Life Sciences in Scotland
Industry Leadership Group
Digital & Data Subgroup
Opportunities and Priorities
Final Report
November 2021

Contents

Executive Summary

This report was commissioned by Scottish Enterprise on behalf of the Life Sciences in Scotland Industry Leadership Group (LSS ILG) Digital & Data Subgroup (ILGDD).

The aim of the Digital and Data Subgroup is to take forward specific actions to address key challenges that fall within the Life Sciences in Scotland digital and data theme, including the improved use of healthcare data to drive efficiencies, deliver patient outcomes and attract R&D investment to Scotland. The group is also considering how to expand existing economic activity within the current landscape and influence the strategic changes that are required. The ILGDD is supported in its work by the Digital Health and Care Innovation Centre (DHI) and Scottish Enterprise (SE).

The ILGDD has focused its work on identifying data and digital opportunities for industry which are relevant to health and care, and synergistic with the activities and reflections of the NHS Innovation Steering Group (ISG) and of the Scottish Health and Industry Partnership (SHIP).

The objective of this Stage 1 report is to identify priorities for industry relating to data and digital health and care but selected for optimal synergies with priorities of other stakeholders such as the NHS and Scottish Government.

Stage 2 of this process is to develop an action plan with a roadmap proposing indicative and realistic implementation timescales.

This report is structured around the seven identified priorities, set out in proposed priority order with outline time horizons, as summarised in the table below for consideration.

1. National Infrastructure	
1.1 Recognition of Data as a National Asset	Immediate and ongoing
1.2 Establishment of National Health and Care data Platform for Research and Industry	Immediate to Short
1.3 Once for Scotland - Governance	Immediate
1.4 Once for Scotland – Innovation Adoption (PULL)	Immediate

2. Thought Leadership	
2.1 The Health for Wealth Programme	Immediate and Ongoing
2.2 Data and Artificial Intelligence	Immediate and Ongoing
2.3 Cultural Alignment	Immediate and Ongoing
3. Opportunity Analysis	
3.1 Establish a health and care "opportunity pipeline"	Immediate and ongoing
3.2 Complete a review of health and care procurement spend (digital and data)	Short and ongoing
3.3 "Declutter" the Scottish Health Research and Innovation Ecosystem	Short to medium
4. Increased Digitisation	
4.1 Address the basic digitisation needs that exist today across health and care	Immediate and ongoing
4.2 Ensure real time dataset access for key clinical areas and emerging sectors	Medium
4.3 Develop a national strategy for engaging with Clinical Research Organisations	Short to medium
5. Data and Artificial Intelligence	
5.1 Establish a safe, structured, and accessible dataset to accelerate the digitisation of health and care and the use of Data & AI.	Short to medium
5.2 Provide sufficient funding to scale impactful and respected programmes in a structured manner to develop innovative "PUSH" solutions from Industry, whilst accelerating solution matching for "PULL" from health and care.	Medium
6. Further Enabling Technologies, Preventive Care and System Convergence	
6.1 Meaningful deployment of further enabling technologies once Priority 1 and Priority 4 addressed.	Medium to Long

6.2 Priority 1, 4, 5 and 6.1 enable extended preventive care strategy. (Align with ANIA Horizons)	Medium to Long
6.3 Addressing health and care system convergence / citizen data technology challenges.	Medium to Long
7. "Outside of System" Innovation, Personal Wellness Technology & Data	
7.1 Support "outside of the system" innovation as part of Health for Wealth activity and for implications and insight.	Ongoing
7.2 Support businesses focused on health and care systems outwith Scotland	Ongoing
7.3 Horizon scan developments in personal wellness technology and data, and consider implications and opportunities for health and care system.	Ongoing

This priority list was developed from the review of over 100 documents, of which an initial 37 supplied documents were predominantly Scottish Government, Scottish health and care system and Scottish industry / economic reports, with this then augmented by review of reports and other relevant information identified during the work including UK Government, Office for Life Sciences, NHS England, along with other UK wide and international health and care digital and data related reports.

The complete list of documents is included as a Bibliography, with relevant extracts from key reports.

Senior Stakeholder Interviews

A long list of priorities highlighted by these reports then informed interviews with 20 senior stakeholders, who were all asked: -

"Based on your understanding of the Scottish health and social care market what do you consider to be the key short-, medium- and long-term data & digital opportunities, and how can they be prioritised and aligned as opportunities for Scottish industry?"

The interviews were semi-structured in nature and were completed over the period 4th August 2021 to 16th September 2021, to accommodate both annual leave and availability of senior stakeholders due to competing commitments. The extended period of

interviews was significantly greater than anticipated, but this allowed the discussions to evolve as the pool of documentation reviewed increased. The individual interviews were confidential.

Desktop Report Review

It was increasingly dismaying to read the many reports, some of which have become very hard hitting in recent years, [1,7,37] which have clearly **identified Priority 1 as an absolute requirement for Scotland** upon which rests many of the immediate and long-term needs of the Scottish health and care system, and its interaction with industry. The Bibliography attached to this report effectively provides an audit trail of past recommendations. The findings of this review and the suggested priorities provide an update on the reality of progress in facing and dealing with these challenges, and the conclusion that **significant immediate action is required**.

Interview and Report Review Findings

The findings from the reviews and interviews are as follows.

- An **absolute need** to establish a "Once for Scotland" national data architecture and governance system.
- Any previous Scottish national "edge" over other national / international competitors has already been or is currently being lost due the lack of a coherent national data plan. **Research is going elsewhere**. However, the prompt development and execution of a unified national plan may allow Scotland to leverage its inherent strengths and improve its position. The urgent and immediate priority is to fulfil the requirement across the Triple Helix for access to structured and real time national data.
- Recognition that there will be an **over-riding priority to address waiting list** pressures due to Covid-19. Senior Stakeholders recognise that managed correctly this should be viewed as an opportunity for system innovation with mutual benefit for all partners to work together to impact the waiting list.
- That a focus on completion of digitisation of the health and care system is an immediate and fundamental enabling capability to provide the IT platform that supports future advances. This aligns with OECD [102] findings that the health and care sector globally is still a long way behind other industries in reaping digital opportunities, which is the key theme in many current Scottish and UK health and care sector reports and plans. [6, 7, 11, 12, 15, 23, 30, 32, 33, 37, 38, 39, 41, 44, 45,46,53, 62, 63, 69, 77, 87].

- Weary acceptance that the care sector is starting from a **very low base of digitisation**, is resource constrained (funding and digital skills) and operating in a complex, fragmented system.
- That the real value of AI and deployment of further enabling technologies will only be usefully achieved once the national data architecture and governance, and additional digitisation of the health and care system has progressed from its current state.
- Consensus across desk-based research findings and interviews that not addressing the fundamental barriers to entry for industry highlighted in this report will have significant and **long reaching impact on the health and wealth agenda.**

Alongside these findings the interviews and reports, when taken as a whole, highlighted other issues.

- The importance of the role of the ILGDD in thought leadership, particularly regarding the need to align all parties around the Health for Wealth agenda, contribute to the public Data and Artificial Intelligence debate, and provide an ongoing contribution to ensuring Cultural Alignment between the health and care system and industry aspirations, with this latter issue being exacerbated by the transitional challenges of digital and data innovation.
- The need to develop a coherent and accessible health and care opportunity pipeline, with transparent metrics against which progress could be measured, including current baseline figures, and alongside this “declutter” the health and care innovation ecosystem to facilitate navigation.
- The need to look widely at innovation “outside of the system” as not all Scottish companies will formally engage with / be engaged by the Scottish health and care system, and health and care innovation is developing apace globally using personal wellness technology, which will at some point crossover with the formal health and care system.

A final impression that requires consideration, is one of "stretch", as the Scottish health and care research and innovation ecosystem tries to compete with and cover as many bases as alternative (larger) systems.

“Once for Scotland” Health and Wealth System

The urgent and immediate priority identified is the need for researchers and industry to access **structured and real time national health and care data**, addressing this need is described in Priority 1 – National Infrastructure.

The priorities, recommendations and findings of this paper are based on Scotland addressing this need as an urgent and immediate priority.

Gaining control of national health and care data will enable the introduction of a “Once for Scotland” Health and Wealth system, harnessing the elements of the current ecosystem into a cohesive and dynamic system. Figure 1 shows one interpretation of how a simplified “Once for Scotland” Health and Wealth system might be structured; this is also included in the appendices:

Figure 1- "Once for Scotland" Health and Wealth System

This is a two-stage solution:

1. Health and Care Data is exclusively shared with the Safe Havens to create a National Health and Care Data Set.
2. Solutions are pulled through to Health and Care to address prioritised Health and Care Problem Statements

(This outline model will need to evolve to reflect the emergence of the National Care Service once its IT strategy is agreed. [69,77])

Further Considerations and Initial Report Feedback.

During the preparation and drafting of the final report two sets of reports from the OECD and Financial Times / Lancet were identified that significantly paralleled and underlined many of the key findings. These reports have been added, and commented on, in an Addendum to this report.

The April 2021 OECD "*National Health Data Infrastructure*"[103] report surveyed health systems in twenty-three OECD countries and identified ***that whilst Scotland was rated and ranked fifth in terms of data governance, it ranked nineteenth in terms of dataset availability, maturity, and use***. This more technical analysis looked at eight elements: dataset availability, coverage, automation, timeliness, unique identification, coding, data linkage and regular reporting of indicators of health care quality and system performance. It is worth reflecting that this report, in the absence of manifest error, is highlighting effective governance of what will be increasingly ineffective systems. These findings should also act as reality check on any lingering perceived superiority of the Scottish health and care data and digital systems due to early adoption of markers such as the CHI (community health indicator) number. The emerging reality is that, in comparison to the other OECD benchmarked health and care systems, Scotland, when viewed in totality, has been surpassed and is near to the bottom of this OECD league table on key data availability. If left unaddressed this would not only have a potential economic cost for Scotland in terms of its attractiveness as a destination for health research, but it would also delay or deny delivery of the benefits of health data to all or parts of its population, thereby adding to health inequality.

The July 2021, OECD report "*Empowering the health workforce*"[102] and October 2021 The Lancet / Financial Times Commission report: "*Governing health futures 2030: growing up in a digital world*"[108] both ultimately stressed the need for government, health and care systems, commerce, and for the public to fully engage in the process of:

- ensuring fair and transparent processes and structures are put in place as ***"the digital ecosystem itself (becomes) an increasingly important determinant of health".***[108]
- and to "invest in the enablers of digitally transformed health systems".[108]

This is a broad challenge. It goes to the heart of the commissioning of this report, that of ensuring that the Scottish economy is mobilised to contribute to and benefit from the digital transformation. It highlights the need to align health and care technology pull with industry push. Finally, and arguably most fundamentally for Scotland, it points to the need for ***government to invest in the education and training of current and future generations*** so that they have the skills to contribute to and benefit from the digital health and care transformation. ***Digital transformation in the health sector is not a simple matter of technical change but requires a complex adaptive change in human attitudes and skills***.[103] This will include cultural issues around leveraging expertise of industry and citizen engagement with what will be their health and care data. Again, if not addressed, this will have a direct impact on the economic prospects for Scotland and the wellbeing of its citizens. Government needs to provide political leadership and implement across a range of policies to address this.

Initial Feedback

Initial feedback on the draft report confirmed consensus dissatisfaction with the current extent of digitisation across the Scottish health and care system, and a strong desire from all parties to address this. We would agree that the report is skewed towards health at the expense of care. This was identified as an issue early during the initial work programme and the planned interviews and desktop review programme was expanded to try to rebalance this, but the limitations have been acknowledged at points in the report. The key perspective and conclusion regarding the care ecosystem is that it is large, diverse, and fragmented, and digitisation is a very big challenge. The National Care Service digitisation and data plans will be pivotal to future progress on this front.

Some of the feedback included comments and further examples that pointed to the health and care system "digital reality" being significantly worse than has been portrayed in the report, and potentially very challenging, if not impossible, to resolve. This raises an uncomfortable but necessary question; should this reality lead to an acceptance that there will be no complete, coherent "once for Scotland" solution, and hence work should focus on a "good enough - 80/20" solution, which will inevitably be a compromise and sub-optimal, potentially leaving some service elements or regions of the Scottish health and care system outside of a more integrated system? As well as in effect accepting future health and care inequality (i.e. when *the digital ecosystem itself (becomes) an increasingly important*

determinant of health), this would also imply an acceptance that Scotland may not remain a prime location for health and care research.

There was a longer list of very good and highly informed, specific suggestions. Given the report remit was potentially both technically specific as well as wide ranging, judging the appropriate level of detail was a challenge. We concluded that some of the more detailed suggestions lie outside the scope, capability, or budget for this work, or are very specific technical or organisational proposals. All points should be listed and forwarded to the working parties that now need to be established to confirm and progress the Priority Areas recommended in this report, where they can inform the detailed action plans.

Introduction

This report was commissioned by Scottish Enterprise on behalf of the Life Sciences in Scotland Industry Leadership Group (LSS ILG), who have established a Digital & Data Subgroup (ILGDD), which will report regularly to the LSS ILG, and to the NHS & Social Care Innovation Steering Group (ISG).

The aim of the of the ILGDD is to take forward specific actions to address key challenges that fall within the Life Sciences in Scotland digital and data theme, including the improved use of healthcare data to drive efficiencies, deliver patient outcomes and attract R&D investment to Scotland. The group is also considering how to expand existing economic activity within the current landscape and influence the strategic changes that are required.

The ILGDD is supported in its work by the Digital Health and Care Innovation Centre (DHI) and Scottish Enterprise (SE).

The ILGDD has a focus on identifying data and digital opportunities for industry which are relevant to health and care, and synergistic with the activities and reflections of the NHS ISG and of the Scottish Health and Industry Partnership (SHIP). SHIP is a government initiative hosted by the Chief Scientist Office of the Health and Social Care Directorates and the Enterprise and Innovation Division of the Economy Directorates, to strengthen Scotland's innovation activities in health and social care.

The objective of Stage 1, i.e., this report, has been to:

- Identify clear and specific priorities (i.e., prioritised opportunities) for ILG short term focus (areas of immediate impact).
- Scope out potential medium and longer-term interests.

This stage was intended to identify priorities for industry relating to data and digital health and care, with these selected for optimal synergies with priorities of other stakeholders such as the NHS and Scottish Government.

Stage 2 of this process is to develop an action plan with a roadmap proposing indicative and realistic implementation timescales.

Method

The tender set out a proposed methodology for development of the report and action plan:

1. The initial Stage 1 task was to carry out an immediate desktop review of relevant and up to date reports and materials to inform the identification of a long list of priorities. An initial list of 37 relevant background documents were provided. These were predominantly published reports, and smaller number of policy / briefing papers from Scottish Government, health and care system and industry organisations directly relating to the current performance, and future direction and needs of the Scottish health and care system, (e.g., Supply and Demand for Medicines Report; Mind the Gap Report; CfSD Workplan – 2021-2022).

   Alongside this several wider Scottish economic ecosystem reports, e.g., Scottish Technology Ecosystems Review, and 11 further reports on international health and care systems were supplied to provide a wider industry and global context. However, there was an expectation that additional relevant documents should be identified and sourced. To date over 100 reports have been reviewed.

   These additional reports cover further Scottish Government reports, health and care systems reports that were not included in the original list, more technical or specific reports on relevant projects, along with reports and relevant information from a range of other sources including, UK Government, Office for Life Sciences, NHS England, and UK wide industry organisation digital and data related reports. The complete list of documents is included as a Bibliography.

2. Once the initial document review was completed, the main Stage 1 task was to develop bespoke questionnaires and complete interviews with up to 12 senior stakeholders and advisors to further explore insights and gaps from the desktop review.

   A list of potential interviewees was provided. This process became protracted due to the work being initiated over the 2021 summer holiday period, and it was also identified after some initial interviews that it would be useful and appropriate to canvas opinions from a

larger group of interviewee's to address some specific points identified from the further document review, understand some issues from both and governance and operational level, and also to achieve a more representative range of opinions given the potential breadth of the topic. In total 20 interviews were carried out.

The findings from these interviews, along with the document review, highlighted recurring themes and priority areas set out in this report. All interviews were confidential so that individual views could be freely expressed without these then being individually identifiable in the final report. The final 20 interviewees represent a senior and highly relevant group of key executives across the Scottish health and care system, academia, industry, and other organisations. Even after expanding the interviewee list, it still felt as if there were further layers of relevant interviews that should be held.

Given the potential breadth of the topic, there are areas where more work could be done. Notably the care system is challenging, as it encompasses a very wide variety of services, covering all aspects of potential care, and is provided by a very wide range of organisations, both public, private and third sector.

We would like to take this opportunity to thank those who took part for the time and contribution to this report.

3. The final Stage 1 task was that, based on the interviews and document review, the findings should be ranked for the ILGDD informed by 1) Opportunity Ranking Criteria (see below); 2) interviews with key stakeholders and advisors; 3) realistic timeframes, to inform a Report to the ILGDD.

This report is the output from Stage 1 and completes that stage.

The intended Stage 2 actions are as follows:

4. Develop recommendations for the further development, refining and weighting of the Opportunity Ranking Criteria to inform the evolution of the ILGDD action plan.

5. Develop and propose key elements of an action plan for short term horizon, and roadmap for medium to longer term.

Opportunity Ranking Criteria

The report specification required the development of criteria to prioritise identified opportunities, and that these would likely include evaluating the extent to which an opportunity:

- Is focused on digital and data innovation
- Addresses industry priorities
- Builds on existing industry capabilities
- Addresses Scottish health and care priorities
- Can access already available data sets and agreed data standards
- Can be supported by existing ICT infrastructure for integration of the identified product/solution
- Can leverage available funding opportunities e.g., Healthy Europe, UKRI, Horizon Europe
- Is synergistic to other developments and opportunities in the broader Scottish digital tech ecosystem
- Is in an area where Scotland has a specific competitive advantage.

In addition to the initial Opportunity Ranking criteria provided to inform the work, we identified two further over-riding criteria as result of the desk-based research, senior stakeholder interviews, review and analysis work. It is our opinion that these two criteria are of such significance given the current challenges faced by health and social care, that they should be weighted accordingly.

- Is a PULL Innovation: addressing a prioritised and described need within health and social care.
- Supports the health and social care system in addressing the waiting list challenges due to Covid.

We also identified four additional more specific health system or commercial criteria.

- Has identified and agreed a budget for adoption across health and social care system
- Has a defined and achievable procurement plan with agreed and realistic timelines
- Is provided by an organisation that is financially viable in the medium to long term
- Has identified, or secured, a clinical champion

One final criteria outlined in the Health for Wealth Programme was for potential environmental benefits that might arise as result of carbon reduction from reduced transportation and wastage.

These ranking criteria are set out in Appendix 2 – Opportunity Ranking Criteria, alongside a proposed weighting model that has been tested on specific detailed opportunity cases.

However, the seven Opportunity Priorities that are the recommendations of this report did not ultimately use this approach for ranking. What became clear from the interviews and discussions was that the emerging opportunity priority areas were higher-level challenges that had **clear and significant interdependencies**, ie. priorities 1,2,3 and 4 must happen to fully enable priorities 5 and 6, or any subsequent priorities.

The report is therefore issued in the assumption that the opportunity ranking criteria in Appendix 2 will be applied by the individual opportunity working parties when assessing and ranking detailed opportunities in priorities 5, 6 and, potentially, 7.

Priorities

From the initial document review we identified, and have captured in a database, over 400 “priorities” – the long list. This long list, combined with our findings from the desk-based research and the senior stakeholder interviews informed the production of several priority areas, shown in priority order:

Priority Area 1: **National Infrastructure**

Priority Area 2: **Thought Leadership**

Priority Area 3: **Opportunity Analysis**

Priority Area 4: **Increased Digitisation**

Priority Area 5: **Data and Artificial Intelligence**

Priority Area 6: **Further Enabling Technologies, Preventive Care and System Convergence**

Priority Area 7: **“Outside of System” Innovation, Personal Wellness Technology & Data**

Priority Area 1: National Infrastructure

Timescale: Urgent

When reviewing the Research and Innovation infrastructure from an external and high-level perspective there are several key strengths that sets Scotland's Health and Care system apart from many other regions:

- The population demographic makes it a desirable research partner - 5.5M population and significant opportunities to improve health outcomes ("Sick man of Europe").
- There are a multitude of national organisations and many cross-working parties with senior representation and governmental support *(Figure 2 - Scottish Health Research and Innovation Ecosystem).*
- Across Scottish health and care there are many single platforms in use, or agreements to reduce platforms, Electronic Patient Records (EPR), LIMS, PAS, GP systems, etc.
- There is a well-established National Safe Haven, with federated Regional Safe Havens.
- There are a plethora of organisations and initiatives working at a regional, national or specialist level to support the research, development, evaluation, adoption and implementation of research, best practice, and innovation.
- Thirty years track record of the Community Health Index number ("CHI").
- All underpinned by strong local, regional, and national working relationships and a "Once for Scotland" ethos.

From the research we have undertaken it becomes clear that the reality differs from the perception.

- Global research partners with a long-term commitment to Scotland find themselves unable to conduct clinical trials with Scotland and instead are working with other regions, with Scotland falling further and further behind.
- There are c.150 organisations or initiatives that have active support programmes yet the two most talked about innovations are ScotCap and CytoSponge.
- The safe havens are only receiving c.40% of data from health boards, and this requires significant reworking – the answer is not to create a new initiative but to fix the problem at source.
- There are multiple initiatives with multiple data silos (F*igure 2 - Scottish Health Research and Innovation Ecosystem*) making it a "cluttered" space where companies

will jump from programme to programme in an effort to "crack the system" – expending scarce resources.

Figure 2 - Scottish Health Research and Innovation Ecosystem

- A 2021 OECD review of Health Data Infrastructure and Governance [(103)] rated Scotland fifth for data governance but fourth from bottom, out of twenty-three countries surveyed, for national health dataset maturity, availability, and use. See Figure 3.

