Digital Health Strategic Implementation Roadmap

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Key Terms

Key Term	Definition
Data	In the context of health and technology, data refers to electronic information gathered and stored, often via medical devices, digital health records, or health studies. This information can include patient histories, biometric readings, genomic data, images from medical scans, or statistical health information. It provides critical insights into health trends, disease patterns, treatment efficacy, and can aid in the development of personalised medicine, improved healthcare strategies, advanced research, and better patient outcomes.
Digital Health	The use of information and communication technologies to improve health outcomes, healthcare services and facilitate wellness. It includes the tools and information to empower patients to better understand and manage their health.
Electronic Health Record (EHR)	An EHR is a digital version of a patient's medical record that is designed to be shared between different healthcare organisations, such as hospitals, clinics, and pharmacies. EHRs are designed to improve patient care coordination and communication between healthcare providers.
Integrated care	A coordinated and seamless approach to healthcare delivery that brings together various healthcare providers, services, and settings to provide comprehensive and holistic care to patients.
Interoperability	Interoperability is a core philosophy of the target technology architecture for the healthcare system and means that technologies conform to a set of standards which allow data exchange and integration.
Patient Empowerment	Is about supporting patients to have an active role in decision-making and address important issues for better health and social care outcomes.
Patients	Patients and / or service users who engage with various aspects of the healthcare system, including accessing their health information, seeking advice for preventive measures, receiving medical care, treatment, or support from healthcare professional.
Shared Care Record	A digital record aggregated from various electronic data sources that provides a holistic view of a patient's health status across healthcare settings. It can contain information about a patient's diagnoses, test results, procedures, care plans, and more.
Summary Care Record	A digital snapshot of a patient's essential clinical information including medications and allergies available to healthcare professionals.

Foreword

I am pleased to present the Health Service Executive Digital Health Strategic Implementation Roadmap. This Roadmap sets down a clear path for the integration of digital technologies in our healthcare system and marks a crucial step in our journey towards a patient-centred, digitally enabled health and social care environment. It signals our commitment to leverage digital technology in healthcare in order to provide people with an improved healthcare experience. During this journey we want to foster patient involvement in their care journey, jointly improve accessibility to our services, while enhancing efficiency, patient access, and the overall quality of care.

This Roadmap has been developed in alignment with the Department of Health's Digital for Care – A Digital Health Framework for Ireland which harnessed other key documents such as the Sláintecare Action Plan, and the Digital Ireland Framework. The Roadmap serves as our digital plan towards an integrated, universal, and high-quality health and social care system for all patients.

Our vision is to create better health outcomes through a digitally enabled environment, where your health data is utilised to provide seamless data sharing by care providers. This necessarily involves a considerable and sustained investment in digital infrastructure, skills, and digital products. The Roadmap encompasses six Principles and 48 Initiatives aimed to drive this vision.

1. Patient as an empowered partner
2. Workforce and workplace
3. Digitally enabled and connected care
4. Data driven services
5. Digital health ecosystem and innovation
6. Secure foundations and digital enablers.

Our focus remains firmly on the patient. Their empowerment and efficient, personalised access to healthcare form the foundation of our transformation journey. Keeping pace with the rapidly advancing digital landscape, we aim to ensure that our Roadmap remains responsive and reflective of patient needs.

In addition, clinical involvement, and endorsement is required to lead us through this digital transformation. By reconfiguring how we work, through integrated care and the use of modernised care pathways we can empower patients and healthcare professionals as we plan and build digital systems to support that care.

By supporting them, enhancing skills and capabilities, and helping people to fully participate in their healthcare journey we will serve the purpose for all to own and access their health information.

We know from our own and international experiences, that this transformation will require a substantial commitment of resources. Enabling this transformation will require significant investment in both digital infrastructure and systems, as well as a corresponding investment in developing digital skills and capability for all healthcare staff and the public who use our services. This Roadmap shows what is possible with the right investment, and along with the corresponding Department of Health Framework provides the basis for that investment case.

In addition to increased investment, the revised HSE structures will provide improved governance and the operating model required to use digital technology to improve access to current services as well as enable modern care pathways that allow care to be provided in settings closer to home where appropriate.

At the heart of all this transformation are people – our patients, healthcare professionals, and staff. Their engagement and participation will continue to be our most valuable resource. As we move forward in our digital journey, I strongly believe that we are creating a more resilient, efficient, and high-quality health and social care system, with our patients at its heart. In laying down this Roadmap, I am confident that we are set to make a profound impact on the health and wellbeing of our people, and the future delivery of healthcare in Ireland. I look forward to our shared journey towards this.

Bernard Gloster

Chief Executive Officer

Executive Summary

Digital health is a key enabler in delivering modern health and social care. It offers innovations and solutions that supports improved access, efficiency, and quality of care. Leveraging digital technologies will change health and social care delivery, optimise resource allocation, and empower patients to actively participate in their own care. Using digital systems that enable patient information to be shared and accessed seamlessly across the health and social care system and will be essential to enable successful integration that is responsive to the changing needs of patients and their families. A comprehensive digital health investment is imperative to address many of the current challenges faced by the Irish health system and the patients, population and public that use it, such as rising costs, siloed health information systems and increasing demand for services.

The Health Service Executive (HSE) recognises the potential of digital technology to transform and improve health and social care delivery and patient outcomes. This Digital Health Strategic Implementation Roadmap (the Roadmap) and the Strategic Initiatives detail what is required to deliver this transformation. The Roadmap highlights the importance of digital health to assist the transformation required to change the way we deliver care to patients. It also details the importance of incorporating the patient's own voice in their health and social care and allowing them to input their own health data.

This is a comprehensive Roadmap that builds upon and aligns with the Department of Health (DoH) Digital for Care – A Digital Health Framework for Ireland and(the Framework), the Sláintecare action plan, and the Department of the Taoiseach's Digital Ireland Framework. Combined, the Framework and the Roadmap outline Ireland's ambitions, Principles, and the future Roadmap for digital health from year 1 to year 7. Key drivers and enablers for the Roadmap's success include alignment with national and international objectives, such as the DoH Framework, The Health Information Bill (in development), Sláintecare, the European Health Data Space (EHDS), and the World Health Organization's Global Strategy on Digital Health.

The primary purpose of the Roadmap is to set out digital health Initiatives which will deliver the vision and mission set out in the DOH's Framework. These Initiatives are prioritised and will be undertaken from year 1 to year 7 and the Roadmap highlights the benefits for patients, the population, the health workforce, and the overall health system in Ireland. The Roadmap aims to integrate and connect health and social care services, providing timely, efficient, and patient-centred care with ready access to high-quality up-to-date health information. The Roadmap recognises the need for significant and sustained investment to achieve transformational goals, including the implementation of Electronic Health Records (EHRs), and Shared Care Record (SCR), allowing a single point of access to health information for patients and staff.

The development of this document involved extensive consultation, in collaboration with the DoH, across the health and social care system, including with patients, the health workforce, industry, and innovator groups. Insights and experiences from other countries have been considered, as well as advancements in digital health technologies, legislative developments, and national and European policy drivers. The DoH Framework was developed by the DoH in conjunction with the HSE, this Roadmap was developed by the HSE in conjunction with the DoH.

To drive large-scale transformation, a flexible and learning-oriented approach is crucial, enabling various services and systems to seamlessly collaborate. Digital health should be viewed as a strategic investment, with agility as a key principle to adapt quickly and efficiently. Collaboration with universities, academic health networks, and health innovators across the health and social care system will play a crucial role in supporting the innovation that is required to support the delivery of this transformation across the system.

The document provides a Roadmap to support the transformation of health and social care delivery in Ireland, empowering patients, enhancing trust and data protection, promoting connected care, through building a robust digital infrastructure and providing general direction and guidance to our health and social care transformation journey. By embracing the transformative capacity of digital health, Ireland can work towards achieving an integrated, universal, and high-quality health and social care system for all patients.

The key outcomes that this transformation will deliver include empowering patients by giving them greater access to information, ability to remotely engagement with health services, enabling them to have more involvement in decision-making. They will have easy access to information and expanded options for care. This transformation will also improve efficiency, safety, and coordination in the health and social care system, benefiting both patients and the health and social care workforce. Additionally, the integration of data and analytics will lead to better patient outcomes and informed decision-making.

By incorporating digital solutions and improving digital skills, a key outcome will be improved health and social care delivery. This transformation seeks to create fully integrated healthcare with clear decision-making, strong leadership, and governance, promoting transparency and interoperability.

Overall, the transformation will have positive impacts on patient empowerment, access to care and information, efficiency, safety, and patient outcomes. It will enhance the experience and wellbeing of healthcare workers, streamline workflows, improve collaboration and connectivity, and enable informed decision-making through data and analytics.

Some of the immediate next steps outlined in the conclusion and next steps chapter include increasing the involvement of patients and healthcare professionals, creating open channels for communication, establishing a dedicated transformation team, and implementing national data and workflow standards. Additionally, the Roadmap highlights the need for a responsive architecture that can adapt to new developments and aligns with existing strategic frameworks. By following these steps, Ireland can lay the foundation for achieving its vision of a patient-centred, digitally enabled health and social care system that improves access, efficiency, and quality of care.

The Principles

The DoH and HSE have established a digital health strategic direction to assist the transformation of the Irish health system. This is underpinned by the DoH Framework and this Roadmap. The shared strategic direction is underpinned by one vision and mission, six Principles and 48 Initiatives.

Vision

Better health outcomes enabled by seamless, safe, secure, and connected digital health services which support health and wellbeing for both our patients and providers.

Mission

To harness the power of digital to increasingly connect how health and social care services are delivered for our population.

The following Principles have been jointly developed by the DoH and HSE. Our Principles give us a shared goal to work towards so that the vision and mission of the transformation can be achieved and bring real value to patients and the health and social care workforce.

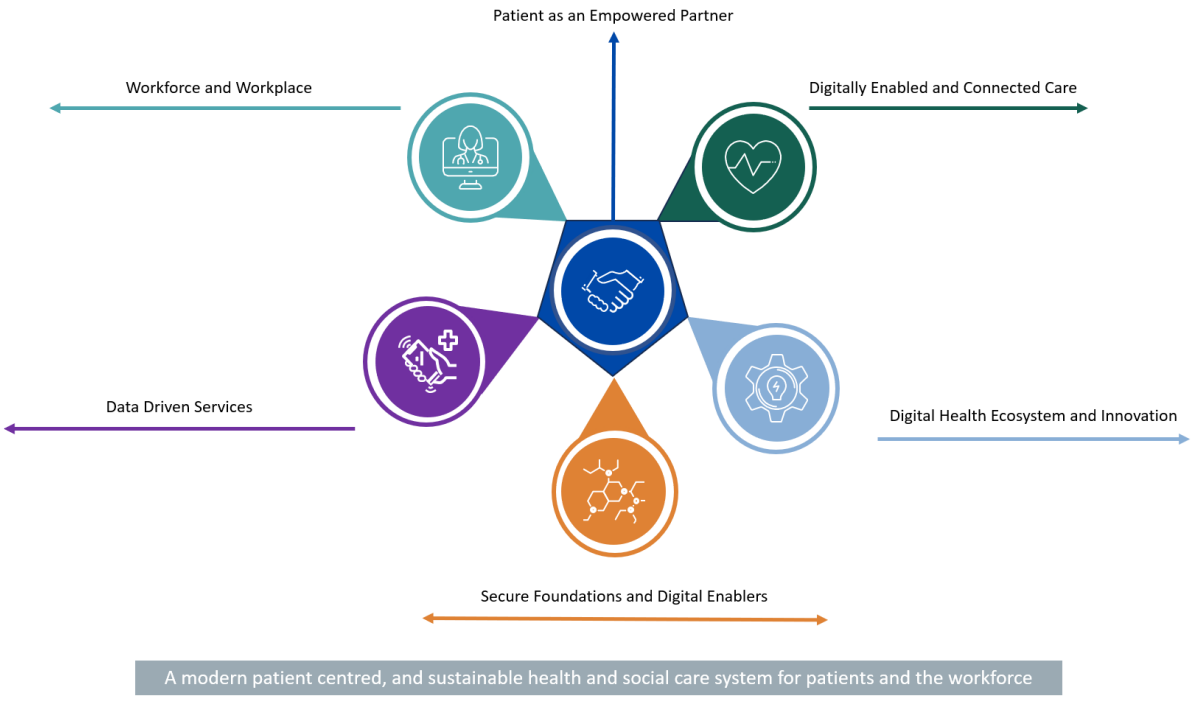


Figure 1: The Six Strategic Principles

The successful implementation of the Initiatives outlined in Principles 1 – 5 depends greatly on establishing digitally secure foundations, which is the focus of Principle 6. Principle 6 is crucial for the success of Initiatives outlined in Principles 1-5. It establishes secure digital foundations, ensuring effective governance, supportive culture, and robust infrastructure. This principle integrates architecture, cyber security, agile delivery, and data engineering into the health service, guaranteeing a secure digital environment. It emphasises building digital capability and capacity within the health and social care system to improve patient care and outcomes.

1. **Patient as an empowered partner** will give the public greater access to their personal health information and care options, while providing greater patient involvement, autonomy, and choice in their healthcare. Digital channels allowing better information flow will give patients greater access to services, with more choice in the care settings and the types of care.
2. **Workforce and workplace** will support the health and social care service in providing a digitally skilled and supported workforce with appropriate digital tools and connectivity allowing for collaborative working. This will lead to improved efficiency and accessibility to health and social care services for patients.
3. **Digitally enabled and connected care** will deliver connected and coordinated health and social care data flow, across digital systems; to allow access to a comprehensive view of each patient's health information, enabling collaborative, evidence-based and timely decision-making, leading to improved patient outcomes.
4. **Data driven services** will be enabled through enhanced access to information and analytics. This will enable evaluation of service demand and capacity planning and resource management to enhance patient care.
5. **Digital health ecosystem and innovation** will provide the guidance, tools, and resources necessary for those who engage with and work in the health and social care ecosystem to unlock innovative solutions that improve the experience of both the patient and workforce.
6. **Secure foundations and digital enablers** will ensure clear governance, a supportive culture, a secure infrastructure resilient to external factors, aligned to standards and legislation. This is enabled by enhancing our workforce with digital health capability and embedding architecture, service design, cyber security, agile delivery, and data engineering within our health and social care service.

Key Critical Success Factors

This Roadmap is developed with the view that every participant in the health and social care system plays an important role in achieving the transformation outlined in the six Principles: patients, carers, the workforce, public and private providers, voluntary organisations, government, industry, innovators, and the broader community.

While the Roadmap comprises a large portion of the requirements to deliver the transformation outlined in the vision, it also calls out additional critical external dependencies such as new funding, governance, and operating model.

To achieve the transformation outlined in the Roadmap, a balanced investment is crucial, not only in terms of capital but also in the allocation of Whole Time Equivalent (WTE) and non-pay revenue. This investment must be distributed across clinical, operational, and Technology and Transformation both nationally and regionally. The Roadmap's success through to 2030 hinges on the commitment to yearly increases in both capital and revenue funding, accompanied by a corresponding increase in staffing levels. The workforce, data, and operational infrastructure are foundational to the Initiatives' success, and as such, they are a primary focus of the investment strategy.

An annual digital health budget of between 4% and 6% of the overall healthcare expenditure, which is inclusive of current funding, is being sought to deliver the Initiatives outlined in the Roadmap and is yet to be approved. The timing of the implementation of the Initiatives in the Roadmap are dependent on the funding being secured through the annual funding mechanisms. Essentially, this Roadmap serves as the business case for acquiring such funding.

A vision for multi-agency strategic governance is outlined in the DoH Framework for the collective digital transformation strategy. The multi-agency model champions a coordinated approach, involving various stakeholders contributing unique expertise and collaboration to oversee transformation objectives and outcomes. The multi-agency governance will ensure an integrated approach, supporting the strategic direction of digital health Initiatives and providing the necessary oversight and adaptability for successful implementation.

Operational governance for this Roadmap needs to fully align with operational governance of the health service including any new governance arrangements emerging from the HSE centre/regional reform design. Delivery of digital health Initiatives will be incorporated into the overall governance of the HSE.

An organisation-wide operating model that supports the delivery of this Roadmap is crucial and is prioritised as a 'Now' foundational initiative within Principle six (see page 63). This will require multi-disciplinary teams to work together and deliver the transformation, within an organisation that allows for regional autonomy for delivery alongside national consistency. This Roadmap acknowledges the criticality and urgency of delivering the new operating model for the regional and national teams in the near future.

Introduction

Our Digital Health Strategic Implementation Roadmap (the Roadmap) is aligned to and builds upon the Department of Health (DoH) Digital for Care – A Digital Health Framework for Ireland (the Framework). The Roadmap supports the collective ambition set out in the DoH Framework, the Sláintecare action Roadmap[1] and the Department of the Taoiseach Harnessing Digital – The Digital Ireland Framework[2]. The Roadmap advances key Sláintecare Initiatives such as progressing digital records in the community (e.g., the Integrated Community Case Management System programme (ICCMS)[3]), the National Shared Care Record programme[4] (NCSR) and the development of a Roadmap and investment case for Electronic Health Record (EHR) deployment[5]. Integrated care is core to the Sláintecare strategy and dependent on connected data flow to allow the delivery of the right care, in the right place, at the right time, by the right team. The Framework and the Roadmap together describe the aims, ambitions, Principles, and future Roadmap for Digital Health in Ireland from year 1 to year 7.

Extensive consultation across the health system as well as collaboration with the DoH, has informed the development of this Roadmap. In addition, experience from other countries, developments in digital health technologies and the wider technology sector, and policy drivers nationally and across the European Union has helped to further refine the Roadmap. Engagement and consultation have been undertaken across all elements of health care services and has included consideration of the evolving regional areas.

Patient and clinical demand for the adoption of digital health accelerated in response to Covid-19 resulted in a sustained increase in the use of telemedicine, remote care programmes and electronic transfer of prescriptions[6]. The momentum during the Covid-19 pandemic[7] has informed the Roadmap, including the positive impact digital health and access to data played in informing our response, and the 2021 ransomware and cyber attack on the HSE, which led to a decision to switch off all HSE IT systems[8].

The health and social care system faces growing challenges from increased demand for connected health and social care services, to patients with complex and multi-faceted health and social care needs and other significant challenges such as a growing population, an ageing population, and staffing challenges. The learnings we have from responding to the Covid-19 pandemic[9] and the cyber attack[10], are driving the need to develop robust health information systems and create a strong foundation to transform and expand digital health. These have enabled a deeper understanding of technology's ability to support the transformation of the health system.

Patients and the health workforce expect health and social care services to be integrated and connected, to deliver patient care that is safe, timely, efficient. To deliver integrated care, patients and the health workforce expect and require readily available access to high quality, accurate and timely health information when and where required. In the ever-evolving healthcare landscape, it is essential to involve public and patient partners in the design and delivery of the Strategic Initiatives. Their unique perspectives and experiences ensure that Initiatives address real-world challenges and deliver patient-centred solutions.

Keeping the patient at the centre is key for delivering effective and patient centred care. The World Health Organization (WHO) notes that the "advancement of technology and the exponential growth of data are providing the opportunity to … improve quality of care, decision making, the efficient use of resources, while reducing costs and burden of diseases"[11]. The WHO states that digital health which benefits patients in an ethical, safe, secure, reliable, and equitable way is a necessary part of all health and social care priorities. By prioritising patients, digital health can empower the public to actively participate in their own healthcare journey, leading to improved outcomes and experiences[11].

With a focus on patients and their needs, this Roadmap and transformation applies to all services across the Irish health and social care system including but not limited to acute illness, chronic disease, mental health, community health, general practice, and disability services. Patient care and the secure movement of patient information, across public and private providers, and voluntary organisations will be key to achieving the transformation outlined.

Not everyone will be comfortable using digital tools to support their health needs. Some patients might not be familiar with technology, some may have difficulty using technology due to disability, reading capability and access to technology[12]. Others

may prefer not to engage digitally. While many like the idea of using technology for health and social care information, it is necessary to make sure that everyone can access the care they need in a way that best meets their needs. To achieve this, efforts will be made to educate and empower those who are less familiar with technology, helping them feel confident in using digital solutions for their health and social care needs. At times more traditional approaches may be appropriate based on the patient or healthcare need.

In addition to the benefits to the public and health workforce that will be achieved through the implementation of the Initiatives detailed in this Roadmap, it is crucial to note that digital wellness of the workforce is also at the forefront of this Roadmap. The focus will be on creating an intentional and healthy relationship with technology in the workplace through taking steps to protect employee's mental and physical health from the harms of overuse of technology.

In a digitally enabled workplace, digital health and wellness will be intertwined with every aspect of employee health from social, to emotional, to physical[13]. To deliver high quality health care, the health workforce will be provided with opportunities to develop their digital skills and provided with the tools and resources to fully adapt to the new ways of working, embedding a culture of continuous digital learning.

The Current Irish Digital Health Landscape

Although Ireland is currently ranked the 5th most advanced digital economy in the European Union (EU) by The Digital Economy and Society Index[14], we are still significantly behind in terms of digital health maturity. According to the Organisation for Economic Co-operation and Development' Health at a Glance 2023 report, Ireland ranks last in digital health readiness among developed nations[15]. Issues identified include limited access to datasets, inadequate preparation for analytics and AI, and challenges in governing health data.

Our health service is held back with inconsistent, paper based and siloed documentation of patient interactions. Paper based record-keeping such as these are time-consuming, inefficient, and often susceptible to errors. Consequently, essential patient information remains trapped in isolated repositories, preventing an integrated approach to patient care. The result is a lowered efficiency of healthcare delivery and potential compromise on the quality of patient care.

Additionally, the lack of digital tools and limited access to health information necessitate in-person treatments. This limitation hampers the provision of digital therapy and remote monitoring, causing issues for mobility-challenged or remotely located patients[16].

Digital solutions are required that allow information to be shared across care teams, regardless of location, to enhance the overall effectiveness, while also improving the experience for patients. To support this, we need to address the underlying need for fundamental infrastructure, processes, and governance that will lay the groundwork for the solutions. These solutions will deliver safe, integrated, and high-quality care. Leveraging appropriate innovative and emerging technologies will enable a greater proportion of care to be delivered within community settings and allow patients to access care closer to home.

The transformation goals of the Roadmap and the Framework, as well as Sláintecare cannot be achieved without significant additional sustained investment. While increased investment has occurred in digital health in recent years, it has been insufficient to move Ireland's low ranking in digital health implementation. The delivery of the agenda in the Roadmap and Framework will require significant year-on-year investment to deliver the infrastructure and technologies that can assist and accelerate the required health system transformation.

While many gains have been made over the last few years, health records stored in different locations and systems do not support effective or integrated care. This is especially serious, for example, when a patient is being treated by clinicians in a hospital, when they do not have access to the patient's medical and medications history contained in the GP or pharmacy records. The Health Information Bill 2023[17], is a key enabler to facilitate the sharing of patient records when required across the separate governance and operating structures within the health and social care system (including public, voluntary, and private providers).

Irish people frequently use digital services across sectors such as travel, banking, and government services[18]. The public and the workforce are increasingly expecting the same when accessing their health information and their health and social care[19]. Harnessing Digital – The Digital Ireland Framework sets a government target to have 90% of applicable government services consumed online by 2030[20].

Increased digital connectivity and the accelerated use of digital health solutions and platforms during the Covid-19 Pandemic is driving the way patients want to interact with their health and social care, their health information and health services[20,21].

The Irish population are digitally active, according to the Central Statistics Office, 94% of all Irish households have internet access and 94% of internet users use the internet daily[20].

Effective use of digital technologies is crucial to meet evolving needs of the health system. However, a siloed approach often leads to duplicate data and wasted resources. Proactive measures must be taken to reduce costs and delivery times while addressing concerns about digital change. Challenges include enterprise solutions, technology differences, and data integration. Overcoming these challenges requires incremental and long-term change approaches, strong leadership, governance, and a supportive culture.

Initiatives that have shown digital health success for end users and the workforce across the health system, include the National Integrated Medical Imaging System (NIMIS)[25], Maternity, gynaecological and Neonatal Clinical Management System (MN-CMS)[22] and Telehealth[23]. A selection of notable achievements can be found in Appendix 1.

Reimagining How we Deliver Transformation

The need for a change in the way we deliver transformation within the health system in Ireland is becoming increasingly evident. Historically, when a technology need was identified by stakeholders, the answer tended to involve procurement of a single solution or set of solutions. That system typically required a multi-year procurement followed by a multi-year implementation using a waterfall methodology. This embedded approach has resulted in a series of siloed solutions, often disconnected from existing systems, and has also led to:

- Large programmes running in parallel consuming all the same resources,
- Increased technology complexity, often requiring workarounds,
- Implementations that are not fully completed,
- Lack of focus on full patient workflows.

While the current approach may have served its purpose in the past, this Roadmap recognises that it no longer workable as the sole method of delivery. To successfully deliver on this Roadmap, a significant change will be required. This change will entail placing a strong emphasis on reusability and alignment, based on the concept of platform-based architecture outlined in the next section. It also means embracing another mode of delivery that is faster and more agile. It does not replace the current mode of delivery entirely, but rather works alongside it. In some cases, projects will continue to be delivered in the traditional manner.

Embracing Multiple Approaches to Transformation Delivery

This Roadmap further advances Agile development methodologies to enable incremental delivery of new capabilities. Fully digitising healthcare will require leaders to explore development and implementation approaches outside of traditional IT to enable faster-paced incremental changes. Agile projects and programmes cannot be fully planned in advance, and therefore need new methods of funding, coordination, and accountability.

Bimodal operation is the practice of managing two separate but coherent styles of work, one focused on predictability and the other on exploration.

- Mode 1 is built to run; it is predictable with multi-year innovation cycles.
- Mode 2 is built to evolve; it responds to disruptive innovations, is agile and is adaptive.

The figure below depicts how these two approaches work together. The challenge of transformation is using these two change methods effectively.

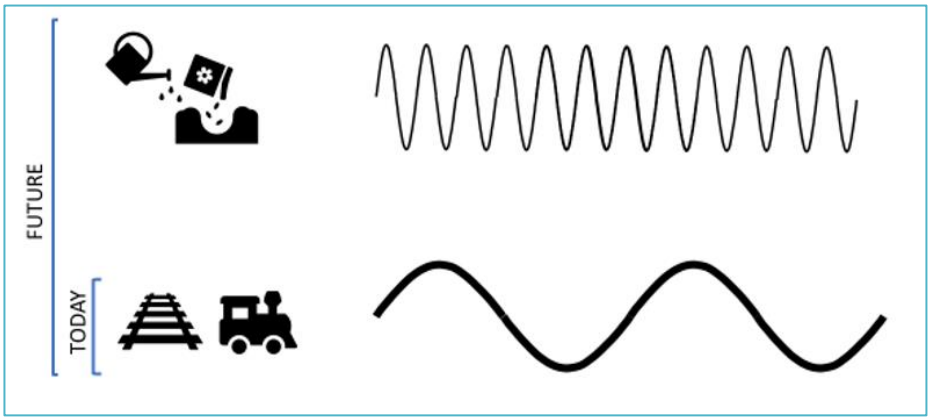


Figure 2: Two types of change working alongside each other

Platform and Modular Based Architecture

A key element in this evolution is the adoption of a platform-based architecture. This involves leveraging pre-existing platform components and services to expedite solution development, reduce costs, and establish a solid foundation. This will enable modular and scalable solutions and systems that are more easily maintained.

The strategic design of solutions using platforms and platform services follows a modular and scalable approach that aims to maximise component reusability. This involves identifying and cataloguing core platform components and services that address essential capabilities. These services include basic platform functions like authentication, integration, and data management, as well as higher-level features such as patient management, case management, appointment scheduling, communication, and content management. By leveraging these platforms, valuable solutions can be developed that contribute to a cohesive architecture. This model is similar to the approach used by large cloud providers in their platform-as-a-service offerings.

