on a new website with a range of supporting resources is launched, which brings together the best learning from last decade on innovation, based around an Innovation Framework co-developed with the NHS Wales Innovation leads group.

To conclude implementation, a Written Statement is issued by the Welsh Government that summarises key delivery milestones from across all four missions of the ISW and IDP on 19th March 2025.

CHAPTER 8: DISCUSSION, CONTRIBUTIONS, IMPLICATIONS AND CONCLUSIONS

8.1 Introduction to the chapter

In this chapter the synthesis of discussion of the results are discussed, including revisiting delivery of the research aims and objectives and examining the relevance of the literature and research methods used (section 8.2). The results of this research study are discussed; focused on the contributions to policy, practice and knowledge. This includes presenting the impact on stakeholders and findings from each Research Phase (Section 8.3). Implications of the study for innovation management and the conceptual framework emerging from the results of this research is presented (section 8.4). Implications for research are summarised (Section 8.5) and impacts for practice and policy are discussed, including implications for the practice of innovation management (section 8.6).

The limitations and challenges encountered during this research and study are detailed, informing areas where further research can be undertaken, with specific areas for future work proposed - both nationally and internationally (section 8.7). A summary of the previous chapters is then provided (section 8.8). Key conclusions are drawn from the research (section 8.9) and finally a chapter summary is presented (section 8.10).

8.2 Revisiting the research questions and key findings by Research Phase

RQ.1: Identify and consider Welsh innovation context; challenges, enablers and barriers, alongside personal experience, to support the development of an Innovation Strategy for Wales (ISW).

Phase 1 identified and considered the Welsh innovation context; challenges, enablers and barriers, using the researchers own personal experience, to support the development of an Innovation Strategy for Wales (ISW). A strong methodological approach was set out, with underpinnings, data collection methods and justification of the use of action research as my chosen research method, as a senior practitioner in policy. Combining the literature review on innovation and innovation ecosystems, knowledge gaps, personal reflections and Welsh socio-economic context made a strong policy, academic

and political case for a new ISW, which had strong Ministerial backing for development and delivery through the Labour Government manifesto of August 2021. A particular strength of the ISW is its commitment to focus on all devolved areas of Government policy, focused through its four key missions. The Health and Wellbeing mission, as the biggest area of Government spend and with the NHS Wales as the largest employer in Wales, was arguably the key priority area for innovation to be applied.

RQ.2: Develop a broad and robust evidence base for healthcare innovation policy, to support the Health and Wellbeing mission of the ISW.

Phase 1 also developed a broad and robust evidence base for healthcare innovation policy, to support the Health and Wellbeing mission of the ISW. Developing and combining three key evidence bases of the NHS Wales Covid-19 Innovation and Transformation Study in 2021, with the Cardiff Business School Key Opinion Leader Study with the NHS Wales request for evidence provide a strategic, credible and highly detailed evidence foundation for the Health and Wellbeing mission, based on organisational and practitioner level needs and feedback.

RQ.3: Review and analyse the evidence to inform the development of the final 2023 ISW

Phase 2 reviewed and analysed the three broad evidence bases, using thematic analysis to inform the development of the key themes underpinning the version of the 2023 ISW which was issued for public consultation, with a draft set of recommendations. Public feedback was collated and analysed, with several changes made to produce the final ISW.

RQ.4: Test and verify the ISW to allow for public launch by the Ministerial, alongside development of an underpinning Innovation Delivery Plan (IDP).

Phase 2 also tested and verified the ISW to allow for public launch. The ISW was taken through senior and Ministerial approval processes within Government and was subsequently launched, with the full support of the Welsh Government Ministerial Cabinet. In addition, the process of undertaking a statutory health policy impact assessment was begun, which considered all the potential impacts of the ISW as a new Government policy for healthcare. The key themes and a range of strategic commitments made in the ISW, provided the foundation for the development of an underpinning Innovation Delivery Plan (IDP).

RQ.5: Launch and implement a supporting Innovation Delivery plan (IDP), that realises the commitments made in the Health and Wellbeing mission of the ISW, reflecting on progress to end of Year 1 by end March 2025

Phases 3 and 4 developed, launched and implemented the Innovation Delivery plan (IDP), based on the commitments made in the Health and Wellbeing mission of the ISW. This IDP is rigorously tested through a set of workshops with senior stakeholders from across the innovation ecosystem and presented at the highest levels of NHS Wales and Welsh Government leadership. Feedback is gathered and analysed, resulting in the production of a Ministerially launched IDP in October 2023. The ISW is then delivered through the IDP between October 2023 and March 2025; senior buy in and resources are secured to establish a national innovation programme and delivery team which is tasked towards delivering a range of specific IDP commitments through a multifaceted national innovation work programme that delivers national innovation infrastructure. This includes an Innovation Framework, the HSCIW web resources, the NHS Wales innovation leads network, an innovation assessment and adoption tool, accredited ISO56001 innovation training and an introduction to innovation training module for the NHS Electronic Staff record. Key progress is then examined and reflected upon at the end of March 2025, with a public Ministerial statement made which summarises key ISW and IDP achievements. The key achievements are then discussed and conclusions drawn, with limitations, challenges and areas for future research set out.

8.2.1 Summary table – Policy, academic, decision, practitioner and Ministerial announcement papers developed in support of this research – including publications and awards.

The highly applied, action research nature of this study required that a number of policy, academic, decision, practitioner and Ministerial announcement papers were developed in support of this research. These papers tell the evolving story of how evidence informs, research, which informed public policy. This policy in turn has supported the funding, development and implementation of a range of practice, articulated through the ISW and IDP and meeting a range of specific innovation needs in the system and subsequently resulted in a range of ecosystem and stakeholder impacts. A summary of these policy, academic, decision, practitioner and Ministerial announcement papers is attached at Table 31 below, with each paper cross referenced to the achievement of their corresponding research objectives.

Table 31: Summary of Policy, academic, decision practitioner and Ministerial announcement papers developed in support of this research.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Paper 1 – National evidence request letter to all NHS Wales CEOs and Innovation Leads - SWOT analysis of the healthcare innovation landscape in Wales. Issued by WG 2nd December 2021	Issued by Welsh Government (WG) Director for Technology, Digital and Transformation.	Evidence returned by most NHS Wales organisations to support ISW development**.**	RO1 – Results identified innovation context across healthcare in Wales. RO2 – Supports development of the underpinning evidence base of the ISW
Paper 2 – Developing the 'Healthier' chapter of an Integrated Innovation Strategy for Wales. Presented on work undertaken across the Welsh Government and HSCEY Group on the development of the Innovation Strategy for Wales (ISW). Presented by Tom James, 6th June 2022.	Health and Social Care and Early Years (HSCEY) Group Policy Forum. Assesses all proposed and new policies for the HSCEY Group, to ensure alignment and provide advice and critical challenge.	Agreed content of the paper and the draft 'Healthier' chapter of the ISW. Policy Forum then approved the draft version of the ISW to be issued for public consultation.	RO1 – Considers work by WG to date to develop the ISW, including challenges and enablers. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW.
Conference Paper 1 - Case study as the first PhD study under the All-Wales Academy (Intensive Learning Academy) for Innovation in Health and Care. Presented September 2022.	17th European Conference on Innovation and Entrepreneurship, Pafos, Cyprus.	Peer review.	RO1 – Identified innovation context across healthcare in Wales. RO2 – Supports development of the underpinning evidence base of the ISW

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
			RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW.
Paper 3 – Supporting a new phase of the Welsh innovation ecosystem though an Innovation Strategy for Wales and a supporting Innovation Delivery Plan Paper sets out the strategic approach to the ISW and the draft IDP, post ISW consultation. Presented by Tom James, 18th October 2022.	NHS Wales Leadership Board, the highest-level strategic decision-making forum in NHS Wales, composed of all NHS Wales Chief Executives and senior Welsh Government HSCEY Directors.	Agreement to implement the strategic approach and key themes set out in the ISW. Agreement to the proposed content of the IDP, to be communicated to all NHS Wales organisations.	RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO3 – Reviews and analyses the evidence to inform the final version of the ISW.
Paper 4 – Developing an Innovation Strategy for Wales – Final version of the ISW Health and Wellbeing mission Presented by Tom James on 11th January 2023.	WG HSCEY Executive Directors Team.	Approval of Final version of the ISW Health and Wellbeing mission.	RO1 – Considers work by WG to date to develop the ISW, including challenges and enablers. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO3 – Reviews and analyses the evidence to inform the final version of the ISW

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Paper 5 – Integrated Impact Assessment for Wales Innovates - Our Innovation Strategy for Wales: Creating a stronger, fairer, greener Wales: Approved on 12th January 2021.	Welsh Government Cabinet Ministers for: Economy, Health and Social Services, Climate Change and Education.	Approval of statutory Integrated Impact Assessment for Health.	RO1 – Considers work by WG to date to develop the ISW, including challenges and enablers. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW.
Paper 6 – Innovation Delivery Plan Workshop 1 – 'Innovation Pull' leads – Friday 27th January 2023. Co-facilitated by Tom James.	'Innovation Pull' leads - NHS Wales organisational leaders overseeing or directly responsible for innovation within their organisations.	Gained 'pull' consensus on the three key themes supporting the actions in the Innovation Delivery Plan.	RO4 - Sets out what evidence produced and analysed to date, to develop the IDP. RO4 – Develops the specific actions within the IDP.
Paper 7 – Innovation Delivery Plan Workshop 2 – 'Innovation Push' leads – Friday 3rd March 2023. Co-facilitated by Tom James.	Innovation "Push" leads from publicly funded organisations and initiatives such as Universities and WG funded innovation programmes.	Gained 'push' consensus on the three key themes supporting the actions in the Innovation Delivery Plan.	RO4 - Sets out what evidence produced and analysed to date, to develop the IDP. RO4 – Develops the specific actions within the IDP.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Paper 8 – Innovation Delivery Plan Workshop 3 - All leads for Innovation 'Pull' and Innovation 'Push'. Friday 31st March 2023. Co-facilitated by Tom James.	All 'Innovation Pull' leads and Innovation "Push" leads.	Gained group consensus on the three key themes and co-delivery of the supporting the actions in the Innovation Delivery Plan.	RO4 – Secure stakeholder endorsement for the ISW and IDP. RO4 – Establish shared ownership of the IDP approach. RO5 – Clarified roles, set out actions and secure support to implement the IDP.
Paper 9 – Establishing a new innovation approach in Wales and the Innovation Delivery Plan Presented by Tom James, April 2023.	NHS Wales Leadership Board, the strategic decision-making forum for NHS Wales, all NHS Wales Chief Executives and senior Welsh Government HSCEY Directors.		RO4 – Secure stakeholder endorsement for the ISW and IDP. RO4 – Establish shared ownership of the IDP approach. RO5 – secure senior leadership buy-in to champion IDP implementation.
Publication 1 – Challenges, innovation opportunities, and lessons learned from a prolonged organizational crisis: A case exemplar of the National Health Service Wales. Published June 2023.	Academic Press – Accelerating Strategic Changes for Digital Transformation in the Healthcare Industry.	Peer review in Information Technologies in Healthcare Industry Journal, Vol 2.	RO1 – Identified innovation context across healthcare in Wales.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Conference paper 2 – Innovation in practice: Developing a coherent health and social care innovation ecosystem, as part of implementing an Innovation Strategy for Wales. Published June 2023.	XXXIV ISPIM Innovation Conference, Ljubljana, Slovenia. International Society for Professional Innovation Management.	Peer review / external validation at an international network for professional and academic innovation managers.	RO1 – Identified innovation context across healthcare in Wales. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO3 – Reviews and analyses the evidence to inform the final version of the ISW.
Conference paper 3 – Developing a national research and evidence base for the health and wellbeing chapter of the Welsh Government's 2023 Innovation Strategy for Wales: A case study. Published September 2023.	18th European Conference on Innovation and Entrepreneurship (ECIE), Porto, Portugal.	Peer review / external validation at an international academic network.	RO1 – Identified innovation context across healthcare in Wales. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO3 – Reviews and analyses the evidence to inform the final version of the ISW.
Conference paper 4 – Using an action research approach to develop the health and social care component of an Innovation Strategy for Wales. Published September 2023.	International Symposium on Technology and Society (ISTAS), Swansea, UK	Peer review / external validation at an international academic network.	RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO3 – Reviews and analyses the evidence to inform the final version of the ISW.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Conference paper 5 – Developing an innovation action plan to implement the health and wellbeing chapter of the Welsh Government's 2023 innovation strategy for Wales.	International Society for Professional Innovation Managers Connects conference Salzburg, Austria,	Peer review at an international academic network.	RO1 – Identified innovation context across healthcare in Wales. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO4 – Develops the specific actions within the IDP.
Paper 10 – Implementing the Innovation Delivery Plan policy paper. Presented by Tom James, 22nd December 2023.	WG Chief Digital and Innovation Officer and senior team	Secured resources and buy in to establish a national innovation programme, projects and team to deliver IDP. Continue with IDP project implementation. Further progress update paper to NHS Wales Leadership Board in May 2024.	RO4 – Establish shared ownership of the IDP approach RO5 – Clarified roles, agreed actions and secured resources to implement the IDP.
Paper 11 – Interview: The ISW, with Judith Paget CBE– Director General, Health Social Care and Early Years Group, Welsh	n/a	Responses to the questions validated the three key ISW themes, supporting the	RO1 – Results identified innovation context across healthcare in Wales.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Government / Chief Executive Officer – NHS Wales, Undertaken by Tom James, March 2024.		commitments set out in the IDP.	RO1 – Considers work by WG to date to develop the ISW, including challenges and enablers. RO4 – Secure stakeholder endorsement for the ISW and IDP. RO4 – Establish shared ownership of the IDP approach RO5 – secure senior leadership buy-in to champion IDP implementation.
Paper 12 - Progress update on implementing IDP. Presented by Tom James, 21st May 2024.	NHS Wales Leadership Board, the strategic decision-making forum for NHS Wales, all NHS Wales Chief Executives and senior Welsh Government HSCEY Directors.	Secured NHS Wales Leadership Board agreement to the six key IDP actions and nine projects forming the national innovation infrastructure.	RO4 – Maintained leadership ownership of the IDP approach. RO5 – Clarified roles, agreed actions and secured resources to implement the IDP. RO5 – secure senior leadership buy-in to champion IDP implementation. RO5 – Provided a platform to engage widely across NHS Wales to deliver the IDP.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Paper 13 – Internal WG IDP Progress update Year 1 IDP progress update across Welsh Government group and provided progress on Health and Wellbeing Mission. Produced by Tom James September 2024	Internal WG IDP working group. Innovation Advisory Council for Wales	The full update showcased strong progress against the IDP commitments made for Health and Wellbeing, which included the national innovation programme and projects.	R05 - Generated significant expert and political interest in IDP implementation. R05 - Motivated the Minister for Mental Health and Well-being to make an Oral Statement on Innovation, supporting and championing the IDP
Paper 14 – Press release - Launch of the Health and Social Care Innovation Wales infrastructure and resources. Written by Tom James 12th March 2025	National innovation programme team.	Public press release made summarising the launch of the HSCIW innovation infrastructure, framework,functions and support.	RO5 – Main deliverable of the IDP achieved. RO5 - HSCIW enables NHS Wales and Social Care staff to find the support they need to develop and implement innovation in priority areas, helping to improve patient outcomes and deliver better value. RO5 – Innovation Framework delivered through HSCIW. RO5 – HSCIW is embedded within the NHS Wales planning framework as the main innovation support tool.

