Swansea Bay University Health Board

Business Intelligence Strategy

2022 - 2025

Harnessing Data to Deliver Insights & Intelligence

Presented By

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DIGITAL INTELLIGENCE
Swansea Bay

Document Tracking

Version Control

Version	Date	Change
.01	**15-02-2020**	**Partial draft**
.02	**15-06-2021**	**Updates Post Covid**
.03	**01-07-2021**	**Updates based on feedback from CEO**
.04	**01-10-2021**	**Updates based on consultation period Feedback**
.05	**29-10-2021**	**Updates based on Digital Intelligence review**
.06	**10-01-2022**	**Updates based on Feedback and the removal of initiatives that have already taken place**

Signoff

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CONTENTS

ACKNOWLEDGEMENTS

We would like acknowledge the contributions of the following:

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Meg Aranow - Senior Research Director - Advisory Board

Rachel Longhurst - Dedicated Advisor for the UK - Advisory Board

EXECUTIVE SUMMARY

Welcome to the Health Board's Business Intelligence Strategy "**Harnessing Data to Deliver Insights and Intelligence**".

Business intelligence is an essential element of the health board's digital transformation plans which will support the Swansea Bay University Health Board's wider transformation agenda.

Business Intelligence and advanced analytics are the methods and systems by which the organisation can answer healthcare related questions, propose new questions, learn, adapt, improve and gain actionable insights and intelligence. This will lead to better planning and decision making.

Now is the right time to adopt this strategy given our current levels of business intelligence maturity and the organisational need for insights and intelligence to support the organisation's strategies, plans, aims and objectives. The strategy sets out how this will be delivered including self-service analytics and other mechanisms such as analytical support and training. It also covers what will be required to ensure that the environment that data is held in is fit for purpose to allow the organisation to use the data in the most efficient and effect manner. It will help to ensure that the organisation's workforce as well as our analysts are taken on the same journey to have confidence in using data to make evidence based decisions with principles and actions from local and national plans guiding its implementation.

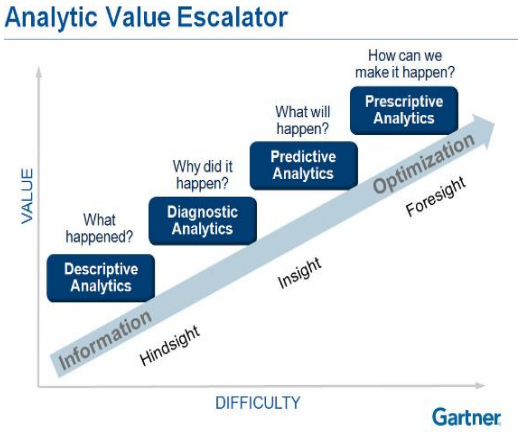
1 OUR AMBITION

Our ambition is to deliver actionable insights and intelligence to the organisation in order for clinicians, managers, executives and other stakeholders to make better informed decisions.

Delivering evidence-based decision making will support the delivery of the Health Board's Organisational Strategy, Clinical Services Plan and Annual Planning. This will help us to achieve the Health Board's ambition to deliver "Better Health, Better Care, Better Lives" to our population.

In order to undertake this we are transforming our Information Services Department into a Digital Intelligence Department that provides Business Intelligence (BI) and advanced analytics directly to our user's desktops and mobile devices.

The organisation requires multifaceted reporting which will need to include analytical services and self-service reporting utilising the most advanced technologies available to any organisation today[1], with an emphasis on predictive reporting so that users can act before a problem arises. Work with stakeholders will need to be undertaken to tailor solutions to their needs creating personalised reporting, dashboards and advanced analytical models to help the organisation become data-driven. This work will help us to gain better insights and provide foresight. To ensure a quality assured single version of the truth for our data, the Digital Intelligence Department will work with Subject Matter Experts (SMEs), data stewards and clinicians to bring new data into a new enterprise data warehouse which is linked at person level to help enable holistic views of healthcare information.



It is recognised that dashboards and self-service reporting alone will not be enough. The Digital Intelligence Department will enhance their existing ad hoc Information Request Service to also offer access to Business Intelligence Partners who will be able to perform advanced analytics and help users interpret analytical results and the limits of data. This, along with the new governance structure, a data literacy and value initiative and the creation of stakeholder groups, will directly help improve some of the areas identified in the **Advisory Board's Business Intelligence Maturity Model** (see appendix 1). Moving us to an advanced analytics/intelligence process automation model.

2 SCOPE AND CONTEXT

2.1 Scope

This strategy covers the period 2022 to 2025 and provides the high-level strategic direction. The scope of this strategy is limited to the improved delivery of Business Intelligence to the organisation and where appropriate our partners. A subsequent business intelligence implementation plan, will provide the detail around how we will achieve the ambition set out in this strategy.