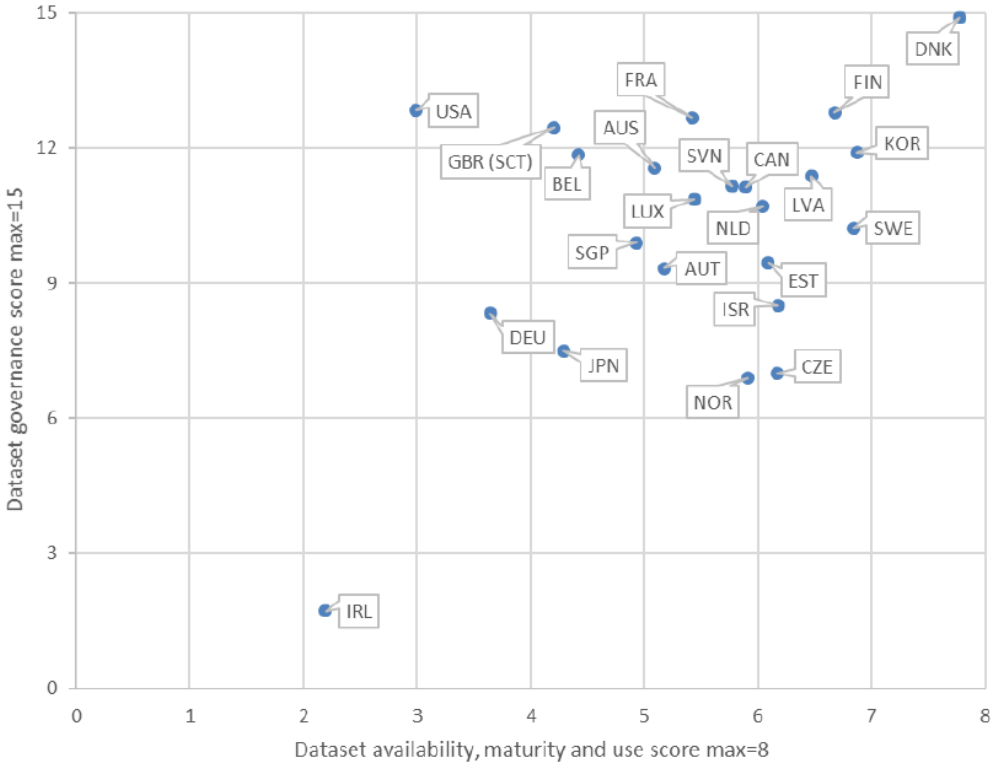


Figure 3 – OECD Report on Health Care Dataset Infrastructure and Governance [(103)]

- There are excellent examples of “Once for Scotland”, but this needs to be championed in unity across all organisations
- There remains a **cultural divide** between the health and care community and commercial partners, exacerbated by the evolving nature of digital and data systems and business models. This issue divide needs care and attention.

There currently exists a more than sufficient number of programmes/organisations/initiatives across Scotland, they are equipped with cutting edge technology and staffed by the brightest minds, yet there is no clear plan for how Scotland realises the value of a readily available and increasingly valuable National Asset – data.

The remainder of this report focuses on identifying and leveraging immediate opportunities, health and care digital transformation, industrial strengths, AI, Analytics and Data Insight, health and care system convergence, and emerging market opportunities.

Without a clear and unified national plan and a commitment to execute this plan in a timely manner, the remainder of this paper is irrelevant.

Within the National Infrastructure category four distinct priorities have been identified that are foundation stones of the digitisation / establishment of a more cohesive Scottish national digital data infrastructure.

The four priorities, and respective timescales are: -

Priorities	Timescales
1.1 Recognition of Data as a National Asset	Immediate and ongoing
1.2 Establishment of National Health and Care data Platform for Research and Industry	Immediate to Short
1.3 Once for Scotland – Governance	Immediate
1.4 Once for Scotland – Innovation Adoption (PULL)	Immediate

Priority 1.1: Recognition of Data as a National Asset (Immediate and ongoing)

The data of the Scottish population needs to be **recognised and protected as a valuable National Asset**. Despite starting from an advantageous position Scotland has fallen behind its peers and this needs to be urgently addressed. There have been previous attempts to address this need and there are currently initiatives underway to establish a national platform, including the National Digital Platform from NHS Scotland Education for Scotland (NES) and the National Data Safe Haven (eDRIS), governed, and managed by Public Health Scotland and operated by EPCC at the University of Edinburgh under an IT agreement.

Our research has identified numerous papers setting out the potential value of this National Asset and previous attempts to realise its value on behalf of Scotland – to date these initiatives have failed to harness the data across Scotland. **This is a failure of the system – with real and long-lasting impacts on the health and wealth of the nation**.

The creation of Research Data Scotland does in some ways appear to address this – however, there appears to be a risk that the work already underway will be undermined or stopped in favour of the next replacement programme to secure governmental attention or funding.

The immediate action is for Scottish Government to formally recognise and protect Health and Social Care data as a valuable national asset. This is a clear statement from Scottish Government that they are taking responsibility (and stewardship) of a valuable National Asset to realise its value, in a safe and secure way, on behalf of the people of Scotland.

Priority 1.2: Establishment of National Health and Care Data Platform for Research and Industry (Immediate to Short)

To realise the value of the National Asset there is first a requirement to establish a **National Health and Social Care Data Platform for Research and Industry.** This is, in essence, a simple task with several programmes already established, that requires only **clarity, commitment, and unity:**

- clarity of thought,
- commitment to an achievable plan, and
- unity of action against this plan.

Unlocking the maximum potential of the Scottish health and wealth agenda will ONLY be realised when there is access to a consistent and comprehensive national health and care data set for research, innovation, and commercialisation.

Our research has identified c.150 programmes/organisations/initiatives supporting research, development, innovation and/or commercialisation of data/digital products relating to health and social care in Scotland. There are at least 39 "data repositories"– some working in co-operation, but none with a complete data set.

The federation of regional Safe Havens, led by the CSO, are a network of mature and trusted research environments, with demonstrable impact over several years, yet they only access c.40% of all available data and are, at time of writing, dependant on raising funding from external sources to ensure their sustainable future. Whilst there are undoubtedly variations across the Safe Havens, in general, they have strong regional and national relationships and a richness of institutional knowledge, drawing on the strengths of other organisations for operational infrastructure – e.g. EPCC.

The immediate action is to identify which of the current initiatives will create the National Asset; National Digital Platform (NES), National Data Safe Haven (PHS) or Research Data Scotland (RDS). The best elements from these initiatives/organisations should be brought together under a National Data Asset (Health and Care) programme, sufficiently funded for the long-term and accelerated towards completion; this may require the engagement of key Scottish industrial partners as required.

The short-term action is to ensure 100% collection of data nationally across Health and Care. This requires immediate action at a regional level, with agreement at a national level. We have identified one potential approach that could be enacted at pace with existing organisations operating within their current remit, the key high-level steps we believe are required to achieve this, with an accompanying diagram (*Figure 4 - National Dataset for Research, Innovation and Commercialisation*)

- **Standard Research Reporting (Health Board (HB)- Chief Executive Officers (CEO))**
  We understand that whilst there is one EPR across the 14 health boards, each has been tailored to the needs of the individual health board, resulting in 14 variations in approach, structure, and coding. This disjointed approach is then replicated to a greater or lesser degree across other key systems (LIMs, PACs, Care Data, etc). This needs to be addressed at source, as a priority with the unified support of the HB CEOs,

as demonstrated with the ANIA pathway and other key stakeholders across health and social care.

The immediate action is to complete an intelligent and efficient gap analysis to identify how far apart the systems are with respect to introducing Standard Research Reporting, this should then lead to agreement between HB CEOs and the owner of the National Health and Care Research Platform on the structure for data sharing. This could perhaps be supported by Scottish industry partners assisting with intelligent "scraping" of the data structures across HBs to present a proposed ideal structure for evaluation by HB CEOs, key stakeholders, and Safe Haven leaders.

- **Push research data exclusively to the regional safe havens (CSO)**

  Our research has identified at least 39 known health and/or care data repositories being populated with data from a range of sources. **This needs immediate review.** Data should be shared exclusively with the Regional Safe Havens, and from there to the National Safe Haven. This ensures that data flow from the NHS is controlled and channelled through trusted research partners ONLY.

  This approach has multiple benefits including:

  - Sending a positive message to the regional population about the security of their data by retaining source data in-region.
  - Regional data can be prepared for the National Safe Haven locally in adherence with the agreed national standard – this also allows for a potential two-phase approach to Standard Research Reporting.
  - NHS resources are only called on by one trusted (regional) partner to share data.
  - Leveraging the existing relationships and connectivity between HBs and Regional Safe Havens.

  The immediate action is to map the existing data flows from HBs to Data Repositories across Scotland, agree a National Standard for this exchange.

  An **additional immediate action** is for all HBs to share health and care data for research and innovation exclusively with their Regional Safe Haven, this is not

currently the case and undermines the work of the Safe Haven, which in turn prevents the creation of a National Asset and the opportunity to realise the value of this asset for the advantage of the Scottish people.

- **Push from regional safe havens to National Safe Haven (eDRIS)**

  Whilst the data flow is described in multiple ways in multiple documents from a range of sources, it has not been possible to definitively capture the current flow of data from HB to the National Safe Haven:

  - data either flows from HB direct to eDRIS where it is prepared and shared back with the Regional Safe Haven, or
  - data flows from HB to the Regional Safe Haven where it is prepared and shared with the eDRIS, or
  - data is shared with both the Regional Safe Haven AND eDRIS, or
  - the most likely scenario: a combination of all three potential flows, dependant on the region, the programme, the data-set and localised preferences.

  It is apparent that there are also multiple other flows of data from HBs to a multitude of data repositories. It will never be possible to create a National Asset, in which the population has well placed confidence in its security, until the flow of data from within health and social care is controlled and then understood.

  The immediate action is for HB CEOs to mandate that data will flow ONLY to the Regional Safe Havens and for Regional Safe Havens to share data with eDRIS.

- **Pseudonymise once (NADS)**

  If control can be established over the flow of data – the ability to Pseudonymise "Once for Scotland" is a viable reality.

- **Push to National Dataset for Research, Innovation and Commercialisation (RDS)**

  A challenge throughout our research has been to firstly identify (and keep abreast) of all the stakeholders within the ecosystem, and then to understand the role, remit, and responsibilities of these partners.

The relatively newly formed Research Data Scotland (RDS), which has a remit broader than health and care, has identified this as a key area for development. There is also a clear stance that RDS would be the "front door to Scotland" for research data.

Providing RDS with a Pseudonymised "All of Scotland" health and social care data set would allow them to realise the value of the National Asset.

The immediate action is to develop a National Asset that RDS can realise the value of on behalf of the Scottish population.

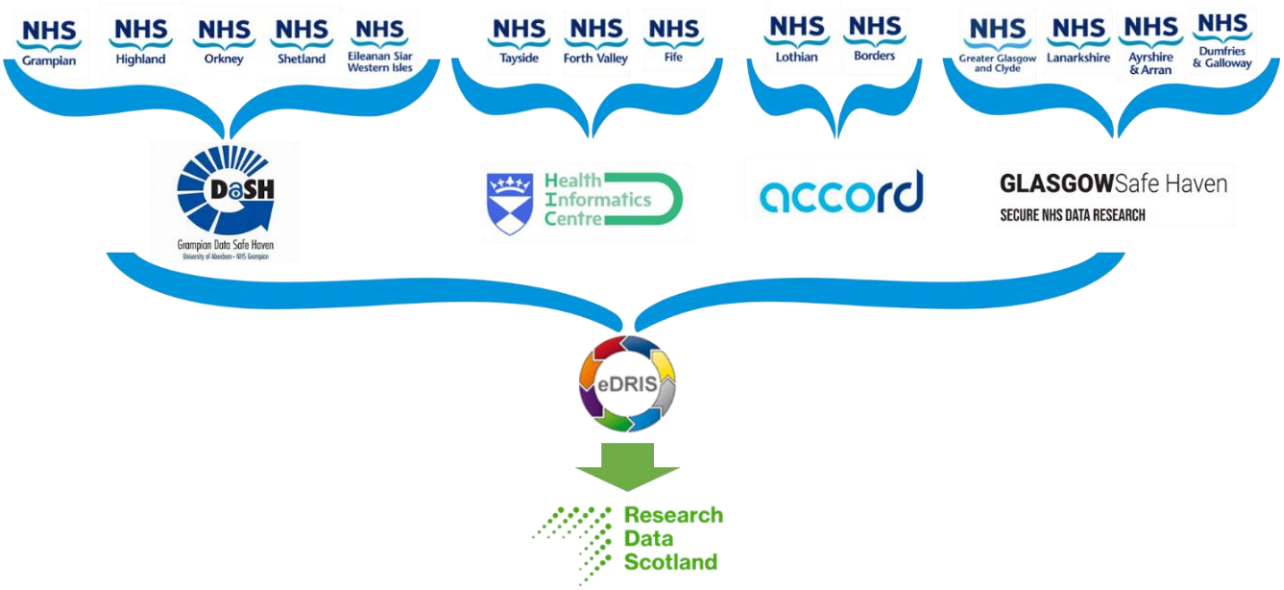


Figure 4 - National Dataset for Research, Innovation and Commercialisation

Priority 1.3: Once for Scotland – Governance (Immediate)

Information Governance ("IG") has been identified as a consistent barrier to entry for industry and researchers throughout our research. It is recognised that there are initiatives underway at a local, regional, and national level to have a "Once for Scotland" approach to accelerate the IG pathway. However, this is quite often referred to as "beginning at the beginning every time" by both researcher and industrial partners.

The need for a **"Once for Scotland" – Information Governance** approach is clear and has been well documented across a multitude of documents. Further words on this point are not required. **Action is required.**

The immediate (and very urgent) action is for Scottish Government to mandate that NHS Scotland impose a "Once for Scotland" Information Governance policy. NHS Scotland will mandate that all national, regional, and local bodies will adopt this policy.

Priority 1.4: Once for Scotland – Innovation Adoption (PULL) (Immediate)

Given the current pressures on the system it would appear to be appropriate to fully focus all resources for the time being on a "**Once for Scotland" – Innovation Adoption"** (PULL) approach, that is supported by the HB CEOs, as evidenced in the ANIA pathway (Appendix 3) and described in recent Innovation Steering Group documents setting out the remit, responsibilities, and roles. Low priority or still evolving innovations could be moved back from a health system that is facing unprecedented demand and extended waiting lists.

Action is required.

The immediate (and very urgent) action is twofold:

1. For HB CEOs to describe the urgent needs via problem statement documents that require or would benefit from innovation.
2. For all key stakeholders in the research and innovation ecosystem to focus on PULL innovation, moving PUSH innovation to a development and readiness cycle as described in Priority Area 4 – Digitisation.

Priority Area 2: Thought Leadership

Timescale: Immediate and Ongoing

During the document review and interviews it was identified that there is an immediate and ongoing action for the Digital and Data sub-group to provide consistent and visible thought leadership in key policy areas, including some where public perceptions are still evolving.

Priorities	Timescales
2.1 The Health for Wealth Programme	Immediate and ongoing
2.2 Data and Artificial Intelligence	Immediate and ongoing
2.3 Cultural Alignment	Immediate and ongoing

Priority 2.1: The Health for Wealth Programme (Immediate and ongoing)

The benefit to Scotland of a successful Health for Wealth Programme is set out in the vision of that programme, as follows:

"*Scotland is a world-class health & care economy, where innovation flourishes and citizens live longer and healthier lives".*

The underlying principles of this programme have been signed up to by all stakeholders.

This message could perhaps be more explicitly expanded.

"The Scottish economy generates wealth that funds health and social care for citizens today, and medical research for tomorrow. This ensures healthy citizens to run today's economy and a beneficial legacy of medical knowledge for future generations."

We consider that this basic principle requires immediate and ongoing reinforcement particularly due to the challenges of operating in the rapidly evolving digital and data arena. The implications of this wider vision, if it is accepted as correct, touch on other key thought leadership messages.

- In relation to the objectives of this report, optimising the alignment of the strengths of Scottish industry with the opportunities arising from the Scottish health and care systems, a specific action is required to establish clear metrics, including baseline data (Priority 3.2), of the extent to which the current health and care system budget is spent within whatever

is defined as Scottish industry, and to monitor and highlight progress, or otherwise, over time.

- Further, while it is fully recognised that the health and care system should be able to choose the industry services or technologies that are the most effective and economic for health and care service users, this does not permit the Scottish health, care, and research communities to disengage from the economic reality that their choices today may directly impact the ability of the Scottish economy to support future health, care, and research activities. There is no "us" or "them", at some level there needs to be clear accountability within the Scottish health and care system to consider and act on this, if it is to be a meaningful Scottish policy.
- A further element of a successful Health for Wealth agenda is the availability of a digitally literate workforce through upskilling of current employees and appropriate training of new entrants, for both the health and care system and industry. The challenges within Scotland of providing this have already been identified [31], the ILGDD should add to the voices contributing to the debate on this challenging issue.

Priority 2.2: Data and Artificial Intelligence (Immediate and ongoing)

There is already a high profile and ongoing public debate and challenge, nationally, UK wide and internationally, over access to and use of health and care data for research, exchange across services, and in wider digital citizen services. Frequent reference was made during interviews to the challenge of matching health and care system data governance capability with industry access requirements, while ensuring that all round trust was retained.

The key thought leadership challenges for the ILGDD will be to participate and lead in this engagement with citizens, addressing longer term cultural and technological challenges arising from wider data access and artificial intelligence, whilst ensuring that at no point is citizen trust lost or damaged.

This is a significant challenge and task that will take time and effort and will potentially put the ILGDD at the forefront of what may be a spirited debate.

Referring to the Health for Wealth Programme messaging, it is important that the debate over health and care data access fully recognises that the access granted for research purposes goes towards providing improved care for current and future generations.

This benefit to future generations is a fundamental message that should be amplified, as the willingness to provide medical data clearly generates a different response from that of blood or organ donation, yet the health and care benefits from the data can be as significant. This issue is of particular importance for precision medicine, where the medical data heritage of the current Scottish population provides a direct insight and connection to the well-being of future Scottish generations.

The quid-pro quo for this data access must be fair usage where the data is used for commercial purposes, and appropriate access to the benefits gained from the data insight where these insights are commercially developed.

As identified in Priority 1 – National Infrastructure, Scotland has already established innovative approaches to providing fair usage access (Safe Havens), albeit these havens do not encompass the whole Scottish population. Ensuring fair access to the arising insights will be a key challenge that will require careful governance and negotiation by the health and care system. This negotiation would logically be best done on a "Once for Scotland" basis, with the optimal negotiating position achieved where the data access on offer includes the whole population.

Priority 2.3: Cultural Alignment (Immediate and ongoing)

As identified in Priority 1 – National Infrastructure, there remains a subtle, sometimes more explicit, cultural divide between the health, care and academic community and Scottish industry as the commercial community in this report. There needs to be recognition across all elements of the triple helix that this cultural disconnect needs to end – **the ILGDD undertaking a wide-reaching thought leadership exercise addressing this issue is of paramount importance.**

This issue is heightened in the relatively rapidly evolving area of digital and data health and care, where the parties are still iterating business and service engagement models, working out relationships and new contractual terms, are cautious or unclear about boundaries, are cautious of new data governance rules and increased cyber-security threats, and where in-house digital "build" aspirations may compete with over-sold "buy" ambitions.

The ILGDD will have an ongoing task to openly address these perceptions and continually nurture cultural alignment.

Avoidance of conflicts of interest and retaining trust and integrity on all sides is vital. Equally the economic reality of the mutual inter-connectedness and long-term common interest is unavoidable.

For the health and care system some of these cultural alignment issues could be addressed by consideration of what it takes to be a “good customer”, this point is touched on in Priority 3.3 - “Declutter” the Scottish Health Research and Innovation Ecosystem.

For the commercial community one area of potential change is at the level of engagement with what is referred to as “innovation” within a health and care context but would perhaps better be defined as “procurement ready innovation”. This is discussed in more detail in the Section on Other Observations.

Again, there would appear to be a benefit to leading the debate to openly discuss this issue, identifying causes and addressing issues, and providing thought leadership. The ILGDD is well placed to do this.

Priority Area 3: Opportunity Analysis

Timescale: Immediate / Short Term / and Ongoing

For the ILGDD to effectively measure the impact of its efforts on the health and wealth agenda it must understand the immediate opportunities within health and care, establish a baseline from which to measure the impact of any changes it implements and focus the resources available to it in a cohesive and impactful plan. Our research has led us to identify three priorities:

Priorities	Timescales
3.1 Establish a health and care "opportunity pipeline"	Immediate and ongoing
3.2 Complete a review of health and care procurement spend (digital and data)	Short and ongoing
3.3 "Declutter" the Scottish Health Research and Innovation Ecosystem	Short to medium

Priority 3.1: Establish a health and care "opportunity pipeline" (Immediate and ongoing)

As described in Priority 1.4 – there is an immediate and urgent need to adopt a "Once for Scotland" – Innovation Adoption (PULL) approach, this is the most logical way to support health and care in the short to medium term. To fully understand the potential scale and value of the market opportunity, we have recommended that the ILGDD draw on a methodology common in the commercial sector – **an opportunity pipeline.**

During WP1 (Desktop review) we identified c.400 "opportunities", of which c.100 were potential procurements or developments of solutions. The ANIA pathway will identify the "Problem Statements" of the HB CEO resulting in an (as yet unqualified) number of priority opportunities. This extremely valuable information is hidden within the multitude of documents produced by the health and care system and needs to be extracted and presented in a unified manner. A similar methodology has been championed by Health Innovation

Manchester, and subsequently adopted across the English Academic Health Science Network for PUSH innovation.

The immediate and ongoing priority is to specify and commission an ILGDD / ISG opportunity pipeline capturing the status and value of the immediate needs within health and care across Scotland, initially populated with the HB CEOs "problem statements" and the wider long list of qualified opportunities.

Priority 3.2: Complete a review of health and care procurement spend (digital and data) (Short term and ongoing)

Establishing a baseline of health and care procurement spend for digital and data opportunities with Scottish companies will ensure the accurate evaluation of the work of the ILGDD and other key partners. Our research has not identified a comparative evaluation that has been completed recently, although that is not to say this information is not currently available.