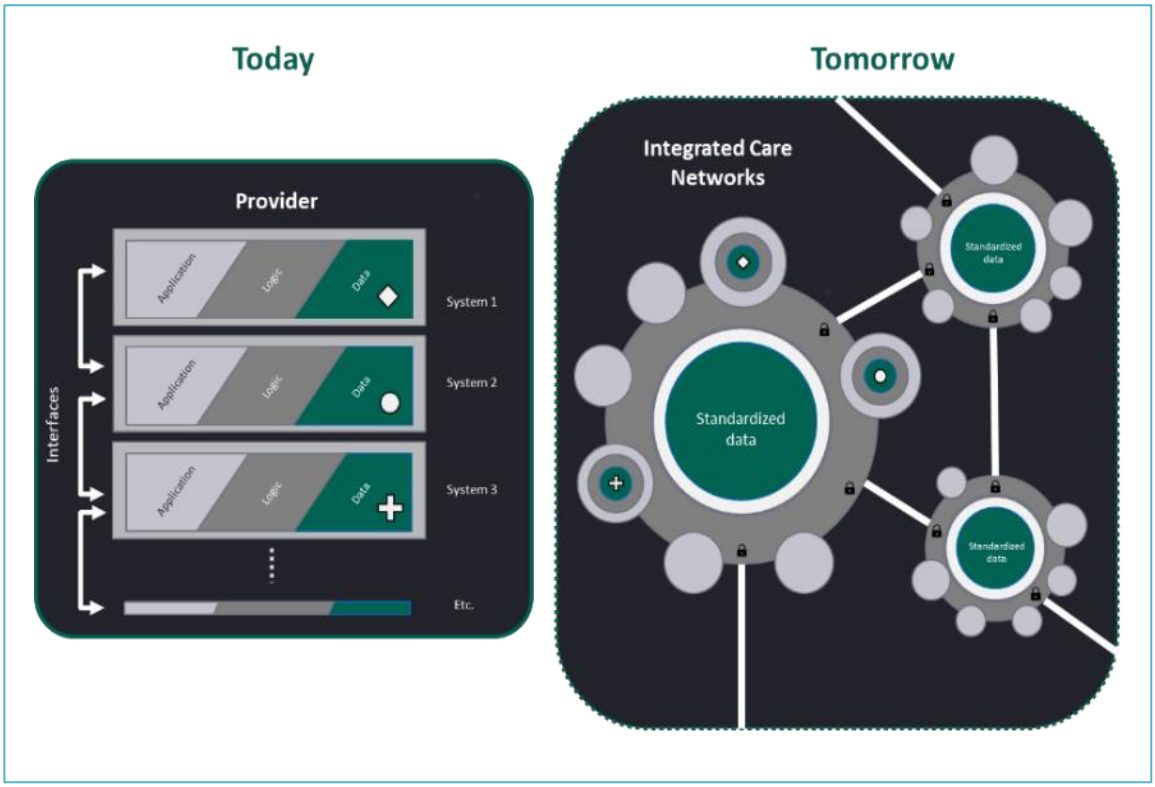


Figure 3: Moving beyond independent, fragmented solutions by reuse of existing core capabilities

Key to this Roadmap is a commitment to making different services work together smoothly and independently within a larger system. This requires managing effectively between solutions, platforms, and platform services. The goal is to balance the need for progress with the need to avoid getting locked into a specific solution.

The design focuses on scalability and flexibility, ensuring that services can handle changing demands and can be easily expanded horizontally. Reusability is emphasised, to streamline development efforts and ensure consistent functionality across the health system.

The integration of development and operations enhances collaboration and efficiency. Automation, particularly through continuous integration and deployment pipelines, helps maintain high-quality service delivery and quick feature enhancement. This disciplined approach manages the risks commonly associated with similar approaches.

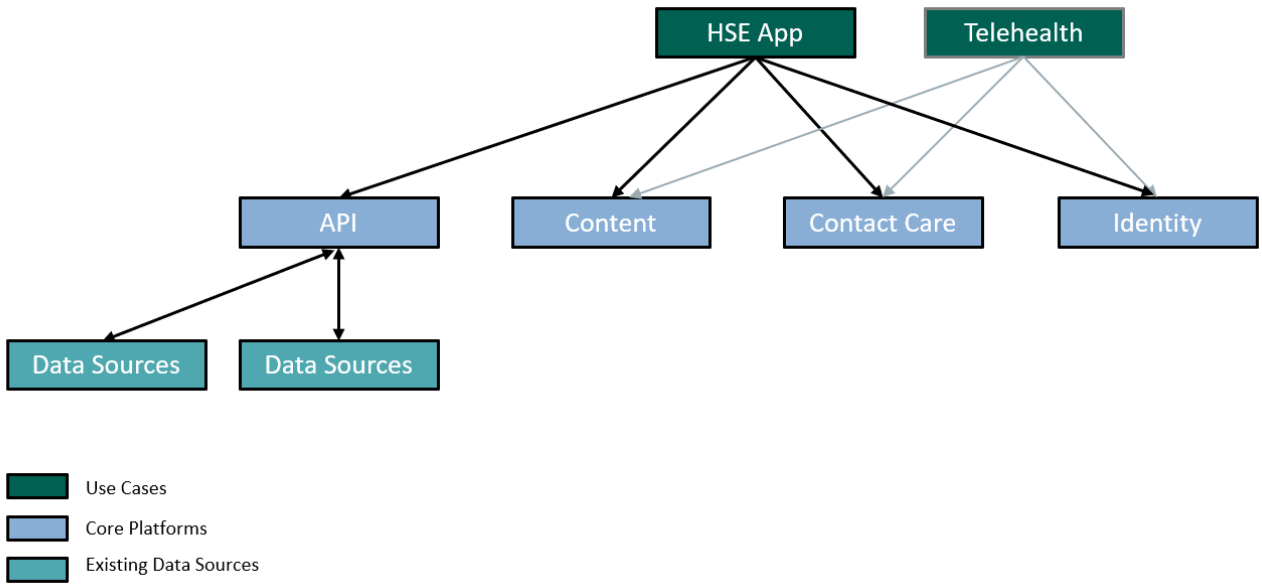
Using this approach, the delivery of technology change within the health system will be streamlined and expedited. This will enable a more effective response to emerging clinical needs and ensure that the delivery approach remains adaptable and responsive to the healthcare landscape.

Applied Example: HSE App

An illustration of the approaches and methodologies described above are demonstrated through the design and development of the HSE App. The programme places great emphasis on delivering incremental improvements and value according to a predefined Roadmap. A key feature of the HSE App is its capacity to gather and surface data from various existing systems and sources. This capability is made possible by implementing the platform architecture approaches described earlier.

Essential principles embraced in this approach include:

- The health system stakeholders understand the problems and opportunities that the HSE App is trying to solve. They also understand how to measure its success in addressing these.
- The health system stakeholders have not been required to decide or have a deep understanding of the technical complexities associated with the solution but instead allowed to focus on the measurable value.
- The core components of the solutions developed have been created with an agenda to provide solutions for more than one area.
- As mentioned above incremental deliverables are vital to maintain stakeholder support and interest but also allowing flexibility.
- Strong focus on the utilisation of existing technologies and capabilities. Utilisation of platforms that are known to work well, with existing skills and knowledge to help accelerate the development.
- Use reusable elements as a crucial part of the platform, offering the same features to meet similar needs.



Please note this is an applied example, for more information about this strategic initiative, including delivery timeframes, please see page 27.

Figure 4: Reuse of platforms across products/services

Supporting the Transformation through Management of Change

To achieve the transformation needed, it is important to recognise that technology alone is not enough. The challenges of transformational change management are all about people, not technology. True transformation comes from using technology and implementing change in people, processes, and management to achieve defined outcomes. This means that the challenges of change management are primarily focused on people, rather than technology.

Change management involves providing support to the workforce and leaders in areas that are undergoing major changes as part of the new direction set within healthcare transformation. This includes training the health workforce in new ways of working and leveraging new technologies. This approach should be aligned with the Health Services Change Guide and regional change plans.

Transformational change in the health and social care system is a profound and comprehensive shift that aims to revolutionise how services are delivered and improve patient outcomes. It requires transforming core processes, systems, structures, culture, and mindset to drive sustainable and positive change. This goes beyond incremental improvements and routine modifications, and instead focuses on reimagining and redesigning the healthcare ecosystem with innovative approaches.

One common concern in this transformation is the challenge of balancing current service delivery with the work of redesigning processes for the future. This highlights the need for a separate office dedicated to the transformation, which can prioritise and coordinate transformation Initiatives. This will also require the development of new digital transformation skillsets and expertise.

Managing change brings the anxiety and emotional tension that comes with it[24]. It is crucial to include and engage people, both patients and the health workforce, in shaping and implementing the change. When people feel involved, are involved, engaged in designing the change and listened to, the transition is likely to be smoother and the implementation more successful.

Maintaining focus on change and transformation is essential. Often, organisations start projects but get distracted by new issues, causing delays and an acceptance that tasks do not need to be completed. To avoid this, it is important to establish a well-defined project scope with effective governance. Clear goals, measurable milestones, success criteria, and timelines should be set and monitored diligently to ensure project progress. Additionally, a capable change management leadership team should be assembled, and lessons should be learned from successful digital transformation Initiatives in health and in other sectors. Finally, strong sponsorship from senior levels within the health system is crucial for the viability and success of the transformational change process in healthcare.

Key Drivers

Our approach to digital health is aligned to multiple internal and external drivers, as we recognise that we cannot deliver digital health development in isolation. Our approach will rely on joint policy and implementation effort, which is why alignment to wider national and international objectives will help us deliver against this Roadmap.

Internal drivers:

- **Covid-19 Pandemic**: the pandemic has shown us the potential of digital tools in supporting and accessing health and social care and by better informing our responses to health crises. The Covid-19 Pandemic showed how responsive Irish people were to new technology, and how reactive the public were to being in control of their own health and social care[25]. Vaccinations and testing were booked online, and the Covid-19 Tracker App created easy access to personal Vaccination Certificates, as well as contact tracing. While the pandemic acted as a catalyst to adopt digital health offerings, it also highlighted the need to make digital health a part of everyday life.
- **Conti Cyber Attack**: on May 14, 2021, the HSE suffered a major ransomware cyber attack that resulted in all its IT systems nationwide being shut down[8], reminding us of the immense dangers posed by cyber threats. The impact of this attack was severe as it caused disruption in patient care, loss of communication and the loss of non-clinical, clinical, financial, and procurement systems. The attack called out the need for major transformation in our IT systems and cyber security preparedness.
- **Sláintecare Report**[1]: the 2017 report sets out the policy direction for the future of the health service in Ireland. The report noted eHealth as a "critical enabler to implement the change required to deliver an integrated, universal, high quality health system". The aim is to deliver the Sláintecare vision of one universal health service for all, providing the right care, in the right place, at the right time.

- **Moving to a new structure with health regions**: the health service is being restructured into six new health regions[26]. This will allow for more integrated care closer to patients' homes, to plan and deliver services around the needs of local populations, to improve governance and accountability at all levels, to strengthen local decision-making and to provide consistent quality of care across the country. During the restructuring of our health care system is it crucial to provide the digital tools that will remove barriers to integrated care.
- **DoH Digital for Care – A Digital Health Framework for Ireland 2024-2030**: the ongoing collaboration between the DoH and HSE has resulted in the development of the Strategic Framework and this detailed Implementation Roadmap for digital health development in Ireland. This collaboration has been designed to provide an informed Strategic Framework to guide future and recurring investment, to deliver excellence in digital health and social care transformation, provide better access to health data and improve patient outcomes. The Principles in the Framework will be the vision and direction of travel for Irish digital health and social care goals for 2030 and beyond.
- **Environmental, Social and Governance (ESG) drivers**: HSE ESG reporting requirements will be supported by digital solutions. Digital tools will reduce the carbon footprint of the health system though minimising the need for travel and in-person appointments, reducing paper-based applications[27]. Patient empowerment and increased healthcare access through digital solutions will create positive social impact in the health system[28]. Positive social impact will be further driven using technology to maximise the workforce skillset and assist diversity and inclusion across the health system. Governance and leadership will play pivotal roles in the successful transformation. Implementing robust data privacy and security measures in digital health solutions aligns with good governance practices[29]. This will protect patients' sensitive health information and maintain their trust in the health system.
- **Desired digital experience of clinicians:** clinicians want a better digital experience and optimum access to and use of digital technology to improve the health and wellbeing of citizens. The Digital Roadmap for Nursing and Midwifery (2019-2024) highlights how digital capabilities and health technologies will be fundamental to ensure a sustainable, quality, and safe healthcare service. They can help to tackle some of healthcare's greatest challenges and to change 'how we do things'.

External drivers:

- **Patients want a better digital health experience:** The Irish Platform for Patient Organisations, Science, and Industry (IPPOSI) conducted The Citizens' Jury on Access to Health Information to gauge the public's view on handling their own medical records[30]. Six recommendations were published expressing a strong preference for greater access to health information in Ireland. The recommendations highlight the need for digital health records, portals, a people-first approach, safety, and cyber security. A discussion held by IPPOSI with health service leaders who managed patient care during the Covid-19 pandemic also highlighted the urgent need for digital solutions and agreed with the deliberations and recommendations of the Citizens Jury[31].
- **Harnessing Digital -Digital Ireland Framework[2]:** The Digital Framework outlines Ireland's ambition to be a digital leader. Dimension Four of the Framework is the Digitalisation of Public Services with a specific focus on the Irish health system. One initiative in the Framework is the Health Information Bill which is aimed at ensuring appropriate legislation is in place to enable data flow allowing for a fit for purpose national health system. The Harnessing Digital Framework is being driven out by the Department of Taoiseach - the Framework is set out across four core dimensions, which are in line with the four points of the EU's Digital Compass: Digital Transformation of Business; Digital Infrastructure; Skills; and Digitalisation of Public Services. This is supported by a modern, cohesive, well-resourced regulatory framework. The Strategy includes clear targets, along with high-level workstreams and associated deliverables. Implementation will be driven by the Cabinet Committee on Economic Recovery and Investment, which is chaired by the Tánaiste, with supporting official-led sub-structures. Strong political leadership and oversight on digital issues right across government, led by the Tánaiste, and active stakeholder engagement will ensure a joined-up approach and effective delivery of framework ambitions.
- **Health Information Bill**[17]: The Health Information Bill (the Bill) was initiated to strengthen the rights of individuals in relation to their health information. The purpose of the Bill is to ensure that Ireland's national health information system will provide enhanced patient care and treatment and supports better planning and delivery of health services to the people. The provisions in the Bill have been designed to support integrated patient care, empower patients, provide access for patients to new technologies, increase efficiency in delivery of patient care, support development of digital health records and make health information accessible subject to strict governance rules that will ensure a high performing and dynamic health service driven by information and innovation.

- **Europe's Digital Decade to 2030**[32]: Path to the Digital Decade sets out the European Commission's ambition to make the 2020s Europe's 'digital decade'. The European vision for 2030 is a digital society where no-one is left behind. The ambitions are summarised into digital skills, digital infrastructures, digitalisation of business and of public services. The European Commission states that advances in digital health could lead to benefits of up to €120 billion per year by introducing more online interaction, paperless services, electronic transmission, and access to data.
- **European Health Data Space**[33]: Trilogues held between the EU Council, Commission and Parliament concluded in March 2024, with an agreement on the European Health Data Space (EHDS) Regulation text. On April 24 2024 the European Parliament voted to officially support this agreed text. The EHDS is a health ecosystem of rules, standards and practices, infrastructure and a governance framework that aims to increase digital access to and control of electronic personal health data across the European Union. EHDS will empower the public to own their health data, provide requirements for interoperability, security, safety, and privacy, enable healthcare professionals to have access to health data, grant access to health data for researchers and assist policy makers and regulators in accessing relevant health data.
- **World Health Organization Global Strategy on Digital Health**[34]: the vision of this global strategy is to improve the health of everyone, everywhere through increased development and adoption of person-centred digital health solutions. The purpose is to strengthen health systems through digital health technologies for consumers, health professionals, health care providers and industry groups.

Stakeholder involvement and approach

As part of the development of the Roadmap, extensive stakeholder involvement was achieved via a survey and a series of engagement sessions and cross-collaborative workshops delivered alongside the DoH. This approach was taken to ensure that the Roadmap is informed by digital health consumers and providers across the health and social care system.

There were more than 260 clinical and non-clinical respondents to the Roadmap readiness survey and over 400 participants in our stakeholder involvement sessions from across the health and social system. Seventy-six hours of stakeholder engagement was undertaken over forty-one separate sessions.

In addition, feedback was sought from wider established forums to gather the expertise and experience needed from ICT, Clinical and Operations. Existing forums that feedback was sought from include the CxIO, the HSE eHealth Delivery Programme Managers forum, National Clinical Advisor and Group Lead, Community Digital Oversight Group, Acute Digital Oversight Group, and regional forums. Wider socialisation of the document was undertaken both at a national and regional level and an overview of the Roadmap was presented at national conferences.

The feedback received from across the system has been used as a key input into the development of the Framework and the Roadmap.

Strategy Programme Steering and Reference Advisory Groups

As well as extensive stakeholder involvement throughout, the Digital Strategy Programme Steering Group was established to oversee the development of the Roadmap. The Steering Group is made up of 16 clinical and non-clinical members. This group has met monthly to oversee, provide guidance and decisions throughout the development of key components of the Roadmap.

In addition, a larger Reference Advisory Group was established to act in an advisory capacity for both the Steering Group and Programme Team. The initial Reference Advisory Group was made up of over 40 members from across the health system. Reference Advisory Group members have reviewed and provided advice on the Roadmap throughout its development, as well as acting as advocates for other key stakeholder groups.

Significant time has been invested from members of both groups. The diversity, breadth and depth of experience, skills, and knowledge from the members of both groups have been instrumental in the development of this Roadmap, helping to shape and inform key areas.

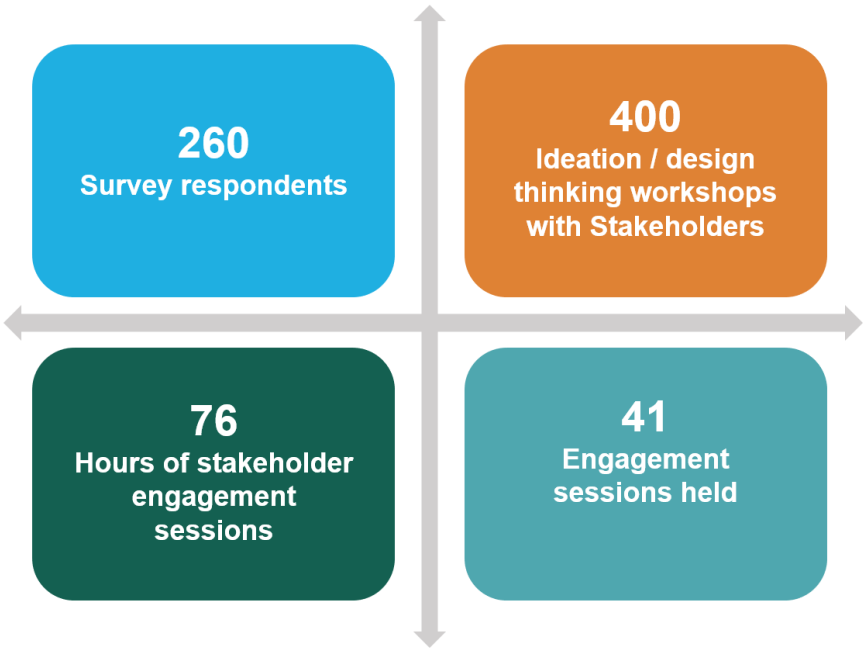


Figure 5: Stakeholder engagement approach during Roadmap development

What patients told us

- **Patient centred:** patients want to use digital tools to be responsible for their own health decisions while also allowing them and their carers to readily access their own health records. Patients want to form an effective clinician-patient partnership to support their health and social care. Patients want digital health services that offer personalised information, treatment, education, and the ability to track, manage, input, and collaborate with their own health and social care processes.
- **Enhance trust and protect data rights:** patients want a transparent, safe, and trustworthy health and social care system that can deliver high quality health services. The priority for the public is the platforms and tools that maintain high levels of privacy and data security, ensuring the confidentiality of personal health information.
- **Connected care:** patients want appropriate access to their medical information from across all health and social care providers when and where required to deliver quality and safe patient care. Patients do not want to provide personal health information at multiple touch points. Patients believe having connected care will reduce the risk of harm to them and will reduce the duplication of tests.

What the workforce told us

- **Access to the right information at the right time in the right place**: provide trust and confidence that the right information is accurately captured and readily available, leading to improved patient outcomes and reduced workload for the workforce. This access to information can be especially crucial in emergency situations when rapid decision-making is essential reducing stress and burnout at work.
- **Built around the patient**: health services should be built around the patient needs and provide safe and secure digital foundations, allowing the workforce to feel confident in their use of digital technology to improve the access to and delivery of care. Digital health solutions can improve communication between the public and the health workforce, enabling better coordination of care.
- **Robust and sustainable digital infrastructure**: a well-designed and robust digital health infrastructure provides health and social care workers with reliable tools and systems. This includes EHRs that store patient information securely and efficiently, health information exchange platforms that allow seamless sharing of patient data between different health and social care providers, and interoperable systems that ensure continuity of care across different settings. A sustainable digital infrastructure ensures that the technology remains up-to-date, secure, and cost-effective in the long run.
- **Digital skills**: the success of digital health solutions depends on the ability of health and social care workers to use these technologies. Training and developing digital skills among the health workforce are crucial to maximise the benefits of

these solutions. Ongoing evaluation of digital skills needs to be undertaken. Many survey respondents indicated that the implementation of patient centred EHRs is a key component in the development of digital health in Ireland.

- **Leadership, decision makers and governance**: strong leadership and decision-makers who understand the potential of digital health and can drive its implementation and adoption are required. Effective governance ensures that data privacy, security, consistency, and ethical concerns are addressed, instilling confidence among patients and health and social care providers in utilising digital health tools.
- **Data Quality:** ensure there are solid and transparent data-governance processes within the health and social care system to improve data quality and safety. To fully harness the power of the data recorded, there should be standardised processes in place to improve the data quality and the ways in which it is used. The safety and the quality of patient care will be improved within the integrated health and social care system that allows seamless sharing of high-quality health data.

Strategic Initiatives

The Framework encompasses six Principles, each comprising a series of HSE-defined Strategic Initiatives. These Initiatives serve as the necessary steps to realise the goals set forth by the Principles. Informed by stakeholder engagement and involvement across the health sector, the Initiatives outline the deliverables that will support the transformation of the health and social care system.

A total of 48 Strategic Initiatives have been identified, prioritised, and the associated costs have been estimated, using inputs, advice, and involvement from stakeholders across the health sector at each stage of the development. Key steps involved in identifying the 48 Strategic Initiatives include:

- **International analysis:** global trends and local and international analysis were reviewed to understand strategic direction, leading practices, lessons learned and regulatory and policy considerations. More information about the international analysis can be found in Appendix 2.
- **Stakeholder involvement**: a survey was undertaken to understand stakeholder opinions regarding digital health, that could be incorporated into the Roadmap. The HSE and DoH then conducted joint stakeholder involvement sessions across the health system. Key findings were documented from stakeholder involvement sessions and were used as the basis for the development of the Strategic Initiatives.
- **Steering and Reference Advisory Groups established**: a Steering Group was established to oversee the development of the Roadmap. In addition, a larger Reference Advisory Group was established to act in an advisory capacity for both the Steering Group and Programme Team. Throughout the development of key components of the Roadmap, each section has been tested and validated with the Steering and Reference Advisory Groups.
- **Capability assessment**: a capability assessment was completed to document the current digital maturity score across the system. This assessment incorporated the internationally recognised Healthcare Information and Management Systems Society (HIMSS^{SM})[35] maturity models and examined capabilities such as governance, organisational capability, infrastructure, information sharing, and integration. The assessment highlighted gaps which were used to inform the development of the Initiatives. More information about the capability assessment can be found in Appendix 3.
- **Strategic Initiative definition**: using the findings from the international analysis, stakeholder involvement and the capability assessment, a broad set of Initiatives were defined for testing with stakeholders. Extensive stakeholder testing of the Initiatives was undertaken to validate the direction of the Roadmap to achieve digitisation of health information. Testing also ensured that existing inflight projects have been captured within the strategic Initiatives. The testing refined the broad list to 48 Initiatives.
- **Alignment with the DoH Framework and Principles**: while the Initiatives were being refined and tested, an exercise with the DoH was undertaken to align the Initiatives in the Roadmap to the Principles in the Framework. The alignment of Initiatives to Principles can be found in the following section.
- **Alignment with HSE Cyber Security Statement of Strategic Intent (CSSI):** the CSSI and the Roadmap have been drafted at similar times allowing for alignment across the two documents. The CSSI outlines the HSE's strategic approach to improving cyber security over the next three years. Having an aligned CSSI and Roadmap ensures that goals for enhancing cyber security and improving digital health services are aligned. It reduces risks and vulnerabilities, and enables a smooth, safe digital transformation across the healthcare system.

- **Cost estimation**: a phased approach was used to develop the cost estimations. This included developing top down, experience-based estimates; validation of estimates with HSE Subject Matter Resources (SMRs); an external review with global health SMRs; and an external review by Gartner.
- **Prioritisation and Roadmap**: criteria were developed and tested with the DoH and the Steering Group. Once the criteria were agreed, the Initiatives were then prioritised as 'now', 'next' or 'future'. This prioritisation was validated with the DoH to ensure alignment with the Framework. Once prioritisation was complete, the Roadmap for implementation was developed. Initiatives being delivered Now are inflight Initiatives or Initiatives that will commence in year 1 and year 2; Initiatives categorised as Next will commence delivery in year 3 and year 4; Initiatives categorised as Future will commence delivery in year 5 onwards.

What this means for our population

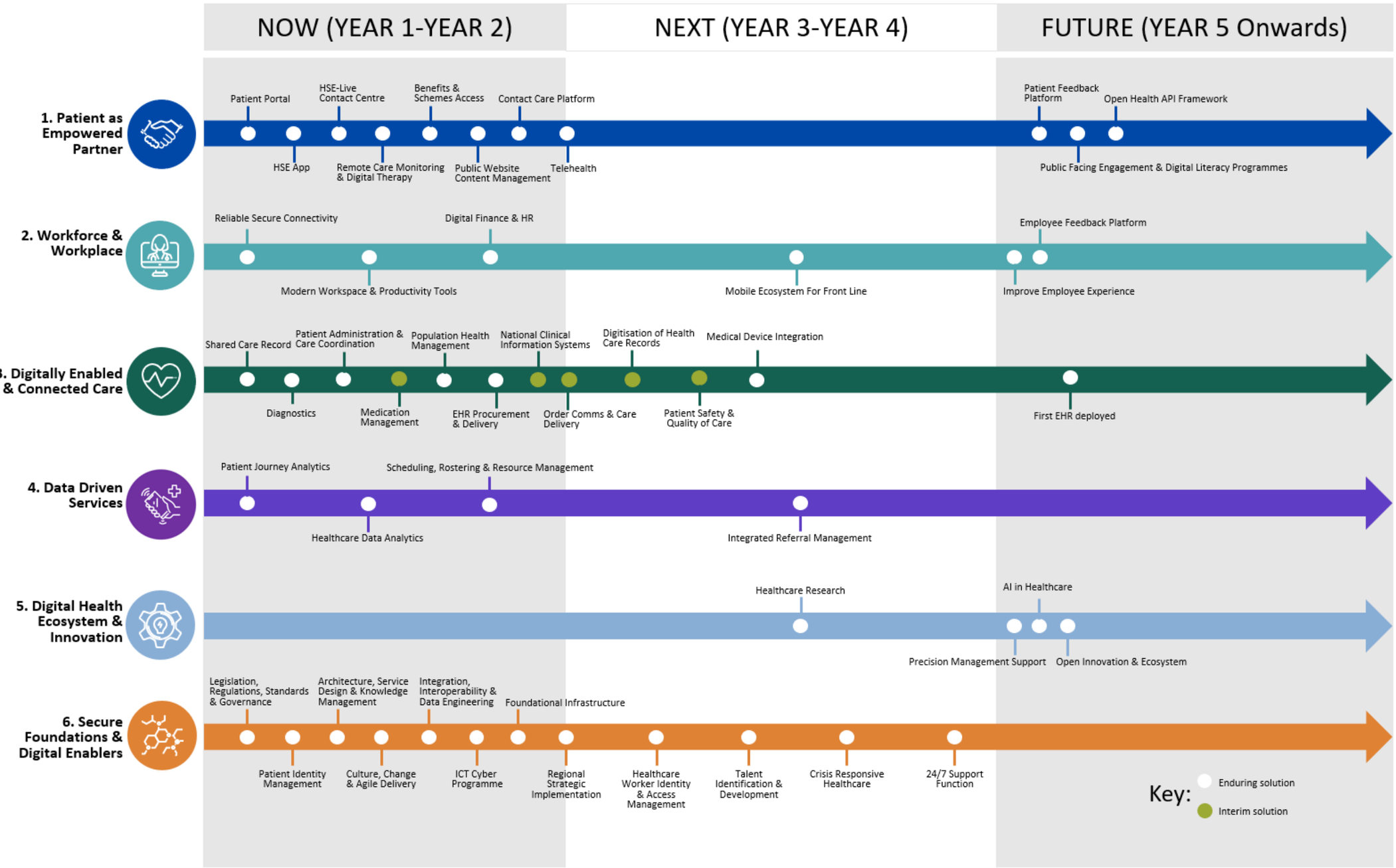
To convey the impacts of the Strategic Initiatives detailed in the Roadmap, a series of Persona and Patient Care Journeys have been created. These are fictional, generalised characters that encompass the various needs, goals, and behaviours of real people. By following these care journeys, we will reflect on how the Roadmap will impact us as patients, staff, healthcare professionals, carers as well as other participants of the health and social care ecosystem. An overview of the Care Journey for one of these Personas, Mrs. O'Neill, has been provided below.