Paper / Publication number, title, purpose and date	Recipient or decision-making group	Decision, Outcome and impact	Achievement of Research Objectives and impact
Publication 2 - Building a Digital Health Innovation Ecosystem: Tech-Push, Demand-Pull, and Government Policy - Information Systems Journal - Wiley Online Library Accepted for publication in October 2025. Published December 2025.	Information Systems Journal.	Demonstrates external verification of the research in a 4* CABS journal with a 4% acceptance rate.	RO1 – Identified innovation context across healthcare in Wales. RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. RO5 – Demonstrates how HSCIW enables NHS Wales and Social Care staff to find the support they need to innovate.
Publication 3 - "AI vs. MBA: Who Wins the Future of Work? Integration of AI in Business" A panel report on the integration of AI in business and the evolving role of business education, La Rochelle, France. Published September 2025.	International Conference for Technologies and organisations, La Rochelle, France, July 2015.	Publication of an expert panel report.	RO4 – Demonstrate how ISW supports a more supportive environment for AI.
Association for Information Systems Award – Regulatory (Government) Impact award Applied for in November 2025, award won at AIS Conference, Nashville, 15th December 2025	Association for Information Systems	AIS Impact Award won.	RO2 – Sets out what evidence has been produced and analysed to date, to develop the draft ISW. R05 - Generated significant expert academic interest in ISW and IDP implementation.

8.3 Discussion of results – contributions to policy and practice.

The evolution of the evidence-based ISW and subsequent IDP emerged through a blend of practitioner insight and empirical research, revealing both the strengths, weaknesses, opportunities and threats (challenges) across the Welsh healthcare innovation landscape. This research highlighted a number of systemic gaps and needs within the Welsh healthcare innovation ecosystem namely (i) fragmented ecosystem organisation and governance, (ii) the need for a coherent strategic vision, (iii) need for a unified policy framework, (iv) lack of central technological support and enablers and (v) inconsistent evaluation. These gaps have historically hampered the organisation, scaling and sustainability of healthcare innovation.

;. Christensen's three success factors supporting and driving disruptive innovation in healthcare (technological enablers, business models, and value networks) mentioned in Section 2.2.2 of the literature review are highly prevalent in the results of this research and are compared and discussed in further detail in this Chapter, specifically Sections 8.4 and 8.5.

The impact resulting from the policy and practice generated as a result of this research are set out in full detail in Section 8.5.

Table 32: Summary of contributions to policy and practice

Contributions to policy	Contributions to practice
A Ministerial Cabinet approved Innovation Strategy for Wales (ISW) and Innovation Delivery Plan (IDP)	A national innovation programme and budget.
A model for structuring the Welsh healthcare innovation ecosystem that aligns healthcare need with system support.	A suite of practical innovation resources and tools that directly support innovation delivery within NHS Wales, based around the HSCIW infrastructure.
An NHS Wales innovation framework, embedded in formal NHS Wales planning guidance.	An innovation training model for healthcare staff, based on:

	1. Innovation core concepts as a mandatory module, on the NHS Wales Electronic Staff Record – accessed by 90,000 staff 2. A cohort of 20 ISO56001 internationally accredited innovation management professionals.
An innovation impact model	An Innovation Assessment and Adoption Tool
	Mapping of the Welsh innovation ecosystem, linked to the Innovation Framework.

8.3.1 Contributions of the research to government policy

By integrating academically robust methods with practitioner-led insights, the research has made the following contributions to strategic government policy in Wales through:

A key outcome of the study was the development and approval of the Innovation Strategy for Wales (ISW), built upon a robust, participatory process involving the integration of professional leadership reflections, empirical analysis, and extensive stakeholder engagement. This process underscored the necessity for a coherent, long-term model, improved knowledge-sharing mechanisms, and greater inter-organisational collaboration to foster a culture of continual learning and improvement. Policymakers and managers of health care organizations need to consider the diffusion and implementation of innovation not as discrete arenas but as interlinked aspects of the innovation process (Scarbrough and Kyratsis, 2022).

Central to the ISW is the Innovation Delivery Plan (IDP), co-developed with stakeholders from government, NHS Wales, the life sciences sector, and national innovation programmes. The IDP's conception relied on aligning 'innovation pull' (the needs and priorities identified within NHS Wales) with 'innovation push' (external innovation partner capabilities), structured around three strategic pillars: ecosystem coherence, system need prioritisation, and mechanisms supporting wide-scale adoption of innovations.

The development and implementation of the IDP followed an iterative and participatory model. This included national workshops and formal consultations, with feedback cycles ensuring system-wide alignment and practical relevance. Approval from senior governance structures and subsequent public launch reflected broad political and organisational buy-in.

8.3.3 Impact and Implications for Policy-makers

The development of a uniquely positioned, cross-government *Innovation Strategy for Wales* signals a major policy shift toward a unified, strategic approach to innovation across all devolved areas of Welsh Government. Its formulation—underpinned by academic methodology and rigour—demonstrates the potential of evidence-based policymaking to shape coherent, long-term innovation strategies at a national level.

The accompanying *Innovation Delivery Plan* provides a structured set of actions to implement the ISW across all devolved policy areas. This reflects an important policy implication: innovation strategies require not only high-level vision but also actionable, cross-sectoral mechanisms for delivery, accountability, and monitoring.

The introduction of a national healthcare innovation ecosystem model, built on the principle of aligning innovation *pull* (system needs) with innovation *push* (external capabilities), marks a significant innovation policy development. Based on a successful local implementation in Aneurin Bevan University Health Board, the national model reinforces the importance of scaling proven local practice into national policy, offering a replicable structure for other public sectors.

The integration of the *Innovation Framework* into the *NHS Wales Planning Framework* signifies a meaningful shift in policy toward institutionalising innovation as a core component of health service planning. This reflects a strategic implication for innovation policy: to ensure sustainability and uptake, innovation tools and processes must be embedded within mainstream governance, planning, and performance systems.

The ISW provides an evidence-based, research led, cross Government portfolio and ministerially approved innovation strategy as a case study, which can evidence a range of successful and impactful results through the IDP.

8.3.4 Contributions of the research to practice

The ISW's impact extended beyond government policy; it established a national innovation programme team, enabled formalisation of an NHS Wales innovation framework, built the NHS Wales Innovation Leads group as a national expert and facilitated ongoing peer review in academic and policy forums, anchoring Wales's efforts within the wider discourse of healthcare innovation. The NHS Wales Innovation leads group qualify as a national 'value network', forming one of the three key tenets of Christensen's work, which is discussed further under section 8.5.

Additional milestones included successful publication of Year 1 progress. High-level endorsement was reinforced by ministerial statements, and the launch of a new national infrastructure (Health and Social Care Innovation Wales) provides staff with resources and support, consolidating a decade's worth of innovation learning into a comprehensive framework co-developed with NHS Wales leadership.

The ISW and its delivery through the IDP also address fundamental system challenges such as commercialisation, Intellectual Property management, and ecosystem coordination, which are not unique to healthcare ecosystems but are critical in many other industries and sectors (Cecchi-Dimeglio et al. 2022).

In summary, these findings reveal how a strategic, evidence-based approach anchored in collaboration, rigorous evaluation, and system alignment can drive significant advancements in national healthcare innovation policy and practice.

This study also shows that government plays a key role in the formation, coordination and scaling of the innovation ecosystem by balancing central oversight, devolved decision-making, and knowledge exchange with stakeholders in the ecosystem. In the instance, the Welsh Government set national strategic goals and created optimal conditions for innovation, including policies on IP, funding mechanisms, and commercialisation. As decisions move from the core of governmental control to stakeholders like universities or private sector R&D teams, the control becomes more decentralised. This approach leverages specialised expertise while aligning with national objectives, ensuring a dynamic innovation system.

8.3.5 Impact and Implications for Innovation Practice

The ISW and IDP have redefined healthcare innovation practice in Wales. NHS Wales practitioners now have access to a comprehensive suite of resources hosted within the Health and Social Care Innovation Wales (HSCIW) infrastructure. These resources promote a consistent, structured

approach to innovation across healthcare settings, supporting NHS Wales staff at all levels to engage with innovation processes confidently and effectively.

The innovation resources include:

(i) a *network of Innovation Leads across all NHS Wales organisations*.
(ii) the *HSCIW digital platform and online innovation resources*.
(iii) an *Innovation Framework*.
(iv) an associated *Innovation Assessment and Adoption Tool*.
(v) an *Innovation Funding Directory* (led by the Life Sciences Hub Wales).
(vi) an *Introduction to Innovation* e-learning module, mandated through the Electronic Staff Record of all 90,000 NHS Wales staff.
(vii) *ISO56000 accredited innovation management training* will be made available to 25 NHS Wales Innovation Lead practitioners.
(viii) In March 2026, new *Intellectual Property Guidance* was issued to NHS Wales organisations.
(ix) In 2026, *Commercialisation guidance and models* will be developed for NHS Wales teams and organisations, to support income generation for reinvestment in innovation.

Collectively, these resources enable 90,000 staff at all levels of the health and care system to support, undertake and drive innovation. The overarching objective of this approach is to align existing initiatives, stakeholders, and platforms, to enable positive system impact. Through this systemic organisation, the Welsh healthcare innovation ecosystem is better supported to innovate, using a range of tools (solutions) based on meeting system needs (problems) that will deliver tangible benefits to patients and the wider public. Moreover, the model support other health and care ecosystems in comparative context to prepare to address future healthcare challenges through sustained and collaborative innovation.

At the centre of the HSCIW infrastructure is the *Innovation Framework*, see Figure 29 below, which was developed by the national innovation programme team, with the NHS Wales Innovation Leads group as a specific commitment made in Wales Innovates: The Welsh Government's 2023 Innovation Strategy for Wales. Shaped by a decade's experience of NHS Wales innovation teams, the framework draws on international best practice, including the ISO56000: International Standard on Innovation Management, technology readiness levels, and design thinking. The framework provides a structured approach to innovation for over 90,000 NHS Wales staff, offering clear guidance on

developing, assessing, and scaling innovative ideas, products, practice, and services - providing relevant tools, advice, and connections at each framework stage. The Framework considers literature that sets out concepts required for successful implementation, which include those relating to the process of implementation (the stages and steps), the innovation to be implemented, the context in which the implementation is to occur (divided into various numbers of domains), influencing factors, strategies, and evaluations. (Moullin et al, 2015)

The Framework is also hosted online on the publicly accessible HSCIW platform, which forms part of a range of technology enablers the ISW and IDP contribute to the development and enrichment of the healthcare innovation ecosystem in Wales.