The immediate action is to complete a review of Procurement spend in a manner that ensures an efficient, accurate and ongoing perspective of this information, additionally this will create the key performance indicator against which the ILGDD should measure itself: **what percentage of the identified health and care market opportunity has been procured from Scottish companies.**

Priority 3.3: "Declutter" the Scottish Health Research and Innovation Ecosystem (Short to Medium term)

As evidenced in *Figure 2 - Scottish Health Research and Innovation Ecosystem* and consistently referenced in the research and interviews we have completed, the current support system for health and care research, innovation and commercialisation in Scotland can be politely described as "cluttered". [(61)]

There are many programmes / organisations / initiatives operating at a local, regional, and national level making it challenging for industrial partners to identify the most appropriate route to market. This results in an, at present, unquantifiable expenditure of "innovation pounds" by organisations striving to bring their products to market.

Whilst there are excellent examples of initiatives attempting to address this, most notably the recent review and refresh of the HIAP gateway managed by the NSS, there is a requirement for a unified and singular approach for digital and data providers seeking to access the Scottish health and care market.

Combining the findings of the comprehensive research we have completed with our previous experience and an independent perspective we have identified a potential solution that builds on the strength, remit, and responsibilities of several key organisations to address this "cluttered" landscape *(Figure 5 – De-cluttered Scottish Health Research and Innovation Ecosystem)*:

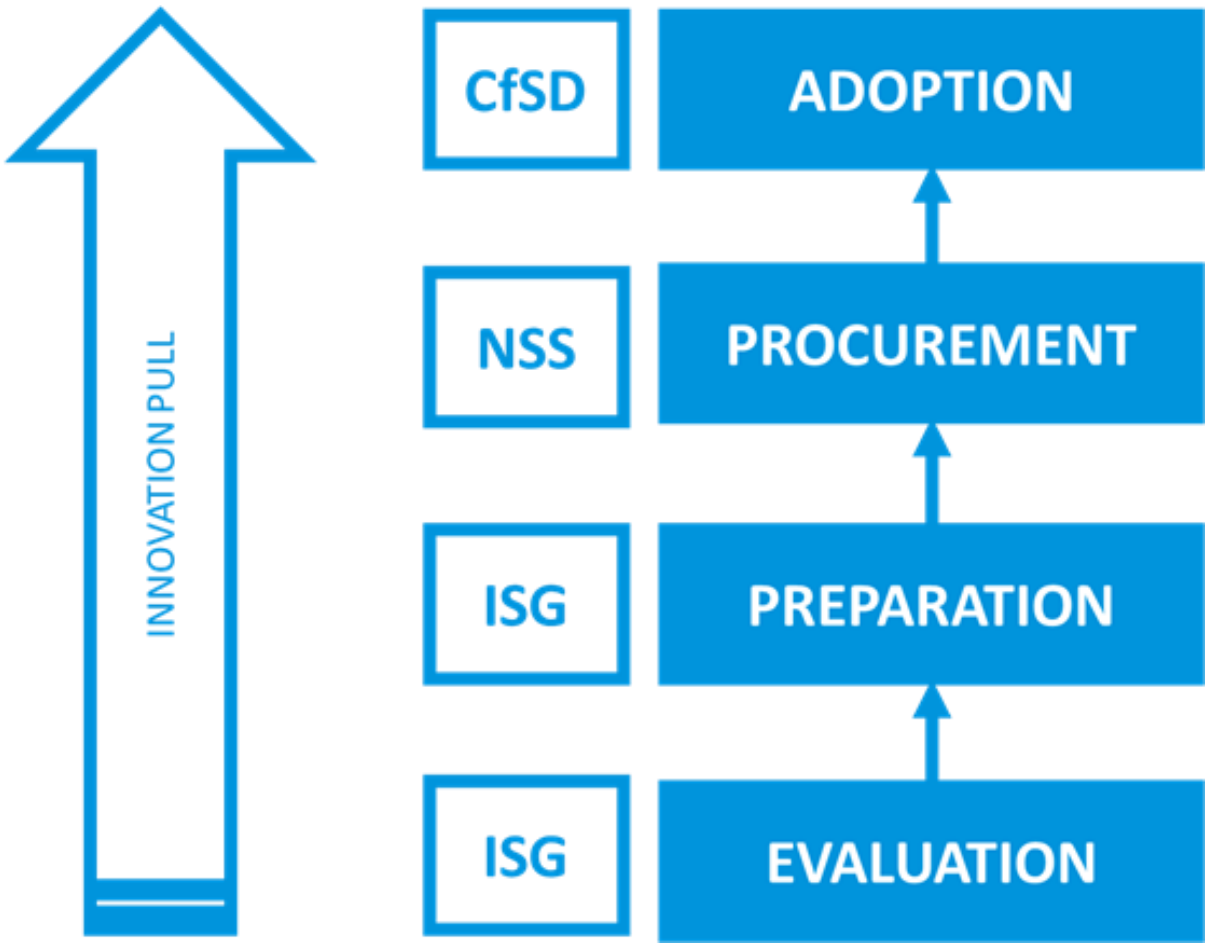


Figure 5- De-cluttered Scottish Health Research and Innovation Ecosystem

The short-term action is to de-clutter the Scottish health and care research and innovation ecosystem – with a specific focus on digital and data. (Priority 3 assumes that control has been gained over the flow of health and care data, as described in Priority 1.)

- **Evaluation (ISG)**

  One of the consistent elements of exemplar support programmes globally is sufficient scrutiny in the evaluation of commercial or innovation opportunities against an

appropriate and agreed set of criteria and then only investing resource in those that meet with the needs of the market. In this case the immediate market is the PULL from Scottish health and care, however we have also set out below how companies not matching with a PULL requirement should be supported.

This is within the remit of the Innovation Steering Group, and a process for evaluations has been set out in recent ISG papers.

The immediate action is for the role of the ISG to be recognised nationally, with ministerial support and enforced for (as a minimum) digital and data projects, leveraging the control over access to Scottish health and care data as described in Priority 1.

- **Preparation (ISG)**

  Another consistent element of exemplar support programmes globally is the allocation of dedicated and experienced "Navigators" (with both health and care and commercial experience) guiding companies through the required preparatory work, identifying sufficiently credible and influential champions from within the health and care system and supporting the key stakeholders in the adoption process.

  As previously identified there exists within the Scottish ecosystem a multitude of programmes/organisations/initiatives providing support to companies in preparation for adoption into the health and care system and we have seen many good examples from established organisations – including the DHI and the regional Innovation Hubs.

  The immediate action is to capture the strengths of each of the current support programmes/organisations/initiatives and their capability as a "Once for Scotland" provider of "Navigators". It will be the responsibility of the ISG to match company with navigator.

  The supplementary action is referenced in Priority 2.3 – Thought Leadership and requires the ILGDD to communicate the "decluttering" strategy effectively to the multitude of organisations/initiatives and **ensure compliance**. Given the representation from the ecosystem on both the ILGDD and the ILG this is both achievable and within remit.

- **Procurement (NSS)**

  NHS NSS has demonstrated its ability and desire to support the procurement of innovation into the Scottish health and care system, drawing on various procurement tools and mechanisms to achieve this. The solution we have described assumes that NSS would identify the most appropriate procurement mechanism to facilitate the onward adoption by the health and care system, this may be through a specific digital and data framework as successfully used by NHS Wales, or through an Innovation Partnership Procurement contract or Pre-commercial Procurement.

  The evaluation stage of this solution prioritises HB CEOs Problem Statements through the ANIA pathway, which will have an allocated and approved budget and commitment from the CEOs to adopt, effectively removing two of the most challenging barriers to entry for innovation adoption.

- **Adoption (CfSD)**

  The relatively recently created Centre for Sustainable Development (CfSD) has set out its role and responsibilities and how it will deliver these in its Annual Workplan. It is best placed, with both ministerial and health and care system support, to drive the adoption of appropriate innovation and best practice.

Navigators

We have identified the importance of dedicated and experienced navigators in Priority 3.3. We would expect that a Navigator will work with a company from evaluation through to adoption – these are long term and critical relationships for both the health and care system and industrial partners. We have also described how Navigators will be drawn from across the current ecosystem, this relies on control being gained over both the flow of data and the support ecosystem.

Priority Area 4: Increased Digitisation

Timescale: Immediate

Alongside Priority Items 1-3, there is an immediate and substantive health and care system priority and industry opportunity to support the PULL from within the Scottish health and care systems by identifying where Scottish industry can contribute to the completion of the digitisation of the Scottish health and care system.

Priorities	Timescales
4.1 Address the basic digitisation needs that exist today across health and care	Immediate and ongoing
4.2 Ensure real time dataset access for key clinical areas and emerging sectors.	Medium
4.3 Develop a national strategy for engaging with Clinical Research Organisations	Short to medium

Priority 4.1: Address the basic digitisation needs that exist today across health and care (Immediate and ongoing)

While this report has not sought to identify and prioritise between individual health and care systems, there is a widely acknowledged gap between the health and care system's level of digitisation and equivalent digitisation in commercial environments and the digital technology in daily use by citizens[102,108]. The extent of this digitisation gap is in some cases surprising, particularly with respect to the care system. Some of this is understandable as it may not previously have been a relevant priority area, particularly relative to more immediate and traditional demands for investment, however some of the needs detailed in care sector reports are very basic. [15]

Recognition does need to be given to the significant advances that have been made over the course of the past eighteen months as a result of the Covid crisis creating an environment where change was the only option. This has resulted in some significant changes in service delivery and progress in system interconnectivity and data exchange within some regional

health and care systems, to the extent that there is now probably a need to refresh the understanding of the actual level of progress in individual regions.

Further recognition also needs to be given to the general ongoing improvements that are being made across the health and care digital infrastructure – but this also highlights the issue of it being a fulltime challenge to maintain adequate awareness of the state of development across such a wide range of systems, particularly where there are variations in the configuration of common systems across regions.

The immediate priorities in this digitisation process have been identified widely in many reports [6, 7, 11, 12, 15, 23, 30, 32, 33, 37, 38, 39, 41, 44, 45,46,53, 62, 63, 69, 77, 87] and include for example:

- Accelerating care system digitisation – which relative to the health sector and commercial sectors would in many cases be more appropriately described as a catch-up exercise. (It was suggested that in this sector well designed smartphone / mobile systems may offer the best path to increasing digitisation, being more likely to be already familiar to care staff, as well as being low cost.)
- Technologies to move from health system first generation telemedicine to more extensive asynchronous consultation, building on the existing telehealth programmes and other recent Covid driven changes.
- Completion of basic primary, secondary and care sector data interconnectivity, including real-time / near real-time data access where possible / desirable.
- Provision of platforms and system data readiness / curation for emerging AI technologies.
- Post-Covid extended waiting list initiatives.
- Further integration of internet of things devices, planning, and preparation for next wave devices.

The, in some cases, quite basic, digitisation requirements have been the focus of many previous reports and were the most frequently cited issue during our documentation review and subsequent interviews. Digitisation of the health and care systems is recognised as an inevitability and a key driver of system efficiency and cost control. Digitisation, along with other priority areas, will be an enabler of gains from data analysis and proven AI in due course.

Priority 4.2: Ensure real time dataset access for key clinical areas and emerging sectors. (Medium)

Covid has shown the need for real-time / near real-time data for management of public health emergencies. This requirement also then extends to the provision of data for clinical research during such an emergency, if one is to be able to track and research the causes.

As precision medicine develops, the scope and demand for increasing data granularity from these systems would be expected to further increase. Again, not having systems that can provide this data will put Scotland at a research disadvantage.

Priority 4.3: Develop a national strategy for engaging with Clinical Research Organisations (Short to Medium term)

Regarding clinical research the message was quite clear and consistent. Scotland has historically had a good reputation for clinical research but the perception that Scotland is maintaining that position was now open to challenge, as the current degree of digitisation was unattractive for clinical research purposes relative to other parts of the UK or many European regions. Consequently, opportunities were not currently being won by Scotland. (There was recognition that the Digital Safe Havens are very helpful but scaling and trials recruitment still presented fundamental challenges.)

A final point on this topic highlighted a more basic issue, that of a need for improved research accounting systems, with research costs sometimes appearing very slowly from within the health system.

Alongside this it was very clear that industry wants to work with the Scottish health and care system, to improve the system and for research, but that every day lost, is a lost opportunity and a day without progress. There is recognition that delivery of many health and care infrastructure projects may be inclined towards larger corporates, but as progress is made additional opportunities for Scottish data & digital companies will emerge to assist in delivery of more general as well as specialist digital services.

Priority Area 5: Data and Artificial Intelligence

Timescale: Short to Medium

Within the Data and Artificial Intelligence category two distinct priorities have been identified that necessarily have to follow on from completion of digitisation / establishment of a more cohesive Scottish national digital data infrastructure.

The two priorities, and respective timescales are: -

Priority	Timescale
5.1 Establish a safe, structured, and accessible dataset to accelerate the digitisation of health and care and the use of data & AI.	Short to medium
5.2 Provide sufficient funding to scale impactful and respected programmes in a structured manner to develop innovative "PUSH" solutions from Industry, whilst accelerating solution matching for "PULL" from health and care.	Medium

Priority 5.1: Establish a safe, structured, and accessible dataset to accelerate the digitisation of health and care and the use of data & AI. (Short to Medium term)

The short-term priority is to put in place the necessary national data processing and information governance infrastructure for health and care, that will enable national health and care datasets to be accessed in an efficient "Once for Scotland" process covering all of Scotland. [7,32, 57]

The benefits to be gained from establishing such datasets has been so widely covered by many previous reports, it feels unnecessary to have to repeat them in detail. The opportunity to identify novel clinical and organisational insight sits alongside the opportunity for process assistance and automation, that will help with workforce efficiency and availability challenges, all of which are opportunities or challenges that the Scottish health and care system needs to embrace.

Not doing this will prolong the current situation where Scotland is currently a less attractive place to access such datasets, as larger datasets can be accessed more easily in other

countries or regions, versus the data not being in an accessible form or available at scale to support development in Scotland.

This priority needs to fully address and put into context any challenges to this national strategy from alternative initiatives that would simply create or prolong sub-scale research data, or where local data insight perspectives disrupt the drive to achieve a national standard.

Further disadvantages to Scotland will arise if this data is not available to support emerging areas, such as precision medicine, both in relation to the international attractiveness of Scotland as a research destination, and in due course to the potential ability of Scotland to provide efficient precision medicine services to its population, where this relies on access to standardised medical data across all of Scotland.

All of this would be a disadvantage for the Scottish health system and academic research community in terms of staying at the forefront of clinical research and development, and will limit the opportunity for Scottish based companies to develop such technologies, other than if they access data from other regions. AI solutions will of course become available across the health and care system, but the opportunity for economic benefit from these being developed in Scotland will have been lost.

There are positive developments in this field notably the innovative iCaird programme and the data Safe Havens. As described in Priority 1 – National Infrastructure, for Scotland to realise the full benefit of the iCaird programme the data Safe Havens needs to move to operating on a national basis as quickly as possible.

The medium-term element of this priority is to then expand the data to cover care information, to the extent considered appropriate. It is assumed this will be a more complicated task which will follow on from increased digitisation of the care sector, and interconnectedness to the health systems. It is assumed to be more challenging due to the less developed and more fragmented care systems, that are not currently connected to digital health systems. The introduction of a National Care System for Scotland may accelerate this process. In addition, it is assumed, as described in Priority 1.3, that there will be further governance challenges to be addressed before the public are comfortable with what could be perceived as quite detailed citizen data being held for management, planning and research purposes, sourced from both health and care systems.

Priority 5.2: Provide sufficient funding to scale impactful and respected programmes in a structured manner to develop innovative "PUSH" solutions from Industry, whilst accelerating solution matching for "PULL" from health and care. (Medium)

Alongside the priority action set out above there is a parallel need to provide sufficient funding to take the existing successful programmes and to grow them.

Currently support for data and digital research and innovation across Scotland, as noted earlier, is cluttered. As an evolving ecosystem there is a need to bring order and allocate funding to those programmes that most closely align with the priorities of the health and care system and, ideally, the health and wealth agenda.

These programmes should be able to demonstrate the ability to provide access to data to an accepted standard whilst also delivering impactful programmes.

In implementing this action this should ensure that the provision of health and care data to regional and national Safe Havens meets the Scottish standard and provides sufficient funding to ensure a sustainable future and protect a valuable national research asset.

Examples of programmes.

- iCaird, whilst a relatively recent initiative, is already showing impact in a rapidly emerging field, and has developed a methodology that allows for funded themes to address specific issues using AI.
- the DHI combines good experience of working with partners to drive innovation adoption and a richness of institutional knowledge.
- CfSD has a clear remit to simplify how industry and the NHS work together and leading on the co-ordination of accelerated national innovation adoption across the regional health boards.
- Regional Innovation Hubs

Priority Area 6: Further Enabling Technologies, Preventive Care and System Convergence

Timescale: Medium / Long

In assigning Priority 6 a “medium and a long-term" categorisation, recognition had to be given to the immediate need to implement the underlying Priority 1, national infrastructure for health and care, and Priority 4, increase general digitisation. Once these earlier priorities are addressed this will provide the capability for the meaningful collection, curation, and access to data at a national scale, and the platform upon which development of Priority 6 technologies and system innovations can be made and deployed at national scale.

Priority	Timescale
6.1 Meaningful deployment of further enabling technologies once Priority 1 and Priority 4 addressed.	Medium to Long
6.2 Priority 1, 4, 5 and 6.1 enable extended preventive care strategy. (Align with ANIA Horizons)	Medium to Long
6.3 Addressing health and care system convergence / citizen data technology challenges.	Medium to Long

The examples of service and technology innovations within this section should not be regarded as an exhaustive, prioritised list of the innovations. They are examples of service and systems changes, and technology innovation that are either dependent on the availability of the national infrastructure; or will be more valuably deployed once the national digital infrastructure is in place; or which are lower priority or longer lead time innovations due to challenges in other aspects of their incorporation into and adoption by the health and care system.

Assuming the successful implementation of national data policies which provide the platform for AI technologies, further advances and developments are expected to arise from these “further enabling technologies”, such as more advanced internet of things (IoT) devices, potentially incorporating sensors that allow novel or more reliable remote sensing, alongside developments in e.g. the use of augmented / virtual reality, robotic devices, wearables, m-health, etc. in health and care settings.

The ability to adopt these types of technologies at scale would be expected to open-up considerable opportunities for innovations in health and care that fall within the preventive care category, helping citizens avoid, delay, cope with or recover from ill health, or providing closely monitored, personalised remote care and support.

Again, the issues associated with the convergence and exchange of citizen data across health and care boundaries would be expected to give rise to primarily non-system challenges which may take time to resolve. Hence it is assumed that these will have a longer lead time to adoption and roll-out, due to cultural, usability and non-system technical challenges.

Alongside this the evolving threat of and very challenging nature of data cyber-security and wider privacy issues will continue to evolve and could delay or disrupt progress at any point.

The availability of national data at scale will allow the commissioning health and care providers to gather and track real-world outcomes data, consider outcomes-based payment for providers of health and care services and technologies, as well as providing greater cross system performance insight.

As enabling base technologies mature, this will allow progress on converged national care structures and support healthy ageing objectives, more pervasive health care “hospital without walls” developments, patient interaction with devices, patient centric versus system centric software, other preventive care / “pre-patient” (or waiting list) support, innovative data ownership & exchange models, and citizen adoption challenges.

During the drafting of this report the ANIA Programme (Accelerated National Innovation Adoption) was identified and the following diagram from that recently published programme aligns closely to this priority area. [104]

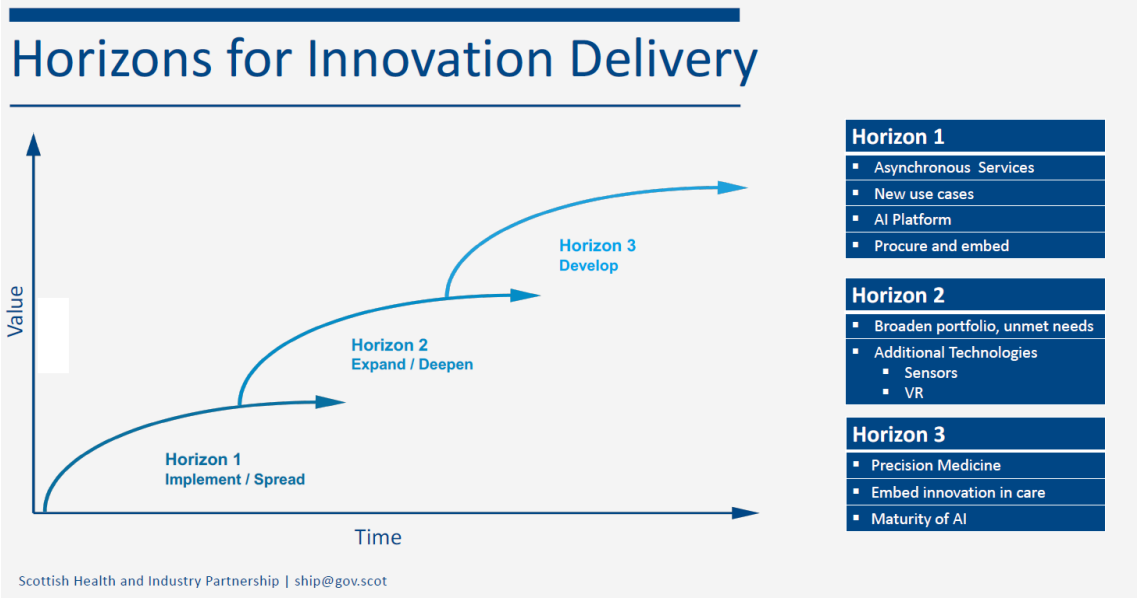


Figure 6 - Horizons for Innovation Capture

It would have been pleasing to have assigned this a short / medium term priority, and it is likely that some sub-scale / or sub-optimal deployments of these technologies will be possible in shorter timeframes, but the derived value and general availability of such early implementations would be more limited, and / or the delivery costs higher due the systems not operating across a national infrastructure.

Health systems in other countries are already progressing with technologies within this category, hence the extent and immediacy of the challenge for Scotland to maintain parity or catch-up, if the Scottish health and care system is to be able to synchronise opportunities arising from within the system with Scottish industry. If not possible, innovative Scottish companies will find themselves supplying innovation to other health and care systems before the innovation value is recognised or can be adopted in Scotland.