Table 1: Care journey of Mrs. O'Neill

Persona	Current experience	Future experience
Mrs. O'Neill *Mrs. O'Neill is a 70-year-old widow with diabetes, hypertension, heart failure and arthritis. She wants quick and responsive services from skilled health and social care providers that talk to one another and that have a good understanding of all her care needs.*	*"I want access to my own health records, to see my measurements and understand whether my glucose levels are within the ideal ranges.* *I need my son to have access to my health records and communicate with my Practice Nurse to support me in my care journey.* *I am interested in participating in clinical trials and want to give my consent to participate."*	*"It is good to know that my doctors, nurses, and GPs have access to my health records, and they talk to each other which means I do not have to repeat my story every time we meet.* *I also feel reassured now that my son has access to my health information and can communicate with my nurses and doctors when needed."*
Karen Millar *Mrs. O'Neill's Nurse*	*"I need to liaise with Mrs O'Neill's GP as appropriate and have access to Mrs O'Neill's progress and care plan when needed; from my office, when I visit her at home or see her at the local health centre. I need to receive alerts when her blood pressure goes above the threshold target agreed for her. I need to customise the information package and add it to Mrs O'Neill's care record. I need to capture Mrs O'Neill's consent to participate in clinical trials following her expression of interest.* *I need to communicate with Mrs O'Neill's Nephrologist and discuss her progress based on the up-to-date information in Mrs O'Neill's health record."*	*"Having easy access to resources related to my career such as onboarding, learning, transferring, or leaving as well as making leave requests via a web portal is hassle free, saves me so much time and allows me to focus more on patient care and less on paperwork.* *"Digital tools have made communication with Mrs. O'Neill's Nephrologist more efficient and effective. We can discuss her progress based on her complete and up-to-date digital health record, enabling us to make well-informed decisions and collaboratively plan her care.* *"Capturing Mrs. O'Neill's consent to participate in clinical trials has become a seamless process. With the digital tools available, I can efficiently document her expression of interest and facilitate her involvement in clinical research, contributing to advancements in healthcare and treatments."*
Corrine Carroll, *Nephrologist*	*"I need to see Mrs. O'Neill's historic blood tests and urinalysis results, and trends of her blood pressure in relation to changes to her anti-hypertensive regime, to support the assessment of the progression of the renal impairment and further diagnosis.* *I need an effective communication and collaboration method with my Multi-Disciplinary Team (Renal Dietician, Renal nurse Specialist, Anaemia Nurse Specialist) and Mrs. O'Neill's GP and Nurse, to plan MDT care with the GP and*	*"Being able to see Mrs. O'Neill's historic health data, test results and treatments from a single unified source enables my multi-disciplinary team to make informed and consistent decisions. We can now ensure Mrs. O'Neill receives constant support during and in between her hospital visits; by providing clear care plans, available to all carers including the GP and Public Health nurse ensuring the best care"*

Persona	Current experience	Future experience
	community service between and after Mrs. O'Neill's hospital visits."	
Paul King, *Clinical Pharmacist*	*"I need to receive a notification that Mrs O'Neill has been assigned to me as part of the clinical trial.* *I need access to Mrs. O'Neill's health records to review a history summary and the shared care plan, have a custom view where I can see a trend graph of her blood pressure readings over the last few years.* *I need to capture trial-related information in Mrs O'Neill's health records which is automatically available to the Clinical Trial Coordinator.* *I need to take part in academic research and The Spark Innovation Programme to improve the Irish Health Service."*	*"The thought of being part of a health and social care system that embraces and effectively utilises health innovations fills me with pride and a sense of purpose in my role as a Clinical Pharmacist. The coming together of health and social care providers, industry partners, and start-ups creates a dynamic ecosystem that promotes continuous improvement and innovation in patient care."*
Jim O'Neill, *Mrs. O'Neill's son, and carer*	*"I need to have access to my mother's health records to understand her care plan and assist her.* *I need to be able to connect with my mother's Practice Nurse to explain issues and support my mother in following her care plan."*	*The introduction of remote monitoring and appointment scheduling has made a world of difference for my mother's experience. It means she can receive the care she needs without unnecessary travel or inconvenience."* *The introduction of remote monitoring and appointment scheduling has made a world of difference for my mother's experience. It means she can receive the care she needs without unnecessary travel or inconvenience."* *"Knowing that strong leadership and governance are in place further solidifies my trust in the health and social care system. It provides a sense of security, knowing that the care my mother receives is not only technologically advanced but also guided by ethical and responsible practices."*
Maureen O'Dea, *Senior Service Manager*	*"I need to have accurate, up-to-date information on our patient's needs so that I can appropriately assign my team based on skill mix. To do this efficiently I also need access to real-time information on the activity, capacity, and flow in my department and across other relevant services.* *I need reports based on service delivery and risk management and I need data that will inform where quality improvements can be made that are most beneficial to Mrs O'Neill and all our patients."*	*"Timely and accurate reporting and forecasting gives me more confidence in making financial and resourcing plans. Now, I have access to reliable data whenever I need it and that removes barriers in getting buy-in from stakeholders.* *"Being able to see patient flow, wait times, hospital capacity and staff availability in real-time and at the same time helps me identify gaps in resources almost instantly. This is beneficial for not only making prompt decisions at critical moments but also for long-term resource planning and in turn, enhancing the quality of our service."*

Persona	Current experience	Future experience
Aoife McDonald *General Practitioner*	*"As primary healthcare provider for Mrs O'Neill, I need easy access to referral to other services from my GP practice electronic system.* *I need to receive structured information back from other services discharge letters, etc. and for investigations undertaken to maintain the most up-to-date record for Mrs O'Neill. I also want to have access to the medication list where changes are made by other services and access broader information through the shared record.* *In view of European requirements, my system needs to be able to provide accurate standardised information to Mrs O'Neill's summary care record and allow good access to other clinicians when she is outside Ireland."*	*"Digital tools have made communication with Mrs. O'Neill's Nephrologist more efficient and effective. We can discuss her progress based on her complete and up-to-date digital health record, enabling us to make well-informed decisions and collaboratively plan her care."*



Note: some technology solutions being undertaken in the interim may not be carried forward, standardisation and workflows will be enduring in the EHR. This Roadmap represents when work on the Strategic Initiative will commence.

Figure 6: The Six Principles of the Roadmap and Strategic Initiative commencement date

PRINCIPLE 1: PATIENT AS AN EMPOWERED PARTNER

Principle 1: Patient as an Empowered Partner

"It is good to know that my doctors, nurses, and GPs have access to my health records, and they talk to each other which means I do not have to repeat my story every time we meet.

I feel reassured now that my son has access to my health information and can communicate with my nurses and doctors when needed."

Mrs. O'Neill, Patient

"Being able to access Mam's patient records through her patient portal and share Mam's concerns and queries with her doctors and nurses makes us feel well informed and connected. I can assist her with her care and advocate on her behalf as needed.

Jim O'Neill, Patient's son

The introduction of remote monitoring and appointment scheduling has made a world of difference for my mother's experience. It means she can receive the care she needs without unnecessary travel or inconvenience."

Jim O'Neill, Carer

Description

As outlined in the Framework, this Principle aims to give patients easy and greater access to their health information and care options creating greater patient involvement, control, and choice in their health and social care. This Principle is focused on creating a joined up digital experience for all patients.

Context

The vision in this Principle is to revolutionise health and social care in Ireland empowering patients to be partners in their own care journey. This includes providing seamless access to real-time information, innovative care models, and collaborative platforms to enhance the patient experience and enable proactive health management.

Patient empowerment is a key driver in achieving patient-centred health and social care. It supports patients to have an active role in decision-making and address important issues for better health and social care outcomes[36]. Digital health services will be designed and delivered to empower patients to manage and improve their health, navigate health and social care services, and access information and care whenever needed.

The Initiatives that underpin Principle 1 allow patients to determine when and where they connect with health services and information. Patient tools such as patient websites and mobile applications provide access to health information, communication with health and social care providers, test results, and prescription refill requests. For example, online booking for blood tests is already available for patients to manage their health.

Consistency across all digital touchpoints is crucial and implementing the HSE design system ensures a unified look and feel with accessibility at its core. Integration of digital touchpoints allows patients to transition seamlessly from seeking information to requesting support and engaging in virtual care encounters. This Principle supports digital-only, digital-first, assisted-digitally, and non-digital approaches, meeting patients where they are on their digital journey.

Underlying this Principle is an information infrastructure supported by the National Shared Care Record (SCR)programme, which provides a rich set of data to empower and support patients. Improved information flow gives patients greater access to services and more choices in care settings and types of care.

Digital tools can help patients take better care of themselves to stay well. The Strategic Initiatives within Principle 1 will enable patients to play an active role in their health, giving patients the tools to stay healthy and avoid getting sick. Digital tools will enable preventative care by allowing patients to monitor their health, access personalised insights, communicate with health and social care providers and make informed decisions about their own health. Examples of preventative programmes include:

- **The QUIT Programme[37]:** this programme is aimed at helping people quit smoking. It provides support, resources, and information to people who want to quit smoking and improve their health. The programme offers services including counselling, medication support, and online resources, to assist smokers in their journey to quit tobacco use.

- **The Text About It Programme**[38]: this programme is a mental health support service. It offers a confidential text messaging platform for people who are in emotional distress or need someone to talk to. By texting the number 50808, individuals can connect with trained volunteers who provide empathetic and non-judgmental support. The programme aims to provide immediate assistance to those in need, offering a convenient and accessible way to access emotional support and guidance.

In addition to expanding choice, Principle 1 aims to enhance access to care and enable patients to receive health and social care services closer to home. This will be achieved through various Initiatives such as remote monitoring and appointment scheduling and management. Examples of these Initiatives include the implementation of an EHR by Children's Health Ireland[39] and MN-CMS[22], which store, and record patient information specifically related to paediatric health, maternity, and gynaecology.

The National Shared Care Record will play a vital role in consolidating data from various health and social care systems, providing a comprehensive and cohesive view of a patient's health history, ongoing care, and future care plans. This ensures that patients can access their care and treatment information regardless of their location. By having access to this health information, patients can receive safe and informed care, reducing the need to repeat their medical history and minimising duplication of tests and appointments.

Throughout the Covid-19 pandemic there were various online tools aimed at allowing the public to manage their health. Vaccinations and testing could be booked online, creating greater access, choice, and control for the public. The Covid-19 Tracker app created easy access to personal Vaccination Certificates, as well as assisting contact tracing[25].

The Telehealth Programme has helped create connected care through remote consultations, remote monitoring of chronic conditions, online health supports and therapies[40] and home-based care. The Telehealth Programme offers improved accessibility to services, increased efficiencies in the health workforce, streamlined workflows and improved patient safety, reduced infection risk and reduced overcrowding. These services have increased patient access to services and empowered patients through self-care tools and access to various communication platforms. This initiative has also enabled secure sharing of patient data, enhanced care coordination and facilitating better decision-making.

Outcomes

1. **Patient empowerment:** patients will have greater involvement, control, and choice in their health and social care journey.
2. **Patient-centric health and social care:** patients will have an active role in decision-making and access to information and care whenever needed.
3. **Expanded choice and access to care:** patients will have more options for care settings and types of care.
4. **Seamless access to information and care:** patients will have easy and real-time access to information and innovative care models**.**
5. **Consistency and integration:** digital touchpoints will be consistent and integrated, allowing patients to seamlessly transition from seeking information to requesting support.
6. **Comprehensive health record:** the National Shared Care Record programme will consolidate data for a comprehensive view of a patient's health history and care plans.
7. **Preventative care:** digital tools and programmes will empower patients to monitor their health and make informed decisions to stay healthy.
8. **Improved health and social care efficiency and safety:** the Telehealth Programme will improve efficiencies, streamline workflows, enhance patient safety, reduce infection risk, and improve care coordination.

More information about the Initiatives under Principle 1 is on the following pages. Please note there is some repetition across the key features described under each Initiative.

Table 2: Principle 1 Strategic Initiatives

#	Initiative	Timeline for Initiative delivery starting		
		Now (year 1-year 2)	Next (year 3-year 4)	Future (year 5 onwards)
1.1	Patient Portal			
1.2	HSE Application			
1.3	HSELive - Contact Centre			
1.4	Patient Feedback Platform			
1.5	Remote Care Monitoring and Digital Therapeutics			
1.6	Benefits and Schemes Access			
1.7	Public Facing Engagement and Digital Literacy Development Programmes			
1.8	Public Website Content Management			
1.9	Open Health API Framework			
1.10	Contact Care Platform			
1.11	Telehealth			

High Level Initiative Descriptions

1.1 Patient Portal

Provides patients with secure online access to manage their digital health identity, personal health information, care coordination, and access to health and social care services. This user-friendly platform will help patients take an active role in their health and social care, support communication between patients and their care provider across the health system thereby increasing information sharing with their care team.

Key features

- **Access to Personal Health Information**: patients can view their health information from across care settings, including medical history, lab results, medications, allergies, and immunisations. This ensures that patients have the most up-to-date information about their health at their fingertips.
- **Communication with Health and Social Care Providers**: the patient portal enables secure messaging between patients and their care providers. This allows for efficient communication regarding health concerns, treatment plans, and follow-up care, helping to reduce misunderstandings and promote a strong patient-provider relationship.
- **Appointment Scheduling and Management**: this simplifies the process of scheduling and managing appointments with health and social care providers. Patients can request appointments, view upcoming appointments, cancel appointments, and receive reminders for upcoming visits, making it easier to stay on top of their health and social care needs across the health system.
- **Prescription Refill Requests**: patients can request prescription refills through the portal, reducing the need for phone calls or in-person visits to the pharmacy. This feature supports patients having a consistent supply of their medications.
- **Access to Test Results**: provides timely access to lab results, imaging studies, and other test results, enabling patients to review their results and discuss them with their care providers. This can assist patients in making informed health and social care decisions and therefore achieve better outcomes.
- **Patient Empowerment**: designed to educate and support patients in managing their health. It offers personalised health, wellbeing, and services information. Patients can access self-care supports, pre and post treatment advice, update their health information, ensure their health information is accurate and access information to improve health outcomes.
- **Contact Care Platform Integration**: seamlessly integrates with the Contact Care Platform, allowing health and social care providers to send targeted messages and communicate with patients using various channels such as email, SMS, and voice messages e.g., the annual flu vaccine.

1.2 HSE Application

The HSE application will empower patients by providing a single app for managing their digital health identity, personal health information, health and social care coordination, and access to services. It seamlessly combines various aspects of the health and social care system into one user-friendly and secure application.

Key features

- **Digital Identity and Credentials**: create a secure, digital identity for each user, ensuring confidentiality and integrity of their personal information. Patients can manage their health card(s) (such as medical cards, drug payment scheme card, European Health Insurance card), prescriptions, and medical certifications, and grant health and social care providers access to their records as needed.
- **Personal Health Information**: this provides another way for patients to view, store and manage essential health information such as medical history, allergies, medications, lab results, and immunisations. Patients can update their health information in real-time and share it with health and social care providers to streamline appointments and support good health and social care services.
- **Care Coordination**: enables patients to collaborate with their care team by scheduling appointments, setting medication reminders, tracking treatment progress, and receiving personalised care plans. With built-in telehealth features, users can attend virtual consultations, message their care providers, and securely share medical records and test results.
- **Access to Services**: will connect users with a wide range of health services and assists with finding patient support groups. It offers a search feature to find nearby health and social care providers, compare ratings and reviews.
- **Patient Empowerment**: designed to educate and support patients in managing their health. It offers personalised health, wellbeing, and services information. Patients can access self-care supports, pre and post treatment advice, update their health information, ensure their health information is accurate and access information to improve health outcomes.
- **Contact Care Platform Integration**: seamlessly integrates with the Contact Care Platform, allowing health and social care providers to send targeted messages and communicate with patients using various channels such as email, SMS, and voice messages.
- **Security and Privacy**: security technologies will be embedded to protect user data and ensure The General Data Protection Regulation (GDPR) compliance. Users have full control over their information and can easily manage data sharing preferences with health and social care providers.

1.3 HSELive: Contact Centre

HSELive is the HSE's contact centre, providing information, signposting, and support to the public. It will be further developed to provide assisted digital and non-digital access to the new online services to support the delivery of an improved patient health service experience. This will be a national solution which will cater for appropriate local and national information.

Key Features

- **Expert Health and Social Care Staff**: HSELive employs trained and knowledgeable care staff to manage all inbound and outbound communications. These staff are well-versed in medical terminology, health, and social care policies, and leading practices, ensuring accurate and efficient handling of patient inquiries.
- **Inbound and Outbound Communication Management**: the call centre effectively manages both inbound and outbound communications, including appointment scheduling, prescription refill requests, follow-up care, and general inquiries. This comprehensive approach ensures timely and consistent communication with patients.
- **Human-in-the-Loop Assistance**: by integrating a human touch in the communication process, HSELive offers personalised assistance to patients, addressing their concerns and answering questions with empathy and understanding.
- **Seamless Integration with Care Connect Platform**: HSELive utilises the robust capabilities of the Care Connect Platform, providing the health and social care workforce with a comprehensive, 360-degree view of patient information and enabling them to deliver tailored, high-quality care.
- **Telephony**: the call centre leverages a cloud-based telephony system, to efficiently manage and route calls, ensuring that patients connect to the right health and social care staff as quickly as possible.

1.4 Patient Feedback Platform

The patient feedback platform will allow patients to provide feedback on their experience with the health and social care system, allowing care providers to understand user experiences and make improvements to services.

Key Features

- **Continuous Feedback Loops**: captures real-time feedback from patients, allowing health and social care providers to understand their experiences and make data-driven improvements to their services.
- **Patient-Reported Outcomes and Experience Measures:** incorporates Patient-Reported Outcome Measures (PROMs) and Patient-Reported Experience Measures (PREMs) to collect valuable feedback from patients regarding their health and social care outcomes, empowering care providers to make informed decisions and continuously improve care delivery.
- **Narrative-Based Data Collection**: utilises narrative-based data collection techniques, encouraging patients to share their stories and experiences in their own words. This qualitative approach provides rich insights into the patient journey and helps identify underlying patterns and trends.
- **Understanding Health**: will help health and social care providers analyse the stories and feedback shared by patients. This analysis supports providers in understanding complicated and ever-changing situations, allowing them to develop suitable and effective responses.
- **Real-Time Data Visualisation**: provides tools that show data in real-time through easy-to-understand graphs and visuals. These visuals help health and social care providers see emerging patterns, trends, and unusual occurrences in patient experiences. With this information, providers can make better decisions and monitor the effectiveness of their actions.
- **Adaptive Learning and Improvement**: this tool creates a flexible learning environment for health and social care providers. It helps them keep learning from feedback given by patients, so they can improve and enhance their services accordingly.
- **Collaboration and Knowledge Sharing**: promotes collaboration and knowledge sharing between patients and the health and social care workforce, enabling the workforce to learn from patient experiences and implement leading practices.

1.5 Remote Care Monitoring and Digital Therapeutics

Remote Monitoring, which harnesses digital tools for patient monitoring outside of traditional clinical settings, is closely linked with telehealth. This combination enables health and social care providers to track vital signs, physical symptoms, patient updates, and communications, and more, from patients' homes or remote areas. It supports early detection of diseases and allows for timely interventions, ultimately reducing the need for emergency department visits, hospitalisations, and lengthy hospital stays. The integration of Remote Care Monitoring and Digital Therapeutics has the potential to transform the health and social care system in Ireland across various areas such as chronic disease management, mental health support, disability services, and community health.

Key Features

- **Remote Monitoring with Personal and Medical Devices**: this platform enables a variety of personal and medical devices, such as wearables, blood pressure monitors, glucometers, and pulse oximeters to be connected into the health and social care system, enabling care providers to monitor patients' health data remotely.
- **Digital Therapeutics**: offers digital therapeutics solutions, which utilise evidence-based interventions to manage, prevent, or treat health conditions, empowering patients to take an active role in their care, e.g., Cognitive Behavioural Therapy.
- **Health Dashboard**: includes a user-friendly health dashboard, providing patients and healthcare providers with a comprehensive overview of patient health data, progress, and trends, allowing for informed decision-making and tailored care plans.
- **Alerting and Notification System**: technology led alerting and notification system that informs Virtual Care Support teams and health care providers of any significant changes in a patient's health status, including deviations from the expected care plan. This allows for timely intervention and adjustments to care when necessary.
- **Secure Data Sharing**: the platform ensures secure and compliant data sharing between patients, health, and social care providers, and connected devices, safeguarding patient privacy, and facilitating seamless communication.
- **Integration with Health Records**: integrates with other health records such as the National Shared Care Record, providing health and social care providers with a holistic view of patient information and enabling more coordinated and efficient care delivery.
- **Remote Mental Health Care:** ensures that mental health and social care can be provided using remote monitoring tools allowing for real time tracking. Mental health therapies and services can be provided virtually, reaching people who cannot attend in-person sessions via text or voice messaging, live chat, and voice and video calling. Online therapies can be provided making access and compliance more patient centred.
- **Remote Monitoring of Disability Care:** remote monitoring tools can help manage conditions and notify caregivers or the health and social care providers of any changes in the person's health and needs.

1.6 Benefits and Schemes Access

Benefits and Schemes Access will improve the patient experience in applying for and accessing health and social care-related benefits. This online platform will simplify the process of obtaining medical cards, benefits schemes, mobility devices, care supports, and home improvement grants for care and accessibility. It will be integrated with HSE.ie and be accessible through the Patient Portal and HSE App.

Key Features

- **Centralised Application Portal**: as part of the HSE App and Patient Portal patients can easily apply for health and social care benefits and schemes, including medical cards, mobility devices, and home improvement grants.
- **Eligibility Assessment**: incorporates an intelligent eligibility assessment that helps patients determine their eligibility for specific benefits and schemes, guiding them through the application process based on their individual circumstances.
- **Application Tracking**: patients can track the status of their applications in real-time, keeping them informed and engaged throughout the process.
- **Benefits Management**: the system provides an easy-to-use benefits management interface for patients. They can see the benefits they've been approved for, access related resources, and request extra support if necessary.
- **Care Support Resources**: contains a wide range of resources related to care supports. These resources include information about available services, support organisations, and advice on managing specific health conditions.
- **Accessibility Supports**: provides guidance and resources for home improvement and accessibility supports, helping patients create safe and comfortable environments that meet their unique needs.

1.7 Public Facing Engagement and Digital Literacy Development Programmes

Digital Literacy Programmes will enable people to navigate digital health environments, to use Irish digital health and social care services independently, confidently, and thoughtfully. Inspired by successful international cases such as the Indian Aadhar digital literacy programmes[41], this initiative will utilise similar action plans to promote digital literacy and digital inclusion among Irish people[42].

Key Features

- **Collaboration with Various Organisations**: the programme partners with many different organisations, such as schools, sports clubs, eldercare organisations, youth groups, and third-level institutions, to provide training and support in digital health literacy.
- **Transition Year (TY) Involvement**: The Digital Health Literacy Champions programme will look to task a school-based programme to promote digital health literacy in the community. It will give students the opportunity to contribute to community digital health literacy efforts.
- **Adapted Digital Literacy Programmes**: the programme partners with accessible communication agencies to develop adapted communications to create inclusive digital health literacy materials.
- **Programme Materials and Training**: the training offers comprehensive support materials and “train the trainer” sessions, enabling volunteers to deliver high-quality digital health literacy training to community members.
- **Badging System for Volunteers**: The Digital Health Literacy Champions programme features a badging system to reward and recognise volunteers for their contributions, promoting continued engagement and commitment.

1.8 Public Website and Managed Health Content

This is a digital front door to the health service, providing health, wellbeing and services information and access to all our digital health and social care services. It offers a seamless digital health service experience across existing and future digital touchpoints such as HSE.ie, Patient Portal and HSE App.

Key features

- **Comprehensive Service Information**: provides detailed information on health and social care services at national, regional, and local levels, including location, opening hours, access requirements, and waiting times for unscheduled services – urgent care and emergency department.
- **Clinically Approved Healthcare Guidance**: offers access to a wide range of clinically approved healthcare guidance, supporting patients in making informed decisions about their health and well-being.

- **Content Management and Publication Process**: supported by a robust content management platform and publication process, ensuring all content is current, evidence-based, safe, and accessible.
- **Seamless Integration with Other Digital Channels**: the platform works together with various online channels. This lets users smoothly raise problems and communicate with either people or automated staff whenever necessary.
- **Benefits and Schemes Access**: acts as the front door for patients to find, access, and apply for benefits and schemes they may be entitled to or be eligible for.
- **Self-Assessment and Self-Management Tools**: provides self-assessment and self-management tools to help users better understand their health needs and access appropriate care.
- **User-Friendly Interface**: features an intuitive, user-friendly interface, making it easy for users to navigate and find the information they need.

1.9 Open Health API Framework

With the API (Application Programme Interface) framework, patients can link all their health and social care records and keep track of their health data from health providers and health apps in one place. It will provide a structure for the sharing of health and social care information across health and social systems. This will enable patients to choose the technology they prefer to manage their health, allowing for greater patient control and flexibility in care management (e.g., wearables).

Key Features

- **Patient Empowerment**: by allowing patients to choose their preferred technologies for managing their health, the API framework promotes patient autonomy and empowers individuals to take control of their care journey.
- **Standardised API Framework**: provides a unified set of standards for data exchange, enabling seamless interoperability between various care systems, apps, and platforms. This standardised framework ensures that patients can access and share their health information across different technologies with ease e.g., smart watches and phones.
- **Implementation Layer for Duty to Share**: the API framework serves as an implementation layer for the Duty to Share described in the Health Information Bill. This ensures that healthcare providers comply with the legislation by securely sharing relevant health information with patients and other authorised parties.
- **Secure Data Exchange**: the APIs employ robust security measures, such as encryption and token-based authentication, to protect sensitive patient information and maintain compliance with data privacy regulations.
- **Wide Range of Applications**: the API framework supports various health and social care applications, including personal health management apps, telemedicine platforms, EHRs, and more. This flexibility allows patients to select the tools that best fit their needs and preferences.

1.10 Contact Care Platform

This is a patient engagement platform that will improve how health and social care services engage and communicate with patients. The platform will streamline interactions between patients and the health and social care workforce, while enhancing patient satisfaction and outcomes, e.g., respiratory patients getting personalised messages about the flu vaccine annually.

Key features

- **Patient 360 View**: the platform offers a comprehensive real time view of each patient's profile, including their demographic information, medical history, appointment history, interactions, preferences, and other relevant data. This unified approach ensures health and social care providers have all the information they need to deliver personalised, high-quality care.
- **Omnichannel Call Routing**: the platform supports omnichannel call routing, seamlessly managing inbound and outbound communication across various channels, such as phone, email, SMS, live chat, and social media. This enables care providers to efficiently handle patient inquiries and provide timely assistance, regardless of the channel used.
- **Case Management**: the platform's case management system tracks and manages all patient interactions, from initial inquiry to resolution. This streamlined process ensures that patient cases are handled effectively, reducing response times, and improving overall patient satisfaction.
- **Patient Analytics**: the platform leverages advanced analytics to gain insights into patient behaviours, preferences, and trends. This data-driven approach enables care providers to identify areas of improvement, tailor their services, and implement targeted interventions to enhance patient outcomes.

- **Intelligent Patient Communication**: the platform's intelligent patient communication system uses AI-powered chatbots and natural language processing to handle inbound and outbound communication efficiently. This advanced technology ensures that patients receive prompt, accurate responses while freeing up staff to focus on more complex cases.
- **Staff Knowledge Base**: the platform features an extensive staff knowledgebase, providing the health and social care workforce with instant access to up-to-date information on medical conditions, treatments, policies, and leading practices. This valuable resource empowers the workforce to handle patient inquiries confidently and accurately.

1.11 TeleHealth

Telehealth will provide a comprehensive platform for virtual care in Ireland, encompassing various services such as audio and video-based consultations, remote monitoring, and online supports. The integration of platforms like Contact Care further enhances healthcare accessibility, streamlines service delivery, and improves the overall patient experience through personalised messaging and communication. Remote Care Monitoring is a crucial component of telehealth, allowing patients to be monitored and treated in their own homes through the establishment of Virtual Wards and remote monitoring capabilities.

Key Features

- **Multi-Modal Communication**: by leveraging the Contact Care Platform, the platform supports multi-modal communication, enabling health care providers to engage with patients through their preferred communication channels, whether it is email, SMS, or voice calls.
- **Video Enabled Care**: allows for audio and video-based consultations, enabling the health workforce to remotely diagnose and treat patients.
- **Contact Care Platform Integration**: seamlessly integrates with the Contact Care Platform, allowing healthcare providers to send targeted messages and communicate with patients using various channels such as email, SMS, and voice messages.
- **Targeted Messaging**: healthcare providers can create customised messages based on specific patient needs, demographics, or health conditions. This ensures that patients receive timely and relevant information to support their care journey.
- **Automated Notifications and Reminders**: Contact Care integration allows healthcare providers to send automated notifications and reminders for upcoming appointments, medication refills, and other healthcare-related tasks, improving patient engagement and adherence.
- **Campaign Management**: healthcare providers can design and manage targeted messaging campaigns to reach specific patient populations, promote awareness of health initiatives, or encourage participation in healthcare programmes. Design and manage targeted messaging campaigns to reach specific internal staff populations to promote awareness of health initiatives or encourage participation in healthcare programmes.
- **Advanced Analytics and Reporting**: the integration with Contact Care offers advanced analytics and reporting capabilities, enabling healthcare providers to track the effectiveness of their communication campaigns and optimise their messaging strategies for better results.
- **Virtual Reality (VR) for Pain Management**: utilising VR technology for pain management can offer non-pharmacological interventions to patients. VR experiences can distract individuals from pain, reduce anxiety, and improve overall well-being during medical procedures or chronic pain management.
- **Remote Monitoring**: Telehealth will enhance healthcare staff interaction supporting multidisciplinary team meetings, and joint consultations with patients where clinical staff are at disparate sites. It will provide real-time support to ambulance crews/other remote healthcare staff dealing with emergencies from tertiary/expert centres. Telehealth will allow specialists to offer virtual assistance to staff in level 3 hospitals (e.g. Critical Care). Care co-ordination meetings including patients/families and the wider care disciplines can also be conducted more efficiently. This will allow increased efficiency and overcome difficulties getting groups together at one clinic site.