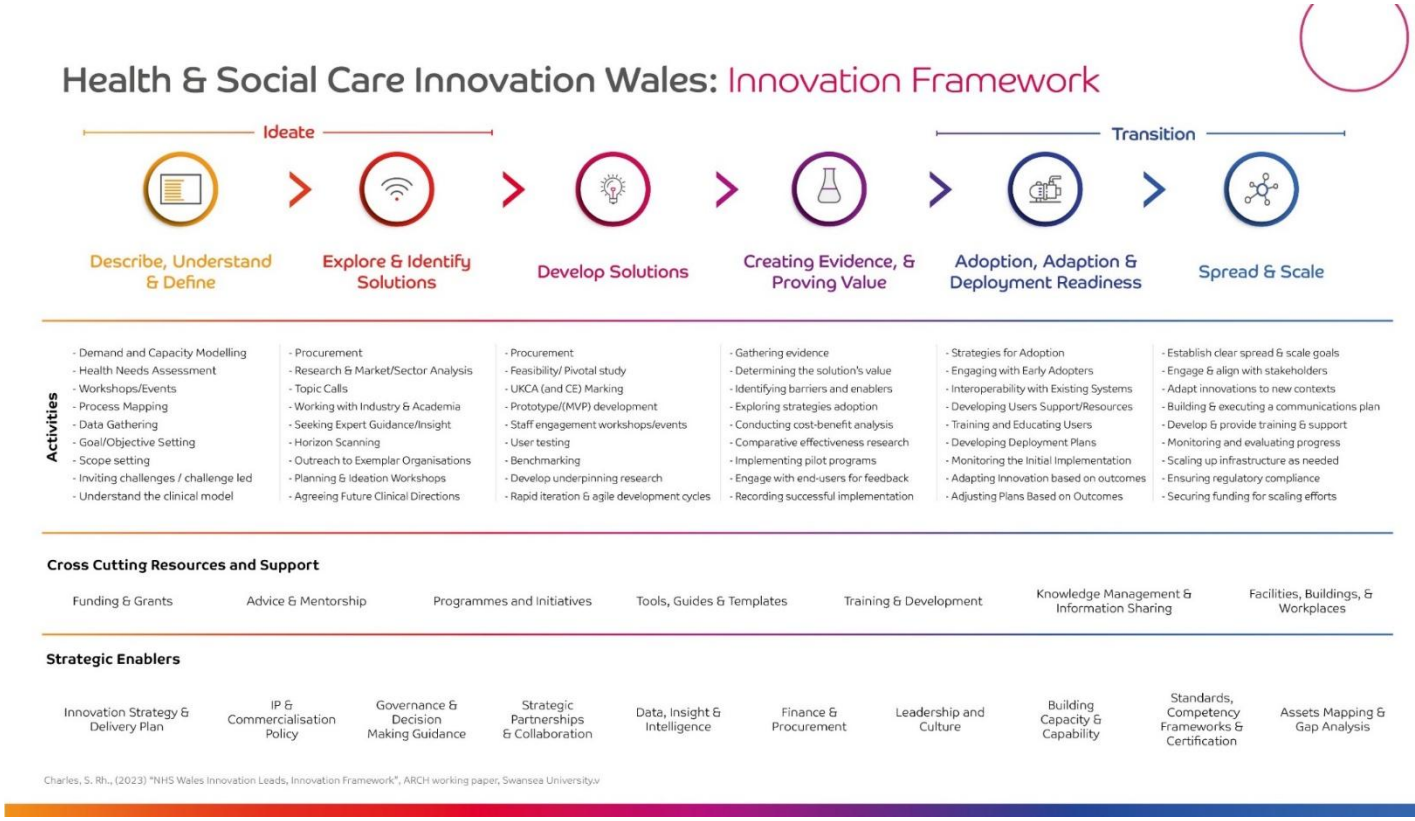

Figure 28: The Innovation Framework

The creation of a centralised *Innovation Funding Directory*, maintained by Life Sciences Hub Wales and accessible via the HSCIW platform, significantly reduces barriers to funding by collating available opportunities in one place for all NHS Wales staff to access and use. This technological enabler supports practitioners in securing financial backing for innovation projects and fosters greater equity of access across the system.

The *NHS Wales Innovation Leads Group* has been formalised as a national network and community of innovation practitioners, with members from every NHS Wales organisation as the 'innovation pull' community and a range of attendees from across 'innovation push' organisations. This Group (expressed by Christensen as a 'value network') receives formal support by Welsh Government in the form of recognised profile, a budget of £100k per annum for an agreed and coordinated workplan with WG, and a dedicated programme team funded by WG. This network ensures that innovation is supported nationally and locally by trained practitioners and strategically aligned with national priorities and resources. The group is supported to engage both nationally and internationally with networks such as the International Society for Professional Innovation Managers (ISPIM), with attendance at these conferences This group has a range of skills, and communities of practice such as the NHS Wales Innovation Leads group need to prepare their members to meet the continuous need for skill adjustments (Tona et al. 2025; Neeley and Leonardi, 2022). The HSCIW infrastructure allows and supports this, to maintain the group's relevance, credibility and profile.

For the first time, *ISO 56000 accredited innovation management training* has been provided to the NHS Wales innovation community. This has trained 20 innovation management associates across most NHS Wales organisations and provides a globally recognised standard for innovation practice, helping practitioners develop high-level innovation competencies that can be applied to their NHS Wales organisation, aligned with international, evidence based and peer review innovation practice. The third party accreditation was provided by RISE, the Research Institute of Sweden (RISE, 2026)

Similarly, the creation of an *Introduction to Innovation training module* forms another important technological enabler and success factor offered by Christensen. The module now forms part of the NHS Wales mandatory training programme, which is hosted on the NHS Wales Electronic Staff Record, which is accessed by all 90,000 NHS Wales staff members. This module directs all NHS Wales staff to the Health and Social Care Innovation Wales (HSCIW) infrastructure and Innovation Framework as the gateway to all of the innovation resources above.

In March 2026, refreshed *NHS Wales Intellectual Property guidance and a template policy* was issued as a Welsh Government Health Circular. This guidance will support and enable NHS Wales organisations and their employees to understand the importance of IP, generate, protect, and exploit IP to encourage innovation, deliver improved patient care, explore new sources of income and protect NHS Wales knowledge from being exploited by others. The Welsh Health Circular requests action by all NHS Wales organisations to ensure that their Intellectual Property (IP) policy is refreshed in line with the Guidance and applying the supporting policy template. This will ensure consistency between NHS Wales

organisations, reduce costs from negotiation and contracting, and will allow a national picture to be established on the use and exploitation of IP across NHS Wales. In addition, specialist legal support was provided to each NHS Wales organisation, to support development. The Welsh Health Circular was published on the Welsh Government website on 26th March 2026 at Refreshed Intellectual Property guidance for NHS Wales organisations (WHC/2026/004) | GOV.WALES.

The development of an *Innovation Assessment and Adoption Tool* provides healthcare practitioners with a systematic method to evaluate their innovation projects. The tool takes users through a set of questions to assess their innovation idea, including clinical need, finance, feasibility, and market readiness, supporting users in identifying strengths and areas for improvement. This embeds best practice and informed decision-making into innovation development processes. This tool is undergoing testing through the NHS Wales innovation leads group on one project per organisation and will be linked to the HSCIW web resources in early 2026. A screen shot of the completed innovation assessment and adoption tool result is shown below in Figure 30. This is the fourth and final example of technological enablers this study references, modelling and supporting Christensen's success factors for disruptive innovation.

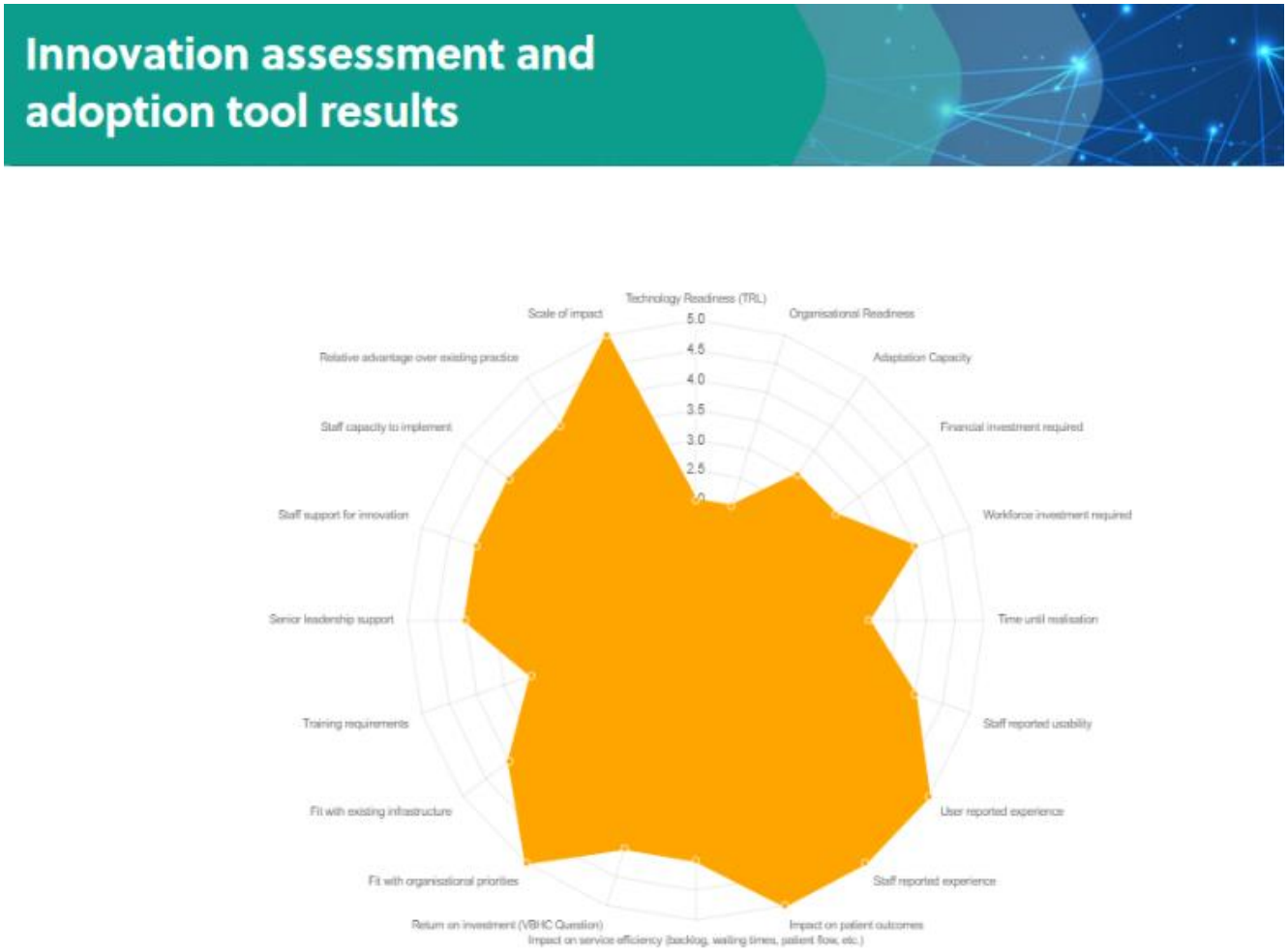

Figure 29: Innovation Assessment and Adoption tool

8.4 Implications of the study Innovation management research

This study represents a unique and significant contribution to the field of health and care innovation policy. By integrating academically robust methods with practitioner-led insights, the research has successfully shaped strategic government policy, most notably the Innovation Strategy for Wales (ISW) and delivered a suite of practical, context-specific tools that directly support innovation delivery within NHS Wales.

At its core, this research bridges the gap between theory and practice by combining national-level, evidence-based inquiry with key concepts from innovation literature. It has produced an innovation framework embedded in NHS Wales planning guidance and supported by a structured set of

delivery products hosted on the *HSCIW*[1] platform. This platform now serves as both a practical resource for staff and a model for structuring the Welsh health and care innovation ecosystem around system-defined needs. The HSCIW platform is a major technological enabler and supports Christensen's third success factor driving disruptive innovation, with three further technological enablers also discussed below.

A major impact of the research lies in its articulation and operationalisation of a more coherent national innovation model. This model (expressed by Christensen as a business model) explicitly aligns *innovation pull* (health system needs) with *innovation push* (external innovation offers) and has been formally disseminated to key system leaders including NHS Wales Chief Executives, Executive leads for innovation, and local Innovation Leads. This alignment addresses one of the three central themes of the Innovation Delivery Plan (IDP) and has begun to foster a more integrated and responsive innovation system.

Historically, the growth of Wales' health innovation landscape while rich in actors, programmes, and infrastructure had lacked coordination. This research addresses this fragmented ecosystem by mapping and categorising the diverse organisations across the Welsh innovation ecosystem. Through a mixed-methods approach, the study captured both organisational innovation priorities and aggregated national needs, thereby enabling a strategic framework for more effective coordination, governance, and impact tracking. In doing so, this work lays the foundation for sustained innovation within NHS Wales and offers a replicable model for other public sector systems seeking to harmonise top-down strategy with bottom-up practitioner needs.