Priority Area 7: "Outside of System" Innovation, Personal Wellness Technology & Data

Timescale: Ongoing

While the scope of this project was to identify opportunities arising from the Scottish health and care system that could be aligned with the strengths of Scottish industry, the ILGDD should have an **ongoing** priority to identify and support Scottish industry in its development of "outside of system" innovation, and innovation in emerging areas such as, e.g., personal wellness technology and data. [9]

The basis for including these areas as a specific priority arises from observations from within Scotland and review of global health and care systems, wider market trends and reports.

Given its relative size and specific structure and needs, the Scottish health and care system does not necessarily represent a large or, for some, an economically attractive, commercially sustainable market for Scottish industry. It also follows that the Scottish health and care system does not have perfect foresight of all innovations today, that will be needed by the health and care system tomorrow. Therefore "outside of the system" innovations need to be supported as equally as any, and the potential arising from some of these technologies could have significant implications for the Scottish health and care system, and this needs to be monitored and considered.

Priority	Timescale
7.1 Support "outside of the system" innovation as part of Health for Wealth activity and for implications and insight.	Ongoing
7.2 Support businesses focused on health and care systems outwith Scotland	Ongoing
7.3 Horizon scan developments in personal wellness technology and data, and consider implications and opportunities for health and care system.	Ongoing

Alongside this health and care system driven perspective, other surveys have highlighted industry preferences that Scottish health and care support programmes should address global markets from the outset, with programmes that were focused solely on Scotland actually of less interest. [29] Given the historic complexity and limited opportunity of selling into domestic health and care markets there are many businesses that have adopted the approach of

securing international sales as a priority, in anticipation of domestic sales following in due course.

Inevitably during this project emerging health and care companies were identified that have secured recent significant investment but who, as far as can be ascertained, currently have limited or no engagement with the Scottish health and care system. **This "outside of system" innovation is a strength of Scottish industry and a sign of a healthy commercial ecosystem.** Horizon scanning for such innovations, understanding why the innovation has not been adopted by the Scottish health and care system, and whether it should be, is the further logical step that should be included within this activity.

Alongside this generalised activity, the emergence of personal wellness technology and data represents both a challenge and an opportunity for the health and care system.

At a simple level it is a trend driven by technology development that is engaging with the citizen as part of their wider lifestyle, before they cross any boundary to entering the health or care system, as the patient or as someone under care. This is beneficial in terms of increasing familiarity with health and care system technologies and processes, and the related issue of ownership and use of the data arising from such systems. This may help ease the transition of the population to more highly digitised health and care system.

There is a potential opportunity to engage with this pre-patient / pre-care population through these systems, to support and monitor well-being before they enter the formal health and care system.

Given the pace of development of low-cost novel sensors, data analytics and privately available precision diagnostics and genetics analytic services, the health and care system will as equally need to engage with demands arising from the "worried well" as from a potentially highly informed health and care population with access to state of the art monitoring and diagnostic insight generated outside of the traditional health and care system. With some of the drive for personal health / life-style monitoring data driven by insurance demands, the consumer may well expect or require some means of data interchange of health and care system, personal and commercially generated data.

As part of the post-Covid recovery planning, engagement with such systems may provide an opportunity to support pre-patient / long-term waiting list patients outside of the formal health and care system.

Finally, alongside the inevitable focus on technological innovation there will be a need to consider innovative approaches as to how this data should be held and exchanged from an organisational, governance and legal structure perspective. This is a clearly a multi-faceted challenge crossing over the boundaries of personally generated data, data generated from skilled or professional insight, diligence or proprietary health and care systems, research data, and commercially generated data, all of which at any level could be subject to governance, regulatory, confidentiality or intellectual property requirements. [9, 102]

As identified in the Priority 2.2 action, (thought leadership on Data and Artificial Intelligence), this aspect of that leadership task will continue to evolve and require innovative approaches that are both equitable, beneficial, and practical for all parties.

Other Observations

Digital and Data Ecosystem Mapping

It is evident that the Scottish data and digital ecosystem is rapidly evolving, with various initiatives and organisations already succeeding earlier initiatives and organisations, which may themselves only have been in place for a few years. We also became aware during discussions of potential plans for successor or analogous organisation to be established that would takeover or expand activities of existing organisations. (We were surprised by the extent to which organisational "discovery" continued throughout this project and cannot be sure whether we ever achieved comprehensive domain knowledge!)

To some extent this is understandable as the sector inevitably encompasses various specialisms and crosses organisational boundaries, before splitting further due to there being national and regional / super-regional bodies, as well as academic and operational bodies.

Even for those reasonably well engaged within the system it was noticeable that the rate of change was significant and navigating this system would be assisted by access to an up-to-date mapped overview of the ecosystem.

The Life Sciences in Scotland Scottish Health Research and Innovation Ecosystem map, *(Figure2)* (Scottish Health Research and Innovation Ecosystem (directories.scot)) was an invaluable guide during the early phase of this review in understanding the context and inter-connectedness of the many organisations involved in the various aspects of the ecosystem.

There is a need to publicise, update and maintain the availability of this resource, and where necessary develop additional ecosystems maps.

This mapping appeared to be a valuable activity for the Life Sciences in Scotland group, not only to facilitate commercial engagement with the system, but it also places in their hands the means to highlight duplication of effort, identify where resources can be shared, map and spread best practice and identify potential gaps or areas where support systems may need to be reconfigured.

Health and Care "Innovation"

During this and other projects, and more generally and contemporaneously, it has become more evident that the use of the word "innovation" in a health and care context is fraught with difficulties.

The underlying issue is that it is a generic term which is open to potentially significantly different interpretations by different audiences and has become politicised as a yet to be defined solution to current or emerging problems.

Within the operational health and care setting the reality of the term “innovation" is at best “procurement ready innovation”, more probably it is mainly “service innovation” which is as likely to be changes to an existing proven system, through enhancement or incremental development of that system, or wholesale system upgrade to a replacement, proven state of the art system from an established supplier and may not even be a technological solution.

The health and care system does have a long-term interest in novel technological innovation, but the reality of adoption and system change is generally not quick and with limited, ideally nil, risk of failure for (i) patients or (ii) careers!

Within industry "innovation" is potentially more of a paradigm shift, potentially soon if not immediate, and with a financial and technological risk / reward appetite divergent to that found within the health and care system.

For start-ups and SMEs, the expectation of health and care innovation programmes is of meaningful engagement and progress within the SME’s funding window. The reality is often much slower, and the inevitable consequence of this mismatch is an expectation management issue, disappointment, frustration from overestimating the rate of progress and potential business failure.

It is accepted that it is unlikely that the ILGDD will be able to convince the Scottish health and care ecosystem, its leaders, and politicians to drop the use of the word “innovation” and switch to “development”, but it can seek to ensure that the reality of the situation is communicated to the particularly, entry level companies in the ecosystem.

It can also work to support the concept that ideally the "innovation" level might be defined as being one step back from the health and care system (e.g. at the DHI level) with anything closer to the system defined as “development” or “procurement ready innovation” only.

In many ways given the challenges facing the Scottish health and care system, in the first instance, innovation is not what is required.

Conclusions

The objective of Stage 1, i.e. this report, was to:

- Identify clear and specific priorities (i.e. prioritised opportunities) for the ILGDD short term focus (areas of immediate impact),
- Scope out potential medium and longer-term interests.

These were intended to identify priorities for industry relating to data and digital health and care but selected for optimal synergies with priorities of other stakeholders such as the NHS and Scottish Government.

After reviewing many impressive, high quality, insightful and comprehensive reports on the Scottish health and care systems during the desktop research, which contained multiple recommendations, the extended range of interviews very quickly began to highlight cross-cutting recurring themes of issues / opportunities that have then been selected as the seven priority themes for the ILGDD to consider.

In drafting these priority areas for Stage 1, we have tried to envisage what we think the ILGDD should be doing. We do anticipate that these will evolve prior to progressing with any Stage 2 work.

We have not tried to produce a comprehensive review of the reports that were read. Many of the initial batch of 37 reports stand in their own right as respected landmark reviews of national policy area or specific and highly informed reviews of key areas of the Scottish health and care system. It seemed more appropriate to produce an enhanced bibliography of these documents with selective quotes, so that they speak for themselves in the areas where they are most relevant and where their recommendations have informed this report. The bibliography also references many other documents that were reviewed to understand detail or provide context of developments elsewhere in the UK or international health and care systems.

After the initial challenge of digesting the breadth of scope and variety of issues covered in these reports, the interviews repeatedly highlighted that many of the issues identified remain unresolved and are directly affecting the deliverability of the Health and Wealth agenda.

Much worse than this was the clear message that Scotland is already losing out relative to what should have been its fair share of research activity, and that any perceived punching

above its weight in health and care research is stalling and likely to be lost to other regions where there was **a more technologically coherent, less organisationally fragmented system**. It was stressed however that as a standalone, sophisticated and, in principle, integrated health and care system, with access to world class academic research centres and investment, and with a population of ~5m, Scotland remains of strong interest to industry as a country to work with. It is just that the competitiveness of the system is declining relative to other options.

The strong themes that emerged were:

- Priority 1 **National Infrastructure**
- Priority 2 **Thought Leadership**
- Priority 3 **Opportunity Analysis**
- Priority 4 **Increased Digitisation**
- Priority 5 **Data and Artificial Intelligence**
- Priority 6 **Further Enabling Technologies and Preventive Care, and System Convergence.**
- Priority 7 **"Outside of System" Innovation, Personal Wellness Technology & Data.**

In arriving at these priorities, we coalesced information from the reports and the interviews, along with our own input from what we see in other systems, whilst also looking at what was being said in the reports and interviews, and how it was being said.

Priority 1 **National Infrastructure**

This was the recurring theme and frustration throughout many reports and interviews. The challenge of creating a "Once for Scotland, for all of Scotland" system must be delivered to capture the benefits from emerging technologies such as AI and precision medicine, whilst also maintaining (or restoring) Scotland's research capability.

Priority 2 **Thought Leadership**

The thought leadership priority may already be one that has been identified by the ILGDD, however as our work progressed, we increasingly felt a need to highlight three specific topics. The interconnectedness of a Health for Wealth agenda needs to be understood by all; there is no us and them. The data and AI debate is one that needs strong informed voices prepared to publicly state the case where needed. Finally, the cultural alignment issue requires continual nurturing to ensure that there is no misalignment, and that the system has good customers and suppliers.

Priority 3 **Opportunity Analysis**

There is, firstly, a need to fully understand at a more granular level of detail the actual available opportunities across health and care, secondly, to capture the value of these opportunities and progress over time, and finally, clarify the health and care innovation ecosystem. We have recommended adopting a simple methodology from industry to capture this information – an opportunity pipeline. Completing a review of previous expenditure with Scottish companies will provide a baseline to evaluate the health and wealth agenda.

Priority 4 **Increased Digitisation**

Closely related to Priority 1, this is an issue that recurs in many reports over the years and was repeatedly highlighted as the major challenge and frustration. There is a lot of good work underway within the health and care system, much having been driven by Covid, but the care system is also coming from a more basic level and the challenges of closely integrating the systems lie ahead, on top of post-Covid operational capacity challenges. This is however the immediate opportunity for Scottish industry to engage with the health and care systems and support it. It is perhaps less leading edge in many areas, in some areas it is distinctly a digital catch-up process. While inevitably many health and care projects will be delivered by large multinational specialist data and digital groups, there may be scope within this broad category for wider engagement with Scottish digital and data companies and to develop long-term relationships.

Priority 5 **Data and Artificial Intelligence**

The data and AI priority is the high-profile win, where an emerging area of technology holds the promise of wide-ranging benefits to the health and care system in many facets of its operations. Whether the systems are used to ease potential workforce issues by automating routine tasks, assist already highly skilled professional staff, or identify completely novel insights, the lure of the benefits is clear. To ensure Scotland's research and commercial sectors can fully participate in the development of this sector the shortcomings and issues in Priorities 1, 2, 3 and 4 need to be addressed. **It is perhaps salutary that this is relegated to being the fifth priority, reflecting the work that needs to be done before the full potential can be realised.**

Priority 6 **Further Enabling Technologies and Preventive Care, Health and Care System Convergence.**

Priority 6 and 7 are the priorities where, having addressed the underlying issues and put in place deployable systems that support the data and AI development, the next generation of health and care technology can move forward.

This sequencing of these priorities appears to align with the ANIA prioritisation – ideally the two should align.

Priority 7 **"Outside of System" Innovation, Personal Wellness Technology & Data.**

This priority strictly sits outside the remit of this report as it does not align health and care sector opportunities with Scottish industry strengths. It was striking that during the work Scottish companies were identified that are progressing in other non-Scottish health and care systems and hence, assuming the Scottish health and care system has a limited capacity to engage with, evaluate, imagine or purchase novel technology, there has to be an ongoing priority within the ILGDD to support these businesses as part of the health and wealth agenda, and to understand why the Scottish health and care system is not engaging with them and question whether it should.

Of equal importance to this there are two additional factors. Some Scottish companies actively avoid engaging with the Scottish health and care system due to the challenges of entering this market. The ILGDD should not lose sight of the innovation arising within these companies.

Finally, technology is evolving in many ways, and this may bring opportunities for external change to facets of health and care that the system is not prepared for. If it is a Scottish company that can do that, it is no bad thing, the ILGDD should be looking outside the system to understand what these changes may be.

The bibliography follows and if not already familiar with all the reports, it is worth perusing some of the highlighted quotes to understand the breadth of the reports already published on various topics. Some of the reports are relevant to areas that the ILGDD can bring specialist expertise and support, others reference much greater challenges for the Scottish economy and education system to address, linking to the other overriding LSS ILG themes of skills and infrastructure, where the ILGDD must be one of many voices from the digital and data sector demanding action.

Addendum – OECD and Financial Times / Lancet Reports

During the final preparation and drafting of this report, two further sets of reports were identified that significantly paralleled and underlined many of the key findings of this report. The reports are, from the **OECD**, April 2021: -

"*Survey results: National health data infrastructure and governance"* (OECD National Health Data Infrastructure and Governance)

and in July 2021: -

"*Empowering the health workforce: Strategies to make the most of the digital revolution*" (OECD Empowering Health Workforce).

and in October 2021 a report from the **Governing Health Futures: The Lancet and Financial Times Commission**

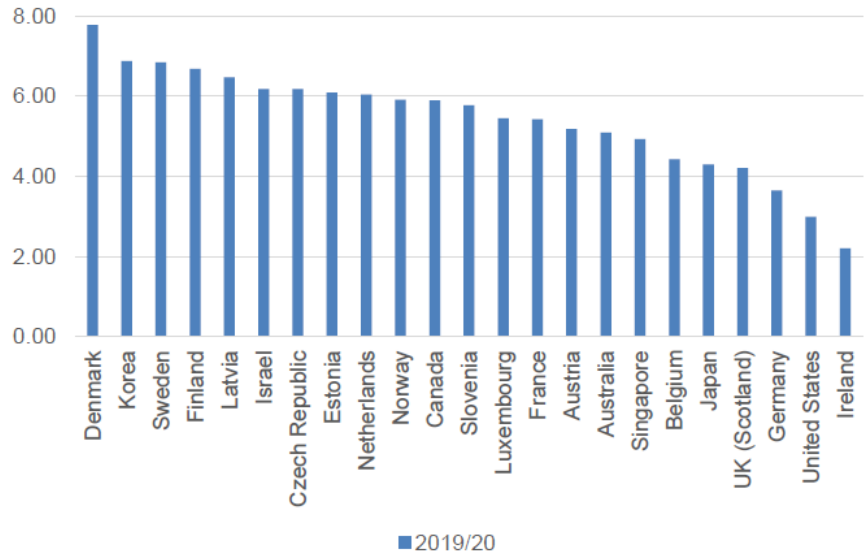
"*Governing health futures 2030: growing up in a digital world*" (Governing Health Futures 2030; Growing up in a digital world).

Key findings of these OECD and Lancet / FT reports are summarised in the preface where they parallel or reinforce the findings of the main body of the report.

OECD Reports

The April 2021 OECD "National Health Data Infrastructure" report surveyed health systems in twenty-three countries and identified ***that whilst Scotland was rated and ranked fifth in terms of data governance, it ranked nineteenth in terms of dataset availability, maturity, and use***. This more technical analysis looked at eight elements: dataset availability, coverage, automation, timeliness, unique identification, coding, data linkage and regular reporting of indicators of health care quality and system performance. It is worth reflecting on this grading that, in the absence of manifest error, is highlighting effective governance of what will be increasingly ineffective systems

Figure 1.1. Key national health datasets availability, maturity and use



Note: Score is the sum of the proportion of health datasets meeting 8 key elements of dataset availability, maturity and use in this survey. The maximum score is 8. See Annex B.1

(Source: 103)

These findings should act as reality check on any lingering perceived superiority of the Scottish health and care data and digital systems due to early adoption of markers such as the CHI (community health indicator) number, with the reality being that in comparison to the other OECD benchmarked health and care systems Scotland is now near to the bottom on a key enabling capability.

This aligns with the main message of this ILGDD report. Unless Scotland's health and care system makes the necessary technical and organisational changes needed to address this ranking, it will not see the benefits of increased digitisation such as enhanced clinical and care insight, improved system efficiency and resource management, safer health and care practices, workforce automation and, importantly, securing its fair share of world class research.

This latter point is neatly under-pinned by looking at the countries at the top of the table, it is those countries who are now mentioned most frequently as the destinations of choice for research due to research data availability and ease of establishing and running trials. **Research is an international market and Scotland is now at a competitive disadvantage in this marketplace**. This will have a direct impact on the economic prospects for Scotland and the wellbeing of its citizens.

This OECD report very much aligns with this report's recommendations to the ILGDD including:

- **Priority 1 - National Infrastructure,**
- **Priority 4.1 - Address the basic digitisation needs that exist today across health and social care, and**
- **Priority 5.2 - Establish a safe, structured, and accessible dataset to accelerate the digitisation of health and care and the use of Data & AI across health and care.**

The second, July 2021, OECD report "Empowering the health workforce" acknowledges the widespread understanding of the abundance of potential benefits from digital technologies in the health and care sector but highlights that, despite an acceleration in the uptake of digital technologies achieved during the COVID 19 pandemic, the health sector as whole remains a long way behind other industries in reaping the rewards of digitisation.

This aligns with the Priority 4 Digitisation finding of the report.

The second OECD report further identifies:

"*that while investment in technical infrastructure plays an important role it is often insufficient, as* ***digital transformation in the health sector is not a simple matter of technical change but requires a complex adaptive change in human attitudes and skills as well as in the organisation of work and the related legal and financial frameworks***. *Digital technologies only provide the tools and cannot transform the health sector on its own but need to be put to productive use by the health workers and patients. While many health workers already use digital systems and perceive the benefits to them and to patients, many also question the value digital technologies produce in health and care or complain about technology getting in the way of their work. Equally health workers often report not having opportunities for the up-skilling required to put the technology to full use or that the legal, financial, and organisational aspects of work – designed in the pre digital era – are not adequately reformed to enable the technology to add value. Workers and patients also demand appropriate safeguards against potential undesired effects of the use of digital tools, including the possible lack of transparency or threats to data privacy. If unaddressed, these concerns not only likely result in additional inefficiency and waste, but also place undue burden and strain on the workers. To address these barriers to successful digital transformation* ***governments will need to provide the necessary political leadership and implement a range of policy actions*** *to support three main objectives:*

1. building trust in the benefits of digital transformation among health workers and patients while minimising any risks;

2. advancing expertise and skills needed for effective use of digital health technologies;

3. adapting the organisation of health service delivery and the related legal and financial frameworks."

Again the wider international perspective of this report is very valuable ***identifying common challenges to all governments in navigating this digital health transformation***.

Capturing how the ILGDD might contribute to addressing some of these issues is set out in Priority 2 - Thought Leadership. This priority sets out the need to contribute to the debate and evolution of organisations and policy through (i) messaging of the circular economy health and wealth benefits of digitisation to all parties; (ii) the need to support the debate and evolution of transparent and trustworthy structures to enable fair use of data and fair access to the insights that technologies such as artificial intelligence may bring to the health and care systems; (iii) cultural alignment support to help ensure the emergence of a "good customer / good supplier" partnership between the health and care system and industry at a time while each is navigating the evolving system changes and business model adaptions that a period of rapid change and uncertainty bring. The second OECD report does however take it a step further, unambiguously making it clear that it is "***the governments (that) will need to provide the necessary political leadership and implement a range of policy actions"*** to fully enable the digital transformation.

The Lancet and Financial Times Commission

Governing health futures 2030: growing up in a digital world

This new report published by a commission set-up by The Lancet and the Financial Times looked at a global level at the digital transformation of health and care and, from the outset given the sponsoring parties, stressed the need for government, health and care systems, commerce, and the public to fully engage in this process to ensure fair and transparent processes and structures are put in place as ***"the digital ecosystem itself (becomes) an increasingly important determinant of health".***

The report had a particular focus on children and young people, of whom it noted 88% of those surveyed already used some form of digital technology for health-related purposes.
The report set out four action areas for sustainable health futures.

- *First, we suggest that decision makers, health professionals, and researchers consider—and address— digital technologies as increasingly important determinants of health.*
- *Second, we emphasise the need to build a governance architecture that creates trust in digital health by enfranchising patients and vulnerable groups, ensuring health and digital rights, and regulating powerful players in the digital health ecosystem.*
- *Third, we call for a new approach to the collection and use of health data based on the concept of data solidarity, with the aim of simultaneously protecting individual rights, promoting the public good potential of such data, and building a culture of data justice and equity.*
- *Finally, we urge decision makers to invest in the enablers of digitally transformed health systems, a task that will require strong country ownership of digital health strategies and clear investment roadmaps that help prioritise those technologies that are most needed at different levels of digital health maturity*.

Again, while going beyond the specific scope of the ILGDD report, the action areas set out above align well with the priorities and findings of the ILGDD report.

With regard to the first action area above, the ILGDD report Priorities 1, 4 and 5 set out the immediate need to recognise and fully enable the transformation of Scotlands health and care, data, and digital infrastructure into the national asset that it should be.

Priority 1 and 2 of the ILGDD report identified the need for the ILGDD to be a representative stakeholder in the debate on data governance, the Health for Wealth agenda and data and artificial intelligence in health and care. This aligns with the second action area above.