PRINCIPLE 2: WORKFORCE AND WORKPLACE

Principle 2: Workforce and Workplace

"Having easy access to resources related to my career such as onboarding, learning, transferring or leaving as well as making leave requests via a web portal is hassle free, saves me so much time and allows me to focus more on patient care and less on paperwork."

Karen Millar, Public Health Nurse

"Timely and accurate reporting and forecasting gives me more confidence in making financial and resourcing plans. Now, I have access to reliable data whenever I need it and that removes barriers in getting buy-in from stakeholders."

Maureen O'Dea, Senior Business Managers

Description

As outlined in the Framework, this Principle will provide a digitally skilled and supported workforce with appropriate digital tools and connectivity, allowing for collaborative working. This will lead to improved efficiencies and accessibility to health and social care services for patients.

Context

Principle 2 aims to give the workforce the digital tools, connectivity and enhanced digital skills required to deliver the right care, in the right place, at the right time, working collaboratively. Investing further in staffing and infrastructure will enhance the permanent capacity of our health and social care services and expand the scale and range of services to be provided in the community. A workforce with the right digital tools and skills will lead to improved patient outcomes, greater access to health and social care services and better value care.

Empowering the health workforce with skills, seamless access to comprehensive health information, cutting-edge diagnostics, and the latest digital clinical tools is a key component of Principle 2. This initiative is designed to equip healthcare professionals with the digital capabilities, access to the information needed, and collaborative tools to deliver optimal care when and where it is needed.

A key enabler for providing the right tools for the workforce is reliable and secure connectivity, tailored to the unique needs of health and social care workers so that they can work digitally. The platform will be designed to be resilient and adaptable, ensuring connectivity in challenging circumstances or crisis situations and ensuring that offline functionality is available. The workforce will have access to high-speed digital connectivity.

Enhancing digital literacy and upskilling the health workforce to adapt to new ways of working is crucial to provide a stress-free work environment which, in turn, will decrease staff turnover in the healthcare services[43]. As digital technologies are being embedded into health and social care systems, there is a higher risk of digital stress caused by being constantly digitally available leading to employee burnout[44]. To prevent employee burnout, appropriate tools will be used as a remedy to offer relief through streamlining communication, enhancing collaboration, and filtering out excess/unnecessary emails and alerts.

An improved employee experience will be achieved by providing fit for purpose digital tools and applications that create a seamless work environment. These tools will include:

- An application and digital wallet giving the workforce access to information, education and learning resources, make leave requests, manage occupation health (i.e., vaccinations) and interact easily with their team and management.
- Simplified joiner, mover and leaver processes that simplifies all touch points for staff when they are onboarding, transferring, or leaving employment.
- Seamless work environments meaning health and social care workers can effortlessly transition between different settings while retaining access to the resources they require.
- Prioritise mental and physical health for the workforce by utilising appropriate digital tools to reduce stress and burnout in the workplace.
- Continuous skill development and evaluation among employees to adapt to new ways of working.

The Safe Nursing Staffing and Skill Mix Framework[45] uses software to provide real time data analysis. Data related to nursing staff workload, patient acuity, and skill mix is collected and analysed, enabling healthcare facilities to make informed decisions

about staffing levels and resource allocation. This leads to improved patient safety and quality of care while ensuring that nursing staff workloads remain manageable and sustainable.

As part of Principle 2, digital clinical safety training needs to be introduced for the workforce. This aims at enhancing the digital literacy of health and social care professionals, boosting their digital skills, and providing them with extensive knowledge on how to use digital tools effectively and safely in a clinical environment. Reliable and secure use of healthcare technology can improve patient outcomes and prevent potential digital risks.

Efforts have been made to ensure a safe work environment and to support healthcare workers during and outside of normal work hours. Policies such as The HSE Policy on Lone Working 2017 have been implemented to protect staff members who are required to work by themselves for significant periods of time without close or direct supervision[46]. This policy includes staff training, increased staff awareness, ongoing risk assessment of lone working, and encourages reporting of adverse incidents.

The Initiatives under Principle 2 will support the health and social care workforce operating in the community by enhancing safety, communication and efficiency while working independently. By integrating these digital tools into the care system, the HSE Policy on Lone Working can be strengthened, ensuring that health and social care workers in communities have the necessary support, resources, and safeguards in place to deliver effective care while minimising risks and enhancing their overall well-being. Community care workers will be supported by:

- **Safety and monitoring**: digital tools will provide real time location tracking and emergency alerts.
- **Communication and collaboration:** mobile apps can facilitate regular check ins, status updates and regular communication.
- **Documentation, data collection and sharing:** digital tools can streamline data collection and documentation during community visits, reducing the administrative burden.
- **Access to information:** mobile apps or digital platforms can provide the workforce with instant access to medical references, treatment guidelines, and drug information, helping them make well-informed decisions on-site.

The employee experience will be underpinned by modern workspace and productivity tools that will improve productivity, collaboration and optimise efficiency.

Outcomes

1. **Improved patient outcomes and accessibility:** digital tools and secure connectivity empower the health and social care workforce to deliver timely and efficient care, improving patient outcomes and accessibility.
2. **Enhanced patient safety and quality of care:** real-time data analysis and staffing frameworks ensure appropriate staffing levels, reducing errors and enhancing patient safety and quality of care.
3. **Improved employee experience:** modern digital tools and streamlined processes enhance the employee experience and job satisfaction.
4. **Enhanced safety and efficiency for community workers:** mobile apps will improve safety, communication, and efficiency for care workers in the community.
5. **Improved employee wellbeing:** streamlined processes and targeted communication reduce digital burden, fostering a positive work environment and enhancing employee wellbeing.
6. **Improved connectivity and resource access:** reliable connectivity and integrated networking services ensure seamless access to information and resources.
7. **Enhanced collaboration and productivity:** modern workspace and productivity tools promote collaboration, enabling efficient communication, information sharing, and productivity.
8. **Strengthened feedback and continuous improvement:** real-time feedback platform enables continuous improvement, informed decision-making, and better support for the workforce.
9. **Improved analytics for informed decision-making:** integration of data enables valuable insights for informed decision-making, optimising resource allocation and enhancing efficiency.

More information about the Initiatives under Principle 2 are on the following pages. Please note there is some repetition across the key features described under each Initiative.

Table 3: Principle 2 Strategic Initiatives

#	Initiative	Timeline for Initiative delivery starting		
		Now (year 1-year 2)	Next (year 3-year 4)	Future (year 5 onwards)
2.1	Reliable Secure Connectivity			
2.2	Modern Workspace and Productivity Tools			
2.3	Improve Employee Experience			
2.4	Mobile Ecosystem for Front Line			
2.5	Employee Feedback Platform			
2.6	Digital Finance and HR			

High Level Initiative Descriptions

2.1 Reliable Secure Connectivity

This Initiative will advance ongoing programmes to provide secure, resilient, and comprehensive connectivity in all locations, including in primary and community care locations. This will provide high-quality Wi-Fi/5G and satellite technology to all areas where care is provided. It will offer integrated networking services for a wide range of use cases, supporting emerging private technologies (e.g., 5G, eSIM), to ensure high reliability and adaptability in crisis situations.

Key Features

- **Internet of Things Networks**: the platform supports Internet of Things networks and medical device integration for seamless communication between devices and systems.
- **Core Networking**: high-speed, secure data transfer is ensured through robust networking infrastructure, enabling efficient communication across various care settings.
- **Wireless Connectivity**: campus-wide, building-specific, and beyond-building wireless communication is supported to provide seamless connectivity for care workers and patients.
- **Telephony Connectivity**: advanced telephony solutions, including private 5G and eSIM technologies, enable reliable voice communication in various care environments.
- **Crisis-Ready**: designed to be resilient and adaptable, ensuring reliable connectivity even in challenging circumstances or crisis situations.
- **Security**: robust security measures are implemented to protect sensitive care data and ensure the privacy of patient information.

2.2 Modern Workspace and Productivity Tools

This solution will provide health and social care workers with the necessary digital tools to optimise efficiency, collaboration, and productivity. It will introduce a wide range of digital services to enhance the workplace experience for care workers, streamline employee interactions, and speed up the adoption of approved clinical applications. These tools and services will integrate with existing workplace experience systems.

Key Features

- **Microsoft 365 Subscriptions**: each health and social care worker will be matched with appropriate Microsoft 365 subscriptions to ensure the most effective use of licensing and provide access to essential tools and services.
- **Collaboration Tools**: MS Teams serves as the core collaboration platform, enabling care workers to communicate, share information, and work together seamlessly. Current in use platforms will need to be reviewed and potentially consolidated.
- **Productivity Suite**: core productivity tools such as Microsoft Word, Excel, and PowerPoint are provided, empowering health and social care workers to create, edit, and manage documents, spreadsheets, and presentations.
- **Planning and Task Management**: planner and task tools help the workforce stay organised, prioritise tasks, and monitor progress.
- **Data and Analytics**: Power BI is available for data visualisation, analysis, and reporting, supporting informed decision-making.

- **Automation and AI-Augmented Tools**: Power Automate enables workflow automation, while AI-augmented tools like co-pilot assist the workforce in completing tasks more efficiently.
- **Additional Tools and Utilities**: distributed decision-making, online whiteboard collaboration tools, and other utilities are provided to further enhance productivity.
- **Integration with Workplace Experience Systems**: employee experience utilities from National Integrated Staff Records and Pay Programme (NISRP), the introduction of the National Estates Information System, and other core national systems are integrated to streamline core employee transactions and interactions.
- **Streamlined Rollout of Approved Clinical Apps**: the deployment process for approved clinical applications (assessed under a Health Technology Assessment framework) is optimised to swiftly provide these tools to healthcare workers who can benefit from them.
- **Seamless Work Environments**: supportive work environment, allowing the workforce to effortlessly transition between different settings and access the necessary resources.

2.3 Improve Employee Experience

This will offer a range of digital applications and tools aimed at enhancing the work environment for health and social care workers, regardless of their location or situation. This suite of services will include a Healthcare Worker App to support seamless working experiences in various settings such as office, connected hub, remote working, hybrid, and emergency situations.

Key Features

- **Streamlined Joiner/Mover/Leaver Process**: the app simplifies onboarding, transitions, and offboarding processes for the workforce, contributing to a seamless and efficient experience. This includes a single email account to make it easier when working across multiple sites or transitioning to a new site.
- **Healthcare Worker App and Digital Wallet**: this integrated app and digital wallet enable health and social care workers to access information, education and learning resources, and execute common transactions (e.g., leave requests) with ease.
- **Feedback and Precision Communication**: the app enables ongoing feedback and targeted precision communication, ensuring continuous improvement in employee experience.
- **AI Communication Support**: advanced communication system intended to decrease employee burnout from being overwhelmed with emails and pop-up alerts by filtering out alerts/emails, so they are only sent to relevant staff members reducing digital burden on the workforce.
- **Educate, Evaluate and Build**: a cooperative effort between leaders and the workforce to foster a healthy workplace by providing appropriate training, continuously evaluating to identify the risks that need to be addressed and support in building the employees technical skillset as technology evolves.
- **Benefits and Schemes Access**: acts as the front door for the workforce to find, access, and apply for benefits and schemes they may be entitled to or be eligible.

2.4 Mobile Ecosystem for Front Line

The ecosystem is designed to give health and social care workers tools, like a smartphone or tablet, that brings together all the digital services and resources they need in one place. This solution is flexible, so it can be adapted to different situations, while ensuring the security of sensitive health data.

By using this system, health and social care workers can efficiently access the information they need, making their work easier and more effective. It also helps protect against cyber threats and reduces the environmental impact. Additionally, during crises, it improves the ability of both employees and the organisation to cope with challenges and emergencies. It is a comprehensive and secure solution that empowers health and social care workers and enhances capabilities across all service sites.

Key Features

- **Multi-Purpose Device**: the foundation of the solution is a mobile phone, laptop or tablet that acts as a central access point for various health and social care applications, services, and resources based on the requirement.
- **Peripheral Options**: health and social care workers can connect their device with various tools, such as lap docks, tablet docks, or office-based docking monitors, to enhance their experience. Lap docks are portable laptop-like devices with built-in keyboards and displays; tablet docks are docking stations that can accommodate tablets, providing additional ports and connections for peripherals.

- **Virtualisation Options**: to improve security and access to resources, the solution provides different virtualisation choices. These options include Virtual Desktop Infrastructure, which creates virtual desktops for users; Desktop-as-a-Service , which offers desktop services from the cloud; and virtualised applications, which let users access applications without having to install them on their device. These virtualisation options help in enhancing security, managing resources efficiently, and giving users more flexibility in how they access and use their tools.
- **Automotive Integration**: the solution can be integrated into vehicles, allowing health and social care workers (e.g., cars, ambulances), to access critical information and services while on the go.
- **Device Security and Provisioning**: the mobile health data station solution ensures robust device security, provisioning, and connectivity as part of the overall service.

2.5 Employee Feedback Platform

A feedback system designed to create a continuous feedback loop for health and social care worker experiences. The platform will focus on gathering feedback from frontline care professionals to help navigate the complex landscape of health and social care transformation and ensure the delivery of valuable change that empowers the workforce.

Key Features

- **Continuous Feedback Loop**: will create a way for health and social care workers to share their real-time experiences and insights. This helps to create an environment where learning and improvement happen continuously. The feedback loop allows the platform to gather information and ideas from those working in care, helping everyone involved to learn and grow over time.
- **Dynamic Sensemaking**: use of conceptual frameworks will assist health and social care managers and research units analyse feedback and understand complex situations, allowing them to identify trends, and make informed decisions about organisational change required in complex unordered domains.
- **Multi-Channel Data Collection**: will allow health and social care workers to give feedback in different ways. They can use surveys, interviews, or even directly share their observations. This multi-channel approach allows them to provide their input using the method that is most convenient for them. It makes it easier for care workers to share their thoughts and experiences with the platform.
- **Advanced Data Analysis and Visualisation**: will use powerful tools to analyse and present data in a way that is easy to understand. It helps to find patterns, trends, and connections in the feedback collected. By using these tools, health and social care workers can make decisions based on evidence and facts. The platform's data analysis and visualisation tools make it easier for people to see and understand the important insights from the feedback given by care workers.
- **Actionable Insights**: will translate the collected data into actionable insights that enable health and social care organisations to adapt and improve their practices, ensuring better support for care workers.
- **Collaboration and Engagement**: will be encouraged among care workers, fostering a culture of continuous improvement and collective problem-solving.
- **Real-Time Monitoring and Evaluation of Initiatives and interventions**: will allow care organisations to measure their impact and adjust strategies as needed.

2.6 Digital Finance and HR

Digital Finance and HR will complete the introduction of modern financial and procurement management systems for the entire health sector. The Integrated Financial Management System (IFMS)[47] programme is well underway, as is the National Integrated Staff Records and Payroll (NISRP)[48] system. These Initiatives will be fully implemented and will support the needs of a modern health system employer, enhancing available workforce information. In time, this data can be used with patient information to enhance the analytics and insights available to the health service.

Current Initiatives such as IFMS will provide the HSE and associated agencies with a modern fit for purpose finance and procurement system. This will give better and more timely financial reporting and forecasting leading to improved financial management, governance compliance and transparency. The system will lead to better overall financial control environment and create many benefits for the health sector.

IFMS will provide quality standardised financial and procurement information, for the first time across both statutory and voluntary services, facilitating:

- valid comparison of costs across the entire sector,
- a more equitable and evidence-based resource allocation model,
- demonstration of value for money to support investment in service development,
- leverage the full procurement capacity of the health sector by having quality data at a catalogue item level,
- allow/support position-level reporting of pay costs for more than 137,745 WTE (equating to 156,285 personnel).

PRINCIPLE 3: DIGITALLY ENABLED AND CONNECTED CARE

Principle 3: Digitally Enabled and Connected Care

"Being able to see Mrs. O'Neill's historic health data, test results and treatments from a single unified source enables my multi-disciplinary team to make informed and consistent decisions. We can now ensure Mrs. O'Neill receives constant support during and in between her hospital visits; by providing clear care plans, available to all carers including the GP and Public Health nurse ensuring the best care".

Corrine Carroll, Nephrologist

"Being able to receive real-time alerts from Mrs. O'Neill's blood pressure monitor means I am instantly informed of any health risks. Also, the ability to provide remote consultations to Mrs. O'Neill reduces the time spent on travelling and makes regular check-ins easier for both of us."

Aoife McDonald, General Practitioner

"Digital tools have made communication with Mrs. O'Neill's Nephrologist more efficient and effective. We can discuss her progress based on her complete and up-to-date digital health record, enabling us to make well-informed decisions and collaboratively plan her care."

Karen Millar, Public Health Nurse

Description

As outlined in the Framework, this Principle will deliver connected digital health and social care systems to allow access to a comprehensive view of each patient's health information, enabling collaborative, evidence-based and timely decision-making, leading to improved patient outcomes. The connected flow of health information for the individual patient ensures the capacity to achieve a fully integrated health and social care model as envisaged in Sláintecare – ensuring the right care, in the right place, at the right time. The provision of the most up-to-date health information will ensure the capacity to use the full multidisciplinary care team enhancing access and providing safer care.

Context

To achieve digitally enabled and connected care, the right information must be securely shared at the right time, enhancing access to care, and creating a more connected and patient centred care experience. This involves integrating information and systems into single digital longitudinal health records (Electronic Health Records, or EHRs), incorporating medication management tools, and the digitisation of the whole health care record. The delivery of EHRs is key in achieving improved patient outcomes and supporting the health workforce in delivering high-quality care[5].

EHRs will serve as the central tool for managing all patient-related health and social care documentation and will interface with the overall digital platform, allowing for the assessment, analysis, and use of all health-related data (such as staffing, financials, and resource tagging) for individual patient and population health management.

EHRs are a key component to health information flow, streamlining communication, and ensuring that the health workforce have immediate access to up-to-date vital patient information. EHRs will enhance care quality by integrating decision support tools and enabling evidence-based clinical decisions.

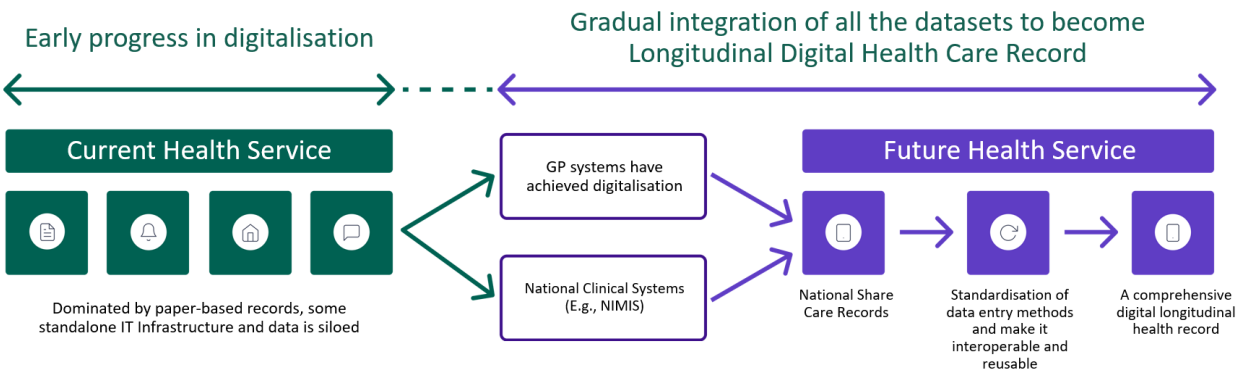


Figure 7: Achieving a comprehensive digital longitudinal health record in Ireland

The approach to the introduction of EHRs will be complex, as we are not starting from a green field setting. Implementing EHRs in Ireland will be a complex process due to the presence of multiple systems that already exist across the health and social care system – including EHRs, laboratory systems, NIMIS and already deployed and future systems.

The DoH Framework provides detail on the national policy, governance, approval, procurement, and deployment of enterprise level EHR systems across the health system. The strategic approach to EHRs places importance on the seamless data flow and interoperability between necessary digital systems. Key actions include identifying the systems that need connection, defining the data to be shared, and establishing required interoperability levels.

The vision is to have a single, comprehensive EHR for every individual, which should be accessible to healthcare professionals and the patient. The approach also acknowledges the need to replace legacy systems with enterprise-level EHR systems delivered on a regional basis, maintaining a national standard.

Taking current and planned procurements into account, the Framework sets out the future policy direction for EHR roll-out across the regions. Working closely with stakeholders across the health system, including acute, community and regional health area management, through collaboration the DoH, HSE, Health Information and Quality Authority (HIQA) , National Standards Authority of Ireland (NSAI) and other relevant standards and regulatory bodies will define critical national standards for data sharing and use to be adopted, interoperability and clinical terminology and establish a national procurement framework for future EHRs resulting in a shortlist of successful enterprise level EHR vendors. The policy is to create a shortlist of enterprise-level EHR vendors.

This approach creates a balance between providing regions with choices and ensuring competitive tension between vendors while managing complexity and interoperability. Regions will run competitions to draw down from this shortlist of successful vendors to confirm their preferred EHR vendor. There will be a number of specific conditions of sanction that regions and hospitals will need to sign up to, in order to access the framework, and associated resources required for implementation. These are detailed in the DoH Framework.

As detailed in the Framework, the approach involves conditions for accessing the procurement framework such as approval of a regional EHR deployment based on affordability and single instance per region/regions using the same solution. Other specifications include that the EHR configuration must accommodate Acute and Community requirements, require unrestricted data sharing for the direct provision of care, and must be compliant with the minimal data set defined by the HSE to support the National Shared Care Record.

The approach anticipates the need for significant streamlining of operational and clinical processes and procedures across the health service, and the need for deployment of EHRs to be clinically led, operationally driven, and technically enabled.

A consolidated number of EHR systems are anticipated to be regionally deployed for data sharing within and between regions. For regions not receiving an EHR first, essential clinical systems will be delivered subject to requisite data standards. Projects to supplement these systems will be undertaken, including electronic referrals, discharges, and prescribing. Key tools like digital identity for staff accessing EHRs will also be delivered.

The GP community are well developed digitally in comparison to the hospital and community sectors. There are several GP solutions and likely over time, there will be a need for rationalisation, further standardisation, coding, etc., to the health and social care data in the GP systems. To allow the patient information to flow better to the shared record; these developments will need support and resourcing as it provides a significant component of the vital clinical information for individual patients and for population health. While some may be interim solutions, overtime the majority will be provided as components of the planned EHR approach or fully interface to the EHR solutions.

Private hospital systems will need to develop interfaces to allow bidirectional flow of clinical information, enabling private facilities and GPs to potentially utilise the single patient record as their own system of record. The planning and development of the business case for a single digital longitudinal health record will require resources with expertise in technical, business, and clinical aspects, considering the replacement of current solutions, futureproofing for GP and private facility adoption, and managing interim approaches. The aim is to achieve a single digital record for healthcare available to all citizens, supported by international evidence promoting high-value, safe healthcare with accurate data at the point of care.

Figure 8: An EHR is the backbone for building a collaborative healthcare network of health care settings such as clinics, hospitals, pharmacies, laboratories, etc., that can work seamlessly to deliver patient care.

An EHR for the Irish health system will:

- **Enhance patient safety**: minimise medication errors and provide alerts for allergies and patient conflicts with new medication**;** identify significant clinical risks e.g., sepsis, imminent collapse, risk of falls, etc.
- **Improve documentation accuracy**: the workforce will have access to accurate and up to date information across all care settings.
- **Improve care coordination**: patient information, test results and treatments can be shared between care providers and the patient. This creates continuity of care, reducing duplication of investigations and procedures across settings and avoids conflicting treatments.
- **Improve access to patient information**: EHRs will consolidate patient information providing a comprehensive view of the patient's history and current care and treatment. This allows the workforce to make informed decisions.
- **Enhance patient privacy and security**: EHRs have built-in security measures and access controls that ensure patient data remains private and protected from unauthorised access.
- **Streamline workflows**: EHRs facilitate streamlined documentation and enable standardisation of documentation, reducing paperwork and administrative tasks for clinicians.
- **Improve communication and collaboration**: digital records enable seamless communication and collaboration among the health and social care workforce. Different members of a patients care team can access and update patient information, promoting better care coordination and reducing communication gaps.

The MN-CMS is an example of an integrated EHR within the Irish health system. MN-CMS is designed to improve patient safety, enhance communication and collaboration among the health workforce, and facilitate the collection of comprehensive and accurate clinical data for the care of women and new-borns.

To deliver against the aims of this principle, the health records and information of all patients need to be created and maintained on a national EHR that is interoperable across Ireland. Key patient data will be accessible in community and hospital settings within the Health Regions.

Outcomes

1. **Improved patient outcomes:** access to a comprehensive view of each patient's health information allows for evidence-based and timely decision-making, leading to improved patient outcomes.
2. **Fully integrated healthcare:** the connected flow of health information for individual patients ensures the capacity to achieve a fully integrated healthcare model as envisioned in Sláintecare, ensuring the right care, in the right place, at the right time.
3. **Enhanced access and safer care:** the provision of the most up-to-date health information enables the use of the full multidisciplinary healthcare team, enhancing access and providing safer care.
4. **Digitally enabled and connected care:** securely sharing the right information at the right time enhances access to care and creates a more connected and patient-centred healthcare experience.
5. **Central management of healthcare documentation:** the EHR serves as the central tool for managing all patient-related healthcare documentation and interfaces with the overall digital platform, allowing for the assessment, analysis, and use of all health-related data for individual patient and population health management.
6. **Enhanced patient safety and documentation accuracy:** EHRs will minimise medication errors, provide alerts for allergies and conflicts, and ensure accurate and up-to-date information across all care settings.
7. **Improved care coordination and access to patient information:** sharing patient information, test results, and treatments between health and social care providers and the patient improves care coordination, reduces duplication, and provides a comprehensive view of the patient's history and current care.
8. **Streamlined workflows and communication:** EHRs facilitate streamlined documentation, standardisation, reduce paperwork and administrative tasks, and enable seamless communication and collaboration among the care team.

More information about the Initiatives under Principle 3 are detailed on the following pages. Please note there is some repetition across the key features described under each Initiative.

Table 4: Principle 3 Strategic Initiatives

#	Initiative	Timeline for Initiative delivery starting		
		Now (year 1-year 2)	Next (year 3-year 4)	Future (year 5 onwards)
3.1	Shared Care Record			
3.2	Population Health Management			
3.3	Care Coordination			
3.4	Medication Management*			
3.5	Diagnostics			
3.6	Order Comms and Care Delivery*			
3.7	Patient Safety and Quality of Care*			
3.8	EHR Procurement and Delivery			
3.9	Digitisation of Health Care Records*			
3.10	National Clinical Information Systems*			
3.11	Medical Device Integration			

*These Strategic Initiatives are interim solutions that may be in the future interfaced or replaced by national EHRs. Some technology solutions being undertaken in the interim may not be carried forward. Standardisation and workflows will be enduring in the EHR.

High Level Initiative Descriptions

3.1 Shared Care Record

A shared care record enables healthcare providers in different settings (such as, primary and community care and hospitals) to view patient records for direct patient care. It brings together information from various systems into a single place for care professionals to use to support the delivery of care. It enables visibility of patient health information, but not an ability to create

Digitally Enabled and Connected Care

or update the information. A shared care record enables healthcare providers in different settings to view selected point in time information for the patient collated from the systems of record. With evolving integrated EHRs, the shared care record will have a narrower role but remain valuable for transitions of care with private providers.

Key Features

- **Comprehensive Data Integration**: integrates core datasets from a variety of locations and sources, including patient administration, care coordination, referrals, discharges, diagnostic reports, vaccinations, primary and community care data, ePrescribing, and other clinical and administrative systems.
- **Modern Standards-Based APIs**: offers modern, standards-based APIs (FHIR) for seamless data exchange and integration with existing and new healthcare systems.
- **Longitudinal and Summary Care Records**: supports both longitudinal shared care records and summary care records, aligning with EU standards and delivering on Ireland's Open NCP commitments.
- **Access Control**: enforces appropriate staff access and use through role-based access controls, ensuring secure, authorised, and auditable access to patient data.
- **General Practice System Interoperability**: sharing of health information, including summary record, data quality, identifier standards and coding standards. This will enable data exchange, creates efficient care coordination, and reduce duplication and errors.
- **Data Availability**: data is available across the healthcare system through various means, including in-context within existing healthcare delivery systems, clinical portals, APIs, clinical apps, and analytical tools.