The results of this study also has a number of important implications for innovation policy, practice and research – based on a range of impact achieved and resulting in significant contributions to knowledge.

8.4.1 Implications for Innovation Management research

Innovation ecosystems are shaped by their context, institutions, and stakeholder roles, requiring tailored solutions and strategies. The interplay between technology-push, demand-pull, and innovation ecosystems, especially in health and social care as the largest sector funded by the public purse, remains complex and evolving. Further research is needed to understand these dynamics, particularly in

[1] www.hsciw.wales

developed countries with ageing demographics, larger populations or developing infrastructures where the pressure on healthcare systems is complex. Overall, the study finds that government-led innovation ecosystems are dynamic, complex, and constantly shaped by ongoing innovations.

Innovation management has become a broad field of research, teaching and practice, with a substantial literature base. However, more work is needed to explore the implementation and application of innovation management practice at a macro level, across health and care ecosystems where such a wide array of competing priorities exists, across such a significant number of large organisations, with substantial levels of funding. Table 4 on Page 51 demonstrates the scale of the impact NHS Wales has from both its employment and expenditure spend, which clearly outlines the size of the prize to support greater levels of innovation and the potential healthcare and economic impacts that are possible across such a large component of our public sector and economy, with such a large amount of associated Government funding, resulting from the taxpayer funded public purse.

This study incorporates a range of innovation management policy, often more focused on the private sector, into the public sector. Innovation management in the private sector requires balancing core activities, adjacent activities e.g. expanding into new areas for the company, and transformational innovations e.g., creating solutions for markets that do not yet exist (Nagji and Tuff, 2012). Maintaining this balance is essential to ensure that innovation efforts align with strategic objectives while providing flexibility to respond to emerging opportunities.

Innovation management also entails understanding the context and problem, staying updated on technological advancements, and using innovation models. The practice emerging from this research embed this theory, as findings highlight that effective innovation management is essential for fostering creativity, growth, and sustainability. Developing a comprehensive innovation framework including evaluation criteria, and partnership guidelines will accelerate the scaling of proven adoption-ready innovations, foster collaboration among stakeholders, and maximise the societal impact of new technologies. This framework was based on ISO56000, the international standard on innovation management (International Standards Organisation, 2020), outlines all stages of the innovation development pathway from ideation to development to national scale and adoption.

The results advance understanding of how innovation/technology-push and demand-pull interact in establishing a government-led national innovation ecosystem. The finding show that effective innovation management is critical for fostering creativity, growth, and sustainability. The findings also suggest that successful innovation ecosystems depend on their historical, regional, and institutional contexts, requiring tailored strategies.

8.4.2 Emerging conceptual model

Emerging from this research is an innovation impact matrix model which extends understanding of the application of innovation pull (system need) with innovation / technology push (system offer). The concept of technology push was developed to support the healthcare system to meet its system priorities (see Figure 28 below) and supports and models Christensen's second success factor of 'business models' in supporting disruptive innovation.

In scaling this local approach nationally, this research applied 'innovation pull' across all NHS Wales organisations, with innovation 'push' applied to ALL national sources of support, from academia, networks, Government funded organisations and funding programmes and industry partners. The push-pull nexus approach met this policy gap between system need and system offer between the relevant actors in the innovation ecosystem. An innovation impact matrix developed as part of this research and illustrates four types of value that impact the push-and-pull nexus.

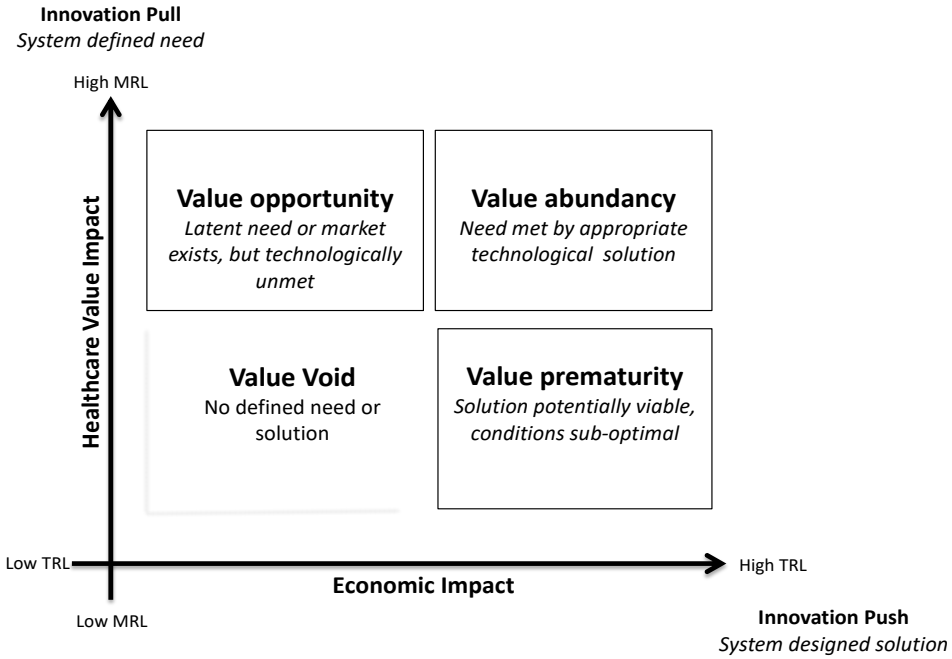

Figure 30: Innovation impact matrix

In the context of this study, 'Healthcare value impact' refers to the outcomes that matter to patients (improved health outcomes and improved patient experience) in relation to the efficiency of resources used to achieve those outcomes (e.g. reductions in cost and clinical time). 'Economic impact' refers to the financial effect that intervention on the ecosystem. To achieve maximum value impact (i.e., value abundancy), a high 'market readiness level' (MRL) and 'high 'technology readiness level' (TRL) is required. Conversely, a low MRL and HTL leads to no value impact (value void).

Value Void – Neither a defined system problem or need – (that could create a new market) or an associated economically viable technology-based product or service solution, exists.

Value prematurity – Technology based product, or service is developed and exists, but does not meet a defined, or realised need in the system - that could lead to a new market.

Value opportunity – A system problem or need exists, that could lead to a new or adjacent market creation, but a viable and scalable technology-based product or service solution does not yet exist to meet that need.

Value abundancy – A system need or problem, that creates its own market, exists and is amply met by an appropriate solution, resulting in both healthcare and economic value.

8.4.3 Broader implications for innovation ecosystems

While this study has been situated within the Welsh context, the findings have broader implications for the governance and organisation of public sector innovation systems enabled by government internationally. Prior literature highlights that national and regional governments are increasingly called upon to function as orchestrators of innovation ecosystems (e.g., Ferlie et al. 2005; Demircioglu & Audretsch, 2017). Yet, compelling rigorous empirical evidence on how such orchestration translates into sustainable outcomes has been limited. Our study contributes by showing how a balanced model of central coordination and distributed decision-making can support both innovation capacity and alignment with strategic objectives. This study also provides specific mechanisms that were deployed to scale impact (i.e., useable, in-use, useful) within the context of the Welsh innovation ecosystem that were not reported in prior studies. In doing so, it adds to comparative discussions in the literature on health innovation networks, policy-led innovation, and ecosystem governance.

The findings suggest that the success of government-led innovation ecosystems is contingent upon the creation of trust-based, bi-directional relationships among diverse stakeholders. This observation aligns with previous research on collaborative governance (Ansell & Gash, 2008) but extends it by demonstrating its applicability in health innovation contexts where resource asymmetries and differing institutional logics can otherwise inhibit collaboration.

8.5 Limitations and opportunities for future research

Managing innovation in healthcare is difficult due to complex systems, limited experimentation, and challenges in spreading ideas (Mossialos et al. 2018). For successful innovation strategy implementation, leaders must acknowledge that strategies evolve, encourage IT innovation mindfulness, support risk-taking, and learn from failures (Pisano, 2015). In the context of this project, achievement was contingent not only upon effective goal setting and strategic leadership, but also on valuing diverse perspectives and synthesizing insights from multiple disciplines.

8.5.1 Limitations of this study

As with all research, there are limitations to this study, that also provide opportunities for future research. During this research, five limitations to the implementation of the IDP were identified. These limitations are grouped into the following thematic areas.

1. Fluctuating Ministerial Support: A notable challenge was the variability in ministerial support for the Innovation Strategy for Wales (ISW). While the ISW initially benefited from strong ministerial backing as a live manifesto commitment during the early stages of the 6th Senedd term (2021- end 2023), this support declined toward the end of the Ministerial term (2024–2025) with a range of political and funding challenges taking priority. The impending electoral cycle contributed to a strategic shift in focus toward short-term, demonstrable outcomes for NHS Wales aligned with political priorities, thereby deprioritising longer-term innovation initiatives such as the IDP.

2. Constraints on Policy Research and Comparative Analysis: The implementation of the IDP was hindered by limited policy research and national delivery capacity, which restricted the ability to conduct comparative analyses of the ISW against other regional or international innovation systems. This lack of benchmarking opportunities constrained the ability to apply lessons learned from comparable contexts and integrate global best practices into local implementation efforts.

3. Systemic Healthcare Pressures*:* The Welsh healthcare system has experienced ongoing, unprecedented pressures in the wake of the Covid-19 pandemic and sustained austerity measures. Rising waiting times and competing healthcare priorities, particularly during periods of seasonal (e.g. winter) strain, contributed to the de-prioritisation of the ISW and IDP within Welsh Government (WG) agendas. In parallel, staff turnover within central government functions further diminished coordination capacity and senior-level support.

4. Resource Constraints Within Government and Health Organisations: Both Welsh Government and NHS Wales Innovation Leads faced significant resource limitations. Although a national innovation programme team was formally established in December 2023, it comprised only six members (with one full-time equivalent post) and was allocated a modest annual budget of £300,000. These resources were insufficient relative to the complexity and scale of the NHS Wales system, which employs over 90,000 staff and operates within a multi-billion-pound framework. Likewise, the organisational capacity of NHS Wales Innovation Leads remained limited, with most teams consisting of no more than three individuals.

5. Limited Impact Measurement Capacity: A further challenge related to the limited capacity for impact measurement of the ISW and IDP to date. Although the IDP outlines planned progress reviews at the three-year (2026) and five-year (2028) marks, mechanisms for ongoing evaluation remain underdeveloped. To address this, Welsh Government has initiated work on an ISW measurement and monitoring framework, drawing on the child poverty strategy model (Welsh Government, 2024) and referencing IDP metrics (as outlined in pages 203–205 of the October 2023 release). However, the development of this framework requires substantial interdepartmental coordination, data integration, and methodological alignment to assess outcomes effectively.

8.5.2 Opportunities for future research

Building upon the findings and limitations identified in this doctoral study, several opportunities emerge for future research that could further develop understanding of the Innovation Strategy for Wales (ISW) and Innovation Delivery Plan (IDP), as well as inform future innovation policy and practice in other comparative contexts. These opportunities are categorised into two broad themes: (1) evaluating delivery and impact, and (2) applying ISW and IDP learning across contexts.

1. Evaluating Delivery and Impact of the ISW and IDP across specific stakeholders

Exploring Coordination Across Push and Pull Partners: Further qualitative research is needed to assess how coordination has occurred between the 'push' (supply-side innovation e.g., academia, government) and 'pull' (demand-side innovation e.g., frontline services, health boards) actors. This could include mapping relationships, identifying barriers to alignment, and evaluating the effectiveness of communication and shared-value frameworks.

Organisational Impact Assessment via Evidence Source 3: Additional data could be gathered by issuing targeted follow-up requests to NHS Wales organisations and affiliated bodies that contributed to *Evidence Source 3*. This would help build a more comprehensive picture of institutional engagement and perceived effectiveness.

Public Perception and Accountability via Survey Research: A public survey, directed at respondents to the 2022 public consultation on the ISW, could provide insight into public and stakeholder perceptions of ISW and IDP delivery and impact, contributing to democratic accountability and inclusivity in innovation policy evaluation.

The patient and citizen perspective: Exploration of the patient specific impact and citizen perspectives in innovation ecosystems, using the ISW and IDP as the blueprint could be seen as important, particularly in several years' time when HSCIW resources have become embedded across the healthcare system and utilised fully by healthcare staff. Patient and citizen engagement in ecosystems is often assumed, but less frequently studied in empirical depth (Sanchez et al. 2022; van Leersum et al. 2024).

2. Applying ISW and IDP Learning across Policy and System Contexts

Comparative studies across other national and regional health and social care systems could examine how variations in governance structures, political contexts, and health system configurations shape the formation and sustainability of innovation ecosystems. Such studies could assess whether balanced orchestration leads to comparable improvements in innovation capacity and strategic alignment. Longitudinal studies could investigate the durability of ecosystem impacts, including whether the value created can be sustained once initial government investment or political support changes.

Cross-Sectoral Application of the Innovation Framework: The ISW and HSCIW infrastructure could be explored as a 'blueprint' for driving innovation in other public service areas such as education, economic development, and local government. Comparative studies could assess the framework's transferability and adaptability.