The third action area calls for new approaches to protect citizens rights, promote public benefit from the data and ensure justice and equity. The ILGDD report Priorities 1,2 and 5 notes the innovative use of data safe havens and postulates the need for the emergence of a Scottish Health Data Endowment as a national profile custodian of data, where data is held

to the benefit of Scotland's current and future generations, and the benefits transparently and regularly accounted for.

The final action area of "investing in the enablers of digitally transformed health systems" is a broad challenge. It goes to the heart of the commissioning of this report, that of ensuring that the Scottish economy is mobilised to contribute to and benefit from the digital transformation. It highlights the need to align health and care technology pull with industry push. Finally, and arguably most fundamentally for Scotland, it points to the need for ***government to invest in the education and training of current and future generations*** so that they have the skills to contribute to and benefit from the digital health and care transformation

Appendices

Appendix 1 – "Once for Scotland" Health and Wealth System

This is a two-stage solution:

1. Health and Care Data is exclusively shared with the Safe Havens to create a National Health and Care Data Set.
2. Solutions are pulled through to Health and Care to address prioritised Health and Care Problem Statements

(This outline model will need to evolve to reflect the emergence of the National Care Service once its IT strategy is agreed. [69,77])

Appendix 2 – Opportunity Ranking Criteria

Priority Action 3.1 has identified the need to establish a health and care "opportunity pipeline" capturing the status and value of the immediate needs within health and care across Scotland. An outline list of ranking criteria was provided, this has been refined throughout the commission into the following list of ranking criteria:

1. Is a PULL Innovation: addressing a prioritised and described need within health and social care
2. Supports the health and social care system in addressing the waiting list challenges due to Covid
3. Has identified and agreed a budget for adoption across health and social care system
4. Has a defined and achievable procurement plan with agreed and realistic timelines
5. Is provided by an organisation that is financially viable in the medium to long term
6. Has identified, or secured, a clinical champion
7. Is focused on digital and data innovation
8. Addresses industry priorities
9. Builds on existing industry capabilities
10. Addresses Scottish health and care priorities
11. Can access already available data sets and agreed data standards
12. Can be supported by existing ICT infrastructure for integration of the identified product/solution
13. Can leverage available funding opportunities e.g., Healthy Europe, UKRI, Horizon Europe
14. Is synergistic to other developments and opportunities in the broader Scottish digital tech ecosystem
15. Is in an area where Scotland has a specific competitive advantage.
16. Offers potential benefits that might arise as result of carbon reduction from reduced transportation and wastage

The initial ranking criteria have been developed into an appropriately weighted model that, it is envisaged, would be incorporated into the opportunity pipeline when available to ensure a consistent evaluation of opportunities. Given the challenges within health and care the model was skewed towards any potential impact on **Health** (70% of the weighting), with the balance allocated to any potential impact on **Wealth** (30%).

The **Health** element was split equally (35%/35%) between two core elements

(i) an identified need within the system (**Identified Need**), and

(ii) the readiness of the system to realise the opportunity (**System Ready**).

Within **Health** – **Identified Need,** the weighting was allocated to reflect the findings that these are the two most important criteria for the short/medium term:

1) Is a PULL Innovation: addressing a prioritised and described need within health and social care (17.5%)
2) Supports the health and social care system in addressing the waiting list challenges due to Covid (17.5%).

The ranking criteria in **Health - System Ready** were weighted accordingly:

3) Has identified and agreed a budget for adoption across health and social care system (7.5%)
4) Has a defined and achievable procurement plan with agreed and realistic timelines (7.5%)
5) Is provided by an organisation that is financially viable in the medium to long term (5%)
6) Has identified, or secured, a clinical champion (5%)
7) Can access already available data sets and agreed data standards (5%)
8) Can be supported by existing ICT infrastructure for integration of the identified product/solution (5%)

The **Wealth** element was split unequally between two core elements

(iii) Building on the perceived advantages of the identified Scottish Industrial Strengths (**Leveraging Scottish Strengths**), and

(iv) Several other factors that could not be classified into distinct elements (**Other**).

The ranking criteria in **Wealth – Leveraging Scottish Strengths** were weighted accordingly:

9) Addresses industry priorities (5%)

10) Builds on existing industry capabilities (5%)

11) Is synergistic to other developments and opportunities in the broader Scottish digital tech ecosystem (5%)

12) Is in an area where Scotland has a specific competitive advantage. (2.5%)

The ranking criteria **Wealth - Other** were weighted accordingly:

13) Can leverage available funding opportunities e.g., Healthy Europe, UKRI, Horizon Europe (2.5%)

14) Is focused on digital and data innovation (5%)

15) Offers potential benefits that might arise as result of carbon reduction from reduced transportation and wastage (5%).

NB. "Addresses Scottish health and care priorities" was not included in the model as this was deemed to be a replication of:

"1. Is a PULL Innovation: addressing a prioritised and described need within health and social care (17.5%)".

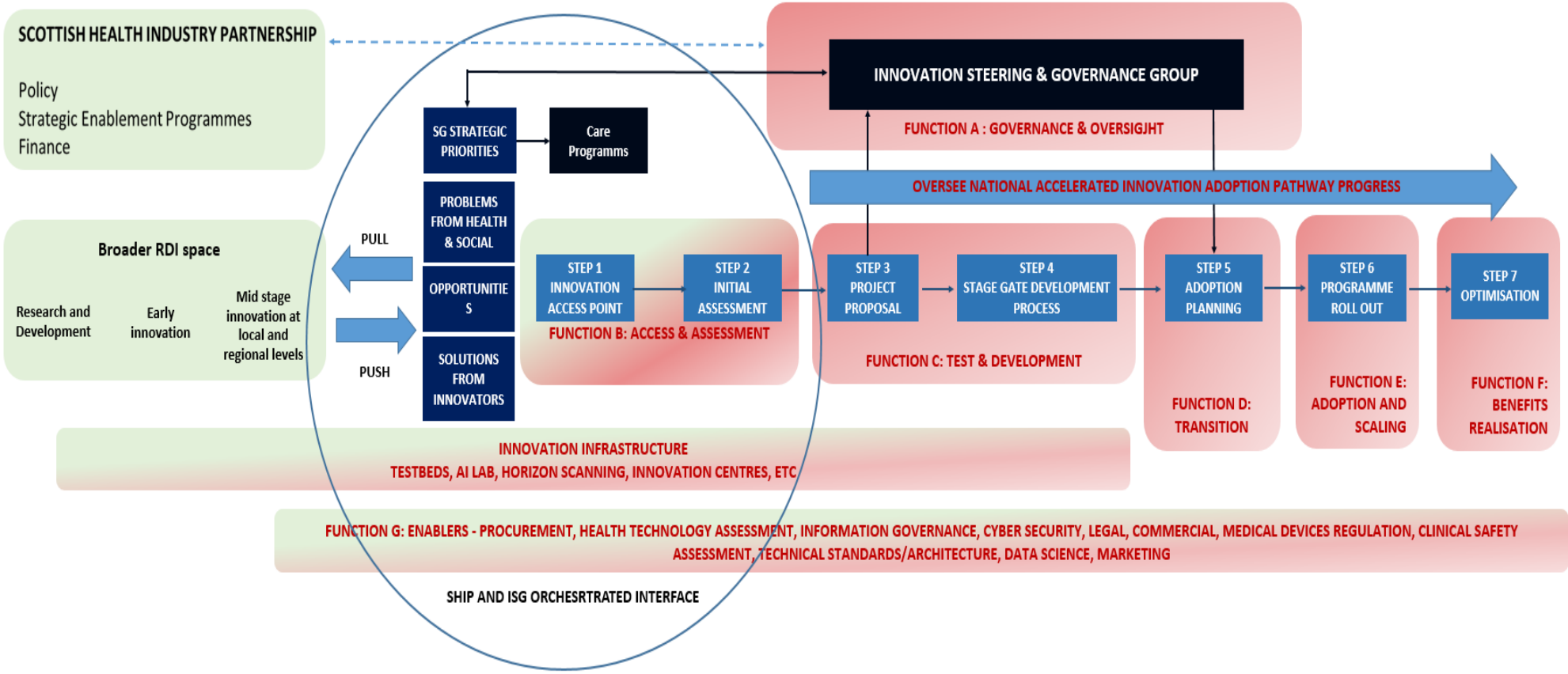
The weighted model has been tested against a number of illustrative examples drawn from relevant and current reports identified throughout the commission to ensure it is fit for purpose in effectively and consistently ranking opportunities against the defined criteria of Health and Wealth at the time of writing.

	Scoring of individual priorities is scored 1-5 (1- Low; 5 - High)	Health 70%		Wealth 30%	
		Identified Need 35%	System Ready 35%	Leveraging Scottish Strength 17.5%	Other 12.5%
1	Is a PULL Innovation: addressing a prioritised and described need within health and social care	17.5%			
2	Supports the health and social care system in addressing the waiting list challenges due to Covid	17.5%			
3	Has identified and agreed a budget for adoption across health and social care system		7.5%		
4	Has a defined and achievable procurement plan with agreed and realistic timelines		7.5%		
5	Is provided by an organisation that is financially viable in the medium to long term		5%		
6	Has identified, or secured, a clinical champion		5%		
7	Can access already available data sets and agreed data standards		5%		
8	Can be supported by existing ICT infrastructure for integration of the identified product/solution		5%		
9	Addresses industry priorities			5%	
10	Builds on existing industry capabilities			5%	
11	Is synergistic to other developments and opportunities in the broader Scottish digital tech ecosystem			5%	
12	Is in an area where Scotland has a specific competitive advantage.			2.5%	
13	Can leverage available funding opportunities e.g., Healthy Europe, UKRI, Horizon Europe				2.5%
14	Is focused on digital and data innovation				5%
15	Offers potential benefits that might arise as result of carbon reduction from reduced transportation and wastage				5%

An Excel based model has been developed that allows opportunities to be evaluated, and

- calculate an overall score,
- ranking opportunities in order based on the ranking criteria
- highlighting where there is close alignment between the priorities of health and wealth
- highlighting where there is NOT close alignment between the priorities of health and wealth
- iteratively evaluating the ranking criteria against the opportunities

Appendix 3 – Accelerated National Innovation Adoption (ANIA) Pathway



Appendix 4 – Priorities

1. National Infrastructure	
1.1 Recognition of Data as a National Asset	Immediate and ongoing
1.2 Establishment of National Health and Care data Platform for Research and Industry	Immediate to Short
1.3 Once for Scotland - Governance	Immediate
1.4 Once for Scotland – Innovation Adoption (PULL)	Immediate
2. Thought Leadership	
2.1 The Health for Wealth Programme	Immediate and Ongoing
2.2 Data and Artificial Intelligence	Immediate and Ongoing
2.3 Cultural Alignment	Immediate and Ongoing
3. Opportunity Analysis	
3.1 Establish a health and care “opportunity pipeline”	Immediate and ongoing
3.2 Complete a review of health and care procurement spend (digital and data)	Short and ongoing
3.3 “Declutter” the Scottish Health Research and Innovation Ecosystem	Short to medium

4. Increased Digitisation	
4.1 Address the basic digitisation needs that exist today across health and social care	Immediate and ongoing
4.2 Ensure real time dataset access for key clinical areas and emerging sectors	Medium
4.3 Develop a national strategy for engaging with Clinical Research Organisations	Short to medium
5. Data and Artificial Intelligence	
5.1 Establish a safe, structured, and accessible dataset to accelerate the digitisation of health and care and the use of Data & AI.	Short to medium
5.2 Provide sufficient funding to scale impactful and respected programmes in a structured manner to develop innovative "PUSH" solutions from Industry, whilst accelerating solution matching for "PULL" from health and care.	Medium
6. Further Enabling Technologies, Preventive Care and System Convergence	
6.1 Meaningful deployment of further enabling technologies once Priority 1 and Priority 4 addressed.	Medium to Long
6.2 Priority 1, 4, 5 and 6.1 enable extended preventive care strategy. (Align with ANIA Horizons)	Medium to Long
6.3 Addressing health and care system convergence / citizen data technology challenges.	Medium to Long

7. “Outside of System” Innovation, Personal Wellness Technology & Data	
7.1 Support "outside of the system" innovation as part of Health for Wealth activity and for implications and insight.	Ongoing
7.2 Support businesses focused on health and care systems outwith Scotland	Ongoing
7.3 Horizon scan developments in personal wellness technology and data, and consider implications and opportunities for health and care system.	Ongoing

Bibliography

Doc ref	Title	Date	Source org	Link	Source	File name
001	Digital Health and Care Transformation Meeting	July 2020	Scottish Enterprise Health and Wellbeing Team / ILG MedTech group		INITIAL DOCUMENT	150720 LSSILG item 4- DHCTFinal

"International competition is fierce (see Appendix 1). Scotland's competitive advantage in health and care data is quickly eroding as countries (e.g. Estonia, Finland, Belgium) or private health systems (e.g. Kaiser) with higher or similar population as Scotland have achieved better data quality, integration, and accessibility. As years go by, the advantage Scotland has in terms of longitudinal data decreases. For several reasons, Scotland has unfortunately been slow at acting on clear recommendations to improve data quality, integration, and accessibility. The data scoping task force produced a 2018 report on building capability to assess real world benefits, risks, and value of medicines (The "Andrew Morris" report[1]). The task force made five main recommendations:

1. *Develop a complete record of medicines use across the healthcare system, reliably track which medicines have been prescribed to which patients;*
2. *Include medicine indication in all prescribing systems;*
3. *Make access to national laboratory data straightforward and non-duplicative;*
4. *Better record patient outcomes;*
5. *Create a learning system of digital health information to support cross national assessment of medicines.*

Implementing these recommendations will be a critical step in creating opportunities for industry and improving patient outcomes (see Appendix 3).

The Scottish Parliament Health and Sports Committee's report on "Supply and demand for medicines" published last month, is very critical on progress made to date by the NHS "to implement comprehensive IT systems which maximise the use of patient data to provide a better

[1] https://www2.gov.scot/Resource/0054/00540468.pdf

service" and urge "to consider the IT and data requirements of the NHS across the country in a strategic way and design systems with long term utility as a matter of urgency". *Similarly, research and adoption of artificial intelligence solutions for diagnosis and other health and care purposes is a global focus for both companies and academia."* *"Scotland has unfortunately been slow at acting on clear recommendations to improve data quality, integration and accessibility"*						
002	Actions from Andrew Morris Data Report: Action Plan				INITIAL DOCUMENT	Actions from Andrew Morris Data Report
003	Belgium February 2021	Feb 2021			INITIAL DOCUMENT - International exemplars	Belgium - February 2021
004	Catalyst for Health and Social Care Industrial Innovation in Scotland 2021-22 draft	August 2020	HIAP		INITIAL DOCUMENT	Catalyst - August 2020
"There is a need for Scotland to sharpen how it approaches demand led innovation – how it addresses market failure and understands and presents its needs and challenges. Our approach to innovation in health is based upon: (a) strengthening the environment to facilitate innovation - (access to information and skills, building an infrastructure, addressing cultural and organisational barriers etc.) – and (b) focusing national powers and resources to actively champion a handful of priority topics."						
005	Catalyst Report Embedded Spreadsheet - Care Plan Projects				INITIAL DOCUMENT	Catalyst Report Embedded Spreadsheet - Care Plan Projects

006	The National Centre for Sustainable Delivery (CfSD) Annual Workplan 2021-22	April 2021	Centre for Sustainable Delivery	https://www.scotphn.net/wp-content/uploads/2021/05/National-Centre-for-Sustainable-Delivery-CfSD-Workplan-2021-2022.pdf	INITIAL DOCUMENT	CfSD Workplan - 2021-2022 - April 2021
"National Data and Performance Analysis *CfSD will work with partners to define the datasets required to be able to deliver on their annual work plan. Where this requires additional data capture and storage this will be delivered by partners across the system as agreed through the National Care Programmes and with Scottish Government."*						
"Supporting Innovation *The CfSD is already supporting innovation through its national programmes including roll-out of SCOTCAP, Cytosponge and the testing of Heartflow. The CfSD will provide a delivery mechanism through national programmes for redesign and transformation to accelerate adoption of innovations as they become ready. The CfSD is also well placed to identify the innovation requirements for health and social care and support commissioning of innovation projects.* *Key priorities for innovation are:* • *Through the national Innovation Steering Group, work with key partners including NHS National Services Scotland, to map the innovation landscape and develop an 'innovation pipeline' to plan delivery and implementation.* • *Ensure the innovation pipeline is aligned with national programmes for redesign and transformation to accelerate adoption of innovation.* • *Identify key priorities for commissioning health and social care innovation to support redesign and transformation. "*						
007	Mind the Gap: How data, digital and technology can help Scotland recover from Covid-19, transform health & social		Scottish Council for Development and Industry (SCDI)	https://www.scdi.org.uk/wp-content/uploads/Mind-the-Gap-SCDI-2021-1.pdf	INITIAL DOCUMENT	Data and Digital in Health and Economic Recovery - SCDI Report

	care, and boost our economy					

"Scotland's health & social care data could be worth an estimated £800 million every year for our society and our economy. Big Data Analytics could also deliver an estimated £5.4 billion in savings for NHS Scotland, 38% of its current budget and three times its predicted budget shortfall by 2025, which could be reinvested in health & social care. The health tech sector could be Scotland's next key growth sector to rival FinTech."

"INFRASTRUCTURE Modernising and upgrading health & social care infrastructure to build a single national data architecture which integrates systems, enables ethical data sharing and creates secure digital health records."

"Health & social care needs the right physical and digital infrastructure to close the Data Gap and achieve our vision. The sector lags others in the use of technology. Much of the sector is burdened with archaic, inadequate, or obsolete technology and equipment. Many facilities and workers struggle without basic software and hardware or with poor connectivity. The NHS estate and Scotland's wider health & social care infrastructure urgently requires significant investment to get the basics right, while also unlocking opportunities to prepare for an accelerated transition to a high-tech future.

The sector's myriad systems do not link to or communicate with each other, preventing access to or ethical and secure sharing of data. The openness, integration and interoperability of data sets and systems to create a single national data architecture – underpinned by common data standards – would facilitate ethical and secure data sharing at a national level and the creation of a single, comprehensive digital health record for everyone in Scotland across primary, secondary, tertiary, and social care. The ongoing project by NHS Education for Scotland to build a National Digital Platform for health & social care is an important first step."

008	Deloitte 2021 Global Healthcare Outlook: Accelerating Industry Change	2021	Deloitte Insights	https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/life-sciences-health-care/deloitte-cn-lshc-global-health-care-outlook-report-en-210226.pdf	INITIAL DOCUMENT	Deloitte Global health care outlook 2021
Future-state health care delivery models *"Care model transformation is neither quick nor easy. It typically requires a multiyear, multistep approach in which organization leaders define the future-state delivery model; assess the gap between the enterprise's current state and desired future state; prioritize and sequence initiatives to invest in; and develop, implement, monitor, and measure each initiative."*						
009	Digital health technology: Global case studies of health care transformation	2019	Deloitte Insights/Deloitte Centre for Health Solutions	https://www2.deloitte.com/content/dam/insights/us/articles/5176_Global-health-technology/DI_Global-health-technology.pdf	INITIAL DOCUMENT - International exemplars	DI Global-health-technology
"Many consumers show greater activity and engagement. *Consumers are increasingly willing to tell their doctors when they disagree with them, are using tools to get information on costs and health issues, are tracking their health conditions and using that data to make care-related decisions, and are accessing and using their medical record data. "* ***"More consumers are using technology for health monitoring.*** *Growing numbers of consumers are using technology to monitor their health, measure fitness, and order prescription drug refills. More than three-quarters of those who track their health say it changes their behaviour at least moderately. "*						

"Health care organizations today are transitioning to health IT systems powered by cloud computing and data and analytics tools to enable real-time, smart digital health. They are using interoperable data and platforms supported by deep learning capabilities, "always on" biosensors, and behavioural research to shape consumer beliefs and actions. They are also applying virtual care, artificial intelligence (AI), and other technologies to personalize medicine, enable real-time care interventions, and provide behavioural nudges." *"Radical data interoperability is a required foundational capability to enable health care providers, insurers, and other stakeholders to deliver patient-facing programs and associated technologies. When implemented correctly, it can help greatly improve care delivery and patient empowerment53 and provide a solid return on investment (ROI) by:* • ***Reducing administrative costs*** *as manual processes such as quality reporting or obtaining prior authorizations are replaced or optimized by technology;* • ***Increasing efficiency of care delivery*** *as providers can leverage technology to more efficiently treat patients through an integrated care delivery model that includes virtual settings;* • ***Reducing the total cost of care*** *through more effective and efficient population health management techniques that use technology to lower unit costs and utilization rates; and* • ***Increasing revenue and growth*** *through an improved patient experience, more effective patient steerage, and enhanced ability to meet quality and cost performance targets. "*						
010	Scotland's Digital Health & Care Strategy	April 2018	Digital Health and Care Scotland	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2018/04/scotlands-digital-health-care-strategy-enabling-connecting-empowering/documents/00534657-pdf/00534657-pdf/govscot%3Adocument/00534657.pdf	INITIAL DOCUMENT	Dig Health & Care Strategy Apr 2018

"We will begin work now to deliver a Scottish health and care 'national digital platform' through which relevant real-time data and information from health and care records, and the tools and services they use, is available to those who need it, when they need, wherever they are, in a secure and safe way."