3.2 Population Health Management

This is a collection of digital tools that will support public health programmes and improve the overall well-being of people and their community. These tools include screening services, contact tracing, health surveillance, disease registry and clinical audit, immunisation and vaccination, outbreak management, and advanced population health analytics. Implementing data analytics and population health management strategies can help identify at-risk populations, prioritise preventive interventions, and allocate resources efficiently to improve overall community health.

Key Features

- **Screening Services**: efficient and accessible screening services which aims to detect health issues at an early stage, promoting early intervention and better health outcomes (e.g., breast screening).
- **Contact Tracing**: robust contact tracing tools to rapidly identify and notify individuals who may have been exposed to infectious diseases, helping to prevent the spread of illnesses to others (e.g., the Covid Care Tracker used during the Covid-19 pandemic).
- **Health Surveillance**: comprehensive health surveillance systems to monitor and detect trends in population health, including the identification of at-risk populations and early warning signs of emerging health threats.
- **Disease Registries**: centralised repositories of information on specific diseases, enabling better understanding and management of these conditions at a population level.
- **Immunisation and Vaccination**: efficient management and tracking of immunisation and vaccination programmes to ensure high coverage rates and optimal protection against preventable diseases in our population.
- **Outbreak Management**: effective outbreak management tools and resources to enable prompt identification, containment, and response to infectious disease outbreaks.
- **Population Health Analytics**: advanced analytics capabilities, including artificial intelligence machine learning model development, staff-based simulation, and data exploration, to support data-driven decision-making and population health management strategies.

3.3 Patient Administration and Care Coordination

A robust platform with accurate identification and demographics that will streamline delivery of various areas of healthcare patient administration. Key features will include scheduling and appointment management, waiting list and waiting time management, patient flow and clinical management, integrated care planning and circle of care coordination, patient reported outcomes / patient experience measures and functionalities for defining the steps in care pathways. Defined pathways can improve quality and reduce risk by ensuring that all relevant steps are adhered to, hand overs are appropriate, and follow-ups scheduled.

Key Features

- **Scheduling and Appointment Management**: enables efficient scheduling and appointment management for healthcare providers, reducing administrative burdens and improving patient access to care.
- **Waiting List and Waiting Time Management**: allows healthcare providers to effectively manage waiting lists and waiting times, optimising resource allocation, and reducing delays in care delivery.
- **Patient Flow and Clinic Management**: streamlines patient flow and clinic management processes, enhancing operational efficiency and ensuring patients receive timely care.
- **Integrated Care Planning and Circle of Care Coordination**: supports integrated care planning and facilitates collaboration among all members of a patient's circle of care, including primary and community care providers, specialists, and allied health professionals.
- **Patient-Reported Outcomes and Experience Measures**: incorporates Patient-Reported Outcome Measures (PROMs) and Patient-Reported Experience Measures (PREMs) to collect valuable feedback from patients regarding their healthcare outcomes, empowering healthcare providers to make informed decisions and continuously improve care delivery.
- **Contact Care Platform Integration**: the platform seamlessly integrates with the Contact Care Platform, enabling multi-modal communication with patients using various channels such as email, SMS, and voice messages and facilitating better coordination of care.
- **Care Coordination APIs**: offers care coordination APIs that allow for easy integration with other digital services, ensuring smooth interoperability and enhancing overall care coordination.
- **Review and Update Regulations**: review and update regulations (e.g., the Misuse of Drug Act) to ensure that the optimisation of medication management technologies is supported by regulations.

3.4 Medication Management

Medication Management encompasses the full extent of the medication-use process across the health system. It has been described as a 5-stage process encompassing medication prescribing, transcribing, dispensing, administration, and monitoring. Digitalisation of this process through a series of interoperable electronic tools will provide seamless access to information on the full range of medication care, from prescribing, dispensing and administration records to closed-loop medication management and inventory control. Availability of these tools will simplify the medication management pathway, improve medication safety across the health system and provide seamless information sharing across acute hospital, primary, community, and integrated care systems.

Medication safety monitoring programmes are aimed at improving communications around medication use for patients. This promotes better ways of communicating between doctors, nurses, pharmacists, and patients and will help the health workforce and patients manage medicines more safely and responsibly.

Key Features

- **Medicinal Product Catalogue:** a centralised repository of medications, including unique product identifier, dosages, interactions, and contraindications, supporting system interoperability and informed clinical decision-making by healthcare providers.
- **Electronic Prescribing (ePrescribing):** integrated solutions for prescribing medications electronically, supporting indication based prescribing and clinical decision support, ensuring accuracy, and reducing the potential for medication errors.
- **Electronic Medication Administration Records (eMAR):** a system for digitally managing and documenting the administration of medication to patients, promoting accuracy and patient safety. This functionality is typically integrated within an electronic prescribing system.
- **Closed Loop Medication Management (CLMM):** CLMM integrates automated and intelligent systems that connect all stages of medication management from pharmacy orders, supply to patient areas, e-prescribing, and e-discharge. The risk of medication errors is greatly reduced by CLMM. CLMM ensures that the right medication is prescribed, accurately dispensed, given to the patient as intended, and fully documented, supported by barcode medication administration and system integration. This comprehensive approach enhances patient safety and minimises the chances of mistakes or miscommunication throughout the process.
- **Pharmacy Stock Control (PSC):** digital solutions supporting electronic procurement and inventory control to facilitate tracking medication stock levels and usage, alerting when there is a shortage and enabling efficient replenishment and minimising waste.

- **Medication Dispensing:** digital functionality typically integrated within the PSC system. Integration of medication dispensing functionality with the electronic prescription solution eliminates prescription data transcription improving the safety and efficiency of the medicines supply process.
- **Medication Ordering:** a system for placing medication orders and tracking their status, facilitating efficient and timely medication delivery. This functionality is typically integrated within an electronic prescribing or EHR system.
- **Formulary Management:** a tool for managing a list of approved medications within a healthcare organisation, helping to control costs and ensure appropriate medication use.
- **Compliance and Audit:** tools for monitoring and ensuring compliance with medication management regulations, as well as auditing medication practices for quality improvement.
- **Patient Safety:** to be enhanced through solutions focused on minimising medication errors, improving medication adherence, alerting a recall of a product, alerting when there is a medication shortage and providing the best option available, and monitoring for allergies and potential adverse drug reactions.
- **Medication Reconciliation:** a process for comparing a patient's medication list across multiple care settings, providing an accurate record of the patient's actual medication history to support decision making by the health professional. Typically, this in integrated within the electronic prescribing solution and though FHIR standard messaging can receive medicines reconciliation information from other prescribing and dispensing systems e.g., GP or community pharmacist.
- **Integration into Primary Care and Integrated Care Systems:** seamless data exchange and interoperability between medication management solutions across healthcare systems, promoting coordinated and efficient medication care.

3.5 Diagnostics

This is a set of digital applications aimed at improving foundational diagnostic capabilities to manage patient care – such as radiology, endoscopy and laboratory investigations and electronic vital signs. This will include the continued delivery and improvement of the NIMIS, upgrade and integration of laboratory information systems, and the development of electronic observations integrated with vital signs monitoring devices.

Key Features

- **NIMIS Expansion and Optimisation**: the continued rollout and optimisation of NIMIS, including the integration of the Individual Health Identifier (IHI), to ensure accurate patient identification and secure management of imaging data across healthcare organisations.
- **Integration and Expansion to Other Modalities**: broadening the scope of NIMIS to cover other imaging diagnostic modalities, such as ultrasound, nuclear medicine, mammography, and echocardiography to provide a comprehensive view of patient imaging data.
- **Modernisation and Integration of Laboratory Information Systems**: the development and implementation of modern, integrated laboratory information systems including digital pathology that streamline laboratory workflows, facilitate efficient data exchange with other healthcare systems, and support accurate and timely diagnostic results.
- **Electronic Observations and Vital Signs Monitoring**: the continued rollout and optimisation of Digital INEWS including further development of electronic observations systems integrated with vital signs monitoring devices and other healthcare equipment, enabling the collection and analysis of real-time patient observation data for improved clinical decision-making and patient care.

3.6 Order Comms and Care Delivery

This is a set of robust tactical tools and solutions implemented in regions where an EHR will be deployed last. Applications will be used to digitally enter diagnostic and therapeutic patient care order requests and to view results. These tools provide standards-based clinical documentation and assessment capabilities, utilising AI-enabled technologies to support clinical workflows, and offering effective individual care planning and case management tools.

Key Features

- **Order Communications and Results**: a digital platform for efficient order communications and results management, enabling healthcare providers to effectively request diagnostic tests, imaging studies, and treatment plans, and access timely and accurate results.

- **Standards-based Clinical Documentation and Assessment**: a range of tools and applications for standardised clinical documentation and assessment, supporting accurate and consistent data capture, exchange, and analysis across healthcare settings.
- **AI-Enabled Assistive Voice Technologies**: intelligent AI-enabled voice recognition and natural language processing technologies to streamline clinical documentation, improve productivity, and enhance patient and healthcare worker encounters.
- **Augmented Assessment Capabilities**: AI-enabled processing of video, audio, and device-based data, enabling healthcare providers to collect richer datasets more frequently, breaking the cyclical constraints of traditional assessment and data collection methods (for e.g., AI-enabled Clinical Decision Support tools for collecting valuable data and predicting patients' health trajectories).
- **Individual Care Planning Tools**: digital applications to facilitate clear communication between patients and their support teams, fostering a collaborative approach to personalised care planning and decision-making.
- **Case Management Tools**: case management solutions to address the complex needs of patients across various healthcare settings, supporting care coordination, and facilitating effective management of multi-disciplinary care teams.
- **Medical Records Management**: a robust system for managing medical records generated during care encounters and episodes of care, ensuring secure storage, accessibility, and data integrity.
- **Theatre Management Tools**: advanced digital solutions will enhance surgical scheduling, resource use and patient care, including peri-operative and post-operative management. Digital tools, like mobile apps for surgical recovery monitoring, will allow clinicians to track patient recovery after discharge.

3.7 Patient Safety and Quality of Care

These tools will focus on providing the highest standards of safety, quality, and evidence-based practices in health and social care delivery. These tools cover various aspects of the care journey, from patient identification and care verification to infection prevention and control, and clinical guidance.

Key Features

- **Patient Identification**: building the use of verified digital credentials into clinical / administration processes to positively identify patients at the point of entry for physical or digital care encounters, ensuring accurate and secure patient records linked to the correct person.
- **Point-of-Care Verification**: implementing technologies for patient tracking and point-of-care verification to improve patient safety, reduce errors, and streamline care workflows.
- **Closed Loop Blood Management**: incorporating closed-loop blood management solutions to minimise transfusion risks and ensure appropriate blood product administration.
- **Clinical Guidance**: enhancing the decision-making capability of care workers by providing them with accurate predictions of a patient's health trajectory such as patient hospital length-of stay, re-admission, or mortality and, evidence-based clinical guidance to support the latest leading practices to improve patient outcomes.
- **Infection Prevention and Control**: implementing robust infection prevention and control measures, including the use of sensors and robots for instrument and environment sterilisation, to reduce the spread of infections and enhance the overall safety. The Track and Trace system will be implemented for tracking all surgical instruments and packs to ensure all medical implants will be tracked[49].
- **Compliance and Audit Tools**: integrating compliance and audit tools within the care environment to improve the quality and consistency of data capture and streamline clinical efficiency and ensure an accurate and transparent assessment of who accesses personal health information.
- **Guidelines for Delivering Safe and Quality Care**: create access to up-to-date evidence-based information and current guidelines to support the workforce to deliver safe and quality care, including the approval of digitally enabled clinical devices by the HPRA.
- **Healthcare Worker Competency Tracking**: monitoring and evaluating healthcare worker competencies to ensure that staff are adequately skilled and trained to provide safe and high-quality care.
- **Staff Ratios and Skill Mix**: assessing patient and healthcare worker characteristics to optimise care team composition and minimise potential risks in care delivery.
- **Management and Safe Use of Medical Technology and Devices**: medical technology and devices are vital for efficient healthcare delivery. They aid in preventing, diagnosing, treating diseases and in-patient rehabilitation and palliation.

Ensuring patient safety necessitates access to secure and beneficial medical technologies. The management of medical devices places them in the right positions, provides appropriate maintenance and ensures correct usage following the intended instructions. With the advent of the Internet of Medical Things (IoMT), data from these devices must comply with standardisation policies and network security protocols to minimise vulnerabilities. Elements of medical device management require a set of digital tools:

- Tracking of medical devices to include Scan4Safety approach for implanted medical devices in line with the requirements of the Medical Device Regulations.
- Implementation of RFID tracking for mobile, re-usable medical devices.
- Standardised approach to medical device evaluation including conformance assessment with relevant international standards, and compliance with HSE data standards for interoperability and integration.
- Implementation of a requirement for Software Bill of Materials (SBOM) for medical devices. This is a formal record containing the details and supply chain relationships of all the software components used in building the overall software application.
- Monitoring of connected medical devices to minimise cyber security vulnerabilities.
- Access to electrical safety, quality assurance, maintenance, and utilisation records.
- Digital Clinical Safety Training for Clinical Users of Medical Devices (including medical device software).
- Quality assessment tool for software as a medical device (in particular for health apps), and provision of a library of health apps which have undergone a base-line quality assessment.
- Quality assessment process for AI tools which meets the definition of "medical device software".
- Sharing of exempla projects where innovative technology or processes have been introduced.
- Standardised processes for the management of adverse events including device recalls and incident investigation for medical devices and digital health software.
- Standardised approach to the management of patient alarms on medical devices.
- Contribution to the minimum set of agreed open standards for Digital Health as they apply to medical devices (e.g., DICOM, European Medical Device Nomenclature (EMDN)).
- Equitable processes for management of medical devices in Community care as well as in the Acute Hospital System.

3.8 Electronic Health Record Procurement and Delivery

Procurement and delivery of EHRs is fundamental to the seamless provision of healthcare services across Ireland. This Initiative will first develop a business case, standards, and a national procurement framework. Next, it will progress the EHR Initiative through the procurement process, and finally, it will coordinate implementation across the six Health Regions.

EHR systems have not yet been fully defined or agreed for the full planning period (through 2030), but systems that are in place or planned so far include the following:

- Maternity and Newborn EHR
- CHI EHR
- National Rehabilitation Hospital Specialised Care Services Clinical Management System SC-CMS
- National Forensics Mental Health Service SCS-CMS (NFMHS)
- National Palliative Care SCS-CMS
- Integrated Community Case Management System (ICCMS)

Key Features

- **Development of Business Case**: including a procurement and deployment model for EHRs, which includes the following:
  - Architecture: assess the technological infrastructure and system requirements for EHR implementation, ensuring scalability, interoperability, and security.
  - Market Soundings: conduct market research and engage with EHR vendors to understand their offerings, capabilities, and experiences in delivering EHR solutions.
  - Futures Scanning: identify emerging trends and technologies in EHR and healthcare delivery, considering how they may impact and shape future EHR implementations.
  - International and Domestic Analysis: analyse successful EHR implementations both within Ireland and globally, learning from leading practices and understanding potential challenges.

- **Establish Multi-Vendor Framework and Achieve Procurement:** the framework will create a systematic approach to procurement that provides regional choice while still creating interoperability.
- **Initiate Regional Deployment:** a phased implementation across all six Health Regions will be coordinated by the HSE.
- **Single Patient Record, Integrated Care Through Digital Means:** this will see the completion of the delivery of a single, comprehensive EHR for every individual.
- **Governance Models**: develop governance structures and processes to oversee the EHR procurement, implementation, and ongoing management, ensuring accountability and transparency.
- **Definition of Critical Standards**: collaborate with the Health Information Bill team, the Health Information and Quality Authority (HIQA)[50], the National Standards Authority of Ireland (NSAI)[51], and other relevant standards bodies to define and adopt critical standards for EHR implementation, such as data protection, interoperability, data quality and information security.

3.9 Digitisation of Health Care Records

This will be the comprehensive standardised data capture and digitisation of health care records, that will quickly deliver value, speed up digitisation within the healthcare system, and prepare essential groundwork for the introduction of EHRs. The digitisation of healthcare records will include an eForms solution developed in collaboration with Office of the Government Chief Information Officer.

Key Features

- **Digitise Existing Paper Records**: convert existing paper patient records into accessible digital formats and databases. This will enhance patient care, reduce administrative burden, and enable the health workforce to make informed decisions.
- **eForms Platform**: will offer a versatile eForms solution, enabling the digital transformation of data capture processes and facilitating seamless data exchange between healthcare providers and systems. An example of this could be a healthcare focused eForms platform that offers pre-built templates for various medical forms such as patient history and consent.
- **Data Structure Standardisation**: supports data structure standardisation, ensuring consistency in data capture and management across different healthcare systems and organisations.
- **Data Dictionary Support**: provides data dictionary support to promote a common understanding of data elements and their meaning, further enhancing interoperability and data exchange.
- **Terminology Standardisation**: incorporates standardised terminology (e.g., FHIR, OpenEHR, SNOMED) to facilitate accurate and consistent representation of clinical information across various healthcare settings.
- **Reference Data Standardisation**: supports the standardisation of reference data, providing a consistent framework for the representation of healthcare data across different systems and organisations.
- **Clinical Knowledge Modelling**: uses a standardised method called OpenEHR Archetypes and FHIR Resources to capture and represent clinical information. This helps in organising and sharing medical knowledge in a consistent and structured way, making it easier for healthcare professionals to access and understand the information they need. This will create a common language for clinical data so that everyone involved in patient care can communicate effectively and work together more efficiently.

3.10 National Clinical Information Systems

To achieve a comprehensive longitudinal health record for all patients, a national approach to the standardisation of digital records with national configuration will be used, like the approach with the NIMIS2.0. The implementation of these systems will be achieved at a local/regional level. The following are point solutions that may be in the future interfaced or replaced by national EHRs. These solutions are currently in place or being put in place to meet current needs.

These national systems (in place/planned) include the following:

- Unscheduled and Emergency Care Information System
- Critical Care Information System
- National Cancer Care Information System (NCIS)
- National Patient Administration Information System (iPMS)
- Nursing Home and Home Support Scheme Information System
- Endoscopy Information System
- Home Support Case Management and eRostering

- Enhanced Community Care
- InterRAI Assessment Tool
- National Dental Patient Record and Information System
- Adult Safeguarding
- CAMHS System
- Children's Disabilities Network Teams IMS (CDNTIMS)

These systems will also be integrated with the National Shared Care Record and integrated into or replaced as part of the development of the EHRs.

3.11 Medical Device Integration

Medical device integration across care settings will deliver seamless collection, aggregation, and integration of patient data from multiple medical devices into their treatment, care plans and healthcare records. This aims to improve patient outcomes, reduce errors, and streamline clinical workflows by giving correct and up-to-date information to healthcare providers, avoiding the risk of misdiagnosis and treatment delays.

Key Features

- **Interoperability**: establishing interoperability between medical devices and health information systems using standardised data formats and communication protocols (e.g., HL7, FHIR, DICOM) to facilitate seamless data exchange.
- **Connectivity**: providing reliable and secure connectivity solutions, such as wired or wireless networks, for medical devices to transmit data to healthcare information systems in real-time.
- **Data Aggregation and Integration**: collecting, normalising, and integrating data from various medical devices into a centralised repository (e.g., EHR, Longitudinal SCR Platform) to enable holistic patient care and decision-making.
- **Patient and Device Association**: ensuring accurate patient-device associations by implementing unique patient identifiers (e.g., Individual Health Identifier) and using barcode scanning or RFID technologies for device identification.
- **Clinical Decision Support**: leveraging medical device data to provide real-time clinical decision support tools and alerts to healthcare providers, improving patient outcomes and reducing errors.
- **Data Security and Privacy**: ensuring data protection, privacy, and compliance with relevant regulations (e.g., GDPR) when integrating medical device data into healthcare records.
- **Training and Education**: providing healthcare workers with proper training and education on using medical devices and interpreting the integrated data for patient care.

PRINCIPLE 4: DATA DRIVEN SERVICES

Principle 4: Data Driven Services

"Being able to see patient flow, wait times, hospital capacity and staff availability in real-time and at the same time helps me identify gaps in resources almost instantly. This is beneficial for not only making prompt decisions at critical moments but also for long-term resource planning and in turn, enhancing the quality of our service."

Maureen O'Dea, Senior Business Manager

Description

As outlined in the Framework, this Principle will enable the evaluation of patient care, patient flow, and workforce interaction. It will be enabled through enhanced access to information and analytics.

Context

Data and information are vital to the health and social care system, supporting the delivery of high-quality health and social care. People expect their health information to be accessible when needed, while also ensuring its appropriate, safe, and secure handling. The health service relies on data-driven insights to inform decision-making, future planning, capacity management, and provide value-based care.

These Initiatives will offer important insights and analysis, enabling efficient management of patient services, resource allocation, and workforce planning. Leaders will utilise data insights to develop policies, ensuring better oversight and system assurance. By analysing wait times, patient outcomes, and operational data, the workforce can identify areas for improvement and enhance overall care delivery. Additionally, analysing patient data will help anticipate demand, determining staff and infrastructure requirements.

Real time monitoring of data will highlight capacity challenges across the system as they arise, driving the ability to make informed decisions and responses efficiently and in a timely manner. Data and insights on patient flow and length of stay or treatment will ensure that resources such as beds, equipment and the workforce are appropriately managed and distributed to match patient demand.

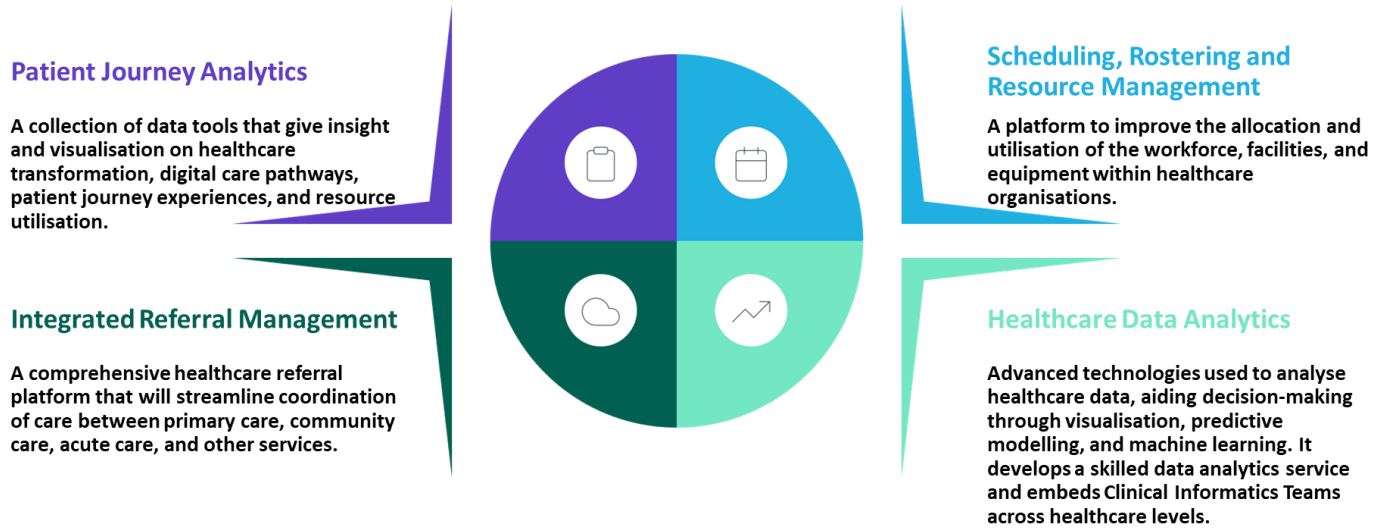


Figure 9: Standardised high-quality data that is accessible to the care workforce enables evidence-based data driven decisions

Data analysis, predictive modelling and real time monitoring are foundational components of effective population health management. Demand forecasting can be used to predict health and social care service demands based on historical data and trends. Real-time data monitoring provides the health workforce with up-to-date information on patient volumes, and capacity management. This will enable quick responses to emerging situations.

The Integrated Information Service (IIS) is the main Data Analytics Service for the wider health sector in Ireland to enable our health sector to become a data-driven, evidence-based organisation[52]. Highly skilled IIS team members use the latest technologies to collect and transform data to provide high quality, timely and relevant information through a centralised enabling service. They have implemented the Health Performance Visualisation Platform (HPVP)[53] to provide the necessary data flows and analytics capacity to examine activity, waiting lists, bed-flow blockages etc., across our hospital network to safely manage services in real time. Since the beginning of the Covid-19 Pandemic, the IIS service has been critical in facilitating the analysis of the enormous volumes of data that was generated during the pandemic response.

During the Covid-19 pandemic, data played a critical role in our response effort. Data from test results, hospital admissions, contact tracing information and vaccination rates helped understand and respond to the pandemic[25]. Data was used in the following ways during the pandemic:

- Health data helped track the spread of the virus, identify clusters or hotspots, and understand the impact on different regions and populations.
- Data analysis assisted in determining appropriate the response and guidelines to mitigate the spread of the virus.
- Health data guided decisions on allocating resources, such as hospital beds, ICU capacity, and medical supplies.
- Data collected through contact tracing efforts helped identify individuals at risk and notify them of potential exposure.
- Health data played a crucial role in planning and delivering the vaccination campaign, including identifying priority groups, monitoring vaccine coverage, and evaluating the effectiveness of immunisation efforts.

Outcomes

1. **Enhanced evaluation of patient care:** by analysing patient outcomes and operational data, care professionals can make informed decisions to provide high-quality care.
2. **Improved patient flow:** with access to information and analytics, care providers can analyse patient flow and identify bottlenecks or inefficiencies in the system. This enables them to make necessary adjustments to improve the flow of patients through the health and social care system.
3. **Informed decision-making and policy development:** data insights can inform decision-making and future planning in the health and social care system. By analysing wait times, patient outcomes, and operational data, leaders can develop policies that ensure better oversight and system assurance.
4. **Capacity management and resource allocation:** real-time monitoring of data allows for the identification of capacity challenges. This enables care providers to make informed decisions and respond to emerging situations. Data analysis and predictive modelling help in forecasting care service demands and allocating resources.
5. **Data-driven population health management:** data analysis, predictive modelling, and real-time monitoring are foundational components of effective population health management. By analysing data and trends, care providers can anticipate demands and respond proactively to emerging health situations.

More information about the Initiatives under Principle 4 are detailed on the following pages. Please note there is some repetition across the key features described under each Initiative.

Table 5: Principle 4 Strategic Initiatives

#	Initiative	Timeline for Initiative delivery starting		
		Now (year 1-year 2)	Next (year 3-year 4)	Future (year 5 onwards)
4.1	Patient Journey Analytics			
4.2	Healthcare Data Analytics			
4.3	Integrated Referral Management			
4.4	Scheduling, Rostering and Resource Management			

High Level Initiative Descriptions

4.1 Patient Journey Analytics

Patient Journey Analytics is a collection of data tools that give insight and visualisation on various aspects of health and social care transformation, digital care pathways, patient journey experiences, and resource utilisation. These tools will help better understand and improve services, leading to improved patient outcomes and more efficient care delivery.

Key Features

- **Transformation Progress Visualisation**: visualises the progress of the transformation programme within the context of real care delivery, care pathway digital transformation, and patient journey experiences. It highlights the milestones achieved and areas of improvement, allowing the impact of their transformations efforts on care delivery and patient experiences to be monitored .
- **Pathway and Patient Journey Performance Metrics**: visualises key performance metrics for care pathways and patient journeys, such as wait times, appointment adherence, and patient satisfaction. These insights help identify areas of success and opportunities for improvement, enabling them to refine their care processes and enhance patient experiences.
- **Resource Utilisation and Load Visualisation**: allows visualisation of resource utilisation and load, providing insights into staffing levels, equipment usage, and facility capacity. By understanding resource utilisation patterns, the health and social care workforce can make data-driven decisions to optimise staffing and resource allocation, ensuring that care is delivered efficiently and effectively.
- **Patient Activity, Progress, and Experience Metrics**: this focuses on visualising patient activity, progress, and experience-related metrics, such as patient engagement, treatment adherence, and patient-reported outcomes. These insights help to identify trends, monitor patient progress, and evaluate the impact of services on patient outcomes and experiences.
- **Integrated Information Service (IIS)**: this is the collection and transformation of data to provide high quality, timely and relevant information through a centralised enabling service.

4.2 Healthcare Data Analytics

This Initiative will apply advanced technologies and methodologies to analyse healthcare data and support decision-making across healthcare settings. This includes data visualisation, performance management, predictive modelling, and machine learning to uncover patterns, trends, and insights that can drive improved care outcomes and efficient resource allocation (e.g., identifying features leading to frequent patient re-admissions and altering the causative attributes'). In addition to the technology key features below, this requires the evolution of a data analytics service with appropriate skills including data science, data analytics, etc. Embedding Clinical Informatics Teams within Primary/Secondary and Tertiary Care to ensure quality data is transformed into information and knowledge for better quality patient care. Collaboration between healthcare/education/industry will be developed to build future Healthcare Clinical Informatics Teams to derive optimal benefit from digital health architecture.