Comparative Studies of Innovation Ecosystems: Comparative research could be undertaken to evaluate how other regional, national, or international innovation systems have been developed, particularly in the public sector. Insights into success factors and structural enablers could inform the evolution of Welsh innovation policy. Longitudinal studies could also investigate the durability of ecosystem impacts, including whether the value created can be sustained once initial government investment or political support changes.

Longitudinal Study on the Impact of Intensive Learning Academies (ILAs): A longitudinal study is recommended to assess the impact of the ILAs on capability development within push and pull organisations. This could include an exploration of partnerships (e.g., with universities, third sector bodies) and funding mechanisms (e.g., Innovate UK, UK Shared Prosperity Fund) that support Research, Development, and Innovation (RD&I) activities in Wales.

By situating this case within broader academic discourse, we show that while the Welsh experience offers unique contextual insights, it also provides transferable lessons for understanding how government and policy can effectively stimulate, coordinate, and sustain health and social care innovation ecosystems.

8.6 Summary of the previous chapters

Chapter 1: Introduction to the Research

The Welsh Labour Government committed to developing a new, cross-portfolio Innovation Strategy for Wales after its 2021 election win, replacing the business-focused *Innovation Wales* strategy from 2014. This updated strategy would need to address the changed policy landscape post-Brexit and COVID-19, adopting a whole-government approach that covers areas such as healthcare, education, economy, and the environment. With this policy need in mind, the chapter then develops the research aims and objectives, demonstrating the research design, methodological approach and structure.

Chapter 2: Literature Review

This chapter provided a comprehensive review of existing literature on innovation, addressing both general national perspectives and those specific to Wales. It examined a range of academic definitions of innovation alongside widely recognised definitions from national healthcare policy. The chapter analysed the Welsh innovation landscape in detail, with particular attention to the innovation specific policy context. It and introduces the concept of an Innovation Ecosystem as applied to Welsh healthcare and examines. Furthermore, it discussed the government's devolved policy responsibilities and role in fostering an environment supportive of innovation, presenting a robust rationale for establishing an Innovation Strategy for Wales (ISW). By synthesising academic research with the unique Welsh context, the chapter delineates the policy, political, economic, healthcare, and social factors that underscore the necessity for an Innovation Strategy for Wales.

Chapter 3: Research Methodology

This chapter discusses the Primary Research Questions from this research, detailing the qualitative, action research methodology used in this study, incorporating both primary and secondary

data. Other data collection and analysis methodologies are examined, with the chosen methodology – action research – justified. Action research utilises an adaptive, iterative framework that engaged diverse stakeholders across four distinct action research phases that applied literature and research into policy and subsequent practice. This approach supported the co-creation of a strategy tailored to Wales' healthcare innovation needs.

Chapter 4: Research Phase 1 - Practitioner reflections and the development of an evidence base to support an ISW

This chapter presented a structured account of practitioner reflections, empirical findings, and the development of an evidence base to support the 'Healthier Chapter' of an Innovation Strategy for Wales (ISW). It described the synthesis and insights gained from professional experience in innovation leadership within NHS Wales, combined with systematically gathered data through mixed-methodological research, including stakeholder interviews, expert panels, surveys, and commissioned reports. By leveraging the practitioner reflections and empirical data from the three chosen sources, this chapter provided a comprehensive understanding of the strengths, weaknesses, opportunities and threats of the innovation landscape within NHS Wales, and identifies areas for future development. The empirical evidence was synthesised into a set of strategic themes and five key recommendations that underpin the ISW as it is drafted and tested further.

Chapter 5: Research Phase 2 – Production of a draft Innovation Strategy for Wales issued for public consultation

This chapter documented the feedback obtained after releasing a draft ISW for statutory public consultation. Feedback from 153 responses led to adopting a mission-based approach, renaming the original 'Healthier chapter' as the 'Health and Wellbeing mission' of the ISW, and making further adjustments. The final ISW was approved through internal WG governance and an integrated impact assessment, meeting all statutory requirements—particularly important during the Labour–Plaid Cymru coalition in the sixth Senedd term.

Chapter 6: Research Phase 3 – Development, testing and launch of the Innovation Delivery Plan (IDP).

This chapter presented the concluding stage of the research process—Research Phase 3—which centred on the development, validation, and formal introduction of the Innovation Delivery Plan (IDP) as the principal vehicle for implementing the Innovation Strategy for Wales (ISW). The discussion highlights the progression of an evidence-driven policy initiative from its initial strategic vision to an actionable delivery framework, supported by comprehensive stakeholder engagement, sound national governance, and political endorsement. This chapter has provided a comprehensive account of the mechanisms by which an integrated innovation strategy has been operationalised through a national delivery plan. It offers a replicable model for evidence-led policy implementation that connects high-level strategic intent with practical system delivery.

Chapter 7: Research Phase 4 – Innovation Delivery Plan implementation.

This chapter documented various activities that were undertaken to implement the IDP. The process began with a proposed method for delivering the IDP, outlined in a policy paper presented to the Welsh Government's Chief Digital and Innovation Officer for Health and Social Care in December 2023. This secured senior support and resources to guide and support the IDP work. A national innovation programme team was formed, working through the NHS Wales Innovation Leads Group to create an NHS Wales innovation framework, which was later presented to the NHS Wales Leadership Board in May 2024. Implementation of the IDP included presenting its approach and delivery plan to both internal and external academic audiences for peer review. The Health and Social Care Innovation Wales was launched as new national infrastructure to support health and social care staff, hosted on a website offering various supporting resources. This initiative consolidates learning from the past decade and is based on an Innovation Framework developed with the NHS Wales Innovation Leads Group. To complete the implementation phase, the Welsh Government issued a Written Statement summarising key milestones from the ISW and IDP on 19th March 2025.

8.7 Conclusions

The Innovation Strategy for Wales (ISW) and its accompanying Innovation Delivery Plan (IDP) is a Ministerially endorsed strategic framework developed by the Welsh Government to guide innovation across all devolved policy domains. As articulated in the Written Statement (section 7.9), the ISW and IDP reflect substantial progress in delivering actions across the strategy’s four mission areas, with demonstrable benefits observed across all regions of Wales.

In the specific context of healthcare and the Health and Wellbeing mission of the ISW and IDP, this research has provided the basis for a comprehensive policy realignment, the co-development of a realigned healthcare innovation ecosystem and a range of underpinning innovation practice. This model was informed by extensive sectoral engagement and incorporates both theoretical foundations from academic literature and proven local practices. Following formal endorsement by senior leaders within both Welsh Government and NHS Wales, a structured programme of innovation infrastructure has been established through this new model, a range of technological enablers and expert practitioner value networks. Again, this research and its impact on practice fits well with the highly regarded work of Christensen et al (2009), who proposed taking disruptive examples of innovation from other sectors and applying that to healthcare.

> "The structure of today's health-care industry is essentially structured around taking our problems to the solution. In the other industries we've studied, disruption inverts this system, so the solution is instead delivered to the problem."
>
> Clayton M. Christensen, *The Innovators Prescription* (2009)

The resulting ISW ecosystem model demonstrates improved organisation and coherence by aligning 'innovation pull' (demand-side or system needs) with 'innovation push' (supply-side or system offers) actors. This alignment is now underpinned by strategy, policy, innovation platforms, dedicated funding mechanisms, and institutional support structures and programmes. This suite of innovation resources (set out in Section 8.5.2) have been embedded within the HSCIW infrastructure. To ensure full embedding within current Welsh Government policy, HSCIWhas been built into the 2025 - 2028 NHS Wales Technical Planning Guidance as the formal WG guidance issued to support the planning of all NHS Wales organisations (Welsh Government, 2025).

Collectively, these resources aim to empower staff at all levels of the health and care system to engage with innovation, while also amplifying the role of Innovation Leads as a national value network, developing both a system and culture of innovation across Wales.

The overarching objective of this approach is to enhance the coordination, alignment, and impact of existing initiatives, stakeholders, and platforms. Through this systemic organisation, the Welsh healthcare innovation ecosystem is better supported to innovate, using a range of tools (solutions) based on meeting system needs (problems) that will deliver tangible benefits to patients and the wider public. Moreover, the model support other health and care ecosystems in comparative context to prepare to address future healthcare challenges through sustained and collaborative innovation.

Looking forward, the next phase of research presents an opportunity to undertake a longitudinal evaluation of the ISW and IDP's longer-term impacts. This will form a critical component of the ongoing monitoring and learning framework, providing evidence to support refinement and optimisation of the strategy and its delivery mechanisms.

8.8 Chapter summary

In this chapter, the delivery of the research aims and objectives was revisited, exploring the extent to which they were achieved. The relevance of the literature and research methods to the results has also been discussed. Findings from each research phase have been summarised, and the impacts and implications for innovation policy and practice were highlighted. The contributions of this research made were articulated. The limitations of the research were acknowledged, with a number of corresponding opportunities for future research provided. Finally, key conclusions were drawn from the research.

REFERENCES

Abbey, J., Davies, G., & Mainwaring, L. (2007). Vorsprung durch Technium? Towards a system of innovation in South West Wales. *Regional Studies, 42*(2), 281-293.

Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*, 84(4), 98-107.

Alexander, A., Bessant, J., Trifilova, A., & Wynne, D. (2017). Responsible innovation in healthcare – The case of health information TV. *International Journal of Innovation Management, 21*(8).

Aneurin Bevan University Health Board. (2021). Annual report and accounts 2020-21. Retrieved April 2021, from https://abuhb.nhs.wales/files/key-documents/annual-accounts/abuhb-2020-21-final-annual-accounts-pdf/

Aneurin Bevan University Health Board. (2024). *Annual report and accounts 2023-24*. Retrieved February 16, 2025, from https://abuhb.nhs.wales/files/key-documents/annual-reports-and-annual-accounts/abuhb-annual-report-and-accounts-2023-24-pdf/

Aneurin Bevan University Health Board. (2019). *Digital strategy - Transformation through digital*. Retrieved November 6, 2021, from https://abuhb.nhs.wales/files/key-documents/digital-strategy/

Andresen, M., Jakobsen, N., & Lykkebo, O. B. (2019). *Innovation barometer for the public sector*. Retrieved November 7, 2021, from https://www.coi.dk/en/tools-and-publications/download/innovation-barometer-for-the-public-sector/

A Regional Collaboration for Health. (2017). *A regional collaboration for health*. Retrieved April 10, 2022, from http://arch.wales/en

Avison, D., Davison, R. M., & Malaurent, J. (2018). Information systems action research: Debunking myths and overcoming barriers. *Information & Management, 55*(2), 177–187.

Avison, D., Lau, F., Myers, M., & Nielsen, P. A. (1999). Action research. *Communications of the ACM, 42*(1), 94–97.

Bailey, D., & Budd, L. (Eds.). (2017). *The political economy of Brexit*. Agenda Publishing.

Baptista, R., & Swann, P. (1998). Do firms in clusters innovate more? *Research Policy, 27*(5), 525–540.

Bate, S., Bielińska-Dusza, A., & Hamerska, M. (2023). Innovation's performance: A transnational analysis based on the Global Innovation Index. *Journal of Risk and Financial Management, 14*(2), 32.

Bateson, J. (2021). *The birth of a whole new tax: The Health and Social Care Levy*. Retrieved November 6, 2021, from https://home.kpmg/uk/en/home/insights/2021/09/tmd-the-birth-of-a-whole-new-tax-the-health-and-social-care-levy.html

Baxter, M., Jones, T. L., & Khanduja, V. (2013). A quick guide to survey research. *US National Library of Medicine National Institutes of Health, 95*(1), 5–7.

BEIS (Department for Business, Energy & Industrial Strategy). (2017). *Industrial clusters in England*. BEIS Research Paper No. 4.

Bell, E., Bryman, A., & Harley, B. (2018). *Business research methods*. Oxford University Press.

Bell, J. (2017). *Life sciences industrial strategy: A report to the government from the life sciences sector*. Office for Life Sciences.

Berelson, B. (1952). *Content analysis in communication research*. Retrieved November 2024 from https://psycnet.apa.org/record/1953-07730-000

Berwick, D. M. (2003). Disseminating innovations in health care. *JAMA, 289*(15), 1969-1975.

Berwick, D. M., Nolan, T. W., & Whittington, J. (2008). The triple aim: Care, health, and cost. *Health Affairs, 27*(3), 759-769.

Bevan, H. (2010). How can we build skills to transform the healthcare system? *Journal of Research in Nursing, 15*, 139-148.

Bevan, H., Connor, M., Crowe, R., & Westwood, N. (2020). *Lean Six Sigma – Some basic concepts*. Retrieved November 10, 2021, from https://www.england.nhs.uk/improvement-hub/wp-content/uploads/sites/44/2017/11/Lean-Six-Sigma-Some-Basic-Concepts.pdf

Bevan Commission – *Innovation Assessment and Adoption Tool* (2025). Retrieved July 2025 from https://bevancommission.org/prototype-adoption-tool/

Birken, S. A., Lee, S.-Y. D., & Weiner, B. J. (2012). Uncovering middle managers' role in healthcare innovation implementation. *Implementation Science, 7*, 1-12.