"3. To make better use of information, knowledge, research, and innovation we will:

- *Provide dynamic data capability, with machine learning where appropriate, that enables a forward-looking predictive view that supports modelling and continuous improvement of future health and care services, finance, and workforce.*
- *Support the development and implementation of common standards across the Scottish Public Sector.*
- *Harness the power of data to better understand the drivers of inequalities and poor public health outcomes, and use this to develop new digitally based services and interventions that can make a difference.*
- *Promote and facilitate appropriate, safe, and secure access to clinical, biomedical, social care and other data about individuals for approved research in the public interest, including through managed collaborations between the public third and industry sectors, and academia.*
- *Work with the Digital Health & Care Institute, CivTech®, and other relevant organisations such as the other innovation centres and Health Data Research UK (HDR UK) in order to leverage opportunities for research, development and analytics, including those offered by the City Deals and Regional Inclusive Growth Deals as well as other UK and EU opportunities."*

011	Digital Citizen Delivery Plan 2021/2022	2021	Digital Health and Care Scotland	https://tec.scot/sites/default/files/2021-06/Digital-Citizen-Delivery-Plan-final-21-22.pdf	INITIAL DOCUMENT	Digital Citizen Delivery Plan 2021.22 V1.0

"Our Four Strategic Priorities

1 Addressing Inequalities and Promoting Inclusion

2 Engaging citizens, staff and services through Co-design and Participation

3 Redesigning Services – Improving Citizen Access/Promoting Wellbeing

4 Innovating to Support Transformation"

"Plans for the Year

- *Progress large scale collaborative projects working in partnership with the DHI for regional and national scale up aligned to strategic themes and readiness levels, including the Moray Growth Deal bid, Dynamic Scot, Right Decision Support Service and Clinical Access Tool (CAT)*
- *Generate proof of concept projects in the DHI Exchange which deliver new data sharing methods and co-design six use cases to seed next generation services*
- *Further develop our UK & International funding collaborations, bringing inward investment in support of improvements and innovations and industry collaborations*
- *Fund and support further Tests of Change to support the pipeline of innovations that offer the potential for future scale up*
- *Organise a range of national and international of knowledge exchange activities that will promote achievements and Scotland's reputation as a leader in digital health and care and foster collaborations*
- *Facilitate engagement activities within networks, clusters, and partners to identify and deliver new opportunities for collaboration on data, digital and innovation*
- *Maximise impact and knowledge exchange adopting relevant learning in projects and activities "*

012	Digital Mental Health Position Paper 2021/22	May 2021			INITIAL DOCUMENT	Digital Mental Health Position Paper

"The ongoing COVID-19 pandemic has led to an unprecedented demand on digital mental health service and in response a significant increase in digital treatment choice, service provision and usage.

In the last 12 months referral rates to CBT have doubled with treatment choice increasing from a single treatment for mixed depression and anxiety to 14 treatments covering a range of anxiety disorders, services for those with long term conditions and child and young people.

Digital mental health services now account for over 25% of all activity in NHS psychology therapy services in Scotland. We have also seen more people use online or digital mental health services either accessed directly or through self-referral. The issue of Digital Inclusion is of critical importance and the opportunity to collaborate with Connecting Scotland programme going forward. "

013	Digital Scale-Up Level-Up Approval Paper	July 2021	Scottish Enterprise		INITIAL DOCUMENT	DSL Approval Paper ELT FINAL

"PROGRAMME VISION, OBJECTIVES AND BENEFITS

The 2026 vision for the Digital Scale-up Level-up (DSL) programme is:

Scotland's regionally balanced digital technology ecosystem is internationally recognised. A critical mass of viable, scaled and scaling digital tech businesses have generated an increase in tech job creation, including a high proportion of green jobs"

014	Estonia January 2021	Jan 2021			INITIAL DOCUMENT - International exemplars	Estonia January 2021
015	Digital Approaches in Care Homes Action Plan	Dec 2020	TEC	https://tec.scot/sites/default/files/2021-06/Digital-Approches-in-Care-Homes-Action-Plan-Final.pdf	INITIAL DOCUMENT	FINAL - Care Home Digital Approaches Action Plan

"Connectivity to, and within, the home

1. Connection capability: Identify care homes that currently lack capability of superfast connection. Support providers to identify solutions so that care homes have connection throughout every care home

4. NHS email: up to 3 email addresses made available and used for each care home

5. Office 365: Identify opportunities for adopting Office 365 across the care home sector

Data collection, data sharing & security

8. Data collection and data sharing: Scope options for improving collection, holding, and sharing of information about residents and care home operations, including electronic health records (recommendations of the Independent Review

of Primary Care Out of Hours Services), sharing Key Information Summaries. Develop an associated action plan.
9. Data security: Explore and identify actions to support effective information governance and cyber-security.
Access to digital services
1. Near Me Support adoption and effective use of Near Me in care homes
3. Remote health pathways Review options for vital signs monitoring and other appropriate care pathways within care homes
4. Telecare Identify how best to support care homes to optimise the use of telecare (including the use of bed, chair, enuresis and universal sensors) to enable and enhance care and support.
Skills and confidence of residents, staff, and providers
3. Knowledge exchange: Facilitate the sharing and exchange of experience to raise awareness of use of technology allow outcomes and impact, and practice and financial implications to be understood."

016	Health for Wealth Programme Plan Approval Paper	July 2021	Scottish Enterprise		INITIAL DOCUMENT	FINAL Health for Wealth Programme Plan Approval Paper

"Key benefits of the programme are expected to include:

- *Significant expansion of Scottish health and digital industry through indigenous growth including increased exports and attraction of inward investors resulting in additional high value jobs and GVA;*
- *Substantial savings from a more effective, efficient, and sustainable health and care system;*
- *Significantly improved health and wellbeing of the Scottish population, leading to a healthier and more productive workforce and improved social inclusion through impact on deprived areas and scarcely populated ones;*
- *Carbon reductions through reduced transportation and wastage."*

017	Finland January 2021	Jan 2021			INITIAL DOCUMENT - International exemplars	Finland Jan 2021

018	Germany January 2021	Jan 2021			INITIAL DOCUMENT - International exemplars	Germany January 2021
019	ILG Digital & Data Sub-Group: Action Plan Development Brief	April 2021	DHI/Scottish Enterprise		INITIAL DOCUMENT	ILG DD Subgroup - Brief – FINAL
020	Policy Landscape: Health, The Economy And Innovation	Jan 2021			INITIAL DOCUMENT	Innovation policy landscape - 19 January 2021 (1)
021	Israel February 2021	Feb 2021			INITIAL DOCUMENT - International exemplars	ISRAEL February 2021
022	Kaiser Permanente February 2021	Feb 2021			INITIAL DOCUMENT - International exemplars	KAISER PERMANENTE Feb2021
023	Life Sciences Vision	2021	HM Government	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1013597/life-sciences-vision-2021.pdf	INITIAL DOCUMENT – UK policy	life-sciences-vision

"Health Data

Overarching Ambition: Unleash the potential of the UK's health data to make the UK the best place in the world to undertake ground-breaking R&D; to start and grow Life Sciences and AI companies; and bring to market new medicines, MedTech and diagnostics, transforming the NHS with efficient, patient-centred, and personalised care. To support our vision of a healthcare system that is able to focus more on early diagnosis, treatment and prevention of disease and harnesses cutting edge innovation, we need to make data accessible, in a trustworthy and transparent way. This is a significant opportunity, recognised by other countries, that will underpin transformative improvements in health outcomes and service delivery, and provide profound insights to support the development of new medicines and technologies. It is a precondition to the success of this Vision that the UK seizes the opportunity provided by Health Data. However, much must be done to unlock the potential of health data and to enable integration with the UK's broader research and genomic capabilities.

COVID-19 has highlighted long-standing problems in the landscape. As is the case in other countries, UK health data is mainly focused on managing patient records in the support of clinical processes and is not structured to facilitate population-wide research and analysis. It is fragmented across a complex institutional landscape, is of variable quality, and is often difficult and slow to access. The pandemic has, however, also provided a glimpse of the enormous potential of health data, in enabling partnerships with researchers and industry to rapidly and safely develop, trial and evaluate new vaccines and treatments, as well as to test the effectiveness of deploying technologies at scale. The ambition is to make this type of population-wide, big-data capability available to support the development, trialling, and evaluation of a much wider range of innovations.

Routinely, we must ensure that data from multiple sources can be linked to create a consolidated 'picture' of the whole person and continuum of care pathway, identify the most suitable patients for clinical research, and continue efforts to improve quality and standardisation. This will take effective, coordinated action – bringing together partners in England and working closely with the Devolved Administrations – as set out in the draft Data Saves Lives Strategy published on 23 June 2021, in a way that secures and retains public trust and consent around who has access to their data and for what reason.

Government and the Sector's top priorities are to:

- *Take concerted action, across the Department of Health and Social Care, NHS England, NHSX and NHS Digital, working with key partners in the health data landscape such as Genomics England as well as the Devolved Administrations, to continue the development of unrivalled 'at-scale' data infrastructure to deliver top R&D opportunities, and make all types of data available, linkable and 'research-ready', in a streamlined secure and privacy-protected way. This includes co-ordinated, strategic action and improvements to data access systems at the national and regional levels.*

● *Provide innovators with smoother and quicker access to reliable, high quality 'real world' data alongside clinical and genomic data. This will support more effective and efficient clinical trials; ease robust regulatory approval through the rapid accumulation of high quality and holistic data; and allow more accurate assessment and evaluation of new innovations and technologies.*

We will do this through:

■ *Accrediting a handful of Trusted Research Environments to become the default route for accessing large-scale NHS data, built to be interoperable and highly secure, to increase access to 'at-scale' data while protecting the public interest.*

■ *Overhauling the governance on data access to ensure that patients, NHS organisations and registries have the confidence and clarity they need to engage with innovators, bringing more consistency and efficiency in decision-making whilst adhering to the highest data protection standards.*

● *Ensure the UK is positioned at the forefront of a new era of computational biology, with at-scale genomics, imaging, pathology, and citizen-generated remote monitoring data assets, creating a vibrant hub in which to develop and deploy AI-enabled tools and technologies. By identifying and targeting new treatment targets, we can help transform the NHS with predictive, personalised prevention, diagnosis and care. If we can consolidate our rich genome sequencing and imaging data, we will have unique scale and diversity to train AI, and support fast, safe deployment; as well as support developments in areas such as Functional Genomics.*

● *Seize opportunities to support the NHS and patients through innovative NHS data partnerships that fundamentally drive improvements in health outcomes and/or reduce health inequalities – whether this is through clinical research, validating AI using the UK's uniquely diverse population, or continuously surveying the uptake, safety and efficacy of diagnostics, treatments, and care pathways. In line with the public's expectations, it is critical that, where patient data is used to support the development of new treatments and technologies, patients and the NHS receive a fair share of the benefits.*

● *Working with all elements of the Sector, take concerted action to develop and recruit the data and analytical skills in the NHS and wider ecosystem that will be critical for utilising and delivering the full potential of the UK's health data – in particular to support population-wide measures that support the early detection, diagnosis and treatment of disease at scale.*

● *Co-develop work with the NHS, patients, the public and medical research charities across the UK to safeguard trust and transparency in how health data can be accessed to support R&D. This includes reviewing patient consent models, incorporating clear standards on the use of privacy-enhancing technologies, enforcing clear expectations and 'red-lines' around the use of data, transparency, and public benefit, and actively promoting diversity in the use of NHS's data- including to tackle health inequalities.*

● *Ensure alignment with other data-driven programmes such as Getting It Right First Time, which drives improvements in treatment and patient care through in-depth review of services, benchmarking and presenting a data-driven evidence base to support change.*

Across all the work outlined in this Vision on research, genomics and data, government, the NHS, and partners will be confident in making the positive case for how the UK's unique strengths and expertise can be used to drive the development of technologies and insights to benefit patients and public in the UK and globally. *It will be critical when delivering the policies outlined above that they secure support from patients, the public, NHS staff, academic and industrial researchers, software developers and data analysts. In particular, it is essential we continue to build support from patients and the public for their data to be used for research and innovation, and there must be a clear onus on demonstrating the public benefits, such as addressing"*						
024	Scottish Technology Ecosystem Review	Sept 2020			INITIAL DOCUMENT	Logan Ecosystem Review - Summary for Wider Sharing
"It is clear that Scotland's ecosystem currently operates in the pre-tipping point state……. Our over-arching strategy, therefore, must be to implement support and interventions that accelerate the ecosystem towards the tipping point."						
025	Life Sciences Sector in Scotland and relevant Scottish Enterprise's Activities Briefing	May 2021	Scottish Enterprise		INITIAL DOCUMENT	LS and SE Briefing
026	Mayo Clinic February 2021	Feb 2021			INITIAL DOCUMENT - International exemplars	Mayo clinic February 2021
027	The Modern Outpatient: A Collaborative Approach 2017-2020	Nov 2016	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/corporate-report/2017/09/modern-outpatient-collabortaive-approach-2017-2020/documents/00524	INITIAL DOCUMENT	Modern Outpatient Report – 2016

				548-pdf/00524548-pdf/govscot%3Adocument/00524548.pdf		
""The Modern Outpatient Programme' will require buy-in from a wide range of professional and patient groups across NHS Scotland,……..it will need to be driven by clinical leaders working with others and Chief Executives will need to ensure the appropriate authorising environment is in place to drive success."						
028	National Digital Health Strategies Around the World	Oct 2018	The Medical Futurist	https://medicalfuturist.com/national-digital-health-strategies-around-the-world/	INITIAL DOCUMENT - International exemplars	National Digital Health Strategies Around the World - The Medical Futurist
029	Research to inform a review of how Scottish Enterprise and partners can unlock the full potential of digital health opportunities for Scottish SMEs	April 2021	TRUSTECH		INITIAL DOCUMENT	PD907 SE Digital Health Research Paper FINAL 13APR21
"From an SME perspective, a good customer will be one that assesses a new product in a timely manner, understands SMEs, is willing to pay for the innovation phase and will work together with the SME to deploy the innovation into their business, pays a fair price for the product, moves to deployment at an economically viable scale for the SME, is a repeat or long term customer, and is perhaps willing to act from time to time as a reference customer for the next sale that the SME is trying to make. *Examples of a "bad customer" can illustrate this issue. Small pilot trials that are more to the customer's benefit than any real intent to buy, unnecessary pilots of products already proven in other areas, protracted delay or lack of connectivity between pilot and commercial contract phases, forced retendering between innovation proof point and adoption, latent conflicts of interest between potential internal*						

delivery options and external innovation bidders, and lack of understanding as to what constitutes a commercially viable long term value commitment to the innovation and the SME."						
"The imperative that every business in the digital health sector should be viewed as a global business was mentioned a number of times, hence any support programme that was overly focused on helping secure opportunities within the Scottish health and care market would be less attractive given the relative scale of that market."						
030	Re-mobilise, Recover, Re-design: The Framework for NHS Scotland	May 2020	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/05/re-mobilise-recover-re-design-framework-nhs-scotland/documents/re-mobilise-recover-re-design-framework-nhs-scotland/re-mobilise-recover-re-design-framework-nhs-scotland/govscot%3Adocument/re-mobilise-recover-re-design-framework-nhs-scotland.pdf	INITIAL DOCUMENT	re-mobilise-recover-re-design-framework-nhs-scotland
"The response to the pandemic has also led to some remarkable and innovative developments in service delivery for the benefit of patients; particularly via the use of digital technology, to enable more services to be delivered at home or in the community. Whilst we will want to retain as much good practice as possible in the next phase, longer-term, wider reform of health and social care, will be taken forward separately, as part of the Renew programme."						

"Phase 4 *As with previous phase but with the following changes:* *Full range of health and social care services provided and greater use of technology to provide improved services to citizens."*						
031	Scottish Technology Ecosystem Review- August 2020	August 2020	Mark Logan/Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/independent-report/2020/08/scottish-technology-ecosystem-review/documents/scottish-technology-ecosystem-review/scottish-technology-ecosystem-review/govscot%3Adocument/scottish-technology-ecosystem-review.pdf	INITIAL DOCUMENT	scottish-technology-ecosystem-review - Aug 2020
"The review identifies three fundamental supporting areas upon which the performance of the Technology Ecosystem depends. In each of these areas, improvements are available which we believe would, taken together, accelerate the ecosystem towards its tipping-point and substantially improve its performance. The ecosystem's fundamental dependencies are: • *Education and Talent: at school level, at university (and parallel access paths), and at start-up/scale-up level.* • *Infrastructure: including physical co-location environments for start-ups and the social infrastructure required to support a vibrant technology ecosystem.*						

- *Funding: including grant funding, public and private investment regimens. "*

"Within schools, teachers are often co-opted from other disciplines, such as Business Studies, to teach Computing Science. This is perhaps not surprising when we consider that 17% of our secondary schools have no dedicated Computing Science teachers."

"This general lack of semi-permanent incubation infrastructure must be addressed by our ecosystem strategy."

"As we have already discussed in this review, we will only attract more inward investment activity towards our start-ups when we fix the problem of not having enough credible start-ups in which to invest. That is why this review places such a strong emphasis on the education element of the ecosystem, followed by having the right infrastructure to support the fruits of that education."

"The second difficulty is that "too much" public financial support for Scottish start-ups may undermine the credibility of the ecosystem to external parties. If the ecosystem is worth investing in, this argument goes, then why does the government need to support its start-ups to such a high degree? There is a balance point, beyond which this perception may take hold."

032	Scottish Health Industry Partnership Forward Plan 2021-22	June 2021	Scottish Government Innovation Life sciences, Health and Social Care- SHIP		INITIAL DOCUMENT - Strategic Groups - SHIP ISG	SHIP - Oversight Group- 15 June 2021 - 2.2 SHIP Forward Plan - DRAFT – MC

"Eight suggested work streams:

1. ***Scottish Health and Industry Partnership Priorities and Opportunities in Scotland:*** *Publish a 'Scottish Health and Industry Partnership Forward Plan'*

Our ambition is to bring more investment to Scotland, support company growth and increase the quality and volume of innovation activity taking place. We seek increased NHS and social care innovation adoption and more rapid commercialisation and trade.

2. ***Supporting the Delivery of Scotland's Artificial Intelligence Strategy:*** *Create a Life Sciences AI working group to deliver a cluster inception plan and develop a case for investment in AI.*

The ambition is to develop a case for investment in Scotland – an end-to-end AI innovation service in health and social care – capable of supporting and sustaining an ambitious pipeline of AI development attractive to investors and able to create and deploy AI solutions addressing NHS and social care needs. Companies will be attracted to locate in Scotland and grow as the global market for AI related products and services rises. Health is the fastest growing global market. "

033	Convergence of Health and Care and Economic Development Priorities	Feb 2021	Scottish Enterprise		INITIAL DOCUMENT	SHIP Briefing from SE feb 2021 15 feb - C McBean amendments

<u>Digital transformation</u>

"As highlighted in a recent report, there is a mandate for change with the public strongly supporting data sharing and digital approaches and patients wanting to be able to access their data and get information and support online."

"Given the global reputation of the NHS a purchase order from it can be seen as a mark of quality which opens doors into other countries' health systems."

034	Singapore: Government driven approach for AI in healthcare		Netherlands Enterprise Agency	https://www.rvo.nl/sites/default/files/2020/11/28%20okt%20Singapore%20-	INITIAL DOCUMENT - International exemplars	Singapore AI in Healthcare

				%20Government%20driven%20approach%20for%20AI%20in%20healthcare.pdf		
035	#SmartHealthSystems: International comparison of digital strategies	Nov 2018	Bertelsmann Stiftung	https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Der_digitale_Patient/VV_SHS-Studie_EN.pdf	INITIAL DOCUMENT - International exemplars	Smart Healthcare Systems
036	Strategic Focus Around Health for Wealth		Scottish Enterprise		INITIAL DOCUMENT - Strategic Groups - SHIP ISG	Strategic Focus of HfW Groups
037	Supply and Demand for Medicines	June 2020	Scottish Parliament Health and Sport Committee	https://sp-bpr-en-prod-cdnep.azureedge.net/published/HS/2020/6/30/Supply-and-demand-for-medicines/HSS052020R6.pdf	INITIAL DOCUMENT	Supply and Demand for Medicines
"797. Examples were abundant throughout our inquiry of efficient solutions which should be progressing but are not due to multiple IT systems in operation which cannot communicate easily."						
"807. We are in no doubt the piecemeal approach to procurement of IT systems, such as has been the case with HEPMA, on a board-by-board basis across Scotland, is unhelpful and each board must be required to operate from the same systems."						
"812. Many have called for outcomes data from medicines to be collected to support evidence-based prescribing and to eradicate waste by ensuring only the most effective drugs were used for patients in the first instance. The differences between outcomes achieved in						

clinical trials and those experienced in 'real-world' scenarios is important beyond being able to achieve innovative and cost-effective pricing."						
"822. Throughout this inquiry we were surprised to learn how little evidence gathering of outcomes and effectiveness takes place. Yet the importance of data to support prescription decision making was emphasised to us from many parties."						
"829. We ask the Scottish Government to reflect on why the sharing of medical records through the Emergency Care Summary suddenly became possible when COVID-19 struck and to make arrangements to extend access to health records to all health professionals who require them to ensure health care provision is as clinically and cost effective as possible. We request a date when this will be achieved. *830. We ask the Scottish Government in its response to this report to include full detail, including timescales, of the "programme of work" to improve data collection on medicines use and outcomes in Scotland."*						
038	Digital Health & Care in Scotland: Report of the External Expert Panel	April 2018	Digital Health & Care Scotland	https://www.gov.scot/binaries/content/documents/govscot/publications/independent-report/2018/04/digital-health-care-scotland-report-external-expert-panel/documents/00534667-pdf/00534667-pdf/govscot%3Adocument/00534667.pdf	Additional Reports	25-April-2018-EXTERNAL-EXPERT-PANEL-REPORT-published
"If Scotland is to become a true 'learning health and care system', digital technology and data science will be a key piece of the infrastructure. There are a number of places where progress is needed. For example, citizens do not routinely have online access to personal health and care records (PHCRs), and they cannot routinely make appointments electronically. While electronic health records (EHRs) are used in general practice, levels of adoption of EHRs in hospitals is patchy, and too many processes remain paper-based. In						

general practice, much of the technology is too old, and not all practices have high-speed internet connections. Practitioners need to use multiple systems to do their day-to-day work, which slows them unnecessarily and is frustrating, particularly where single sign-on is unavailable. Social care providers are generally not yet digitally connected. Social care users generally do not have access to personal records, and there is limited interoperability between electronic records from different providers or authorities. Despite the size of Scotland, significant local variation in the application of individual systems persists, with only a limited number of national applications. While the cloud is used for centralised hosting of national applications joined up by a common broadband network (SWAN) where that is available, it is not routinely used to house electronic data. Ensuring that the technical infrastructures in health and care provide robust security protection of information is a real and recognised challenge as we move towards greater use of digital and outward facing systems, for example with citizen portals and mobile apps."						
039	Scotland's Digital Health & Care Strategy	April 2018	Digital Health & Care Scotland	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2018/04/scotlands-digital-health-care-strategy-enabling-connecting-empowering/documents/00534657-pdf/00534657-pdf/govscot%3Adocument/00534657.pdf	Additional Reports	25-April-2018-SCOTLANDS-DIGITAL-HEALTH-AND-CARE-STRATEGY-published
"The issue is not whether digital technology has a role to play in addressing the challenges we face in health and care, and in improving health and wellbeing: the issue is that it must be central, integral and underpin the necessary transformational change in services in order to improve outcomes for citizens. Over the next decade digital services will become not only the first point of contact with health and care services for many people, but also how they will choose to engage with health and care services on an on-going basis."						