Key Features

- Assessment of existing tools and platforms:
  - Assess the capabilities and limitations of existing data analytics tools and platforms used in care settings, including Health Records and specialised analytics platforms.
  - Evaluate the integration of these tools with various data sources such as clinical data, patient-generated data, claims data, social determinants of health, and other relevant information.
  - Analyse the data quality, data governance, and data security aspects of existing solutions, identifying potential areas of improvement, and ensuring compliance with regulations and standards.
- Market analysis of healthcare data analytics:
  - Research the latest trends, technologies, and innovations in care data analytics, including AI , machine learning, natural language processing, and big data solutions.
  - Identify leading vendors and providers of care data analytics solutions, examining their products, services, market presence, and customer success stories.
  - Evaluate the functionality, scalability, and usability of different analytics solutions, considering factors such as data integration, visualisation capabilities, advanced modelling techniques, and real-time analytics.

- Assess the total cost of ownership, including implementation, maintenance, and support costs, for various data analytics solutions to inform procurement decisions.
- Consider the alignment of potential data analytics solutions with organisational goals, objectives, and overall healthcare delivery strategy.
- By thoroughly assessing the current state of healthcare data analytics tools and platforms, and conducting a comprehensive market analysis, healthcare organisations can identify and implement advanced healthcare data analytics solutions that drive better decision-making, improve patient outcomes, and optimise healthcare operations. This can ultimately lead to more efficient resource allocation, better performance management, and a higher quality of care across healthcare settings.

4.3 Integrated Referral Management

This will provide a comprehensive care referral platform that will streamline coordination of care between primary, community, and acute care, and other services. By providing specialty-specific care referrals, the platform aims to improve communication, efficiency, and patient outcomes across the referral process.

Key Features

- **Centralised Referral Platform**: the platform provides a centralised online portal where care providers can submit and manage referrals for various specialties and services, ensuring a smooth and organised referral process.
- **Service-Specific Referrals**: the platform supports specialty-specific referrals, allowing care providers to refer patients accurately and efficiently to the most appropriate care providers and services.
- **Intelligent Referral Matching**: the intelligent referral matching system analyses patient information and requirements to match them with suitable care providers, optimising resource allocation and ensuring patients receive the most appropriate care.
- **National Shared Care Record (SCR) Integration**: the platform seamlessly integrates with SCR, ensuring that all relevant patient referral information is readily available to care providers involved in their care.
- **Communication and Collaboration Tools**: the platform incorporates secure communication and collaboration tools, facilitating seamless communication between care providers and promoting better coordination of care.
- **Referral Tracking and Analytics**: the platform enables care providers to track the status of referrals in real-time and offers advanced analytics to monitor referral patterns, trends, and outcomes, providing valuable insights for data-driven decision-making.

4.4 Scheduling, Rostering and Resource Management

A care scheduling and resource management platform to improve the allocation and utilisation of the workforce, facilities, and equipment across the health system.

Key Features

- **Staff Scheduling and Rostering:** will offer advanced scheduling and rostering tools, enabling the effective allocation of staff based on competency, availability, and patient needs.
- **Resource Management**: the platform assists in the management of important resources in care settings. This includes rooms, equipment, imaging capacity and other valuable resources that have limited availability. By using the platform, these resources can be efficiently allocated, making sure they are used effectively and avoiding delays or operational capacity issues.
- **Dynamic Resource Balancing**: supports dynamic resource balancing, allowing care providers to adapt and re-allocate resources in real-time, based on changing demands and priorities.
- **Integration with Appointment and Scheduling Platforms**: the platform seamlessly integrates with existing appointment and scheduling platforms, streamlining patient appointment management based on factors like acuity, availability, and convenience to patient.
- **Location Proximity and Transport Options**: incorporates location proximity and transport options into appointment scheduling, helping patients find convenient appointments that minimise travel time and costs.
- **Data Analytics and Reporting**: capabilities are incorporated providing valuable insights into resource utilisation, staff scheduling, and appointment management to support data-driven decision-making.

PRINCIPLE 5: DIGITAL HEALTH ECOSYSTEM AND INNOVATION

Principle 5: Digital Health Ecosystem and Innovation

"The thought of being part of a health and social care system that embraces and effectively utilises health innovations fills me with pride and a sense of purpose in my role as a Clinical Pharmacist. The coming together of health and social care providers, industry partners, and start-ups creates a dynamic ecosystem that promotes continuous improvement and innovation in patient care."

Paul King, Clinical Pharmacist

Description

As outlined in the Framework, this Principle will provide the guidance, tools, and resources necessary to empower patients and the workforce across the health and social care ecosystem to unlock innovative solutions that improve the experience of both the patient and workforce.

Context

Innovation and research within health and social care will enhance care delivery and provide new ways of working using digital tools, evolve new digital solutions, develop safe, quality health applications and technologies that will lead to improved patient and clinician choice for services.

The Health Innovation Hub Ireland (HIHI) was established to promote collaboration between the healthcare sector and industry partners. The HIHI supports the development and testing of innovative healthcare solutions, fostering partnerships between start-ups, companies, and healthcare providers. This Initiative supports the adoption of new technologies and processes across the health system.

Artificial Intelligence (AI) in healthcare can be used to improve diagnostics, support precision medicine, enhance patient monitoring, aid data quality, and assist drug discovery and development[54]. AI can analyse medical images, such as X-Rays and MRI scans, with high accuracy, and assist the workforce in detecting diseases at an early stage. AI can analyse patient data, including genetic information, medical history, and lifestyle factors to personalise treatment plans. This can lead to improved patient outcomes through earlier and more accurate diagnosis and more targeted therapies.

Collaboration with, universities, academic health networks, and health innovators across the health system will play a crucial role in supporting innovation. Partnerships will bring together the expertise, resources, and diverse perspectives from across the health and innovation ecosystem to drive advancements in research, care delivery and technology adoption.

Outcomes

1. **Enhanced health and social care delivery:** innovation and research in health and social care will lead to improved methods of delivering care services.
2. **New ways of working using digital tools:** innovation and research will pave the way for the development and implementation of new solutions in healthcare. These tools can facilitate collaboration, communication, and data sharing among healthcare professionals, leading to improved coordination of care and better decision-making.
3. **Development of safe and quality health applications and technologies:** through innovation and research, new health applications and technologies can be developed that are safe, reliable, and of high quality.
4. **Improved patient and clinician choice for services:** innovation and research can expand the range of healthcare services available to patients and clinicians. By harnessing digital tools and technologies, patients can have greater access to a variety of healthcare options, enabling them to make choices that best suit their needs. Clinicians can have more options in terms of treatment methods, tools, and resources to enhance their practice.

More information about the Initiatives under Principle 5 are detailed on the following pages. Please note there is some repetition across the key features described under each Initiative.

Table 6: Principle 5 Strategic Initiatives

#	Initiative	Timeline for Initiative delivery starting		
		Now (year 1-year 2)	Next (year 3-year 4)	Future (year 5 onwards)
5.1	Precision Medicine Support			
5.2	Healthcare Research			
5.3	AI in Healthcare			
5.4	Open Innovation and Ecosystem			

High Level Initiative Descriptions

5.1 Precision Medicine Support

Embracing precision medicine approaches can revolutionise healthcare by tailoring treatments to an individual's genetic makeup and specific disease characteristics. Genomic sequencing and personalised therapies can optimise patient outcomes.

Key Features

- **New Models of Care**: developing and implementing care models that integrate genomics and precision medicine to deliver more personalised and effective treatment plans, leading to better patient outcomes.
- **Equitable Screening and Diagnostic Testing**: ensuring all patients, regardless of their background or socioeconomic status, have access to advanced genomic screening and diagnostic tests to detect and prevent diseases.
- **Prediction and Prevention**: utilising genomic data to identify individuals at risk of developing certain diseases, allowing for targeted prevention strategies and early intervention.
- **Genomic Test Directory**: creating a comprehensive directory of genomic tests available, including their applications and limitations, to guide healthcare professionals in making informed decisions about appropriate testing.
- **Genomic Laboratory Supports**: providing resources, training, and infrastructure to support genomic laboratories in conducting high-quality testing and analysis.
- **Management of Rare or Inherited Diseases**: utilising genomic information to better understand, diagnose, and treat patients with rare or inherited diseases, improving their quality of life and long-term outcomes.
- **Genomic Knowledge Base**: establishing a centralised repository of genomic data and knowledge to inform research, clinical decision-making, and the development of new therapies and diagnostics.
- **Communications Campaigns**: raising public awareness about the potential benefits of genomics and precision medicine, addressing misconceptions, and promoting informed decision-making among patients and healthcare providers.
- **Genomic Literacy and Education**: enhancing the knowledge and skills of healthcare professionals, researchers, and the public on genomics and precision medicine to promote its effective and ethical use in healthcare settings.

5.2 Healthcare Research

Healthcare Research will be facilitated by a research-friendly environment within the healthcare sector. This Initiative focuses on facilitating the use of healthcare data in a safe and secure way for secondary research purposes, ensuring researchers have access to the necessary resources, infrastructure, and guidance to conduct their studies.

Key Features

- **Data Preparation and Management**: this involves curating, anonymising, and standardising healthcare data to ensure its usefulness and relevance for secondary research purposes, while adhering to privacy and security standards.
- **Trusted Research Environments**: provides secure and controlled environments for researchers to access and analyse healthcare data, ensuring data confidentiality and integrity while enabling collaboration among research teams.
- **Governance and Support**: establishing clear governance frameworks, processes, and guidelines for healthcare research, including ethical considerations, data sharing agreements, and compliance with relevant regulations, helps create a transparent, trustworthy, and accountable research ecosystem.

- **Management of Research Requests**: streamlining the process for submitting, reviewing, and approving research requests can accelerate the pace of discovery and ensure appropriate use of healthcare data in research projects.
- **Evaluation and Monitoring**: continuous evaluation of research projects and monitoring of their impact on patient care and health outcomes can help identify leading practices and ensure the ongoing improvement of healthcare through research efforts.
- **Collaboration and Partnerships**: encouraging collaboration between healthcare providers, academic institutions, funding authorities and other stakeholders to foster the exchange of ideas, knowledge, and resources, accelerating research output, innovation and improving patient outcomes.
- **Capacity Building**: providing training, education, and mentorship opportunities for healthcare professionals, patients, researchers, and other stakeholders to enhance their research skills, promote interdisciplinary collaboration, and contribute to a thriving research culture within the healthcare sector.
- **Research Funding and Support**: working with funding authorities and other entities to secure and allocate funding for healthcare research projects, as well as providing other resources and tools, to help drive research to explore new avenues in patient care, treatment, and overall health outcomes.

5.3 Artificial Intelligence in Healthcare

Artificial Intelligence (AI) in healthcare will use machine learning algorithms, software, and hardware to analyse, present, and understand complex medical and healthcare data while also providing more accurate and/or predictive models of the patient's condition. Implementing AI algorithms to assist in diagnostics can help healthcare professionals analyse medical images, such as X-rays, CT scans, and MRIs, more efficiently and accurately. AI will also assist in monitoring data quality and managing capacity – undertaking repetitive functions such as screening X-rays and pathological slides for abnormalities, freeing clinician time to review complex cases and enhance diagnosis and monitoring of changes over time. A list of key areas where AI tools can be applied to augment healthcare services can be found in Appendix 4. This Initiative will leverage AI in line with national guidance on the use of AI in the Public Service approved by Government and international AI ethics and governance guidance published by the WHO[, 55,56].

Key Features

- These platforms have immense potential in healthcare, including patient support, symptom checking, health education, mental health assistance, and language translation. It can enhance patient engagement, provide information, and improve communication between patients and healthcare providers while complementing the expertise of medical professionals.
- **Development of an AI Strategy:** for the health service and development of the capability across the health system.
- **AI Therapists (Chatbots):** a digital tool in identifying and monitoring mental health. It can offer advice, as well as monitor for keywords that could trigger a referral and direct contact with a mental health professional.
- **Robotics Process Automation**: maximising value from scarce health care resources; integrating robotics and automation technologies into healthcare can improve efficiency and precision in surgical procedures, enable remote surgeries, and assist in repetitive tasks such as medication dispensing and laboratory testing.
- **Blockchain Technology**: providing real-time and secure capturing of patient clinical records; exploring blockchain technology for health data management can enhance security, privacy, and interoperability. It can facilitate secure sharing of patient records among healthcare providers, enable better tracking of pharmaceutical supply chains, and streamline administrative processes.

5.4 Open Innovation and Ecosystem

Aimed at speeding up the pace of innovation and the development of new digital products and services within the health and social care system. This will create the environment where people or groups (internally and externally) come together to create ideas and solutions around specific care challenge themes.

Key Features

- **Innovation Procurement Programme**: initiate an Innovative Procurement programme across government, fully compliant with EU regulations and state aid supports. This programme approach supports the early evaluation, assessment and integration of emerging technologies enabled by clear interoperability standards, and data privacy safeguards to enhance patient-centric care, improve care outcomes, and ensure seamless care experiences.

- **Fostering Innovation and Ecosystem Collaboration**: strengthen HSE's commitment to fostering innovation and collaboration across the health system by actively engaging with Small and Medium Enterprises (SMEs), start-ups and other innovation agencies within the care technology sector. This approach will foster a robust ecosystem that encourages collaboration, entrepreneurship, and exchange of ideas. By encouraging open competitions, facilitating partnership opportunities, and providing supportive environments for start-ups and SMEs, we will attract innovative solutions to care challenges. This strategic engagement will support digitally enabled care transformation of the Irish health and social care system and position HSE as a key player in shaping the future of healthcare technology.
- **Innovation Community of Practice**: establish an Innovation Community of Practice to support adoption and awareness of the innovation ecosystem and processes.
- **Innovation Governance Model**: define, establish, and embed the Innovation Governance Model, including management of the innovation pipeline, expanding the network of designers in residence across the health regions to support providers with horizon scanning and driving future innovative Initiatives.
- **Regional Digital Design Labs**: establish regional digital design labs. These incubation settings will ensure new capabilities can be developed and assessed independent of the production live environments.
- **Healthcare Innovation Cluster**: establish a healthcare innovation cluster closely linked to the health service with the aim to foster collaboration between start-ups, other agencies e.g., GEC (Guinness Enterprise Centre, HIHI), medical practitioners, patients, and problem-solvers and enable greater innovation within the health sector.

PRINCIPLE 6: SECURE FOUNDATIONS AND DIGITAL ENABLERS

Principle 6: Secure Foundations and Digital Enablers

"Knowing that strong leadership and governance are in place further solidifies my trust in the health and social care system. It provides a sense of security, knowing that the care my mother receives is not only technologically advanced but also guided by ethical and responsible practices."

Jim O'Neill, Carer

"Capturing Mrs. O'Neill's consent to participate in clinical trials has become a seamless process. With the digital tools available, I can efficiently document her expression of interest and facilitate her involvement in clinical research, contributing to advancements in healthcare and treatments."

Karen Millar, Public Health Nurse

Description

As highlighted in the Framework, this Principle aims to establish effective governance, foster a supportive culture, and create a secure infrastructure that can withstand external factors while adhering to standards and legislation. This is achieved by integrating architecture, service design, cyber security, agile delivery, and data engineering into our health service.

Context

Principle 6 serves as the anchor of this comprehensive transformation, aiming to improve the health and social care experience for patients. To ensure its success, key foundational elements must be established. These include strong leadership and governance, a secure and reliable infrastructure, data and technical standards, innovative technology platforms, a supportive organisational culture, comprehensive change management support, and proactive security.

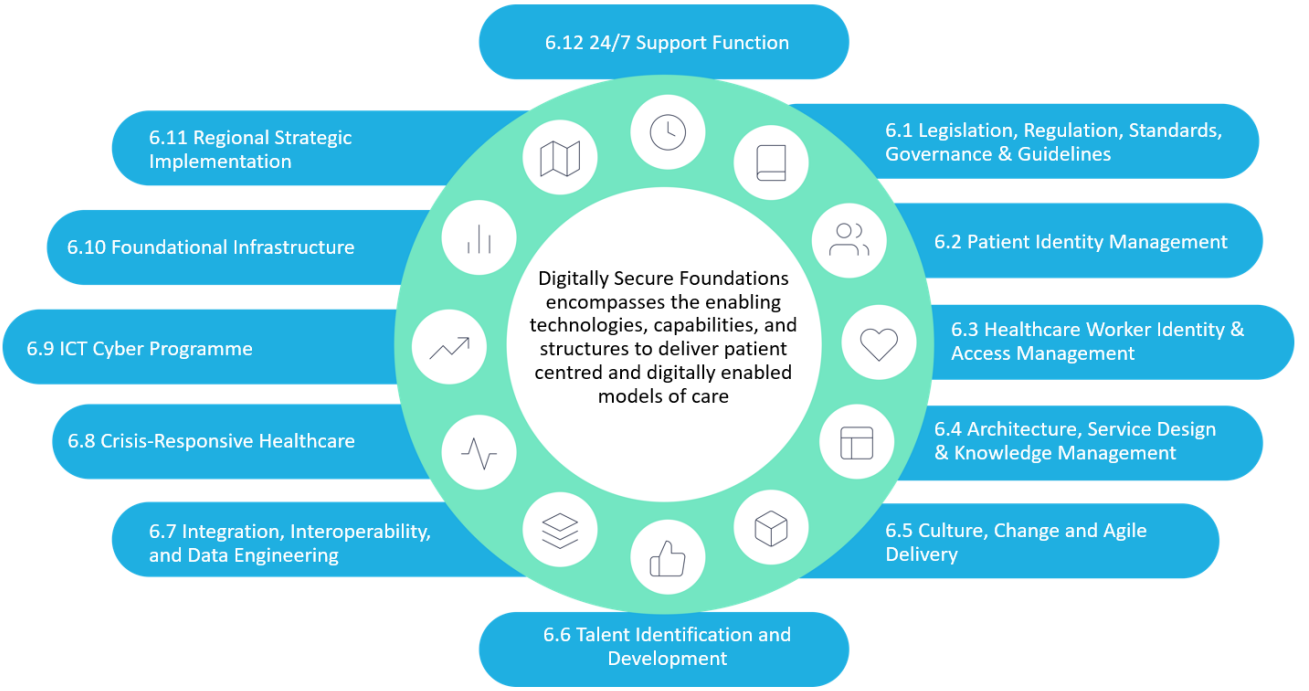


Figure 10: Key enablers for the transformation

Principle 6 aims to improve the health and social care experience for patients by emphasising foundational technologies, governance, and cultural shifts, the health and social care system needs to enhance its capacity to provide patient-centred care. In addition, it prioritises architecture and service design, clinical safety, integration, security, efficiency, empowerment, and transparency in health and social care delivery. These integrated and efficient systems will allow for a more coordinated and seamless care journey, resulting in a better overall experience for patients.

The Initiatives outlined in principle 6 address challenges and barriers uncovered during stakeholder involvement in the development of the Roadmap. While some areas have implemented successful Initiatives, lack of integration limits their impact. These Initiatives provide the necessary enabling technologies, capabilities, and structures to deliver a patient-centred and effective digitally enabled model of care.

Implementing these Initiatives will enable integrated care that combines conventional and digital medicine effectively. This requires a flexible and responsive practice that can evolve with patient needs. An architectural capability with robust processes, platforms, and resources is required, focusing on security and integration.

Integration is crucial for seamless flow of information, which goes beyond integration technologies. Secure Foundations underpin the entire health service, providing reliable solutions for patient identification, care professional authentication, and health information storage and sharing.

At a national level, strong leadership and governance are crucial. This involves establishing clear roles and responsibilities, defining policies and guidelines, and ensuring accountability for decision-making and implementation. National standards and procurement processes also play a critical role in ensuring consistency and interoperability across regions. By setting standards for data and technology, the health and social care system can ensure that different regions can seamlessly exchange information and collaborate effectively.

On a regional level, implementation is managed to ensure that local needs and contexts are considered. This approach recognises that care delivery varies across regions and allows for tailored implementation strategies that address specific challenges and opportunities. Regional implementation teams work closely with local teams to ensure a smooth transition and to address any barriers or challenges that may arise.

Creating strong data foundations, a data strategy, and implementing data governance are key components of this Principle. Data is an invaluable asset in care and having a solid foundation for data management and governance is essential. This includes establishing data standards, ensuring data quality and integrity, and implementing tools and processes for data governance and stewardship. By having a clear data strategy, the health and social care system can effectively utilise data to drive improvements in care delivery, clinical outcomes, and patient experiences.

Data governance is crucial for ensuring that data is managed securely and ethically. It involves establishing policies and procedures for data access, privacy, security, and consent. By implementing data governance practices, the health and social care system can protect patient information, manage risks, and ensure compliance with regulations. Ethical considerations around data use and safety are also prioritised, ensuring compliance with the GDPR. Safety, accountability, privacy, data protection, and transparency are essential in handling patient data.

Overall, establishing effective governance at a national level, managing implementation regionally, and focusing on creating data foundations, a data strategy, and data governance are essential for the success of the transformation Roadmap. These Initiatives provide the necessary structure, processes, and capabilities to enable a patient-centred, digitally enabled health and social care system that delivers integrated and efficient care. By leveraging technology, establishing standards, and fostering a culture of collaboration and innovation, the health and social care system can improve patient outcomes and experiences while driving overall system efficiency and effectiveness.

Culture, management of change, and building people capability and capacity are essential components that support this transformation. Establishing a supportive system wide culture that embraces change and fosters openness is crucial in successfully implementing the Initiatives outlined in Principle 6. This requires encouraging a mindset of continuous improvement, innovation, and collaboration among the care workforce.

Comprehensive management of change is necessary to guide individuals and teams through the transformation process, addressing any resistance or challenges that may arise. Additionally, building people capability and capacity is essential to ensure that the workforce has the necessary skills and competencies to effectively utilise the enabling technologies and embrace the digital-first approach. Investing in training, development, and talent management strategies will empower the workforce to adapt to the changing care landscape and drive the desired outcomes of the transformation Roadmap.

Enabling processes are fundamental to efficient and effective organisations. An operating model that fosters engagement, collaboration, and knowledge sharing is critical for all areas to reach their full potential. Agile delivery, support, and talent Initiatives are key components of this transformation, enabling the health and social care service to become a leader by investing in its people, attracting, developing, and retaining top talent while leveraging advanced technology and new ways of working.

The outcomes delivered through Principle 6 are listed under each initiative. More information about the Initiatives under Principle 6 are detailed on the following pages. Please note there is some repetition across the key features described under each initiative.

Table 7: Principle 6 Strategic Initiatives

#	Initiative	Timeline for Initiative delivery starting		
		Now (year 1-year 2)	Next (year 3-year 4)	Future (year 5 onwards)
6.1	Legislation, Regulation, Standards, Governance			
6.2	Patient Identity Management			
6.3	Healthcare Worker Identity and Access Management			
6.4	Architecture, Service Design and Knowledge Management			
6.5	Culture, Change and Agile Delivery			
6.6	Talent Identification and Development			
6.7	Integration, Interoperability and Data Engineering			
6.8	Crisis-Responsive Healthcare			
6.9	ICT Cyber Programme			
6.10	Foundational Infrastructure			
6.11	Regional Strategic Implementation			
6.12	24/7 Support Function			

High Level Initiative Descriptions

6.1 Legislation, Regulation, Standards, Governance

Standards, controls, and decision flows will be set up and supported by clear decision-making authorities ensuring transparency, traceability, and accountability. These pillars of governance provide the necessary structure and confidence to drive this transformation.

Enabling governance is a prerequisite to ensure this Initiative and the success of the Roadmap. Digital health transformation requires a new form of governance. Digital health governance should consider the health and social care system's challenges and strategies, its leadership, the interests, and rights of all stakeholders, and the difficulties of transformation in the health system.

Key features

- **Legislation and Regulation**: ensuring compliance with existing laws and regulations relevant to care data privacy, security, and usage. Adhere to national and international care laws and guidelines to ensure legal compliance and protection of citizens' rights. Where appropriate establish clear legal frameworks and regulations to govern digital Initiatives.
- **Standards:** define standardised protocols and formats for data exchange and interoperability within the digital health and social care ecosystem. Establish industry standards to promote consistency and compatibility across health and social care systems and platforms. Ensure data quality, accuracy, and reliability by following agreed-upon standards for data collection, storage, and sharing. Define dynamic processes and protocols, roles, and responsibilities to ensure digital health technology supports safe and effective healthcare. This support should extend throughout its life cycle, from pre-purchase to deployment, through risk management and audit, to decommissioning of digital health technologies, which encompasses physical devices, apps, algorithms, and AI technologies.
- **Governance:** establish clear decision-making authorities and structures to oversee and guide the digital health transformation. Ensure transparency, traceability, and accountability in decision-making processes related to digital health

Initiatives. Define roles, responsibilities, and accountabilities of various stakeholders involved in the digital health ecosystem.

Outcomes

1. **Guidance and oversight:** clear decision-making authorities and structures will provide guidance and oversight for this digital health transformation. This will enable the Initiatives to stay on track and aligns with the health and social care system's challenges, strategies, and objectives.
2. **Strong leadership and governance:** establishing clear roles and responsibilities, defining policies and guidelines, and ensuring accountability for decision-making and implementation at a national level will provide effective leadership and governance.
3. **Accountability:** the establishment of clear decision-making authorities and structures will promote accountability for the outcomes of this transformation. There will be defined roles, responsibilities, and accountabilities.
4. **Transparency:** clear decision-making authorities will ensure that all decisions related to the transformation are made openly and with clear communication to all.
5. **Consistency and interoperability across regions:** national standards and processes will ensure consistency and interoperability across different regions. This will enable seamless exchange of information and effective collaboration between care systems in different areas.

6.2 Patient Identity Management

This Initiative will provide a comprehensive solution to support robust identification of patients in both physical and digital environments. It streamlines the process of identifying patients at the entry point of a care encounter, improving efficiency, data quality, and safeguarding privacy and confidentiality.

Key Features

- **Digital Wallet and Credential Issuance**: the platform includes a digital wallet that stores and manages digital credentials, allowing patients to easily share their identity and care-related information. The platform supports the definition and issue of credentials, (such as DigitalHealthPass, entitlement credentials, etc.), immunisation and vaccination certificates, and health-related documents like discharge summaries or prescriptions.
- **Verification App and Integration**: the verification app streamlines the process of positively identifying patients at the entry point of a care encounter. Integration with care coordination and patient administration systems further simplifies identity verification and ensures seamless data flow across care organisations.
- **DigitalHealthPass and Entitlement Credentials**: The DigitalHealthPass is a digital standards-based verifiable credential that serves as a trust anchor for robust patient identification. Entitlement credentials replace or complement physical cards for various schemes, including medical cards, GP visit cards, drug payment schemes, and the European Health Insurance Card (EHIC)[57]. The EHIC card, along with a streamlined application process, fulfils one of HSE's EU Single Digital Gateway[58] commitments.
- **Digital Signing**: this will enable the transition away from wet ink signatures and promoting true digitisation of health and social care processes.
- **Consent and Audit Services**: it is underpinned by a robust and scalable consent and audit service that ensures all interactions and explicit management of consent are captured and audited. This also supports delegated consent scenarios, including acting on behalf of a patient as a carer or guardian.

Outcomes

1. **Efficient patient identification system:** the initiative streamlines the process of identifying patients at the entry point of a care encounter, reducing time and effort required for identification. This leads to improved efficiency in care delivery.
2. **Enhanced data quality:** by implementing a comprehensive patient identification solution, the initiative ensures accurate and reliable patient data, improving the quality-of-care services.
3. **Strong privacy and confidentiality:** strong safeguards for patient privacy and confidentiality will be created by securely storing and managing digital credentials.

Any new digital systems and capabilities deployed going forward must be fully integrated with IHI to link patient data with existing systems – fully integrated means implementing not just from a technical perspective but also must include the operational

processes to clean, merge, and maintain usable linked patient records. Existing legacy systems that are currently not fully integrated must put a Roadmap in place to close this gap as soon as possible – but no later than a 2025 completion.

6.3 Healthcare Worker Identity and Access Management

This will provide identity and access management for healthcare workers in the HSE using their HealthIRL identity. The platform supports healthcare system-wide federated identity, access management, and trust between healthcare organisations, enabling open access to systems for authenticated and authorised individuals. Access management includes national building management access. Work will need to be undertaken to allow easy movement and access for those within the health workforce who work across the public and private providers and voluntary organisations.

Key Features

- **HealthIRL Identity**: the platform provides a unique HealthIRL identity to each healthcare worker, ensuring secure and streamlined access to essential systems and resources across the HSE.
- **Azure AD Federation**: by utilising Azure AD federation, the platform enables system-wide federated identity and access management, allowing healthcare workers to seamlessly access resources from different healthcare organisations while maintaining security and trust.

Outcomes

1. **Improved collaboration and connectivity across the health system:** the health workforce can easily and securely access resources from across the health system, enabling seamless information sharing, collaboration on patient care, and coordinated efforts to improve healthcare outcomes.
2. **Improved workflow optimisation for the health workforce:** the initiative aims to simplify the movement and access for the health workforce across the health system. By allowing easy access to systems and resources, regardless of their location, the health workforce can effectively navigate between different settings.
3. **Streamlined access to essential systems and resources:** this eliminates the need for multiple logins and reduces the time and effort spent on accessing various systems. As a result, the health workforce can easily access the necessary tools, information, and applications required for their work.