Providing Business Intelligence to the general public and our citizens is out of scope.

2.2 Context

This strategy should be considered a sub strategy to the organisation's Digital Strategy and is aligned to the Organisational Plan and national plans such as "A Healthier Wales: our Plan for Health and Social Care", and other internal plans such as the Clinical Services Plan, Annual Plan, Primary & Community Service Strategy, and Quality Strategy.

The Business Intelligence Strategy has been co-termed to the Clinical Services Plan. This will help to ensure that tooling, infrastructure, data and skills are available to help assess delivery of the aims, measure and the outcomes set out in the plan. As our 3-year plan develops, the BI strategy principles will be applied via the operational implementation plan to ensure that everything aligns in terms of deliverables.

2.3 National Context

The national plan “A Healthier Wales: our Plan for Health and Social Care” sets out to move us to a fit for purpose and sustainable health and care system. The Business Intelligence Strategy aligns to that plan and also the “National Clinical Framework: A Learning Health and Care System” which was produced as a result of the aforementioned Healthier Wales plan. The Welsh Government’s National Clinical Services Framework acts as a framework for the planning and delivery of clinical services. It incorporates digital health services, NHS workforce development and the aim of shifting towards primary and community care services when appropriate. This clearly will go hand in hand with the health boards Clinical Services Plan.

2.3.1 The National Data Resource Programme

The National Data Resource (NDR) programme is a strategic initiative to help transform health and care in Wales through a more connected and collaborative use of data. The Programme will enable users to have access to the right data and tools, at the right time, to make well informed decisions. From nurse to care worker, clinician to analyst, government official to Welsh citizen, the NDR will underpin important health and care data initiatives across Wales for years to come.
Digital Health Care Wales (DHCW) will contribute towards our ambition of delivering insights based on holistic data via the National Data Resource (NDR) and the Clinical Data Resource (CDR) data feeds. They will provide unprocessed and processed data (including artificial intelligence outputs) directly into our ecosystem in order to provide a far richer analytical data resource drawn from expertise within and beyond this Health Board. The NDR and CDR present opportunities for truly joined up coproduced analytics between this Health Board, DHCW local authorities and other stakeholders.

Digital Health Care Wales (DHCW) will contribute towards our ambition of delivering insights based on holistic data via the National Data Resource (NDR) and the Clinical Data Resource (CDR) data feeds. They will provide unprocessed and processed data (including data from General Practice clinical systems and Local Authority systems) directly into our ecosystem in order to provide a far richer analytical data resource drawn from expertise within and beyond this Health Board. The NDR and CDR present opportunities for truly joined up coproduced analytics between this Health Board, DHCW, local authorities and other stakeholders. Linking these data at person level will aid in our pathway analytics and allow us to stratify patients in order to target interventions that work and assess intervention which have limited impact or do not make a difference to a person care and quality of life. The advent of obtaining external organisations data via the NDR will allow to us understand patient characteristic in detail so we are able to report on measures such as community based escalation and patient flow from home, to secondary care, community care and back home again.

The NDR Programme have endorsed this strategy during consultation and senior digital intelligence leads will continue to sit on the NDR Programme Board to ensure continued alignment strategically.

3 TRANSLATING OUR AMBITION INTO THEMES

The following ten themes highlight some of the key areas that will benefit from the proposed business intelligence strategic initiatives shown in the next section.

3.1 Holistic Single Version of the Truth

Our Service Delivery Group (SDG) Leads have already expressed the need for high-level views of information in one place with interconnected data forming holistic insights and foresight. The ability to accurately see what has happened, what is happening now and what will happen are essential to the attainment of the organisation's strategic aims. Command and control views of data will need to be created and will show the picture at high level with customisable alerts and the ability to drill down into the detail.

We will deliver on this by ensuring that the technical skills and infrastructure are in place and that data from multiple systems are linked at patient and pathway, enabling long term condition pathway monitoring and well as one system of care. There will be one version of the truth with agreed standards and quality control applied for use by our workforce so that we question the data less and use it to take action.

3.2 KPIs and Automated Reporting

There is a need to increase the range, frequency, richness and features of current Key Performance Indicators (KPIs) used by the organisation allowing for more readily available reporting which is accessible, interactive, joined up, drillable, easy to understand and, where needed, as close to real time as possible. Currently there is no real time data ingested into the organisations Data Warehouse for reporting and whilst this is not needed for many use cases it will be of great benefit for some. Using real time data for uses such as our escalation frameworks, allowing the health board to quickly escalate, take corrective actions and understand the impact before de-escalating.

3.3 Predictive and Prescriptive Analytics

Whilst the emerging discipline of prescriptive analytics (how can we make it happen) is being delivered by some within the private sector, it is rarely found in healthcare globally. There will be a need to build on existing skills internally and collaborate externally with academia, DHCW and industry to ensure we have a reliable pool of expert advisors, users and developers. This will include the need for informational analysts, data scientists, statisticians and software developers to work with our services and groups to implement the required informational views.