"By July 2018, we will establish a national decision-making Board made up of Executive representatives of the Scottish Government, Local Government and the NHS, with additional support and advice from industry, academia and the third sector. This Board will drive forward this agenda by:

- *Making key national decisions, including on areas such as the standards required to deliver interoperability and information sharing across health and care.*
- *Agreeing the financial framework for implementation.*
- *Identifying priorities for development and improvement.*
- *Overseeing and coordinating developments to ensure coherence, address risk of duplication, and maximise synergies and efficiencies.*
- *Reviewing and streamlining existing groups, networks and committees.*
- *Monitoring and reporting on delivery of this strategy at periodic intervals.*
- *Overseeing the development of a measurement framework and support for benefits realisation and evaluation.*
- *Establishing appropriate structures to manage individual programmes of work.*
- *Overseeing adherence to standards, compliance, transition etc.*
- *Sharing best practice and identifying opportunities for collaborative working and embedding new ways of working through appropriate fora.*

National and other organisations with responsibility for implementing elements of this strategy will report regularly to the Board on progress."

"By 2020, we will have in place clear arrangements to deliver a simplified and consistent national approach for Information Assurance which will take into account the different needs of users and citizens, and provide clarity around information sharing across health and care.

For this to be achieved, we will:

- *Establish, through public involvement and professional advice, a clear national approach, consistent with the law, including the General Data Protection Regulation (GDPR), which provides clarity around the required information assurances needed for different uses of health and care information, and appropriate choices for citizens about how their information will be used.*
- *Review information governance boards and groups currently in place with a view to streamlining the landscape, reducing unnecessary complexity and developing a national approach to assurance and cyber security."*

"By end 2018, we will have in place a clear national approach to supporting local co-designed service transformation with clearly identified leads."

040	Catalyst for Health and Social Care Industrial Innovation in Scotland Summary	August 2019	HIAP Scotland	http://www.hiap-scotland.org/News/PresentationCategory/4	Additional Reports	Catalyst-for-Health-and-Social-Care-Innovation-in
041	Public Health Scotland's Digital Strategy	April 2021	Public Health Scotland	https://www.publichealthscotland.scot/media/7431/digital-strategy-2021.pdf	Additional Reports	digital-strategy-2021

"The digital priorities are:

- *engaging and empowering the public*
- *creating actionable insight across the public health system*
- *leading digital collaboration*
- *accelerating digital innovation for the public health system.*

The enabling priorities are:

- *connecting all public health data to create a truly world-class distributed data resource*
- *developing joined-up, scalable, adaptable and easy to use IT solutions*
- *building a skilled and connected workforce operating with a digital-first culture.*

Our digital enablers are the actions we need to take to support our digital priorities. These will feed into our operating model design as we transition from strategy to implementation. Ultimately, we must weigh the success of this strategy against the value it delivers to our stakeholders and the effect it has on Scotland's public health. There is a need for us to develop a set of key performance indicators which will allow us to evidence that our digital strategy is delivering our outcomes and ultimately contributing to a world-class public health system. The digital assets and services we use today have grown organically over time. We know that we will have to align our

investment to those assets that will deliver the priorities, perhaps review what we are currently doing with a view to stopping and, in some areas, re-asses the means of delivery. This will require strong and capability planning combined with portfolio planning."						
042	Financing Scotland's Recovery	Feb 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2021/03/financing-scotlands-recovery2/documents/financing-scotlands-recovery/financing-scotlands-recovery/govscot%3Adocument/financing-scotlands-recovery.pdf	Additional Reports	financing-scotlands-recovery
043	Global Capital Investment Plan Analytical Methodology Note	March 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/03/investing-purpose-scotlands-global-capital-investment-plan/documents/global-capital-investment-plan-analytical-methodology-note/global-capital-investment-plan-analytical-methodology-	Additional Reports	global-capital-investment-plan-analytical-methodology-note

				note/govscot%3Adocument/global-capital-investment-plan-analytical-methodology-note.pdf		
044	Policy priorities for the Scottish Parliament election 2021		Royal College of Physicians Edinburgh	https://www.rcpe.ac.uk/sites/default/files/files/health_priorities_2021.pdf	Additional Reports	health_priorities_2021
"High-quality disease surveillance data and workload activity data in primary and secondary care should be used to respond to increases in patient demand as a result of a coronavirus outbreak, or any other public health emergency." ***Service innovation and redesign*** *"Innovation should be promoted, such as the use of remote technology for consultations with patients or meetings, and staff working in cross disciplines, and not then immediately abandoned after the pandemic abates. These services should be repurposed or adapted to keep things moving in the system. Many patients feel more comfortable using 'Near Me' appointments to meet their healthcare needs, and this should be expanded on where appropriate while remaining aware that due to technological or inequalities issues, some patients cannot access these services as easily and some diseases/illnesses require face-to-face appointments and patient examination."*						
045	The Topol Review: Preparing the healthcare workforce to deliver the digital future	Feb 2019	Health Education England	https://topol.hee.nhs.uk/wp-content/uploads/HEE-Topol-Review-2019.pdf	Additional Reports	HEE-Topol-Review-2019
"Enabling the NHS to adopt and diffuse digital healthcare technologies safely, effectively and efficiently at scale and across geographies requires Board-level Leadership focused on clinical outcomes and on promoting effective and consistent staff engagement (OD4).3 System leaders will need to take a strategic perspective on research and innovation in science and technology, with new senior roles being created to horizon-scan, advise on the opportunities offered by digital healthcare technologies and identify local skills gaps."						

046	InterSystems: Unifying Healthcare in Scotland		InterSystems	https://www.intersystems.com/isc-resources/wp-content/uploads/sites/24/2017/01/unifying_healthcare_in_scotland-32185d0550f0d45dc3285843b6545082.pdf	Additional Reports	Intersystems Scotland Paper 2018
"The NHS Scotland Patient Management System program for hospitals gives authorized users immediate access to better clinical and administration information from one standard healthcare information system……. The program implements TrakCare to replace aging disparate systems with one unified, Web-based healthcare information system to share best practices, minimize harmful variation of processes, and standardize reporting"						
047	Investing in Ambition: Scotland's Risk Capital Market in Context Report 2021	June 2021	Scottish Enterprise	https://www.scottish-enterprise.com/media/4012/investing-in-ambition-risk-capital-market-report-2021.pdf	Additional Reports	investing-in-ambition-risk-capital-market-report-2021
048	Investing with Purpose: Scotland's Global Capital Investment Plan	March 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/03/investing-purpose-scotlands-global-capital-investment-plan/documents/investing-purpose-scotlands-global-capital-investment-plan/investing-purpose-	Additional Reports	investing-purpose-scotlands-global-capital-investment-plan

				scotlands-global-capital-investment-plan/govscot%3Adocument/investing-purpose-scotlands-global-capital-investment-plan.pdf		
049	Life Sciences Industrial Strategy– A report to the Government from the life sciences sector		Life Sciences Industrial Strategy Board	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf	Additional Reports	LifeSciencesIndustrialStrategy_acc2
050	Artificial Intelligence: How to get it right	Oct 2019	NHS X	https://www.nhsx.nhs.uk/media/documents/NHSX_AI_report.pdf	Additional Reports	NHSX_AI_report
051	Putting Good into Practice: A public dialogue on making public benefit assessments when using health and care data	April 2021	Hopkins Van Mil	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/977737/PGiP_Report_FINAL_1304.pdf	Additional Reports	PGiP_Report_FINAL_1304
052	Public Health Scotland's Digital Strategy 2021	April 2021	Public Health Scotland	https://publichealthscotland.scot/media/7431/digital-strategy-2021.pdf	Additional Reports	PHS digital-strategy-2021
053	Public Health Scotland's strategic plan 2020–23		Public Health Scotland	https://publichealthscotland.scot/media/2810/public-health-scotland-strategic-plan-2020-23.pdf	Additional Reports	PHS strategic-plan-2020-23

"We believe that our digital strategy complements Scotland's digital strategy, A changing nation: how Scotland will thrive in a digital world, Scotland's strategy and Scotland's AI strategy. More than this, we view our digital strategy as our contribution to Scotland's digital revolution."

"The enabling priorities are:

- *connecting all public health data to create a truly world-class distributed data resource*
- *developing joined-up, scalable, adaptable and easy to use IT solutions*
- *building a skilled and connected workforce operating with a digital-first culture."*

"The digital assets and services we use today have grown organically over time. We know that we will have to align our investment to those assets that will deliver the priorities, perhaps review what we are currently doing with a view to stopping and, in some areas, re-asses the means of delivery. This will require strong resource and capability planning combined with portfolio planning.

We recognise that we are a key player in the digital health ecosystem and will continue to look outside for inspiration and learn from the experience of others. This learning will not be restricted to health organisations and we will consult with other digital exemplar organisations in Scotland and beyond to learn lessons and put them into practice to deliver our critical success factors."

"Our digital vision is strengthened by our outward-facing digital ambitions in which we will:

- *Use digital to create empowering and personalised relationships with the public*
- *Digitally connect the public health network to overcome barriers facing local partners*
- *Lead an ecosystem of digital innovators with industry, academics and public health partners*
- *Curate data at a national and local level to support intelligent processes and actionable insight"*

"Overview of key findings

The results of our maturity assessment produced pleasantly surprising results for an organisation in our current state of maturity.

- *Our people have been highlighted as a key strength in our current operating model. Over 30% of respondents suggested that PHS possess highly capable digital resources.*
- *However, where we lead in culture and people, there was a perception that there are opportunities to improve our processes and technology to exploit the power of digital.*
- *We possess a vast, yet fragmented, digital and data estate. Most of our assets consist of systems focused on healthcare activity and the ownership of these systems is devolved across the organisation.*

A large proportion (87%) of the digital assets only relate to the creation or provision of data.

- *Our information and data governance capabilities are a core strength. However, many of our capabilities are inconsistent across the organisation, organised in silos reflecting legacy organisations.*
- *While PHS has a strong workforce across many data, analysis and solution development areas, much of this resource is aligned to business-as-usual activity, rather than enabling change and new services."*

054	Public Health Scotland Digital Strategy 2021 Exec Summary	May 2021	Public Health Scotland	https://publichealthscotland.scot/media/7432/phs-digital-strategy-executive-summary-2021.pdf	Additional Reports	phs-digital-strategy-executive-summary-2021
055	A consultation on a new National Public Health body: 'Public Health Scotland': NHS Health Scotland Response	July 2019	NHS Health Scotland	https://consult.gov.scot/public-health/public-health-scotland/consultation/view_respondent?sort=excerpt&order=ascending&_b_index=0&uuId=578456571	Additional Reports	phs-legislative-consultation-nhshs-response
056	Public Health Priorities for Scotland	June 2018	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/corporate-report/2018/06/scotlands-public-health-	Additional Reports	public health priorities for Scotland

				priorities/documents/00536757-pdf/00536757-pdf/govscot%3Adocument/00536757.pdf		
057	Scotland's Artificial Intelligence Strategy	March 2021	Digital Scotland	https://static1.squarespace.com/static/5dc00e9e32cd095744be7634/t/606430e006dc4a462a5fa1d4/1617178862157/Scotlands_AI_Strategy_Web_updated_single_page_aps.pdf	Additional Reports	Scotlands_AI_Strategy March 2021
"Because data powers AI, we recognise that our data infrastructure is crucial to Scotland's future. The Infrastructure Investment Plan committed £110m to boost funding in this key area, helping to build the foundations of an AI ecosystem which will power our public services. Also, we know that AI only creates value when it's based on the right high-quality data. The creation of Research Data Scotland is a major step forward in advancing ethical AI and securing access to data for the public good."						
"Key actions *First 100 days* • *Begin work on the Scottish Playbook for AI* • *In collaboration with Research Data Scotland, initiate a programme to unlock the value of data through trustworthy innovation for the benefit of everyone* • *Work with partners to align the AI Strategy with other national technology initiatives and programmes"*						
058	Shaping the future of digital technology in health and social care	April 2021	The King's Fund	https://www.kingsfund.org.uk/sites/default/files/2021-04/Shaping%20the%20future%20of%20digital%20technology%20in%	Additional Reports	Shaping the future of digital technology in health and social care

				20health%20and%20social%20care.pdf		
059	St James's Place: The Social Care Report		St James's Place	https://www.sjp.co.uk/~/media/Files/S/SJP-Corp/document-library/reports/2021/sjp-social-care-report.pdf	Additional Reports	sjp-social-care-report
060	The Future of Growth Capital Report	August 2020	Deloitte, Innovate Finance, ScaleUp Institute	https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/financial-services/deloitte-uk-the-future-of-growth-capital-august-2020.pdf	Additional Reports	The-Future-of-Growth-Capital-August-2020-1-1
061	The science of success: UK biotech financing in 2020	Feb 2021	UK BioIndustry Association	https://www.bioindustry.org/uploads/assets/4a953291-ff29-4379-b2f2526faac5bdc7/The-science-of-success-WEB-small.pdf	Additional Reports	The-science-of-success-WEB-small
062	Technology and Innovation in the NHS: Scottish Health Innovations Ltd		SHIL	https://archive2021.parliament.scot/S5_HealthandSportCommittee/Inquiries/TINN031_Scottish_Health_Innovations_Ltd.pdf	Additional Reports	TINN031_Scottish_Health_Innovations_Ltd

"…in order to be viewed as a dynamic, innovative health provider more needs to be done internally and externally to shake historical, and at times continuing, associations of bureaucracy." *"Scotland boasts one of the most highly developed health informatics systems in the world and there is huge recognition of the value of health data in Scotland and the ability to use technology and data analysis to better inform patient care."* *"At present, it is recognised by most participants that the healthcare innovation landscape in Scotland is cluttered, with a range of (sometimes competing) organisations and perspectives involved"* *"In June 2012, "Health and Wealth in Scotland: A Statement of Intent for Innovation in Health" suggested that Scotland has potential to be: 'a world leading centre for innovation in health through partnership working between Government, NHS Scotland, industry and the research community'."*						
063	Technology and Innovation in the NHS: InterSystems		InterSystems	https://archive2021.parliament.scot/S5_HealthandSportCommittee/Inquiries/TINN044_InterSystems.pdf	Additional Reports	TINN044_InterSystems
"NHS Scotland ultimately needs a unified Health Record for Patients that includes both documents and structured data…….that is accessible through multiple channels which can deliver and present far richer information in an intuitive and structured manner."						
064	Data and Intelligence Commission: Underpinning Data & Intelligence Deliverable 4: Documentation outlining customer requirements		NHS Health Scotland		Additional Reports	udi-deliverable-4-final

065	Data and Intelligence Commission: Underpinning Data & Intelligence Deliverable 5		NHS Health Scotland		Additional Reports	udi-deliverable-5-final

"Our ambition

The document should be read with the understanding that the innovative use of knowledge, data and intelligence will be a key tool in achieving the ambition for Scotland to be a world leader in improving the public's health. Public health reform will create a culture for health in Scotland that recognises the social and economic issues that affect health and creates environments that drive, enable and sustain healthy behaviours in our communities; supporting individuals take ownership of their own health where possible. The goal is to improve health and reduce health inequalities by working with national and local Government, the third sector, private sector and communities to create a culture for health in Scotland that supports more effective collaboration to improve health and wellbeing. Within this wider context, the ambition for data and intelligence is to:

- *Make best use of whole system intelligence.*
- *Support ease of use of available intelligence & evidence.*
- *Be impartial, adaptable and innovative.*
- *Enable a 'Once for Scotland' approach to decision making, both strategic and tactical.*
- *Reduce duplication of effort, organisationally, locally, regionally or nationally.*
- *Be a world leader."*

066	UK Innovation Strategy July 2021	July 2021	Department for Business, Energy & Industrial Strategy	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf	Additional Reports	uk-innovation-strategy July 2021
067	UK Industrial Strategy Seminar Glasgow 17.06.19	June 2019	Scottish Council for Development and Industry		Additional Reports	UKIS-SEMINAR-GLASGOW-17.06.19

068	The Economic Contribution of the Pharmaceuticals Sector in Scotland	Jan 2021	University of Strathclyde Fraser of Allander Institute	https://www.abpi.org.uk/media/8472/the-economic-contribution-of-the-pharmaceutical-sector-in-scotland.pdf	Additional Reports	2021-01-12-The_Economic_Contribution_of_the_Pharmaceutical_Sector_in_Scotland
069	A National Care Service for Scotland – Data Extract	August 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2021/08/national-care-service-scotland-consultation/documents/national-care-service-scotland-consultation/national-care-service-scotland-consultation/govscot%3Adocument/national-care-service-scotland-consultation.pdf	Additional Reports	A National Care Service for Scotland - Data Extract

"Data about an individual is often held in multiple different places, making it difficult for people providing support across health and social care to access the most relevant, up-to-date information. This makes effective delivery of care, and continuity of care across different service providers and over time as care needs change, more challenging than it needs to be. It also hampers planning and development of services, research, and continuous improvement.

The pandemic has further emphasised that despite the volume of data, there remain significant information gaps and concerns around data quality and reliability. This includes, but is not limited to, information on care at home services, levels of unmet need, experiences of service users, and, crucially, the outcomes achieved for people. Most importantly, it makes it difficult to fully recognise and reflect a complete picture of an individual's personal needs and aspirations in an integrated approach that supports their wellbeing across health and social care.

In addition, there is a lack of a common approach to how data is recorded, what data is stored, and how service users are identified. This makes it challenging to provide services and understand things like equity of provision, and places additional burdens on individuals and provider organisations who may need to provide multiple different types of data to different commissioners for different purposes. *The gaps in existing data and intelligence are made worse by a vast array of formal and informal digital (and paper) systems for recording data across service providers. Data is overwhelmingly held in separate silos at the local level, so it is difficult to form a national picture. The increase in use of technology by individuals to manage their own care also generates a wealth of additional data (which is either captured in proprietary formats or probably held in silos).* *This makes accessing and sharing of information to help improve and tailor the services being delivered to people far more challenging. And this extends to how information is shared from social care into and with health (and vice versa)."*						
070	Data Delivery Group (DDG) Priorities Jan 2020	30 January 2020	Scottish Government/Digital Scotland		Additional Reports	DDG Priorities Jan2020
"Annex A –Potential Priorities for 2020 *8b. Developing a new service model to standardise and improve the stewardship of requests to use NHS Scotland data from academic and commercial organisations."*						
071	Delivering Innovation through Research - Scottish Government Health and Social Care Research Strategy	Oct 2015	Scottish Government/NHS Scotland	https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2015/10/delivering-innovation-through-research-scottish-government-health-social-care-research/documents/00488082-pdf/00488082-	Additional Reports	Delivering Innovation through Research

				pdf/govscot%3Adocument/00488082.pdf		
"It is critical to the success of our national ambition that research in Scotland is supported by efficient structures in the NHS – both for R&D governance purposes and for ethical approval……Having national R&D Directors of the appropriate standing and commitment is vital to its future success. It is therefore important to clarify both the key responsibilities of these national posts and the expectations on their successors."						
072	Digital First Service Standard		Digital Scotland	https://resources.mygov.scot/dfss-poster-feb-17.pdf	Additional Reports	Digital First Service Standard (Digital Scotland)
073	Digital Health & Care In Scotland	March 2021	Scottish Development International	https://www.sdi.co.uk/media/2614/digital-health-care-scotland-proposition-2021.pdf	Additional Reports	digital-health-care-scotland-proposition-2021
"In comparison to rest of UK and US, Scotland has an incredibly stable population, with cradle to grave patient records underpinned by a unique patient identifier assigned to everyone registered with a GP practice. We also have a centralised healthcare system (including a national Picture Archiving System) and a high incidence of morbidity in common disease areas such as diabetes, COPD, obesity and CVD."						
"And when you choose to locate in Scotland, you'll benefit from a designated Safe Haven platform for the use of NHS electronic data in research feasibility, delivery and pharmacovigilance. This means you'll be assured of a secure environment supported by trained staff and agreed processes, whereby health data can be processed and linked with other data and made available in a de-identified form for analysis to facilitate research."						
074	The Getting It Right First Time Programme: Early views from the provider sector	Feb 2018	NHS Providers	https://nhsproviders.org/media/4365/girft-final-pdf.pdf	Additional Reports	girft-final-pdf

075	GLASGOW Safe Haven: Secure NHS data research		NHS Greater Glasgow and Clyde	https://www.nhsggc.org.uk/media/266674/glasgow-safe-haven-user-guide.pdf	Additional Reports	glasgow-safe-haven-user-guide
"The Safe Haven provides a governance route and a trusted research environment to provide access to, and conserve the security of, patient-level data for NHS Greater Glasgow and Clyde. *Working in collaboration with departments across the NHS, we receive regularly refreshed data from NHS GGC core health systems serving secondary care and other divisions of the local health data infrastructure.* *In addition, we host historical datasets of patient information which, although not updated dynamically in the same way as our other NHS data sources, nevertheless present opportunities to design novel health data linkage projects."*						
076	Healthcare data safe havens: towards a logical architecture and experiment automation	Oct 2016	The Journal of Engineering	https://ietresearch.onlinelibrary.wiley.com/doi/epdf/10.1049/joe.2016.0170	Additional Reports	Healthcare data safe haven 2016
"The Scottish Government, in particular, considers safe havens to be a crucial element of its health informatics strategy and has the vision to set an international standard for the safe and secure use of electronic health records for research purposes."						
077	Independent Review of Adult Social Care in Scotland	Feb 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/independent-report/2021/02/independent-review-adult-social-care-scotland/documents/independent-review-adult-	Additional Reports	independent-review-adult-care-scotland

				care-scotland/independent-review-adult-care-scotland/govscot%3Adocument/independent-review-adult-care-scotland.pdf		

"People told us how frustrating they found it to be asked to repeat the same information to several different professionals when better data sharing arrangements would remove the need.