Bouchard Jr, T. J. (1976). Unobtrusive measures: An inventory of uses. *Sociological Methods & Research, 4*(3), 267-300.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Sage Publications, Inc.

Boyer, J., & Kokosy, A. (2022). Technology-push and market-pull strategies: The influence of the innovation ecosystem on companies' involvement in the Industry 4.0 paradigm. *Journal of Risk Finance, 23*(5), 461–479.

Braczyk, H.-J., Cooke, P. N., & Heidenreich, M. (1998). *Regional innovation systems: The role of governance in a globalized world*. Psychology Press.

Bradley, S. R., Hayter, C. S., & Link, A. N. (2013). Models and methods of university technology transfer. *Foundations and Trends® in Entrepreneurship, 9*(6), 571–650.

Brakman, S., & van Marrewijk, C. (2013). Reflections on cluster policies. *Cambridge Journal of Regions, Economy and Society*, 6(2), 217–231. https://doi.org/10.1093/cjres/rst001

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper (Ed.), *APA Handbook of Research Methods in Psychology, Vol. 2: Research Designs* (pp. 57–71).

Braun, V., & Clarke, V. (2021). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative Research in Sport, Exercise and Health, 13*(2), 201-216.

Brekhus, W. H., Galliher, J. F., & Gubrium, J. F. (2005). The need for thin description. *Qualitative Inquiry, 11*(6), 861-879.

Breschi, S., & Malerba, F. (1997). Sectoral innovation systems: Technological regimes, Schumpeterian dynamics, and spatial boundaries. In C. Edquist (Ed.), *Systems of innovation: Technologies, institutions, and organizations* (pp. 130-156). Pinter Publishers.

Bristow, G. (2001). The Structural Funds and additionality in Wales: Devolution and multilevel governance. *Environment and Planning A*, *33*(6), 1083–1100.

Brunt, H., Barnes, J., Jones, S., Longhurst, J., Scally, G., & Hayes, E. (2017). Air pollution, deprivation and health: Understanding relationships to add value to local air quality management policy and practice in Wales, UK. *Journal of Public Health, 39*, 485-497.

Burrell, G., & Morgan, G. (2017). *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life*. Routledge.

Business News Wales. (2021). Tech challenge launched for health and care system in Wales. Retrieved November 7, 2021, from https://businessnewswales.com/tech-challenge-launched-for-health-and-care-system-in-wales/

Business Wales. (2021). *Innovation*. Retrieved November 7, 2021, from https://businesswales.gov.wales/innovation/

Cameron, G. (1996). *Innovation and economic growth* (CEP Discussion Paper No. 277). Centre for Economic Performance, London School of Economics and Political Science.

Carayannis, E. G., & Campbell, D. F. J. (2009**).** 'Mode 3' and 'Quadruple Helix': Toward a 21st-century fractal innovation ecosystem. *International Journal of Technology Management, 46*(3–4), 201–234. https://doi.org/10.1504/IJTM.2009.023374

CAVUHB, Cardiff and Vale University Health Board. (2021). *Clinical innovation*. Retrieved November 6, 2021, from https://cavuhb.nhs.wales/our-services/wound-healing-services/clinical-innovation/

Chen, J. (1996). Foreign direct investment and economic growth in Wales. *Regional Studies, 30*(7), 687–697.

Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.

Chiaroni, D., & Chiesa, V. (2006). Forms of creation of industrial clusters in biotechnology. *International Journal of Technology Management, 33*(1-2), 1-19.

Chowdhury, M. F. (2014). Interpretivism in aiding our understanding of the contemporary social world. *Open Journal of Philosophy, 4*(3), 432-438.

Christensen, C. M., Grossman, J. H., & Hwang, J. (2009). *The innovator's prescription: A disruptive solution for health care*. McGraw-Hill.

Church, R. M. (2002). The effective use of secondary data. *Learning and Motivation, 33*(1), 32-45.

Civil Service Commission (2025). *The Civil Service Code*. Retrieved 10th February 2022, from https://civilservicecommission.independent.gov.uk/code/

Collis, J., & Hussey, R. (2003). *Business research*. Palgrave Macmillan.

Colman, A. M., & Preston, C. C. (2000). Optimal number of response categories in rating scales: Reliability, validity, discriminating power, and respondent preferences. *Acta Psychologica, 104*(1), 1-15.

Cooke, P. (2004). *Regional innovation systems: The role of governance in a globalized world*. Routledge.

Cooke, P. (2001a). Biotechnology clusters in the U.K.: Lessons from localisation in the commercialisation of science. *Small Business Economics, 17*, 43-59.

Cooke, P. (2001b). Regional innovation systems, clusters, and the knowledge economy. *Industrial and Corporate Change, 10*, 945-974.

Cooke, P., & Clifton, N. (2005). Visionary, precautionary and constrained 'varieties of devolution' in the economic governance of the devolved UK territories. *Regional Studies*, *39*(4), 437–451.

Cooke, P., Clifton, N., & Oleaga, M. (2004). Social capital, firm embeddedness and regional development. *Regional Studies, 39*(8), 1065–1077.

Cooksey, D. (2006). *A review of UK health research funding*. HM Treasury.

Cooper, A., Gray, J., Willson, A., Lines, C., McCannon, J., & McHardy, K. (2015). Exploring the role of communications in quality improvement: A case study of the 1000 Lives campaign in NHS Wales. *Journal of Communication in Healthcare, 8*, 76-84.

Crespo, N., & Fernandes, C. (2016). Global Innovation Index: Moving beyond the absolute value of ranking with a fuzzy-set analysis. *Journal of Business Research, 69*(11), 5056–5061.

Davies, P., Andrews, H., Bagnall, D., Brangan, E., & Davies, R. (2021). Co-producing knowledge in health and social care research: Reflections on the challenges and ways to enable more equal relationships. *Humanities & Social Sciences Communications, 8*(1), 105.

Davison, R. M., Martinsons, M. G., & Kock, N. (2004). Principles of canonical action research. *Information Systems Journal, 14*(1), 65–86.

Davies, G. H., Roderick, S., & Williams, M. (2018). A sub-regional innovation ecosystem? Life sciences and health in the Swansea Bay City Region. *International Journal of Innovation and Regional Development, 8*, 15.

Dawes, J. (2008). Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point, and 10-point scales. *International Journal of Market Research, 50*(1), 61-104.

D'Este, P., & Patel, P. (2007). University-industry linkages in the UK: What are the factors underlying the variety of interactions with industry? *Research Policy, 36*(9), 1295-1313.

Dechenaux, E., Dutrieux, D., & Mairesse, J. (2011). Beneath the tip of the iceberg: Exploring the multiple forms of university–industry linkages. *Higher Education, 64*(2), 237–265.

Delgado, M., Porter, M. E., & Stern, S. (2010). Clusters and entrepreneurship. Jo*urnal of Economic Geography*, *10*(4), 495–518.

Deloitte. (2018). *Measuring the return from pharmaceutical innovation 2018*.

Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management Science, 32*(11), 1422–1433.

Demircioglu, M. A., and Audretsch, D. B. (2017). "Conditions for innovation in public sector organizations." *Research Policy* 46, no. 9: 1681-1691.

Doneddu, D., Bourne, J., Davies, G., Howson, T., Joyce, N., Rees, D., Hughes, S., Charles, S., & Beharrel, W. (2021). *The NHS Wales Covid-19 innovation and transformation study report*. NHS Confederation Wales.

Donne, S., Djemal, R., & Ashford, M. (2021). The role of healthcare innovation in improving service delivery: A Welsh case study. *IEEE Access*, *9*, 192177–192189.

Dornauer, M., Girvan, G., & Roy, A. (2020). United Kingdom: *#10 in the 2021 World Index of Health Innovation*. Retrieved November 6, 2021, from https://freopp.org/united-kingdom-freopp-world-index-of-health-innovation-841829e75313

DTI, Department of Trade and Industry. (2001). *Business clusters in the UK: A first assessment*. In D.F.T.A.I (Ed.).

Dutta, S., Lanvin, B., Rivera León, L., & Wunsch-Vincent, S. (Eds.). (2023). *Global Innovation Index 2023: Innovation in the face of uncertainty*. World Intellectual Property Organization.

du Preez, N., & Louw, L. (2008). A framework for managing the innovation process. *South African Journal of Industrial Engineering, 19*(2), 1–13.

EIIT, European Institute of Innovation and Technology. (2015). *EIT Regional Innovation Scheme (EIT RIS) Implementation Guidance Note*.

Ekins, R., & Newman, B. (1970). Theoretical aspects of saturation analysis. *European Journal of Endocrinology, 65*(1 Suppl), S11-S36.

Emerald Publishing Limited. (2021). *7 ways to drive innovation in your business*. Retrieved November 7, 2021, from https://www.emeraldgrouppublishing.com/archived/promo/7-ways-to-drive-innovation-in-your-business.htm

European Commission. (2017). *Wales smart specialisations*. Retrieved April 10, 2022, from http://s3platform.jrc.ec.europa.eu/regions/UKL/tags/UKL

European Commission. (2010)**.** *Innovation clusters in Europe: A statistical analysis and overview of current policy support*. Publications Office of the European Union.

European Commission (2023). *EU Structural Funds in Wales 2000-2023.* Retrieved April 10, 2022, from

EU Structural Funds in Wales 2000-2023 – Infrastructure, Regeneration & Tourism

Farrington, D. P., & Loeber, R. (2006). Some benefits of dichotomization in psychiatric and criminological research. *Criminal Behaviour and Mental Health, 10*(2), 100-122. https://doi.org/10.1002/cbm.349

Feilzer, Y. M. (2010). Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm. *Journal of Mixed Methods Research*, *4*(1), 6-16.

Ferlie, E., Fitzgerald, L., Wood, M., and Hawkins, C. (2005). "The Nonspread of Innovations: The Mediating Role of Professionals." *The Academy of Management Journal 48*, no.1: 117-134.

Flessa, S., & Huebner, C. (2018). Innovations in health care—A conceptual framework. *International Journal of Environmental Research and Public Health, 18*(19), 10026.

Fleuren, M., Wiefferink, K., & Paulussen, T. (2004). Determinants of innovation within health care organizations: Literature review and Delphi study. *International Journal for Quality in Health Care, 16*(2), 107-123.

Foray, D., David, P. A., & Hall, B. H. (2009). Smart specialisation – The concept. Knowledge Economists Policy Brief No. 9. European Commission.

Future Generations Commissioner for Wales. (2021). *Well-being of Future Generations (Wales) Act 2015*. Retrieved November 1, 2021, from https://www.futuregenerations.wales/about-us/future-generations-act/

Gaille, B. (2018). *25 advantages and disadvantages of qualitative research*. Retrieved November 2, 2021, from https://brandongaille.com/25-advantages-disadvantages-qualitative-research/

Gallaire, H., Minker, J., & Nicolas, J.-M. (1989). Logic and databases: A deductive approach. In *Readings in Artificial Intelligence and Databases* (pp. 231-247). Elsevier.

Gatehouse, M., & Price, A. (2013). *State of Innovation: Welsh Public Services and the Challenge of Change*. NESTA. https://media.nesta.org.uk/documents/state_of_innovation.pdf

Gill, J., & Johnson, P. (2002). *Research methods for managers*. Sage Publications, Inc.

Godin, B., & Lane, J. P. (2013). Pushes and Pulls: Hi(S)tory of the Demand-Pull Model of Innovation. *Science, Technology, & Human Values, 38*(5), 621–654.

Goldkuhl, G. (2012). Pragmatism vs interpretivism in qualitative information systems research. *European Journal of Information Systems, 21*(2), 135-146.

Granstrand, O., & Holgersson, M. (2020). Innovation ecosystems: A conceptual review and a new definition. *Technovation, 90–91*, 102098.

Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C., Hinder, S., Fahy, N., Procter, R., & Shaw, S. (2017). Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. *Journal of Medical Internet Research, 19*(11), e367.

Gulbranson, C. A., & Audretsch, D. B. (2008). Proof of concept centers: Accelerating the commercialization of university innovation. *The Journal of Technology Transfer, 33*(3), 249–258.

Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics, 133*(2), 662–676.

Hall, B. H. (2011). Innovation and productivity. *National Bureau of Economic Research Working Paper No. 17178*.

Heidenreich, M. (1998). The regional innovation system in Wales: Evolution or eclipse? In H.-J. Braczyk, P. Cooke, & M. Heidenreich (Eds.), *Regional innovation systems: The role of governance in a globalized world* (pp. 214–233). Routledge.

Henderson, D. (2000). *EU regional innovation strategies*. *Regional Studies, 34*(7), 673–680.

Hengsberger, A. (2018). *10 measures to create a culture of innovation*. Retrieved November 10, 2021, from https://www.lead-innovation.com/english-blog/measures-to-create-a-culture-of-innovation

Herzlinger, R. E. (2006). Why innovation in health care is so hard. *Harvard Business Review, 84*, 58.