Prescriptive analytics - sometimes referred to as "what if" analytics such as Discrete Event Simulation (DES) - will help us to answer questions based on scenario generation. Prescriptive analytics can be used to test and better understand what is happening now and what will happen if we change resources and/or processes. This allows for the investigation of ways in which services might be improved or redesigned and connects decisions and activities with expected outcomes. Insights delivered from prescriptive analytics will be invaluable to the ambitions described within the Clinical Service Plan for system-wide transformation of services such as outpatient appointments and clinic delivery, new approaches to surgery and discharge planning.

3.4 Quality, Service Improvement and Redesign (QSIR)

QSIR principles are essential in the design and implementation of more efficient and productive services and processes. The organisation needs to ensure that a data-driven approach is taken for QSIR with quality assured data feeding the tools used. The data needs to be automated and quality assured in order to feed QSIR projects and, where practicable, needs to include automatically transformed data including data from our clinic letters.

The King's Fund and NHS digital amongst others promote the use of tools such as run charts, Statistical Process Control (SPC) charts, Vitals charts and Pareto charts for QSIR projects. These tools look at variation over time, flow (demand, activity and work in progress) and the most significant categories to concentrate effort. Such tools have utility beyond QSIR, for example the organisation already uses all of aforementioned visuals within the Emergency Department page of the Patient Flow Dashboard. Tools such as these along with others, need to be further embedded into dashboards, reports and ad-hoc pieces of analysis so they become business as usual for our consumers of information. Their importance and the value that they bring will need to form part of a data literacy and value initiative so that our workforce understand them and have confidence in their use. Links and governance processes with specific Teams such as the, Value Based Health Care Team, Finance SLR and BI Team and Health Care System Engineering Team will ensure collaboration and best use resource, skills and best practice are adopted.

3.5 Improved Operational Efficiency and Demand and Capacity Management

The organisation needs to ensure that it is using its resources efficiently in order to meet the demands put on it whilst maintaining performance against internally and externally reported targets such as Referral to Treatment Time (RTT) targets. There is a need to remove manual processes from this type of work and provide new automated tools to reduce errors and free up time for managers to use the insights from the analytics to make decisions.

Swansea Bay Health Board already has some business intelligence products, such as the Theatres Dashboard, that are refreshed daily, pre-programmed with calculations and co-produced with the service to examine operational efficiency. This type of work is aligned to the planned care ambition for surgical services set within our Clinical Service Plan. The organisation will require this type of work to be enhanced with predictive and what if analytics in order to realise its ambition for the ongoing planned care work. It will also require a platform capable of performing analytics such as:

- Measuring outpatient demand and variation
- Understanding core capacity
- Understanding clinic slot utilisation
- Understanding outcomes (clinical outcomes, case-mix variables, Patient Reported Outcomes)

In addition to bringing in new analytics around Patient Reported Outcome Measures (PROMs) and Patient Reported Experience Measures (PREMs), there also needs to be a focus on real-time demand and capacity management to improve patient flow from home to the front door of hospital and back to home again. This includes the One System of Care, My Home First and Better Together principles including the monitoring of the Hospital to Home Service.

3.6 Reduced Costs Waste & Analytics for Commissioning

The Digital Intelligence Department already has strong links with the Finance Service Intelligence & Commissioning Team with co-produced costings data hosted within the organisation's existing data warehouse. However, the organisation's business intelligence platform must be able to support richer

data, which is processed more quickly, to enable better monitoring and understanding of targets, variation and gaps.

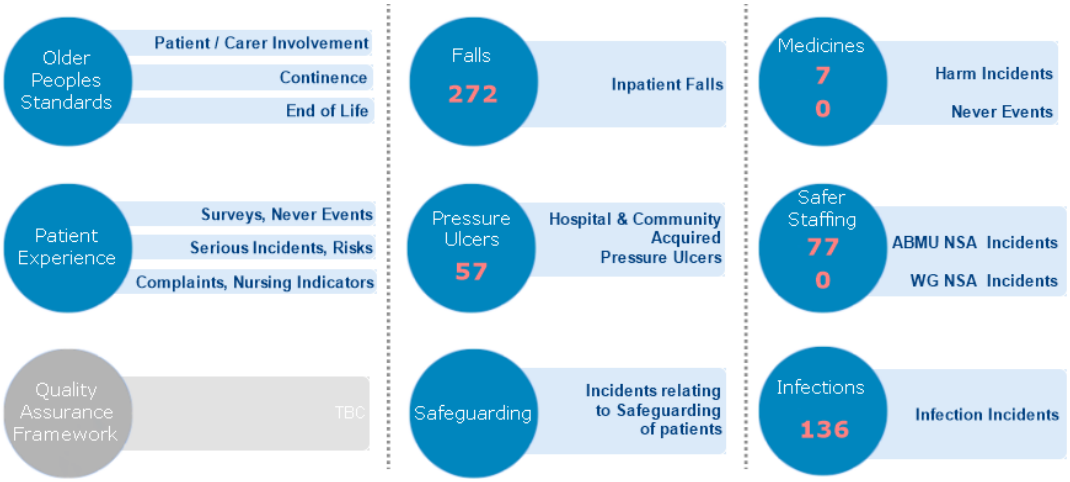
Although there are some products such as the Clinical Variation Application and the Volume Cost Risk (VCR) application that combine financial and clinical data to provide insights there is a need to improve the existing platform's abilities and to process data more quickly.