We were told consistently that Scotland needs to shift its attitude towards technology and data sharing to improve people's experience of social care. Technological solutions should of course never be "forced" on people as a substitute for other kinds of care, but experience during the pandemic has highlighted that, for some people, technology can really help people to live independently in their own communities and to feel less lonely.

Technology is not a replacement for support provided by another person, but it can play a much bigger role in improving the lives of people who use social care services and supports. It can also help with people's ownership of their care and support, particularly when people "own" their own data or information that is about them and share it with the people who support them."

"Within the National Care Service, provision will also be needed to oversee priorities that currently have no home in the national infrastructure, such as workforce planning and development, data and research, IT and, as appropriate, national and regional service planning, and to manage services that are better organised on a once-for-Scotland basis, such as support for people with complex and specialist needs, provision in custodial settings including prisons, and so on."

*"**Recommendations:** 25. Be responsible for social care support functions that currently have no home in the national infrastructure, such as workforce planning and development, data and research, IT and, as appropriate, national and regional service planning, and to manage services that are better organised on a once-for-Scotland basis, such as support for people with complex and specialist needs, provision in custodial settings including prisons, and so on."*

078	A National Care Service for Scotland - Consultation	August 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2021/08/national-care-service-scotland-consultation/documents/national-care-service-scotland-consultation/national-care-service-scotland-consultation/govscot%3Adocument/national-care-service-scotland-consultation.pdf	Additional Reports	national-care-service-scotland-consultation
079	NSS Strategy 2019-2024		NHS NSS	https://www.nss.nhs.scot/media/1516/nhs_nss_strategy2019to2024.pdf	Additional Reports	nhs_nss_strategy2019to2024
080	Towards trusted data sharing: guidance and case studies		Royal Academy of Engineering	http://reports.raeng.org.uk/datasharing/cover/	Additional Reports	RAENg Data SHaring Dec2018 inc DaSH
081	Towards trusted data sharing: guidance and case studies - DaSH		Royal Academy of Engineering	http://reports.raeng.org.uk/datasharing/case-study-9-grampian-data-safe-haven/	Additional Reports	RAENg Data SHaring Dec2018 inc DaSH CS9 Extract
082	Riding The Wave Of Recovery	August 2020	IQVIA		Additional Reports	Riding the Wave of Recovery_IQVIA Recommendations to Scottish Government

"Scotland has several key attributes which make it an ideal location to conduct clinical research. A single coherent healthcare provider (NHS Scotland) servicing a stable population of over 5 million people with a high incidence of chronic disease."						
"However, Scotland's unique research differentiator is its globally recognised electronic medical record (EMR) system -largely due to the ability to identify patients from 'cradle to the grave', through linked health data across primary, secondary and social care, using Scotland's unique Community Health Index (CHI) number."						
"Scotland holds the potential to become the global leader in delivering enabled, health data-centric clinical trials and real-world studies, but this can only be fully realised if there is the appetite to make this happen at pace and scale amongst the key clinical and health data stakeholders. It is IQVIA's belief that if the opportunity is taken, Scotland would become not just a leader, but the global health data flagship country in health data-enabled clinical research delivery."						
083	A Charter for Safe Havens in Scotland	Nov 2015	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/agreement/2015/11/charter-safe-havens-scotland-handling-unconsented-data-national-health-service-patient-records-support-research-statistics/documents/charter-safe-havens-scotland-handling-unconsented-data-national-health-service-patient-records-support-research-	Additional Reports	Scotland Safe Haven Charter 2015

				statistics/charter-safe-havens-scotland-handling-unconsented-data-national-health-service-patient-records-support-research-statistics/govscot%3Adocument/00489000.pdf		

"Safe Havens operating under an accreditation framework have been considered to be the most appropriate environments to facilitate research using de-identified (also termed 'pseudonymised') data from electronic patient records when it is not practicable to obtain specific consent from the individuals for the use of data in their records"

"The National Safe Haven may be best placed to take the lead when research requires the processing and linkage of national datasets. Similarly, it is anticipated that data controllers in NHS Boards will select the regional Safe Havens in the NRS nodes to support research that involves the processing and linkage of data using local/regional NHS datasets"

"eDRIS can act as a first port of call for researchers on behalf of the federated network to coordinate research and advise researchers about what the Safe Havens in the federated network can provide, although each Safe Haven can also be approached by, and work with, researchers directly on regional Health Board data."

"Principle 1
Safe Havens will provide secure environments that are trusted by NHS Data Controllers which allow the safe and secure transfer of data with maximum fidelity from Data Controllers in Health Boards (and where applicable other bodies) to Safe Havens and between Safe Havens."

"Principle 5
Safe Havens work in partnership with academia, public service providers and industry to undertake research using de-identified or anonymised data that is in the public interest."

084	Scottish Health Technologies Group: Health Technology Assessment (HTA) and links to IRIC	April 2021	NHS Scotland/Health Improvement Scotland/SHTG	https://www.nss.nhs.scot/media/1215/sb461912-ed-clifton.pdf	Additional Reports	Scottish Health Technology Group Apr2021
085	The Scottish Federated Safe Haven Network	Nov	NRS Conference	https://www.nhsresearchscotland.org.uk/uploads/tinymce/The%20Scottish%20Federated%20Safe%20Haven%20Network.pdf	Additional Reports	The Scottish Federated Safe Haven Network
"Data Repository Function • *Provision of linked anonymised datasets for research for a specific cohort to answer a specific research question* • *The internals of how this works within each Safe Haven is slightly different"*						
"All Safe Havens try to recover their costs from research grant where appropriate."						
086	Trusted Research Environments (TRE): A strategy to build public trust and meet changing health data science needs	April 2020	UK Health Data Research Alliance	https://ukhealthdata.org/wp-content/uploads/2020/04/200430-TRE-Green-Paper-v1.pdf	Additional Reports	Trusted Research Environments (TRE)
087	Outline Business Case: Research Data Scotland	July 2021	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/07/outline-business-case-research-	Additional Reports	outline-business-case-research-data-scotland 21JUL21

				data-scotland/documents/outline-business-case-research-data-scotland/outline-business-case-research-data-scotland/govscot%3Adocument/outline-business-case-research-data-scotland.pdf		
"The offering from Scotland around data needs to be much stronger; speed of delivery, ease of access and linking of diverse datasets are impacting on the strength of our offering. There are also challenges with how long it takes to access Scottish data and about the quality and costs of the services required to enable that. More specifically, for academia, this means we are not securing a suitable share of the available UK research funding, and for public bodies, this means that they do not have the data to support public service reform. *Data are also dispersed both between and within public sector organisations. Multiple data controllers mean multiple data access processes. This also leads to blockages in data being available for research and innovation. In essence, we are currently facing a variety of concurrent challenges, including multiple data controllers; multiple data access processes; and data not always linkage-ready."*						
088	Evaluation of the Attend Anywhere / Near Me video consulting service in Scotland, 2019-20	July 2020	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2020/07/evaluation-attend-anywhere-near-video-consulting-service-scotland-2019-20-main-report/documents/evaluation-attend-anywhere-	Additional Reports	evaluation-attend-anywhere-near-video-consulting-service-scotland-2019-20

				near-video-consulting-service-scotland-2019-20/evaluation-attend-anywhere-near-video-consulting-service-scotland-2019-20/govscot%3Adocument/evaluation-attend-anywhere-near-video-consulting-service-scotland-2019-20.pdf		
089	A Route Map to the 2020 Vision for Health and Social Care	2013	NHS Scotland	http://www.sspc.ac.uk/media/Media_473395_smxx.pdf	Additional Reports	A Route Map to the 2020 Vision for HEALTH AND CARE (2013)
090	WoS Innovation Hub eHealth Update	Aug 2021	NHS Scotland/West of Scotland Innovation Hub		Additional Reports	WoS Innovation Hub - Aug21 v3
091	Supporting Digital Front Door Demonstrator Explanation	Aug 2021	NHS Scotland		Additional Reports	WOS Digital Front Door Exploration v2 180821
092	Guiding Principles for Data Linkage	2012	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2012/11/joined-up-data-better-decisions-guiding-principles-data-linkage/documents/joined-up-data-better-	Additional Reports	Guiding Principles for Data Linkage 2012

				decisions-guiding-principles-data-linkage/joined-up-data-better-decisions-guiding-principles-data-linkage/govscot%3Adocument/00407739.pdf		
093	Joined up data for better decisions: A strategy for improving data access and analysis	Nov 2012	Scottish Government	https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2012/11/joined-up-data-better-decisions-strategy-improving-data-access-analysis/documents/joined-up-data-better-decisions-strategy-improving-data-access-analysis/joined-up-data-better-decisions-strategy-improving-data-access-analysis/govscot%3Adocument/00408151.pdf	Additional Reports	Joined up data for better decisions 2012
094	ACCORD: Promoting clinical research excellence for the health and wealth of Lothian and Scotland	Jan 2020	NHS Scotland, ACCORD	http://accord.scot/sites/default/files/ACCORD%20Brochure%20January%202020.pdf	Additional Reports	ACCORD Brochure January 2020

095	Data saves lives: reshaping health and social care with data (draft)	Sept 2021	UK Government	https://www.gov.uk/government/publications/data-saves-lives-reshaping-health-and-social-care-with-data-draft/data-saves-lives-reshaping-health-and-social-care-with-data-draft	Additional Reports	Data saves lives_ reshaping health and social care with data (draft) - GOV.UK
096	GLASGOW Safe Haven: Secure NHS data research		NHS Greater Glasgow and Clyde	https://www.nhsggc.org.uk/media/266674/glasgow-safe-haven-user-guide.pdf	Additional Reports	glasgow-safe-haven-user-guide
097	Trusted Research Environment - Provided by Health Informatics Centre		University of Dundee		Additional Reports	HIC Dundee Executive Slides
098	Using Health Data for Research	Aug 2021	University of Dundee Health Informatics Centre	https://www.dundee.ac.uk/media/dundeewebsite/hic/documents/introduction-to-hic-slides.pdf	Additional Reports	introduction-to-hic-slides

"Large scale enabler for Health Data Research

HIC services supported >£200M of total grants over last 5 years Operates an accredited regional "Safe Haven" or Trusted Research Environment (TRE) for Scottish Government

- *c.17 years+ experience (c.55 expert staff) in secure data management, information security & governance, data engineering, research Infrastructure, software, health Informatics, Machine Learning & AI, data linkage and business support*
- *For 12 years delivered a Trusted Research Environment (TRE or 'Safe Haven' [SH] in Scottish terms) for the Scottish Government and NHS Tayside and NHS Fife Health Board Regions*
- *Delivering secure research managed 'access to' data under robust governance control*

• *Regionally, Scotland, UK-wide & Internationally* • *HIC maintains an information security management system accredited to ISO27001 & Cyber Essentials"*						
099	The Future of UK Clinical Research Delivery: 2021 to 2022 Implementation Plan	June 2021	UK Government/ Department of Health and Social Care	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/995863/the-future-of-uk-clinical-research-delivery-2021-to-2022-implementation-plan.pdf	Additional Reports	the-future-of-uk-clinical-research-delivery-2021-to-2022-implementation-plan
"Scotland has a developed health informatics support infrastructure, with core support provided to 4 regional Data Safe Havens supporting regulated and secure access to NHS data. These Safe Havens work in tandem with the national electronic Data Research and Innovation Service (eDRIS) and Boards to deliver research and help identify patients to take part in studies"						
100	Health for Wealth: Building a Healthier Northern Powerhouse for UK Productivity		Northern Health Science Alliance	https://www.thenhsa.co.uk/app/uploads/2018/11/NHSA-REPORT-FINAL.pdf https://www.gov.scot/publications/health-biomedical-informatics-research-strategy-scotland/	Additional Reports	NHSA-REPORT-FINAL
101	A Health and Biomedical Informatics Research Strategy for Scotland - Enhancing research capability in health informatics for patient	April 2015	Scottish Government	https://www.thenhsa.co.uk/app/uploads/2018/11/NHSA-REPORT-FINAL.pdf	Additional Reports	00475145.pdf

	and public benefit 2015-2020			https://www.gov.scot/publications/health-biomedical-informatics-research-strategy-scotland/		
"A common complaint from both industry and university-based researchers is that there appears to be a multiplicity of entry points, and a confusing array of data providers, governance bodies and permissions processes" *"A major frustration and source of delay with the current system is the requirement to submit the same information in the course of several different approvals"* *"Active engagement of industry will be an important gauge of the success of the new investment in health informatics research. Developing a clear understanding of commercial partners' requirements is a priority."*						
102	Empowering the health workforce to make the most of the digital revolution	June 2021	OECD	https://www.oecd-ilibrary.org/docserver/37ff0eaa-en.pdf?expires=1634125513&id=id&accname=guest&checksum=3957322F04C1B176FFE474D782706B58	Additional Reports	Empowering the Health Workforce OECD Health WP No129
"*However, despite the recent acceleration in uptake of digital technologies achieved during the COVID-19 pandemic, the health sector is a long way behind other industries in reaping digital opportunities."* ***"Digital transformation offers unique opportunities to strengthen health systems*** *and meet the challenges of responding to changing health needs, such as the current epidemics of infectious and chronic diseases. Despite considerable efforts and some promising successes,* ***health systems in most OECD countries have not yet undergone digital transformation****:*						

- ***Different datasets and services still are not linked electronically, hindering the flow of crucial information*** *– a serious problem, for example, during the COVID-19 pandemic.*
- ***The use of telehealth is still limited****, often only to exceptional circumstances,* ***despite growing evidence of general benefits****, hampering progress in improving access to care and moving away from reactive towards proactive approaches to preserving health.*
- ***The use of analytics employing diverse data and technologies such as Artificial Intelligence is only slowly emerging****, despite the complexity of health-sector processes and activities and the high reliance on multifaceted information to solve problems.*

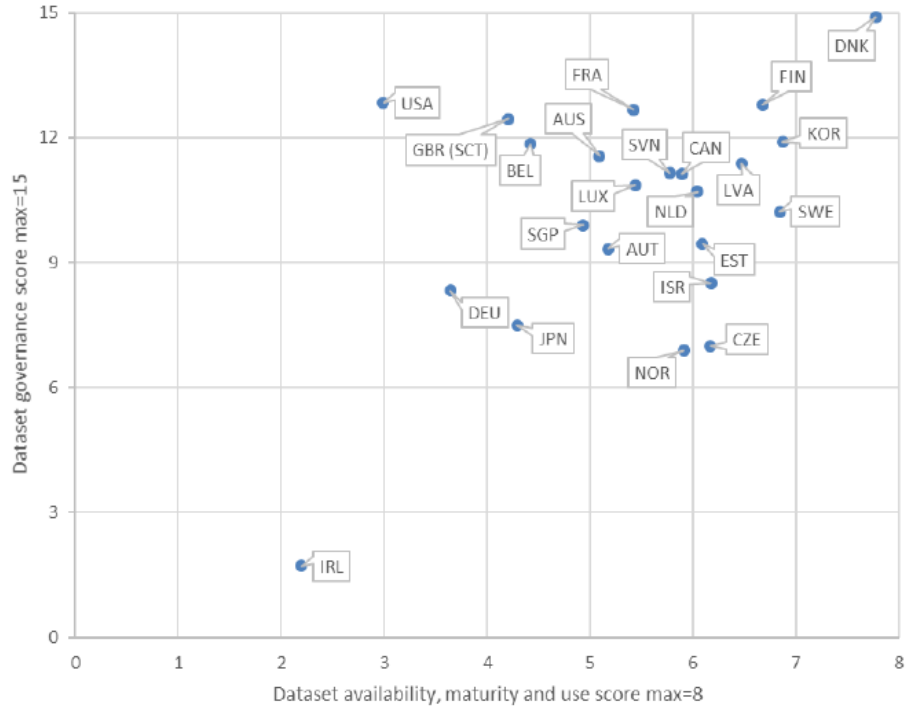
The barriers to progress are not only technical, but also institutional and organisational*. While* ***governments need to commit to continuous investment in interoperability and building of flexible digital architecture****, they also need to* ***ensure timely modernisation of policy and governance frameworks****. The most pressing areas include:*

- *providing adequate support for health workers;*
- *avoiding delays in adjusting legislative and financial frameworks for the digital era;*
- *ensuring effective cross-sectoral approaches and policies."*

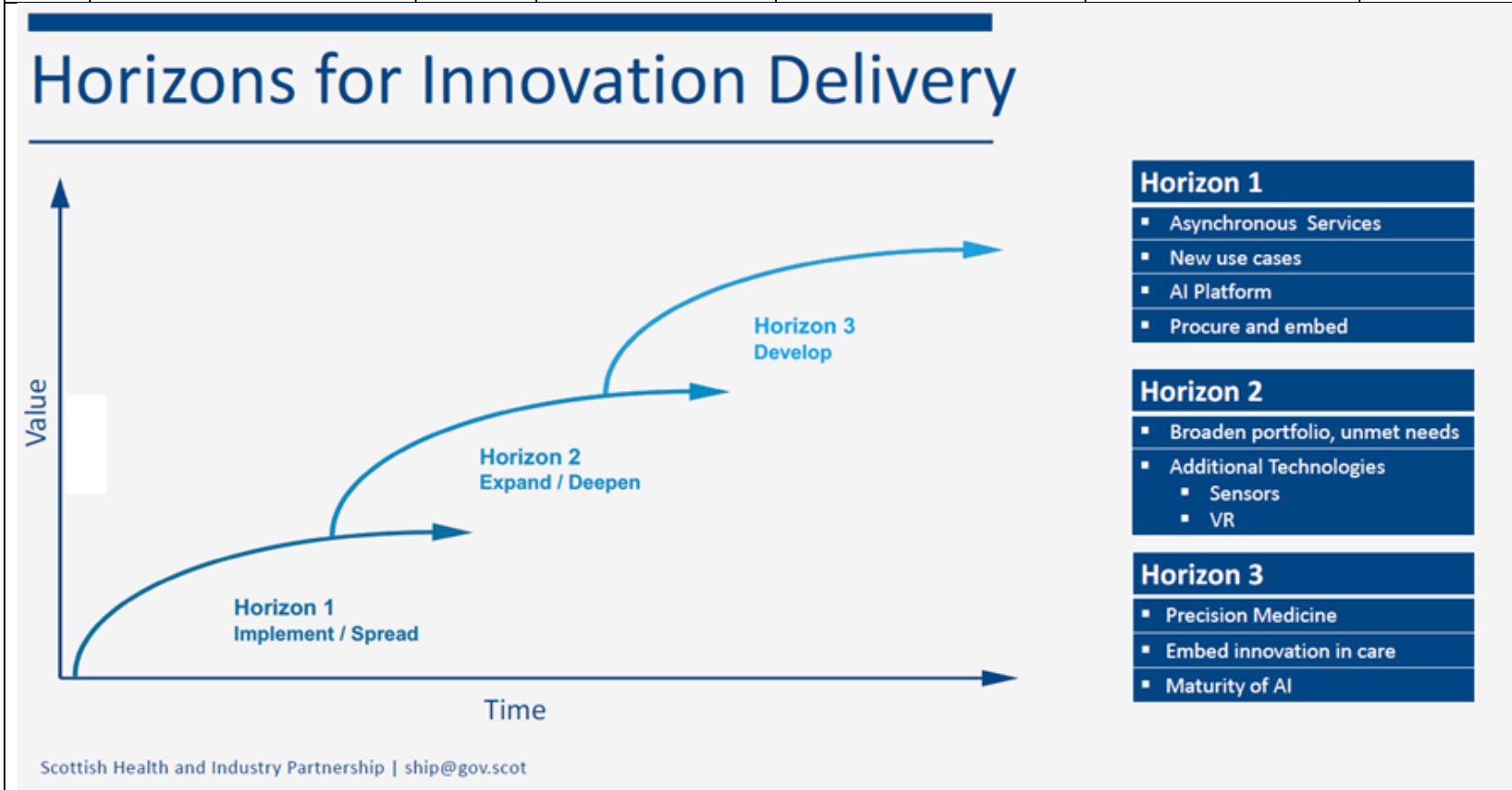
103	Survey results: National health data infrastructure and governance	April 2021	OECD	https://www.oecd-ilibrary.org/docserver/55d24b5d-en.pdf?expires=1634125428&id=id&accname=guest&checksum=349CEE7174A44B2C237671A3AD164FFA	Additional Reports	National Health Data Infrastructure and Governance OECD WP No 127

217. The 2019/20 survey results indicate that there remains variability across countries in health data use and governance. There is a small cluster of countries reporting high agreement with the policies, regulations and practices that foster the development, use, accessibility and sharing of key national health datasets for research and statistical purposes that were measured in this survey; while also reporting high agreement with the health data governance policies and practices that were measured. Countries reporting the strongest national health data availability, maturity and use and health dataset governance policies and practices were Denmark, Finland and Korea. These countries were followed by Australia, Canada, France, Latvia, Netherlands, Slovenia, Sweden and United Kingdom (Scotland) (Figure 4.1).

Figure 4.1. Three countries score highly on both dataset availability, maturity and use and dataset governance



Note: Dataset governance score is the sum or the proportion of health care datasets meeting 15 dataset governance elements and the dataset availability, maturity and use score is the sum of the proportion of health datasets meeting 7 elements of dataset availability maturity and use. See Annex B.1 and B.31.
Source: Author.

104	HSCMB Substantive Items Paper - Innovation Steering Group	Aug 2021	ANIA		Additional Reports	HSCMB Substantive Items Paper - Innovation Steering Group - August 2021. _
						
105	Accelerated National Innovation Adoption (ANIA) for Health and Social Care		Centre for Sustainable Delivery, NHS Scotland		Additional Reports	ANIA CfSD

106	Innovation Pipeline SHIP		Scottish Government		Additional Reports	ANIA SHIP
107	DHI Phase 2 Year 2 Annual Report July 2021	July 2021	DHI Scotland		Additional Reports	DHI Annual Report July 2021
108	The Lancet / Financial Times Commission	Oct 2021	The Lancet / Financial Times	Home - Growing up 2030 in a digital world (governinghealthfutures2030.org)	Additional Reports	Governing health futures 2030: growing up in a digital world.

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