6.4 Architecture, Service Design and Knowledge Management

This initiative aims to address and overcome numerous challenges in the health and social care system while enhancing care delivery throughout the system. By building organisational capability, the Transformation Architecture function will play a crucial role in driving meaningful transformation at all levels of the health and social care service. Digital architecture combines strategic thinking, operational and functional excellence, agility, dynamic leadership skills, and strong execution capabilities to strike a balance between the present, future, and maintaining long-term value. This approach defines, designs, and delivers transformation while prioritising interoperability, integrated care, and avoiding siloed systems, information, and data.

This Initiative faces challenges including integrating data from legacy systems, and where appropriate integrating legacy systems, addressing data privacy and security concerns, managing digital capacity, and effectively implementing change management processes. Additionally, ensuring that the new models are accessible and beneficial in all stages of life is essential. To accomplish these goals, a nuanced and locality-specific approach is required, which requires a detailed understanding of the unique needs of each region. Nonetheless, it is vital to maintain standards across the board and focus on the patient experience throughout the implementation process.

Key Features

- **Architecture Practices**: the introduction of architecture practices to restructure the digital and organisational aspects of the care system to promote interoperability, agility, and scalability.
- **Service Design Practices**: will focus on reshaping the interaction between services and patients, ensuring a more efficient and satisfactory patient experience.
- **Knowledge Management**: aims to efficiently collect, analyse, and distribute information across the care ecosystem to support decision making and continuous learning.

Outcomes

1. **Enhanced interoperability:** through the implementation of digital architecture, interoperability between different systems, across the system will be improved, allowing for seamless exchange of information and better coordination of care.
2. **Increased agility and scalability:** the introduction of architecture practices will enable the health and social care system to adapt and respond to changing needs and demands, ensuring greater flexibility and scalability.
3. **Enhanced patient experience:** by reshaping the interaction between services and patients through service design practices, the initiative aims to improve the overall patient experience.
4. **Improved knowledge management:** efficient collection, analysis, and distribution of information across the system will support decision-making processes and foster continuous learning.

6.5 Culture, Change and Agile Delivery

The Culture and Change initiative has a focus on evaluating the current strengths and opportunities within the health and social care system and enhancing its ability to effectively manage change. This is crucial for supporting the transformation. The goal is to cultivate values and behaviours that drive performance, adaptability, transparency, and accountability.

To address the complexity and uncertainty in developing healthcare technologies, agile delivery methodologies have been incorporated into this Roadmap. By recognising the continuous evolution of patient needs, regulatory environments, and technological capabilities, agile delivery will increase the ability to swiftly adapt to changing circumstances and make this the ordinary way of working. This ensures that solutions are responsive, user-driven, and timely.

While agile practices are not a one-size-fits-all solution, they will be strategically applied to areas where user requirements and solution complexity are significant. Through iterative development, continuous feedback, and cross-functional collaboration, the delivery of critical digital health solutions can be expediated while minimising risks and upholding quality standards.

Adopting an agile approach offers a range of benefits, such as increased stakeholder engagement and involvement, improved solution relevance through ongoing refinement, and the ability to pivot in response to emerging health and social care challenges. However, it is important to note that agile is not the default approach for all projects. Rather, it is a strategic choice implemented where it can have the greatest impact, allowing value to be delivered incrementally in environments where traditional planning models are less effective.

Outcomes

1. **Improved performance and adaptability:** values and behaviours within the health and social care system will drive high performance and adaptability. This will enable the system to respond effectively to changing circumstances, such as evolving patient needs.
2. **Increased stakeholder engagement and patient involvement:** this Initiative will lead to increased patient and stakeholder involvement, ensuring that the solutions are well-aligned with their needs and expectations.
3. **Responsive and user-driven solutions:** by incorporating agile delivery methodologies into the Initiative, the focus is on delivering solutions that are responsive to user needs.
4. **Continuous improvement and relevance:** agile practices promote continuous refinement of solutions to improve their fit and relevance. This iterative approach allows for ongoing enhancements based on user feedback, ensuring that the solutions remain effective and aligned with emerging care challenges.

6.6 Talent Identification and Development

Talent Identification and Development is aimed at attracting, retaining, upskilling, and training all health and social care professionals in achieving the required transformation, delivery, and use of digital technology to achieve the benefits of integrated care for all. Digital health will be a core component of professional training to enable staff to lead and deliver our strategic priorities for health and social care.

Key Features

- **Workforce Strategy**: develop a workforce strategy that addresses the health and social care system's needs, including recruitment, retention, and performance management.
- **Skill Assessment and Gap Analysis**: conduct a comprehensive assessment of existing digital skills and knowledge across the workforce. Identify the gaps between current skills and the skills required to successfully deliver and work with digital health technologies. This analysis will serve as a foundation for designing targeted training programmes.

- **Cross-Disciplinary Training**: offer a variety of learning opportunities, such as workshops, webinars, online courses, and mentorship programmes, to enable the workforce to gain new digital competencies and stay updated on emerging technologies and leading practices.

Outcomes

1. **Strengthened digital workforce across the health and social care system:** this focuses on attracting and retaining health professionals who possess the necessary digital skills and knowledge. It aims to ensure that the health workforce is equipped to effectively utilise digital technologies in delivering integrated care.
2. **Increased digital skills and knowledge across the health and social workforce:** this includes providing training and educational opportunities to bridge any existing gaps between current skills and the skills required for successful implementation of digital health technologies.
3. **Delivering the benefits of integrated care through digital solutions:** the workforce is enabled to effectively deliver the benefits of integrated care through the use of digital solutions. It involves equipping them with the necessary skills and knowledge to leverage digital tools and platforms to improve care coordination, communication, and patient outcomes.

6.7 Integration, Interoperability and Data Engineering

Integration, Interoperability, and Data Engineering creates a cohesive and well-coordinated care data infrastructure promoting seamless communication and data exchange. This will be achieved by a national approach to core standards and configuration, while supporting localisation through a regional approach to implementation.

Key Features

- **Establishing a National Data Coordination Framework for Seamless Healthcare Information Management:** establish a national data coordination framework that crosses traditional infrastructural boundaries and promotes efficient data flow across the healthcare system. By implementing a coordinated mechanism, consistent data standards and policies will be applied to ensure high-quality data stewardship. The framework will align diverse regional data activities, allowing for seamless data interactions and empowering all regions with the necessary guidance and support for collective goals in health data management. It aligns with international standards like FHIR for modern data exchange and supports legacy systems through HL7 standards, ensuring inclusiveness during the digital transformation. Overall, this framework will enable efficient and effective healthcare information management at both regional and national levels.
- **Unified Standards with Local Flexibility:** we are committing to a unified set of data management standards, providing clear guidance for privacy, security, and data exchange that applies across the extended healthcare system supporting both current and future organisation designs. This ensures consistency in how health data is managed, accessed, and protected, with support into regions to implement these standards in ways that best serve their local populations.
- **Advanced Data Engineering and Integration:** building data engineering and integration capabilities are a key component of this Initiative. Establishing interoperable interfaces but also ensuring that data flows seamlessly between diverse health systems, facilitating near real-time access and supporting informed decision-making.

Outcomes

1. **Integration:** a cohesive healthcare data infrastructure will be created by integrating diverse health systems. This will enable seamless communication and data exchange between different regions and healthcare providers.
2. **Interoperability:** interoperable interfaces will be established, enabling data to flow seamlessly between various health systems. This promotes near real-time access to information and supports informed decision-making.
3. **Data engineering:** this focuses on building advanced data engineering capabilities. This ensures that data is managed and integrated effectively, allowing for efficient data exchange and utilisation.
4. **National data coordination:** a national data coordination framework will be established that goes beyond traditional infrastructural boundaries. This framework aligns activities and data flow across the healthcare continuum and promotes high-quality data stewardship.
5. **Unified standards with local support:** the initiative commits to a unified set of data management standards while supporting localisation through a regional approach to implementation.

6.8 Crisis-Responsive Healthcare

A Crisis-Responsive Healthcare Service is a healthcare system that can effectively respond to all types of crises. This includes organisational roles for digital crisis response, governance structures, and key response tools, as well as data collection and analytics capabilities. This initiative will be informed by and aligned with the EU Field Guide for Managing Complexity (and Chaos) in Times of Crisis, published by the EU Commission Joint Policy Research Centre[59].

Key Features

- **Organisational Roles for Digital Crisis Response**: crisis-responsive healthcare services will establish designated roles responsible for coordinating digital crisis response efforts, ensuring efficient and timely decision-making and resource allocation during emergencies.
- **Governance Structures**: to ensure proper management and coordination during crises, the healthcare service will implement governance structures that facilitate communication, collaboration, and decision-making among stakeholders.
- **Key Response Platforms**: crisis-responsive healthcare services will leverage a variety of response platforms, including crisis messaging and contact management systems, to enable efficient communication, coordination, and information sharing during emergencies.
- **Crisis Suite for Coordination**: a dedicated crisis suite will be established to manage internal and external communication and engagement during emergencies. This suite will enable the healthcare service to effectively coordinate resources, personnel, and information to address the crisis at hand.
- **Data Collection and Data Analytics Capabilities**: the crisis-responsive healthcare service will incorporate data collection and analytics capabilities to inform decision-making during emergencies. These capabilities will enable the healthcare service to monitor the situation, predict outcomes, and evaluate the effectiveness of response strategies.
- **Alignment with the EU Field Guide for Managing Complexity (and Chaos) in Times of Crisis**: the crisis-responsive healthcare service will be informed by and aligned with leading practices and guidelines provided by the EU Commission Joint Policy Research Centre[83] to ensure effective management of complex and chaotic situations during crises.

Outcomes

1. **Effective crisis response:** this will enable the healthcare system to effectively respond to all types of crises. This includes having designated roles for coordinating digital crisis response, implementing governance structures for proper management and coordination, and leveraging key response platforms for communication and information sharing.
2. **Efficient decision-making and resource allocation:** efficient and timely decision-making and resource allocation will occur during emergencies. This will help in effectively managing and addressing the crisis at hand.
3. **Enhanced coordination of resources:** a dedicated crisis suite will allow the healthcare service to effectively coordinate resources, personnel, and information during emergencies. This will help in ensuring that resources are allocated and utilised efficiently to address the crisis.

6.9 ICT Cyber Programme

Following the 2021 cyber attack, the HSE Board, the Chief Executive Officer, and the Executive Management Team , commissioned a third party with conducting a Post Incident Review (PIR)[60]. The report emphasises the need for significant and fundamental advancements to the technological infrastructure of the HSE to ensure the continued provision of vital healthcare services and the essential implementation of cyber security measures. With a third-party reassessment of our cyber security maturity, it was highlighted that the ongoing programme Initiatives have successfully contributed towards improving the HSE level of cyber security maturity. As a result, HSE is now better equipped to identify, protect, detect, and respond to cyber security threats.

This programme will oversee the cyber maturity uplift of the health system, including voluntary hospitals and voluntary community organisation through the provision of 27 funded Initiatives over 7 years covering areas such as:

- Managing the compliance of the HSE as an operator of essential service against the National Cyber Security Centre under the NISD directive.
- The implementation and operational management of a HSE Cyber Security Incident Response Team and associated threat identification, protection, detection, and monitoring services.

- The uplift of the HSE's legacy technology stack across applications and hardware along with the acceleration of underpinning technology such as HealthIRL.
- The implementation of proactive measures to ensure the HSE's technology landscape is consistently managed from a threat and vulnerability management.
- The delivery of an IT asset register, and configuration management database and implementation of Identity Management, O365 across voluntaries, 2FA (Two-factor authentication) etc.

The HSE's Cyber Security Statement of Strategic Intent (CSSI) outlines its strategic approach to improving cyber security over the next three years. This includes implementing recommendations from the PIR, investing in infrastructure, and upskilling, and establishing a new Chief Information Security Officer and cyber team. The HSE aims to ensure cyber security maturity, regulatory alignment, and clear responsibility lines for future cyber incidents. The strategy also emphasises the importance of collaboration, prompt response to cyber threats, the development of a strong cyber security culture, and staff upskilling.

Outcomes

1. **Continued improved cyber security maturity:** continued improvement of the HSE's level of cyber security maturity, making it better equipped to identify, protect, detect, and respond to cyber security threats.
2. **Modernised legacy technology:** an uplift in the HSE's legacy technology stack, including applications and hardware, as well as accelerating the adoption of underlying technologies like HealthIRL.
3. **Proactive threat and vulnerability management:** implementation of proactive measures to consistently manage the HSE's technology landscape from a threat and vulnerability perspective, reducing the risk of cyber attacks.

6.10 Foundational IT Infrastructure

This Initiative will provide the fundamental technologies required to enable and support the workforce in delivering the transformation set out by the Roadmap. Within this Initiative, there will be both a breadth and depth of changes to the current technologies and devices in use, ranging from technology security, control, and governance, to network, communications, data centre and cloud services. The scope of change also encompasses Section 38 and Section 39 health care agency network and technology sustainment Initiatives.

Outcomes

1. **Improved technology security:** improved security measures and protocols will exist to protect IT infrastructure from potential threats and breaches.
2. **Enhanced control and governance:** policies and frameworks will be introduced to enable proper control and governance of the IT infrastructure.
3. **Improved data centre capabilities:** data will be handled and stored more efficiently through the establishment or improvement of data centres.

6.11 Regional Strategic Implementation

This will ensure enhancement of the regional skilled staff resource for digital health for successful implementation of digital solutions. A hub and spoke model will be used, involving regional staff in the national configurations and development of standards. This will ensure a voice for regional needs and will ensure high levels of knowledge around solutions enhancing the opportunity to support the successful implementation at regional level.

Outcomes

1. **Enhancement of regional skilled staff resource:** develop and increase the number of skilled staff in the digital health field in regions across the health system. This will lead to better expertise and capabilities for successful implementation of digital solutions.
2. **Regional voice:** by involving the regional staff in the development process, this initiative ensures that regional needs and concerns are given a voice. This allows for better implementation of digital solutions to meet the unique requirements of each region.

3. **Support for successful implementation:** by enhancing the skills and knowledge of the regional health and social care workforce, this initiative aims to improve the capacity to effectively implement digital solutions at the regional level. This ultimately enhances the opportunity for successful adoption and utilisation of digital health solutions across different regions.

6.12 24/7 Support Function

This will provide a full support for frontline staff to access help that will allow them to have full access to the necessary information to do their job. This will include technology tools (for self-service) and support personnel including technically proficient IT staff and solution experts to assist with service requests (password resets, access, new user accounts, etc) and incident (application failure, internet/Wi-Fi unavailable, etc.) management.

Outcomes

1. **Improved self-service capabilities:** the implementation of technology tools will enable frontline staff to access necessary information and resources through self-service. This will empower them to solve common issues on their own, reducing the need for external support and ensuring quicker resolution of problems.
2. **Efficient service request management:** the provision of technically proficient IT staff and solution experts will ensure that frontline staff receive prompt and effective assistance with service requests such as password resets, access issues, and setting up new user accounts.
3. **Effective incident management:** with the presence of IT staff and solution experts, frontline staff will receive immediate support in case of any application failures or network connectivity issues, such as internet or Wi-Fi unavailability.

Cost Estimates and Roadmap for Implementation

IT spend for the health service has increased significantly in recent years, delivering improvements in core IT resilience, and new digital capabilities. The transformation envisaged in the DoH's Digital for Care – A Digital Health Framework for Ireland and described in this Roadmap will require significant investment and increase in resources.

The current level of IT funding allocation as a portion of the overall health spend in the health service has increased from 1% to 2.2% (in 2023) over the lifetime of the previous strategy. An industry benchmark report states that IT spending in healthcare organisations ranges from 4.0% to 5.4%[13].

This Roadmap is supported by planning and cost estimates that set out the timeline of delivery for the Strategic Initiatives through a national, coordinated approach. The approach includes agreed priorities and the required investments which, alongside the Roadmap, form the business case.

The Roadmap estimates developed for planning include internal resource costs, external resource costs, and other costs. Other costs include hardware and devices, licenses and subscriptions, and support and maintenance. Details on the approach taken to the cost estimation can be found in Appendix 5.

Prioritisation approach and criteria

To develop the Roadmap for implementation a prioritisation exercise was undertaken, using agreed prioritisation criteria. This approach prioritised the Initiatives according to the timeline they will be delivered in. The prioritisation criteria were developed and validated with the reference advisory group, steering group and the DoH.

The 48 Strategic Initiatives were assessed using the criteria and categorised as being delivered Now, Next or Future. Initiatives being delivered Now are inflight Initiatives or Initiatives that will commence in year 1 – year 2; Initiatives categorised as Next will commence delivery in year 3 – year 4; Initiatives categorised as Future will commence delivery in year 5 onwards.

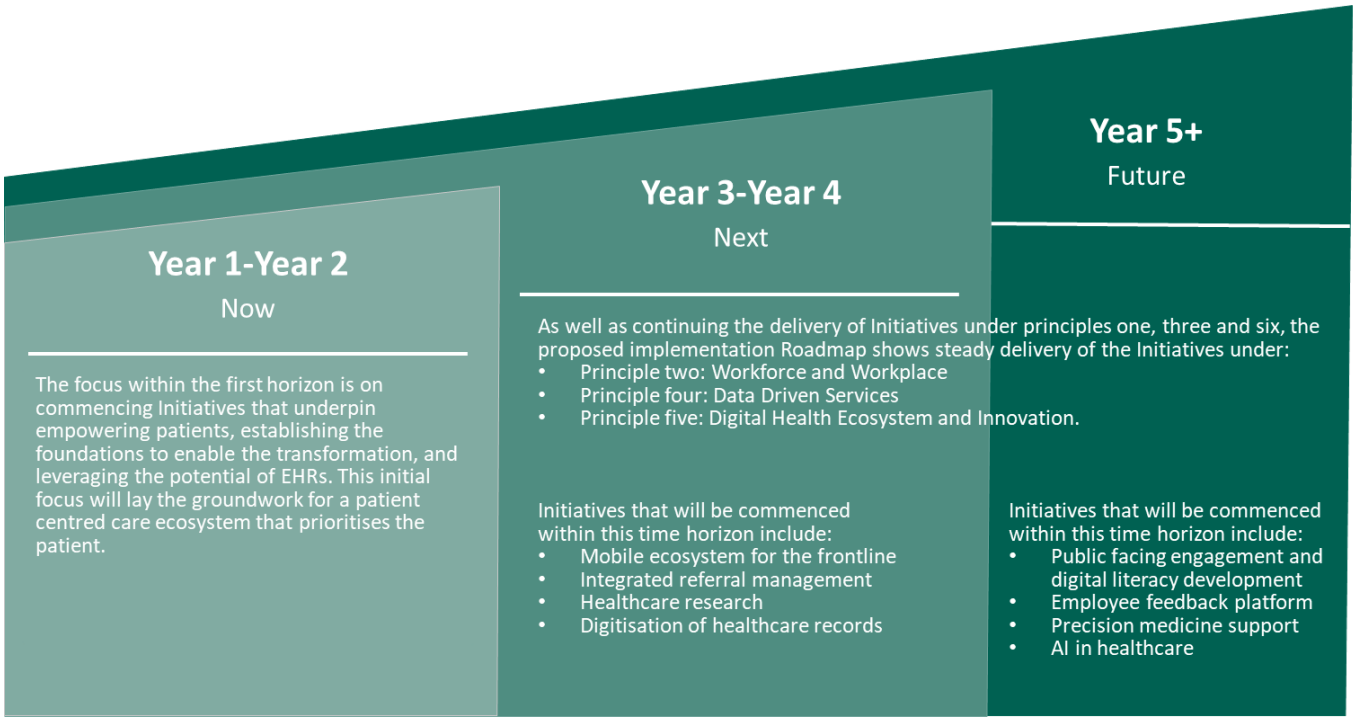


Figure 11: High level prioritisation

The prioritisation criteria used is as follows:

1. Alignment to joint DoH / HSE Principles:
    - Patient as an mpowered artner
    - Workforce and workplace
    - Digitally enabled and connected care
    - Data driven services
    - Digital health ecosystem and innovation
    - Secure foundations and digital enablers
2. Impact on the patient – characteristics include:
    - Cross life stage (access to care / demand management; % of population impacted; ability to increase capacity; improve integrated care; operational resilience)
    - Cross ecosystem and setting
    - Improves patient safety through appropriate access to information
3. Readiness for implementation – characteristics include:
    - Inflight Initiatives
    - Resource availability and capacity
    - Already procured
4. Improve staff experience – characteristics include:
    - Frontline first
    - Reduce work burden
    - Enhance workplace
5. Quick wins – Initiatives where outcomes can be achieved quickly

The proposed implementation Roadmap below outlines the sequencing of the Strategic Initiatives in the now, next, future categorisation and timeframes. The sequencing is based on the prioritisation assessment, in addition to logical considerations regarding phasing, grouping and dependencies of Initiatives. The below is a proposed implementation Roadmap and is subject to approval and funding.

The 'now' time horizon is initially focused on empowering patients and services users, establishing the foundations to enable the transformation, and leveraging the potential of EHRs. This initial focus will lay the groundwork for a patient centred care ecosystem that prioritises the patient.

The proposed implementation Roadmap shows steady delivery of the Initiatives under Workforce and Workplace across now, next and future. This recognises the challenges that come with change and providing adequate resources and support to deliver a smooth transformation for the health and social care workforce.

Conclusion and Next Steps

The Digital Health Strategic Implementation Roadmap presents a comprehensive and forward-thinking approach to embracing the power of digital health in Ireland. It recognises that digital health is a crucial enabler in delivering modern health and social care, offering innovative solutions that improve access, efficiency, and quality of care. By leveraging digital technologies, care delivery can be transformed, resource allocation can be optimised, and patients can actively participate in their own care.

The Initiatives within the Roadmap emphasise the importance of incorporating the patient's voice in their care and allowing them to input their own health data. The Roadmap acknowledges the potential of digital technology to transform healthcare delivery and improve patient outcomes. The Roadmap and the Strategic Initiatives outlined within it provide a Roadmap for achieving this transformation.

One of the key priorities highlighted in the Roadmap is the seamless sharing and accessibility of patient information across the health and social care system. This is essential for successful integration and responsiveness to the changing needs of patients and their families. By implementing digital systems that enable such sharing and access, Ireland can overcome the challenges of rising costs, siloed health information systems, and increasing demand for services.

This Roadmap will deliver platforms that can capture real-time data from patients, staff, and services. They will generate actionable knowledge from the data and will drive culture change, bringing people together in learning communities, to put that knowledge into practice and improve care. This Roadmap will help to create a Learning Health and Care System.

Importantly, this Roadmap aligns with existing strategic frameworks such as the DoH Digital for Care – A Digital Health Framework for Ireland, the Sláintecare action plan, and the Department of the Taoiseach's Digital Ireland Framework. Together, these frameworks outline Ireland's ambitions, Principles, and future Roadmap for digital health from year 1 to year 7.

There are practical next steps required to effectively mobilise and prepare for the transformation outlined in this Roadmap. Successful implementation involves careful planning, stakeholder involvement, resource allocation, and continuous monitoring. Some of the immediate next steps include increasing the involvement of patients, the workforce, and the health and social care sector in the transformation process. Open channels for communication and active listening to feedback and concerns must be created to ensure stakeholders feel included and valued in shaping and implementing the change.

Immediate actions required include the establishment of:

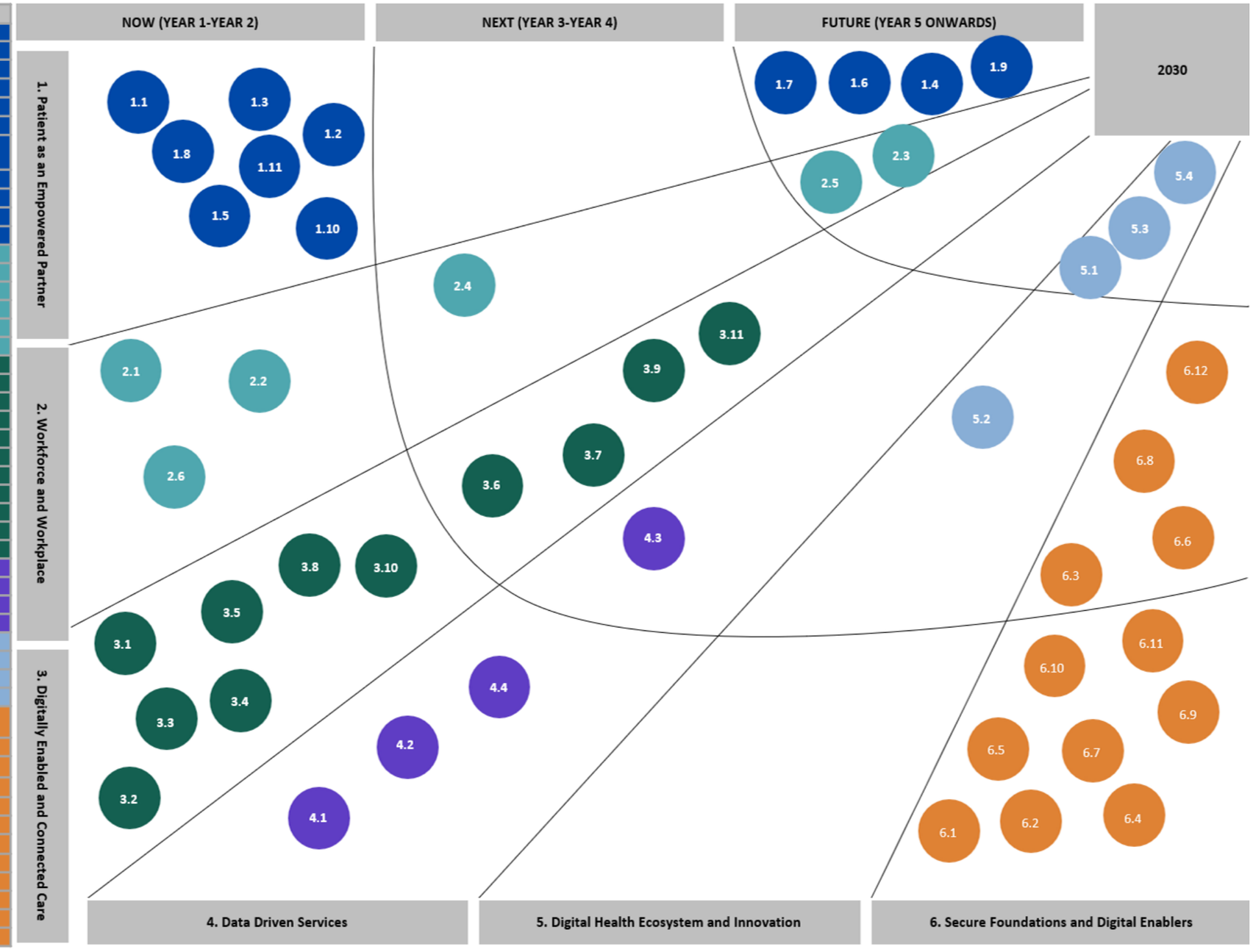
1. **A governance framework which is** fundamental to guiding the transformation process, ensuring accountability, prioritisation and enhancing the chances of achieving the outcomes outlined in the Roadmap.
2. **A dedicated transformation team** to navigate the complexities of transformation more efficiently, mitigate risks, and enhance the likelihood of a successful transformation.
3. **Data, standards, and interoperability requirements** to serve as a critical foundation for successful implementation. These elements will create connected systems and ensure seamless flow of information across the health system.

A Digital health capability function should be established early to support the workforce and the delivery of the transformation.. An architectural practice will also be established to dynamically update the framework, infrastructure, and guidelines, ensuring an agile and responsive architecture that adjusts to new developments and needs.

In summary, the Roadmap in Ireland sets the stage for a patient-centred, digitally enabled health and social care system. It emphasises the importance of leveraging digital technologies to overcome current healthcare challenges and improve patient outcomes. By aligning with existing strategic frameworks, investing in infrastructure and technology, fostering collaboration, and implementing practical next steps, Ireland can achieve its vision of an integrated, universal, and high-quality health and social care system for all patients.