Hong, S., Oxley, L., & McCann, P. (2012). A survey of the innovation surveys. *Journal of Economic Surveys, 26*(3), 420-444.

Hötte, K. (2023). Demand-pull, technology-push, and the direction of technological change. *Research Policy, 52*(5), 104740.

Houlis, A. M. (2021). This interview trend is more common than you think — Here's what to know before you go on one. Retrieved November 2, 2021, from https://fairygodboss.com/career-topics/semi-structured-interview#

Hox, J. J., & Boeije, H. R. (2005). Data collection, primary versus secondary.

Howe, K. R. (1988). Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational Researcher, 17*(8), 10-16.

Huggins, R., & Kitagawa, F. (2012). Regional policy and university knowledge transfer: Perspectives from devolved regions in the UK. *Regional Studies, 46*(6), 817–832.

Hutton, W., & Schneider, P. (2008). *The failure of market failure: Towards a 21st century Keynesianism*. NESTA.

Hwang, J., & Christensen, C. M. (2008). Disruptive innovation in health care delivery: A framework for business-model innovation. *Health Affairs, 27*, 1329-1335.

Institute for Government. (2021). *Health and social care levy*. Retrieved November 10, 2021, from https://www.instituteforgovernment.org.uk/explainers/health-social-care-levy

Ishak, W. (2017). *Creating an innovation culture*. Retrieved November 7, 2021, from https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/creating-an-innovation-culture

ISO/TC 279. (2020). *ISO 56000:2020 - Innovation management – Fundamentals and vocabulary.* International Organization for Standardization

International Organization for Standardization, (2024) ISO 56001 - *Requirements and guidance for establishing, implementing, maintaining, and improving an innovation management system.* International Organization for Standardization. Retrieved 5th September 2025 from https://www.iso.org/standard/79278.html#:~:text=In%20today's%20fast-paced

Javadi, M., & Zarea, K. (2016). Understanding thematic analysis and its pitfalls. *Demo, 1*(1), 33-39.

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research, 1*(2), 112-133.

Johnston, M. P. (2017). Secondary data analysis: A method of which the time has come. *Qualitative and Quantitative Methods in Libraries, 3*(3), 619-626.

Kaplan, R. S. (1998). Innovation action research: Creating new management theory and practice. *Journal of Management Accounting Research, 10*, 89-118.

Ketels, C. H. M. (2013). Recent research on competitiveness and clusters: What are the implications for regional policy? *Cambridge Journal of Regions, Economy and Society, 6*(2), 269–284.

Klenke, K. (2008). *Qualitative research in the study of leadership*. Emerald Group Publishing.

Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (2000). *To err is human: Building a safer health system* (Vol. 6). National Academies Press.

Langrish, J., M. Gibbons, W. G. Evans and F. R. Jevons (1972), *Wealth from Knowledge*: Studies of Innovation in Industry, London: Macmillan.

Länsisalmi, H., Kivimäki, M., Aalto, P., & Ruoranen, R. (2006). Innovation in healthcare: A systematic review of recent research. *Nursing Science Quarterly, 19*, 66-72.

Lau, A., & Kennedy, C. (2019). *When online survey respondents only 'select some that apply'*. Retrieved November 2, 2021, from https://www.pewresearch.org/methods/2019/05/09/when-online-survey-respondents-only-select-some-that-apply/

Leyden, D. P., & Link, A. N. (2013). Knowledge spillovers, collective entrepreneurship, and economic growth: The role of universities. *Small Business Economics, 41*, 797-817.

LSHW, Life Sciences Hub Wales. (2025). *Funding Directory.* Retrieved from https://lshubwales.com/funding-directory 8th July 2025.

LSHW, Life Sciences Hub Wales. (2021). *Accelerate Wales*. Retrieved November 7, 2021, from https://lshubwales.com/innovation-support/accelerate-wales

LSHW, Life Sciences Hub Wales. (2018). *Accelerate programme: Driving health innovation in Wales*. Retrieved 8th July 2025 from https://lshubwales.com/programmes/accelerate-wales

LSHW, Life Sciences Hub Wales. (2015). *Life Sciences Hub Wales: A central pillar in Wales' life sciences ecosystem*. Retrieved November 7, 2021 from https://businesswales.gov.wales/sites/business-wales/files/documents/Campaigns/Hub%20Case%20Study%20AWEB.pdf

Lundvall, B.-Å. (1992). *National systems of innovation: Towards a theory of innovation and interactive learning*. Pinter.

Malcarney, M. B., Horton, K., Seiler, N., & Hastings, D. (2017). Advancing the public's health by scaling innovations in clinical quality. *Public Health Reports, 132*(4).

Manna, Z., & Waldinger, R. (1980). A deductive approach to program synthesis. *ACM*.

Marshall, M. N. (1996). Sampling for qualitative research. *Family Practice, 13*(6), 522-526.

Mathias, P. (2013). *The transformation of England (Routledge Revivals).* Routledge.

Matthews, B., & Ross, L. (2010). *Research methods: A practical guide for social scientists*. Pearson Longman.

Marjanovic, S., Altenhofer, M., Hocking, L., Chataway, J., & Ling, T. (2020). Innovating for improved healthcare: Sociotechnical and innovation systems perspectives and lessons from the NHS. *Science and Public Policy, 47*, 283-297.

McNiff, J. (2013). *Action research: Principles and practice* (3rd ed.). Routledge.

McKinsey. (2014). *Industrial revolutions: Capturing the growth potential*. Centre for Cities.

MediWales 2024 Impact report (2024, MediWales)

Menzel, M. P., & Fornahl, D. (2009). Cluster life cycles - Dimensions and rationales of cluster evolution. *Industrial Studies*, 33(4), 3-29.

Miller, T. R., Baird, T. D., Littlefield, C. M., Kofinas, G., Chapin III, F. S., & Redman, C. L. (2008). Epistemological pluralism: Reorganizing interdisciplinary research. *Ecology and Society, 13*(2), Article 46.

Mogashoa, T. (2014). Applicability of constructivist theory in qualitative educational research. American International Journal of Contemporary Research, 4(7), 51-59.

Mom, T. J. M., Oshri, I., & Volberda, H. W. (2012). The skills base of technology transfer professionals. *Technology Analysis & Strategic Management, 24*, 871-891.

Morgan, K. (2006). Devolution and development: Territorial justice and the North-South divide. *Regional Studies, 40*(4), 345–358.

Morgan, K. (2001). Industrial transformation and the politics of the 'Welsh Experiment'. In J. Bradbury & J. Mawson (Eds.), *British Regionalism and Devolution: The Challenges of State Reform and European Integration* (pp. 185–206). Routledge.

Mossialos, E., Simpkin, V. L., Renwick, M. J., & Kelly, R. (2018). Incentivising innovation in antibiotic drug discovery and development: Progress, challenges and next steps. *International Journal of Antimicrobial Agents, 51*(2), 535–542.

Mossialos, E., McGuire, A., Anderson, M., Pitchforth, E., James, A., and Horton, R. 2018. The Future of the NHS: No Longer the Envy of the World? *The Lancet* 391, no.10125: 1001-1003.

Moullin, J.C., Sabater-Hernández, D., Fernandez-Llimos, F., & Benrimoj, S.I., (2015). *A systematic review of implementation frameworks of innovations in healthcare and resulting generic implementation framework.* Health Research Policy and Systems 13, article number: 16. p9.

Nagji, B., and Tuff, G. 2012. "Managing Your Innovation Portfolio." *Harvard Business Review* 90, no.5: 66-74. (accessed 8th May 2025).

National Assembly for Wales. (2011). *Together for health: A five-year vision for the NHS in Wales*. National Assembly for Wales.

NCATS, National Centre for Advancing Translational Sciences. (2021). *Scientific and operational principles for drug development*. U.S. Department of Health and Human Services, National Institutes of Health. https://ncats.nih.gov/about/about-translational-science/principles

Neeley, T., and Leonardi, P. (2022). Developing a Digital Mindset. *Harvard Business Review* 100, no.5–6: 50–55.

Nelson, R. R., & Rosenberg, N. (1993). Technical innovation and national systems. In R. R. Nelson (Ed.), *National innovation systems: A comparative analysis* (pp. 3–21). Oxford University Press.

Nemet, G. F. (2009). Demand-pull, technology-push, and government-led incentives for non-incremental technical change. *Research Policy, 38*(5), 700–709.

Nesta. (2017). *Open innovation in health: A guide to transforming healthcare through collaboration*. Retrieved from https://www.nesta.org.uk/report/open-innovation-in-health-a-guide-to-transforming-healthcare-through-collaboration/ .

NHS England (2011). *Innovation Health and Wealth.* Retrieved November 2021 from https://www.gov.uk/government/news/accelerating-adoption-of-innovation-in-the-nhs

NHS England. (2019). *Long term plan*. Retrieved November 2021, from NHS Long Term Plan » The NHS Long Term Plan.

NHS England, School of Academic Science (2025) *Clinical Academics.* Retrieved July 2025 from https://nshcs.hee.nhs.uk/healthcare-science/careers-in-healthcare-science/clinical-academic-careers/what-is-a-clinical-academic/

NHS Wales. (2021). *Health in Wales*. Retrieved November 7, 2021, from http://www.wales.nhs.uk/nhswalesaboutus/structure

NHS Wales Ambulance Service. (2024). *Welsh Ambulance Service awarded University Trust status*. NHS Wales. https://ambulance.nhs.wales/news/nhs/2024/welsh-ambulance-service-awarded-university-trust-status/

OECD. (2021). *Defining innovation*. Retrieved November 7, 2021, from https://www.oecd.org/site/innovationstrategy/defininginnovation.htm

OECD. (2012). *OECD Science, Technology and Industry Outlook 2012*. OECD Publishing.

OECD/Eurostat. (2018). *Oslo Manual 2018: Guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing.

Office National Statistics (ONS), *Input Output Analytics tables.* Retrieved 25th January 2025. From https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/articles/inputoutputanalyticaltables/guidanceforuse

Park, J., & Park, M. (2016). Qualitative versus quantitative research methods: Discovery or justification? *Journal of Marketing Thought, 3*(1), 1-8.

PRHSCW (Parliamentary Review of Health and Social Care in Wales). (2018). *A revolution from within: Transforming health and care in Wales*. Welsh Government. Retrieved from https://www.gov.wales/sites/default/files/publications/2018-01/Review-health-social-care-report-final.pdf

Parmar, J., Sacrey, L. A., Anderson, S., Charles, L., Dobbs, B., McGhan, G., Shapkin, K., Tian, P., & Triscott, J. (2021). Facilitators, barriers and considerations for the implementation of healthcare

innovation: A qualitative rapid systematic review. *Health & Social Care in the Community*. *30*(3), 856-868.

Patel, S. (2020). Comparing healthcare models and their role in the Covid-19 response. Retrieved November 9, 2021, from https://www.peaceinnovation.com/blog/comparing-healthcare-models-and-their-role-in-the-Covid-19-response

Perkmann, M., & Walsh, K. (2007). University–industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews, 9*(4), 259–280.

Pike, A., Rodríguez-Pose, A., & Tomaney, J. (2012). Regional economic development and the case of Wales: Theory and practice and problems of strategy and policy. *National Institute Economic Review*, *220*(1), R1–R20.

Pino, R. M., & Ortega, A. M. (2018). Regional innovation systems: Systematic literature review and recommendations for future research. *Cogent Business & Management, 5*, 1463606.

Pisano, G. P. (2015). You need an innovation strategy. *Harvard Business Review, 93*(6), 44–54.

Plsek, P. E., & Wilson, T. (2001). Complexity, leadership, and management in healthcare organisations. *British Medical Journal, 323*(7315), 746.

Porter, M. E., & Stern, S. (2001). *Innovation: Location matters*. *MIT Sloan Management Review*, 42(4), 28–36.

Porter, M. E. (2000). *Location, competition, and economic development: Local clusters in a global economy*. *Economic Development Quarterly, 14*(1), 15-34. https://doi.org/10.1177/089124240001400105

Porter, M. E. (1990). *Competitive advantage of nations: Creating and sustaining superior performance*. Free Press.

Porter, M. E. (1998). *Clusters of innovation: Regional foundations of U.S. competitiveness*. Council on Competitiveness.

Reid, G. (2018). *Review of government funded research and innovation in Wales*. Welsh Government.

Remenyi, D., Williams, B., Money, A., & Swartz, E. (1998). *Doing research in business and management: An introduction to process and method*. Sage Publications, Inc.

Research Institute of Sweden, *About RISE.* From www.ri.se/en . Retrieved 6th July 2025.

Research Institute of Sweden, *Personal Certification in Innovation Management*. From https://www.ri.se/en/system-innovation/innovation-management/service/personal-certification-in-innovation-management. Retrieved 15th February 2026.

Rich, N. (2019). The Big Picture, Bevan Exemplar Cohort 3 Evaluation.

Rorty, R. (1982). *Consequences of pragmatism: Essays, 1972-1980*. University of Minnesota Press.

Rothwell, R. (1994). Towards the fifth-generation innovation process. *International Marketing Review, 11*(1), 7–31. https://doi.org/10.1108/02651339410057491

Rouse, W. B. (2008). Health care as a complex adaptive system: Implications for design and management. *Bridge-Washington-National Academy of Engineering, 38*(1), 17.

RSA, The Royal Society for the encouragement of Arts, Manufactures and Commerce. (2018). *Artificial Intelligence- Real public engagement*. Retrieved November 5, 2021, from https://www.thersa.org/reports/artificial-intelligence-real-public-engagement

Saks, M., & Allsop, J. (Eds.). (2019). *Researching health: Qualitative, quantitative and mixed methods* (3rd ed.). SAGE Publications Ltd.

Salvador, E., & Harding, R. (2006). Innovation policy at the regional level: The case of Wales. *International Journal of Foresight and Innovation Policy, 2*(3–4), 304–326.

Sanchez. R.H., Bergeron-Drolet, L., Sasseville, M and Gagnon, M. (2022). "Engaging patients and citizens in digital health technology development through the virtual space." *Frontiers in Medical Technology* 4: 958571.

Sandelowski, M. (2004). Using qualitative research. *Qualitative Health Research, 14*(10), 1366-1386.

Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research methods for business students* (4th ed.). Financial Times/Prentice Hall.

SBCR. (2013). *Swansea Bay City Region Economic Regeneration Strategy*. In S.B.C.R. Board (Ed.). Online.

Scarbrough, H and Kyratsis, Y. (2022) *From spreading to embedding innovation in health care: Implications for theory and practice*. Health Care Management Review 47(3), pp.236-244

Schneider, C. Q., & Wagemann, C. (2012). *Configuring the world: A critical introduction to qualitative comparative analysis (QCA)*. Palgrave Macmillan.

Schneider, E. C., Sarnak, D. O., Squires, D., Shah, A., & Doty, M. M. (2017). *Mirror, Mirror 2017: International Comparison Reflects Flaws and Opportunities for Better U.S. Health Care*. The Commonwealth Fund.

Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Harvard University Press.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching, 5*(9), 9-16.

Senedd Cymru (2020) Aneurin Bevan University Health Board 2019-20 Financial Statements. Retrieved January 2020 from https://senedd.wales/media/0hyhctg5/gen-ld13288-e.pdf

Sensier, M., & Artis, M. J. (2016). The resilience of employment in Wales: Through recession and into recovery. *Regional Studies*, *50*(4), 586–599.

Siegel, D. S., Waldman, D. A., Atwater, L., & Link, A. N. (2004). Toward a model of the effective transfer of scientific knowledge from academicians to practitioners: Qualitative evidence from the commercialization of university technologies. *The Journal of Engineering and Technology Management, 21*(1–2), 115–142.

Sillanaukee, P. (2020). How Finland is leading the digital healthcare revolution. Retrieved November 7, 2021, from https://www.siemens-healthineers.com/perspectives/mso-digital-healthcare-revolution-finland

Smart Survey. (2021). *Dichotomous questions*. Smart Survey. Retrieved November 1, 2021, from https://www.smartsurvey.co.uk/survey-questions/dichotomous-questions

Social Care Wales. (2024). *Ymlaen: The research, innovation and improvement strategy for the social care sector 2024 to 2029*. Social Care Wales. https://socialcare.wales/about-us/ymlaen-the-research-innovation-and-improvement-strategy-for-the-social-care-sector-2024-to-2029

Sohn, S. Y., Kim, D. H., & Jeon, S. Y. (2016). Re-evaluation of global innovation index based on a structural equation model. *Technology Analysis & Strategic Management, 28*(4), 492–505.

Sommers, B. D., Fry, C. E., Blendon, R. J., & Epstein, A. M. (2018). New approaches in Medicaid: Work requirements, health savings accounts, and health care access. *Health Affairs, 37*(7), 1099–1108.

SQW. (2014). *Accelerating local economic growth - Clusters and deals: Viewpoint*.

StatsWales. (2024). *NHS expenditure by programme budget category and year*. Welsh Government. Retrieved February 15 2025 from https://statswales.gov.wales/Catalogue/Health-and-Social-Care/Health-Finance/NHS-Programme-Budget/nhsexpenditure-by-budgetcategory-year

Stats Wales. (2023). *NHS staff by staff group and year*. Welsh Government. https://statswales.gov.wales/Catalogue/Health-and-Social-Care/NHS-Staff/NHS-Staff-Summary/NHSStaff-by-StaffGroup-Year

Straus, S. E., Tetroe, J., & Graham, I. D. (2009). Defining knowledge translation. *CMAJ: Canadian Medical Association Journal, 181*(3-4), 165–168.

Stringer, E. T. (2013). *Action research*. Sage Publication, Inc.

Swansea University. (2018a). *South Wales Crucible: Final report*. Swansea University.

Swansea University. (2018b). *South Wales Crucible: Initial report*. Swansea University.

Swansea University. (2017). *Internet Coast: Phase 1: City deal proposal impact appraisal* (Version 1.26). Swansea University, School of Management.

Swift, R. (2011). The relationship between health and GDP in OECD countries in the very long run. *Health Economics, 20*(3), 306–322.

Swords, J. (2013). Michael Porter's cluster theory as a local and regional development tool: The rise and fall of cluster policy in the UK. *Local Economy, 28*(4), 369–383.

Tidd, J., Bessant, J., & Pavitt, K. (2001). *Managing innovation: Integrating technological, market and organizational change* (2nd ed.). John Wiley & Sons.

Tona, O., Leidner, D.E., van Der Meulen, N, et al. (2025). "The Deployment of AI to Infer Employee Skills: Insights from Johnson & Johnson's Digital-First Workforce Initiative." *Information Systems Journal*. https://doi.org/10.1111/isj.12594.

TWI Global Ltd. (n.d.). *What are Technology Readiness Levels (TRL)?* Retrieved February 14, 2025, from https://www.twi-global.com/technical-knowledge/faqs/technology-readiness-levels

UK Department for Business, Innovation & Skills. (2010). *Innovation*. Retrieved May 3, 2022, from https://webarchive.nationalarchives.gov.uk/20111108175116/http://www.bis.gov.uk/innovation

UK Government. (2023). *UK Shared Prosperity Fund: Grant determinations 2023 to 2024*. https://www.gov.uk/government/publications/uk-shared-prosperity-fund-grant-determinations-2023-to-2024

UK Government. (2021). *Life sciences vision: A world-leading life sciences sector for the UK*. UK Government. https://assets.publishing.service.gov.uk/media/612763b4e90e0705437230c3/life-sciences-vision-2021.pdf

UK Government. (1975). *Welsh Development Agency Act 1975*. The Stationery Office.

UKRI, UK Research and Innovation. (2025). *Innovate UK funded projects since 2004*. UK Research and Innovation. Retrieved February 15, 2025, from https://www.ukri.org/publications/innovate-uk-funded-projects-since-2004/

UKRI, UK Research and Innovation. (2021). *Responsible innovation*. Retrieved November 6, 2021, from https://www.ukri.org/about-us/policies-standards-and-data/good-research-resource-hub/responsible-innovation/

United Nations. (2021). *Celebrating the creative economy in 2021*. Retrieved November 11, 2021, from https://www.un.org/en/observances/creativity-and-innovation-day

Uyara, E., Edler, J., Garcia-Estevez, J., Georghiou, L., & Yeow, J. (2014). Barriers to innovation through public procurement: A supplier perspective. *Technovation, 34*, 631-645.

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences, 15*(3), 398-405.

Vaus, D. (2013). *Surveys in social research* (6th ed.). Routledge.

Viki, T. (2018). Six principles for creating a good corporate innovation process. *Forbes*. Retrieved November 6, 2021, from https://www.forbes.com/sites/tendayiviki/2018/03/26/six-principles-corporate-innovation-process/?sh=10b0348144f4

Vogel, A. L., Knebel, A. R., Faupel-Badger, J. M., Portilla, L. M., & Simeonov, A. (2021). A systems approach to enable effective team science from the internal research program of the National Centre for Advancing Translational Sciences. *Journal of Clinical and Translational Science, 5*(1), e163.

Welsh Assembly Government. (2005). *Wales: A vibrant economy*. Welsh Assembly Government.

Welsh Assembly Government. (2004). *People, places, futures: The Wales spatial plan*.

Welsh Assembly Government. (2003). *Wales for innovation*.

Welsh Assembly Government. (2001). *A winning Wales: The economic development strategy of the Welsh Assembly Government*. Welsh Assembly Government.

Welsh Government (2026) Welsh Health Circular WHC/2026/004 - Refreshed Intellectual Property guidance for NHS Wales organisations. Retrieved 26th March 2026 from Refreshed Intellectual Property guidance for NHS Wales organisations (WHC/2026/004) | GOV.WALES

Welsh Government (2025). 2025 - 2028 NHS Wales Technical Planning Guidance. Retrieved 29th August 2025 from https://jcc.nhs.wales/the-committee/planning-performance-and-finance-sub-committee/planning-performance-and-finance-sub-committee-meeting-papers/february-2025/317-appendix-7-nhs-wales-technical-planning/

Welsh Government (2024). *Child Poverty Strategy for Wales 2024 - Our updated strategy to help prevent and mitigate child poverty.* Retrieved 29th August 2025 from https://www.gov.wales/child-poverty-strategy-wales-2024-html#137312

Welsh Government. (2023). *Wales Innovates: Creating a Stronger, Fairer, Greener Wales*. Retrieved February 16, 2025 from https://www.gov.wales/wales-innovates-creating-stronger-fairer-greener-wales-delivery-plan-html

Welsh Government. (2023). *Final budget 2023-2024: Motion*. Retrieved February 16, 2025, from https://www.gov.wales/sites/default/files/publications/2023-02/final-budget-2023-2024-motion.pdf

Welsh Government. (2021). *NHS Wales annual planning framework 2021 to 2022*. Retrieved from February 14, 2025, from https://www.gov.wales/sites/default/files/publications/2021-01/nhs-wales-annual-planning-framework-2021-2022.pdf

Welsh Government. (2021). *Written statement: Innovation in health and social care*. Retrieved November 3, 2021, from https://gov.wales/written-statement-innovation-health-and-social-care

Welsh Government. (2019). *NHS Wales planning framework 2020/23*. Retrieved November 11, 2021, from https://gov.wales/sites/default/files/publications/2019-09/nhs-wales-planning-framework-2020-to-2023.pdf

Welsh Government. (2019). *Supporting People National Advisory Board*. Retrieved November 11, 2021, from https://gov.wales/supporting-people-national-advisory-board/membership

Welsh Government. (2018). *A healthier Wales: Long term plan for health and social care*. Retrieved November 3, 2021, from https://gov.wales/healthier-wales-long-term-plan-health-and-social-care

Welsh Government. (2015). *Well-being of Future Generations (Wales) Act 2015*. In N.A F. Wales (Ed.).

Welsh Government. (2014). *Innovation Wales*. Innovation Wales: A framework for action. Retrieved November 3, 2021 from https://gov.wales/sites/default/files/publications/2019-04/innovation-wales-strategy.pdf

Welsh Government. (2013). *Sectors delivery plan*.

Welsh Parliament. (2021). *Agreeing Welsh taxes*. Retrieved November 11, 2021, from https://senedd.wales/how-we-work/our-role/agreeing-welsh-taxes/

Welsh Parliament. (2021). *Making laws*. Retrieved November 10, 2021, from https://senedd.wales/how-we-work/our-role/making-laws/

Welsh NHS Confederation (2021). The NHS Wales COVID-19 Innovation and Transformation Study Report. Retrieved November 11, 2021 from https://www.nhsconfed.org/publications/nhs-wales-covid-19-innovation-and-transformation-study-report

Welsh Youth Parliament. (2013). *Life skills and the Welsh Youth Parliament*. Senedd Cymru / Welsh Parliament. Retrieved January 7, 2025, from https://youthparliament.senedd.wales/media/ekncslh0/wyp-life-skills-e.pdf

White, M. D., & Marsh, E. E. (2006). Content analysis: A flexible methodology. *Library Trends, 55*(1), 22-45.

Williams, R. (2022). *Independent Commission on the Constitutional Future of Wales: Interim report*. Welsh Government.

Wilson, J. (2021). Innovation and Networks: The Role of Social Capital in Collaborative Research. *Journal of Innovation Management, 9*(1), 45–62.

Wu, C., Thompson, M.E. (2020). Basic Concepts in Survey Sampling. In: Sampling Theory and Practice. ICSA Book Series in Statistics. Springer, Cham. (1), 3-15.

Young Foundation. (2011). *Review of innovation in the NHS: December 2011*. The Young Foundation. Retrieved on February 14, 2025, from https://www.youngfoundation.org/wp-content/uploads/2012/10/Review-of-Innovation-in-the-NHS-December-2011.pdf

Yusof, M. M., Kuljis, J., Papazafeiropoulou, A., & Stergioulas, L. K. (2008). An evaluation framework for health information systems: Human, organization, and technology-fit factors (HOT-fit). *International Journal of Medical Informatics, 77*(6), 386–398.