Implementation Roadmap

Principle	Initiative	Horizon	ID
1	Patient Portal	Now	1.1
1	HSE App	Now	1.2
1	HSELive - Contact Centre	Now	1.3
1	Patient Feedback Platform	Future	1.4
1	Remote Care/Monitoring/Digital Therapeutics	Now	1.5
1	Benefits & Schemes	Future	1.6
1	Public Facing Engagement & Digital Literacy Development Programmes	Future	1.7
1	Public Website Content Management	Now	1.8
1	Open Health Application Sharing (API)	Future	1.9
1	Contact Care Platform	Now	1.10
1	Telehealth	Now	1.11
2	Reliable Secure Connectivity	Now	2.1
2	Modern Workspace & Productivity Tools	Now	2.2
2	Improve Employee Experience	Future	2.3
2	Mobile Ecosystem for Front Line	Next	2.4
2	Employee Feedback Platform	Future	2.5
2	Digital Finance and HR	Now	2.6
3	Shared Care Record	Now	3.1
3	Population Health Management	Now	3.2
3	Patient Administration & Care Coordination	Now	3.3
3	Medication Management	Now	3.4
3	Diagnostics	Now	3.5
3	Order Comms & Care Delivery	Next	3.6
3	Patient Safety & Quality of Care	Next	3.7
3	EHR Procurement & Delivery	Now	3.8
3	Digitisation of Health Care Records	Next	3.9
3	National Clinical Information Systems	Now	3.10
3	Medical Device Integration	Next	3.11
4	Patient Journey Analytics	Now	4.1
4	Healthcare Data Analytics	Now	4.2
4	Integrated Referral Management	Next	4.3
4	Scheduling, Rostering & Resource Management	Now	4.4
5	Precision Medicine Support	Future	5.1
5	Healthcare Research	Next	5.2
5	AI in Healthcare	Future	5.3
5	Open Innovation & Ecosystem	Future	5.4
6	Legislation, Regulation, Standards, Governance & Guidelines	Now	6.1
6	Patient Identity Management	Now	6.2
6	Healthcare Worker Identity & Access Management	Next	6.3
6	Architecture, Service Design & Knowledge Management	Now	6.4
6	Culture, Change and Agile Delivery	Now	6.5
6	Talent Identification and Development	Next	6.6
6	Integration, Interoperability and Data Engineering	Now	6.7
6	Crisis-Responsive Healthcare	Next	6.8
6	ICT Cyber Programme	Now	6.9
6	Foundational Infrastructure	Now	6.10
6	Regional Strategic Implementation	Now	6.11
6	24/7 Support Function	Next	6.12



Appendix 1: Achievements to Date

Initiatives that have shown digital health success for end users and the workforce across the health system, include the National Integrated Medical Imaging System (NIMIS), Maternity, Gynaecological and Neonatal Clinical Management System (MNCMS) and Telehealth. A selection of notable achievements include:

- **NIMIS:** has made medical imaging services more efficient and accessible. It allows sharing of diagnostic images and reports easily, reducing delays, duplication and improving patient care.
- **Telehealth:** programmes have allowed patients to access remote consultations, so they can get healthcare from home. This has made it easier for people in rural or remote areas to access care, saving time and money while still getting good-quality care.
- **MN-CMS:** (based on Oracle Cerner Millennium) has been designed to put women andand infants at the centre by introducing a seamless, complete, and reliable fully integrated EHR for all women and babies accessing maternity, gynaecology, and neonatal services in Ireland. This enables clinicians to access the required information quickly and remotely and to accurately make care decisions for the well-being of the patients. MNCMS allows clinicians to receive alerts about the patient's condition and care.
- **The Synergy Electronic Patient Record (EPR) system**: was introduced by Tallaght University Hospital to replace legacy ICT systems and paper-based records. Synergy provides staff with access to a single, integrated source of clinical information, including patient details like test results, medications, and discharge summaries. This innovation streamlines workflows, supports care delivery, and enables communication and information sharing among staff from any device, anywhere.
- **The Evolve EPR system**: was implemented by The Saolta University Health Care Group within all specialities in Galway University Hospital allowing multi-disciplinary teams access to one comprehensive view of the patients record, enabling clinicians to provide timely and informed treatment to the patient. During Covid-19 pandemic, Evolve was critical in facilitating the workforce to deliver virtual outpatient clinics as it meant that copies of scanned patient charts were readily available for staff to access.
- **The Project Oak EPR:** introduced by St James's Hospital records patient encounters electronically, replacing paper records. The system offers clinicians a comprehensive view of patient journeys, enhancing care for the 22,000+ annual inpatients.
- **NFMHS and NRH:** the National Forensic Mental Health Services (NFMHS) and the National Rehabilitation Hospital (NRH) was implemented in a joint approach to create co-working and collaboration and, to enable shared learning and knowledge transfer between the two sites. Access to a comprehensive and unified patient record will deliver benefits, such as the delivery of safer, more efficient, and better coordinated care.
- **Children's Health Ireland (CHI):** are currently implementing an EHR. The delivery of an EHR in the new Children's Hospital will support better management of health information, safer, better care, effective decision making and performance management, delivering substantial benefits to health services.
- **The National Cancer Information System (NCIS):** is a priority project for the National Cancer Control Programme to create a longitudinal record of cancer care for patients attending 26 hospital sites across Ireland. NCIS was implemented to support the multi-disciplinary diagnosis and treatment decision process, in addition to the complex chemotherapy prescribing, preparation and administration processes. This assists in future scheduling of treatment, resulting in better patient journeys.
- **General practice (GP):** in Ireland is almost entirely computerised with Electronic Medical Record's (EMR's) being used routinely. EMRs facilitate critical analysis of GP activity and can highlight important trends for service planning. GPs are also using software routinely to facilitate electronic prescribing, record clinical notes, alert potential drug interactions, and to access lab results.
- **Healthlink:** provides an electronic messaging service which allows the secure transmission of clinical patient information between hospitals, health care agencies, clinical centres, and GPs. It has more than 14,000 user bases across 1,900 sites. Users include GPs, other health practitioners and hospital

administration members. This service is used for referrals, radiology orders along with vaccination reports, sick certificates, maternity shared-care reports, and Primary Care Eligibility and Reimbursement Services (PCERS).

- **The Covid-19 response:** delivered the efficient implementation of test and trace initiatives and a robust and effective vaccination programme. A data driven approach was taken to managing the response allowing for the monitoring of infection rates, tracking the effectiveness of vaccination efforts, and identifying potential hotspots.
- **Analytic and reporting functions**: initiatives such as the Integrated Information Service (IIS), ICU-BIS (Bed Information System) which allowed for tracking of available ICU bed spaces nationally during the pandemic and since and nursing metrics and incident reporting provide data collection, processing, analysis, modelling, and visualisation. This provides actionable information for leaders and decision makers across the health system, leading to improved patient care and services through collection and transformation data to provide high-quality, timely and relevant information. Foundational initiatives such as the data dictionary will provide the health system with a single standardised platform accessible to all individuals. In all of these initiatives, anonymised data is crucial to protect patient privacy while enabling robust data analysis.

Appendix 2: International Analysis

To inform our Strategic Implementation Roadmap and the considerations made throughout the development, international analysis was conducted to understand digital health globally. For the purposes of this analysis, case studies have been developed for the digital strategies from Northern Ireland, Scotland, Australia, Norway, Spain, and Mayo Clinic. These case studies provide the opportunity to understand digital health across a range of jurisdictions. These cases have similarities and differences to digital health in Ireland currently, and the direction in which this Roadmap will take digital health for Ireland.

Document	Overview	Strategic Goals	Relevance
Northern Ireland's Digital Health Strategy[61]	Northern Ireland's digital vision aims to make lives better for the people of Northern Ireland, using digital to transform the way they deliver health, care, and well-being services. Digital holds the potential to provide greater visibility, control, and personalisation of care for the people of Northern Ireland.	• Provide more personalised care, including full visibility of health data and care journeys, moving towards precision medicine to identify the best approaches and care pathways for everyone. A single electronic care record will empower people and staff to have full visibility of care pathways. • Digital solutions will put quality and safety at the heart of all new processes, systems, and ways of working across health and care pathways. Standardised pathways designed with service, staff, and patients in mind. • Effective and joined up care through systems integration and streamlined information flows. Digital solutions with a focus on systems integration and streamlined information flows will optimise efficiency and productivity across care delivery and operations. • Digital will enable health and social care professionals and staff to work more efficiently and collaboratively across standardised systems. • Making better use of data will optimise performance and harness population health insights, whilst ensuring robust data protection standards. Intelligent use of data, underpinned by seamless access, will support integrated management of our health and care pathways. • Digital will support the acceleration of research and innovation to gradually embrace system leading disruptive and cutting-edge solutions.	• Patient centric approach – Northern Ireland emphasises the importance of placing patients at the centre of healthcare delivery. This includes improving access to digital health services, empowering patients with tools for self-management, and enhancing patient engagement through digital platforms. • Interoperability and data exchange - Northern Ireland prioritises creating a framework that enables health systems and providers to exchange patient data securely and efficiently, while adhering to privacy and data protection regulations. • Telehealth and remote care - given the advancements in telehealth and remote care, Northern Ireland wants to embrace the potential of digital technologies in delivering healthcare remotely. This includes promoting telemedicine consultations, remote monitoring, and digital solutions that enable patients to receive care closer to home. • Innovation and Digital Infrastructure - to drive digital health transformation, Northern Ireland highlights the need for innovation, research, and development of digital health solutions.
Australia's National Digital Health Strategy[62]	Australia's National Digital Health Strategy was developed by the Australian Digital Health Agency to evolve digital health capability through innovation, collaboration, and leadership to facilitate digital health integration in the health system.	• Easily accessible health information: My Health Record is a secure online summary of Australian patients' health information that is in operation since 2012. • Secure messaging: Enables secure messaging by introducing secure digital channels and by eliminating the use of unsecure	• Digital health infrastructure – the direction of digital health in Australia focuses on building robust digital health infrastructure, including secure communication networks and standardised data formats. This

Document	Overview	Strategic Goals	Relevance
		email, fax and postage of personal health information. • Interoperability and data quality: Interoperability of high-quality clinical data resulting in integrated health systems with sharing and reuse of health data across organisations and sectors. • Convenient digital management of medicines: Digitally enabled paper-free options for all medication management to increase the safety and quality of medication. • Innovation and new models of care: Digitally enabled models of care that drive improved accessibility, quality, safety, and efficiency. Australia has been relatively successful in implementing their national health identifier service. • Digitally enabled workforce: A workforce confidently using digital health technologies to deliver health and care. • A thriving digital health industry: The Strategy proposes a new initiative to support an expanding set of accredited health apps as well as delivering an improved developer programme.	infrastructure focuses on supporting the secure exchange of health information across different healthcare settings. • Telehealth services - Australia has made significant advancements in telehealth services, facilitating remote consultations, and expanding healthcare access, particularly in rural and remote areas. This was accelerated further during the COVID-19 pandemic. • Health data and analytics - Australia emphasises the use of health data and analytics to drive insights and inform decision-making. This includes leveraging data for population health management, health research, and improving healthcare delivery.
Scotland's National Digital Health Strategy[63]	Scotland's National Digital Health Strategy sets out how they will work together to improve the care and wellbeing of people in Scotland by making best use of digital technologies in the design and delivery of services, in a way, place and time that works best for them.	• Empower individuals and professionals to make better informed decisions by providing access to the right data at the right time by creating a 'digital front door'. • Attract, develop, support, and retain a workforce that is confident and competent in the use of data. This includes all staff having essential data skills to better manage information, and advanced data skills that create more insight from data. • Have a trusted, secure health and care ecosystem where data is shared, managed, and stored securely, consistently, efficiently, and transparently. • Have the technology and infrastructure in place to equip Scotland to better collect, store and use data. This includes structured data held within databases, unstructured data and information held in paper records, near real time data from sensors and the Internet of Things • Improve the quality of the health and social care data, and increase interoperability through adoption and use of common standards, making it easier to re-use and link data. • Work in partnership with health and social care to adopt a whole	• Empowering patients and the workforce – a key focus of the Scottish strategy is to provide access to timely and relevant data, enabling patients and the workforce to make better-informed decisions. • Developing a skilled workforce - Scotland aims to attract, develop, support, and retain a workforce proficient in data usage. This includes ensuring essential data skills among all staff and advanced data skills to derive insights from data. • Enhancing technology and infrastructure - the strategy emphasises the importance of robust technology and infrastructure to collect, store, and utilise data effectively. This includes structured data in databases, unstructured data from paper records, and real-time data from sensors and the Internet of Things.

Document	Overview	Strategic Goals	Relevance
		system approach to creating insight from data that improves services. ○ Support research and innovation by facilitating safe access to health and social care data for industry, innovators, and researchers, to develop better ways of working, better treatments, new medicines, and improved care in Scotland	
Norway's National E-Health Strategy[64]	The vision of Norway's National E-Health strategy (2023 – 2030) is to contribute to a sustainable and innovative health and care sector with good quality and coherence in the services. The key proposed points are the role of strategy, overall goals, and target groups, and five priorities strategic goals.	• Active participation in one's own and close to one's health: Digital health service enables active participation of patients and next of kin in treatment and follow-up of their own and their loved ones' health and wellbeing. • Easier working day: Health care professionals will be equipped with user-friendly digital work tools that will support in their work processes, reduce their workload, and strengthen patient safety. • Health data for renewal and improvement: Increase in data-driven decision making will lead to quality of care, satisfaction, better health monitoring, emergency preparedness and increase efficiency. • Accessible information and strengthened collaboration: Digital health service will increase standardisation and will ensure that health information is secure, of good quality and easily accessible when needed. • Cooperation and policy instruments that strengthen implementation capacity: better cooperation and further development of funding models and regulations are important preconditions for goal attainment.	• Digitalisation and patient empowerment – Norway have been focusing on digital tools to empower patients and improve health care services. This includes initiatives such as providing electronic access to health records, enabling patients to book online appointments, and facilitating remote consultations. • Interoperability and information exchange - Norway aims to enhance interoperability and information exchange among healthcare providers. The goal is to create a seamless flow of information, ensuring that patient data can be securely accessed and shared across different healthcare settings. • Telemedicine and remote care - the Norwegian digital health strategy emphasises telemedicine and remote care solutions. This includes the use of digital tools and technologies to deliver healthcare services remotely, particularly in rural or underserved areas. • Enabling the workforce - the Norwegian digital health strategy aims to optimise workflows, reduce administrative burdens, enhance collaboration, and improve the overall work experience for healthcare professionals.
Spain's Digital Health Strategy[65]	In late 2020 Spain adopted a Digital health strategy aimed at providing health solutions and deploying infrastructures that allow healthcare professionals to use data to promote the health and well-being of citizens. The Strategy is centred around providing	• Empowering and involving people: Spain uses a people centric approach in their healthcare and disease control and facilitating their relationship with health services by promoting their participation at all levels and encouraging their joint responsibility.	• Interoperability and health information exchange – Spain's strategy recognises the importance of interoperability and seamless exchange of health information among healthcare providers. They aim to enhance the sharing of patient data

Document	Overview	Strategic Goals	Relevance
	greater transparency in the public health system and in making innovation the driving force behind its digital health transformation.	• Increase efficiency: Maximising the value of processes for better performance and efficiency of the public health system, supporting the work of professionals, and facilitating communication between them in a way that ensures continuity of care and strengthens the governance of organisations. • Interoperable and high-quality data: Adopting data management and governance policies that allow for interoperable and quality information and create a National Space for Health Data to generate scientific knowledge and the assessment of services. • Innovation: Adapting the progress of the healthcare system to the demands of today's society, through innovation policies oriented towards 5P healthcare (Population, Preventive, Predictive, Personalised and Participatory).	across various healthcare settings to improve care coordination and facilitate decision making. • Electronic Health Records - Spain emphasises the adoption and implementation of electronic health records systems. The goal is to digitise patient medical records and enable healthcare professionals to access and update patient information efficiently. This digital transformation is aimed at improving the quality of care, reducing errors, and enhancing patient safety. • Health data analytics – Spain recognises the value of health data and analytics. They are developing data infrastructure and analytics capabilities to leverage data they have.
Mayo Clinic's Centre for Digital Health[66]	In 2019, Mayo Clinic created the Centre for Digital Health with the vision of bringing Mayo Clinic to a global community that we can deliver Mayo Clinic anywhere in a manner that is simple and is committed to leading the transformation of health care by creating world-class platforms that align with patients-centred culture and values.	• Digital front door: This programme was built with an aim of providing patients with personalised content based on their needs, and that is their digital front door to Mayo Clinic. • Advanced care a home programme: This programme was introduced to provide comprehensive care to patients in the comfort of their own homes. This facility allows some patients with conditions previously managed in a hospital now have the option to transition to a home setting for care and recovery services. • Collaboration and cooperation with key stakeholders: Increased collaboration with key players help to get the most value out of digital health care experience while building the digital platform. • Accelerating transformation: While the ongoing pandemic wrought a multitude of challenges for all health care providers, it forced Mayo Clinic and the CDH to evolve rapidly in order to provide a safe experience for those in need of care. • Patient centred approach: Digital health care system have the power to leverage meaningful data to enhance patient experience and improve outcomes in order to serve what matters most: people.	• Research and innovation – The Mayo Clinic encourage innovation in digital health through initiatives focused on AI, machine learning, genomics and precision medicine to advance diagnosis, treatment and healthcare delivery. • Enhanced Remote Care – there is an emphasis on telehealth services, virtual consultation and remote monitoring consultations to enhance patient care and reduce the need for in-person visits. Mayo Clinic's virtual wards enable the health workforce to remotely monitor patients, especially those with chronic conditions or recovering from surgeries. This leads to improved patient care and early detection and prevention.

Appendix 3: Capability Maturity Assessment

The digital health maturity model is an evidence-based tool that was used to measure the current digitisation and maturity of core digital health capabilities across the health system. Understanding digital health maturity across the health system shows us where further focus is needed to improve performance. This will give the HSE and DoH direction on further investment decisions for Digital Health across Ireland.

The key features of the tool are:

- The model extends the HIMSS EMRAM, O-EMRAM Maturity Models to include several elements critical to the holistic assessment of digital health.
- The model focuses on digital enablers of healthcare, and applies it to each capability, aligned to a patient-centred delivery of care.
- It is scalable and adaptable to changing trends and advancements in digital health.
- This model can act as a road map for health services. It also provides an evidence base to inform better investment decision making.

Capability assessment findings

The capability assessment identified that the overall current digital health maturity level of the HSE is 1.6 out of 5.0.

Maturity Model Capabilities and Subcategories

This model consists of 10 capabilities and associated subcategories.

Maturity Model Capabilities and Subcategories								
Governance and Stewardship								
▸ Alignment of Leadership, oversight and assurance ▸ Investment and direction ▸ Operational, program, technical and clinical governance ▸ Clinical, business and ICT strategy ▸ Manage Compliance & Risk ▸ Manage Ecosystem & Partners ▸ Develop & Manage the Networks of Care ▸ Healthcare coordination Services								
Organisational capability	**IT operations and infrastructure**	**Level of digitisation and functional adoption**	**Security and privacy**	**Information sharing and integration**	**Data & analytics**	**Patient experience and engagement**	**Clinician and staff experience**	**Innovation**
▸ Change capability / clinical engagement ▸ Project capability ▸ Continuous Improvement ▸ Business Continuity Management ▸ Workforce capability ▸ Benefits management ▸ Execution & Resilience Services ▸ Care continuity management ▸ Readiness capability ▸ Culture	▸ IT operations and infrastructure management ▸ IT budget management ▸ IT capability management ▸ Managing IT for business value	▸ Clinical information systems adoption ▸ Electronic Medications Management ▸ Electronic clinical decision support ▸ Electronic order entry capability ▸ Digital tools for consumers ▸ Other eHealth functional capabilities ▸ Digitisation & Standardisation Services	▸ Adoption and continuous improvement of security controls ▸ Cybersecurity Capability Maturity Model (C2M2) ▸ NIST Cybersecurity Framework ▸ Identity & Trust Services	▸ Information Management ▸ Adoption of nomenclatures ▸ Interoperability of systems ▸ Information sharing with third parties ▸ Data quality management ▸ Knowledge, Sensing, Planning & Feedback Layer Services ▸ Automation, Integration and Interoperability Services ▸ Integration Digital Healthcare (Record) Data Services.	▸ Data Quality Management ▸ Data principles ▸ Data governance ▸ Reporting capability ▸ Business intelligence capability health ▸ Healthcare Analytics & Insights Services ▸ Master data management ▸ Imaging management	▸ Technology-facilitated hospital/clinic experience ▸ Virtual care ▸ Patient representation in governance ▸ Digital tools for patients ▸ Access to health information ▸ Measurement of patient satisfaction ▸ Manage Population Health ▸ Healthcare Engagement Services	▸ Quality of user experience ▸ User experience and design principles ▸ Measurement of user outcomes ▸ Coordinate Care ▸ Deliver Care to Patients ▸ Healthcare Enablement, Productivity & work Services	▸ Innovation capability ▸ Innovation initiatives ▸ Innovation funding ▸ Innovation partnerships ▸ HealthIE Cloud Foundations

Appendix 4: List of Key Areas Where AI Tools Can Be Applied

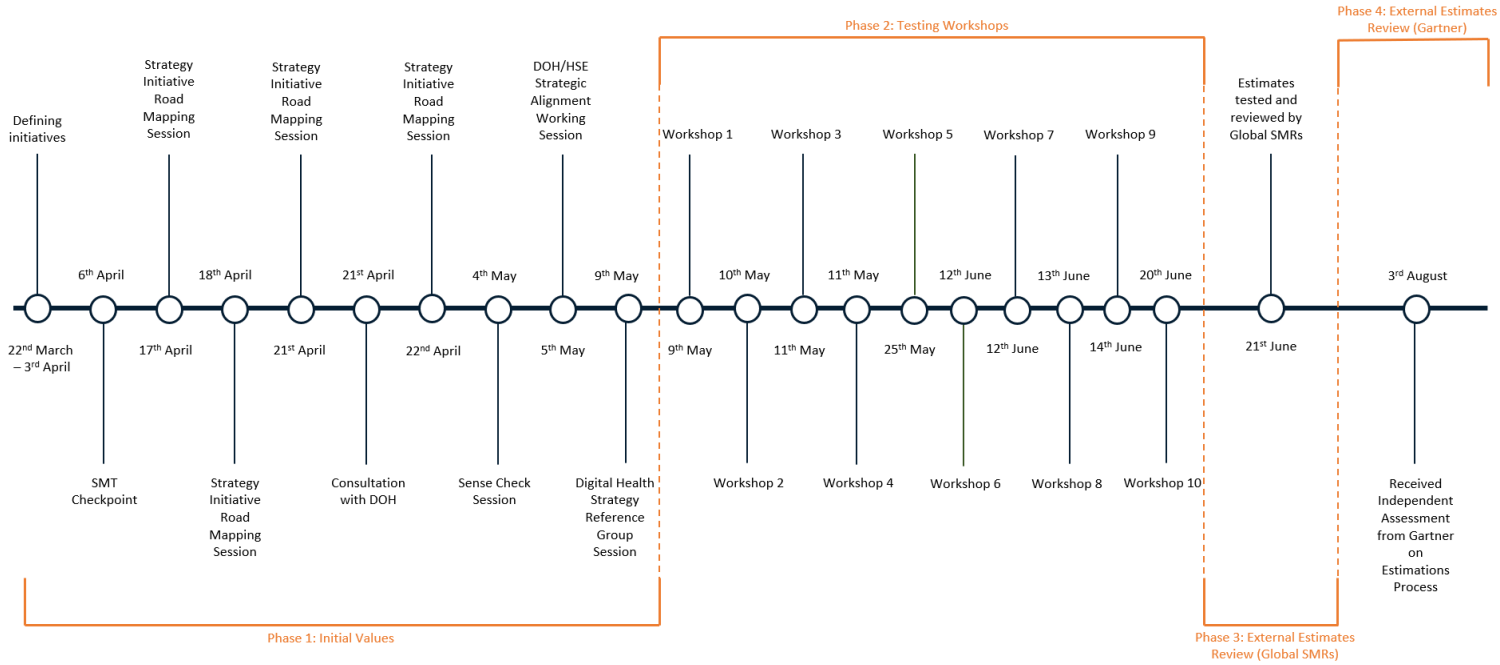
Areas of application	Key drivers for adoption
Medical Imaging and Diagnostics	• *Ophthalmology* – retinal imaging and disease detection • *Pathology* – analysis of samples and identification of cellular abnormalities • *Radiology* – image recognition and analysis
Clinical Decision Support	• *Diagnosis Assistance* – differential diagnoses based on patient data and symptoms • *Treatment Planning* – recommending personalised treatment plans based on patient history, genetic factors, and clinical guidelines • *Prognosis Prediction* – predicting disease progression and patient outcomes
Drug Discovery and Development	• *Target Identification* – identifying potential drug targets based on genomic and molecular data • *Drug Design* – designing new drugs and optimising existing ones • *Clinical Trials* – optimising patient selection, trial design, and data analysis
Precision Medicine	• *Genomics* – analysing genomic data and identifying disease-associated genetic variants • *Personalised Treatment* – determining the most effective treatments based on a patient's unique genetic makeup • *Disease Prevention* – identifying individuals at high risk of developing certain diseases and recommending preventive measures
Healthcare Operations and Management	• *Workflow Optimisation* – improving hospital processes and streamlining clinical workflows • *Supply Chain Management* – optimising the procurement, storage, and distribution of medical supplies • *Financial Management* – predicting costs, optimising reimbursement, and reducing fraud
Patient Monitoring and Engagement	• *Remote Monitoring* – devices and wearables for tracking patients health data and vital signs • *Telehealth* – chatbots and virtual assistants for remote consultations and triage • *Patient Engagement* – facilitating communication between patients and healthcare providers • *Medication Adherence* – promoting patient adherence to treatment plans • *Patient education* - optimising large amounts of healthcare information to provide tailored recommendations and information
Public Health and Epidemiology	• *Disease Surveillance* – monitoring disease outbreaks and predicting their spread • *Health Problem* – identifying effective public health interventions and targeting at risk populations • *Health Policy Analysis* – evaluating the impact of healthcare policies and regulations

Appendix 5: Detailed Cost Estimation Approach

Phase 1 Estimations Approach: Initial Values

The initial estimates were generated using a top down, rule of thumb, experienced based approach. The goal was to derive an estimate of the effort and cost involved in completing each initiative. Different estimates of effort were assigned to each initiative based on experience and knowledge from market. This top-down estimation approach was appropriate for deriving the estimates for this stage of the process. When direction is agreed and Initiatives become business cases / programmes, bottom up and more detailed estimates will be completed. The process used to produce the initial high-level estimates for the Initiatives has been tried and tested across various clients and industries. Ten consultation sessions were held with stakeholders throughout the HSE including attendees from the DoH to discuss the initial estimations. These stakeholders were consulted at this stage to complete an initial review of the estimations.

The below shows a high-level timeline of each phase of the estimations approach



Phase 2 Estimations Approach: Testing Workshops

Internal testing of the estimates was undertaken with a variety of HSE SMRs. Ten estimation testing workshops were held, where 29 key initiative estimates that were originally derived in phase 1, were discussed and tested with the relevant HSE stakeholders.

The below shows a summary of the estimation testing workshops

Phase 3 Estimations Approach: External Estimates Review (Global SMRs)

Following the estimations testing workshops with HSE SMRs, these estimates were further tested with international SMRs. Global Health SMRs were requested to perform an external review of the estimates. The estimates were reviewed, debated, and considered in the context of the HSE. Feedback from the SMRs was documented and considered by the project team members.

Phase 4 Estimations Approach: External Estimates Review (Gartner)

HSE Senior Management Team (SMT) requested an independent assessment of the process undertaken to arrive at the estimates and of the estimations. Gartner was contacted to provide this independent assessment. Gartner was provided with the list of Initiatives, the initiative estimates, the process used, and the stakeholders engaged in the process. Gartner have provided feedback on the estimations process and the overall costs identified for the Initiatives provided.

Glossary and Terminology

Term	Definition
5G	The fifth-generation technology standard for broadband cellular networks.
Application Programming Interface (API)	A set of rules, protocols, and tools that allow different software applications to communicate and interact with each other. It defines the methods and data formats that applications can use to request or exchange information and perform specific tasks. APIs enable access to the functionality of other programmes or services, facilitating the integration and interoperability of various software system.
Artificial Intelligence (AI)	Systems which interpret data, reason through the knowledge from this data, decides the best action(s) to take (according to pre-defined parameters) to achieve a given goal. AI learns to adapt its behaviour by analysing how the environment was affected by previous actions.
AI-enabled technologies	Digital tools with AI support for optimised clinical workflows, patient care, and health workforce experiences.
Care Pathways	Also known as integrated care pathways or clinical pathways, are structured and standardised plans that outline the recommended sequence of healthcare interventions and treatments for patients with specific medical conditions or undergoing specific procedures.
Data Analytics	Data analytics is the process of analysing raw data to make conclusions which then inform business decisions.
Data Dictionary	A collection of names, definitions, and attributes about data elements that are being used or captured in a database, information system, or part of a research project. It describes the meanings and purposes of data elements within the context of a project, and provides guidance on interpretation, accepted meanings and representation[54].
Genomic	Genomics is a study of a person's genes including interactions of those genes with each other and with the person's environment.
Health ecosystem	The interconnected network of individuals, organisations, institutions, technologies, and resources that collaborate and interact to deliver healthcare services.
Individual Health Identifier (IHI)	A unique lifetime identifier code for patients, care providers and care facilities so that all healthcare delivery can be linked to all of these from the outset and throughout and across care pathways[55].
Medical Device Software	Medical Device Software (MDSW) is software designed for use in association with medical devices, as defined by medical regulations. A "medical device" refers to any item, including a software, implant, instrument and more, meant for diagnosing, treating, or alleviating disease or injury in humans. This category also covers devices used for testing or modifying human anatomy or physiological processes, and for analysing body-derived specimens.
Portal	A website or web page providing access or links to other sites.
Remote patient monitoring	A form of homecare telehealth that involves the collection and transmission of health data from a patient to their health care team by using digital health technologies. This allows monitoring of health of patients who are not at the same location as the health care provider.
Telehealth	Also called telemedicine. Uses information and communication technologies for long distance clinical healthcare, health related education, public health, and health administration.

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