This will allow it to perform more descriptive analytical functions as wellbeing capable of moving towards "what if analytics" to see the financial implication of multiple scenario-based planning assumptions and predictive costing.

Working with our colleagues in the Finance Service Intelligence & Commissioning Team to coproduce and support analytics and analytical products we will ensure that the commissioning agenda is met via the use of a business intelligence ecosystem that is able to monitor activity and understand value.

3.7 Reduce Risk and Increase Patient Safety

The Ward dashboard produced by the Digital Intelligence Department already holds a host of patient safety measures which are automatically taken from the incidence reporting and risk management system overnight so data can be reported the next day. However, many other systems hold rich data related to patient safety that could be utilised for automated reporting leading to hindsight, insights whilst also providing foresight. These reports, such as our clinical surveillance software and hospital cleaning system data, need to be joined up at patent and ward level with other data to monitor, report, predict and alert where problems might arise. The ability to graphically overlay floor plans with the data will enable the monitoring of the spread of infections and originating areas. The new Business Intelligence solution platform must be capable of doing this and reporting on the quality assurance framework measures. We will need to employ machine learning and predictive analytical principles to predict outbreak patterns.



3.8 Support Value Based Healthcare (VBHC) & Transformation

Value Based Health Care focusses on reducing unwarranted variation. Michael Porter and Elizabeth Teisberg describe value in healthcare as being the outcomes that are achieved that matter to patients relative to the costs of delivering those outcomes. The value for the patient relates to the whole cycle of care, not just a single intervention. It is also about measuring:

- Personal value, which is what matters to an individual,
- Technical value is the outcomes achieved for the investment,
- Allocative value, which is the optimum allocation of resources across and between populations.

VBHC is a delivery mechanism for prudent healthcare. It is core to our transformation agenda, the delivery of our Clinical Service Plan and our Organisation Strategy. The Annual Plan makes explicit reference to VBHC. In order to do this, we will need to measure the correct data, and implement intelligent analysis that allows us to understand variation in the allocation and use of resources and the outcomes for patients.

This will require work by various stakeholders to acquire new datasets such as General Practice Clinical System data and PROMS data and other outcomes data which will need to be converted into various standards such as ICHOMS.

> The delivery of the anticipated benefits of our Clinical Services Plan primarily requires front line clinical staff to understand their place within the Organisational vision and to actively help deliver the overall Programme. The most important factor in getting staff to understand the vision is our ability to present up to date, accurate and relevant clinical data. The most important advance so far was the creation of our VCR (Volume, Cost, Risk) dashboard which allowed us to identify the largest groups of patients with the greatest cost and clinical risk. This clearly showed that our greatest problems were in common, long term conditions such as heart failure, lung disease and dementia

Aidan Byrne – Ex-Consultant Anaesthetist & formally Clinical Director for CSP

<u>Example of Existing tools used with VBHC</u>

3.9 Population Health

The organisation currently has little access to data and analytics for use with population health. The lack of data from various sources including secondary care, community care, primary care and social care as well as other sources greatly reduces our ability to understand the health of our population and its impact on health and social care. Population health analytics will need to be incorporated into all of the themes outlined within this document to better plan and commission services and target health promotion. Therefore, this strategy will aim to bring in new datasets to address this need as well as addressing use cases such as population needs assessments which are currently difficult to complete due to the lack of data.

We will work with stakeholders within our organisation, NDR, DHCW and Public Health Wales (PHW) to acquire, understand and maintain these new data feeds which are planned for Feb 2024.

Whilst social care data will be provided via the NDR (for delivery during 2024) work will also be undertaken in partnership with our constituent local authorities during 2022 in order to obtain data such as care home placements and package of care data to truly give a “home to home” view of a person’s pathway and care. This will greatly aid in the holistic view of care but also help surrounding

population health understand when joined with disease burden information and social determinants of care data etc. once the flow of data from the NDR is enabled. Combining all of these data will allow us to better understand and create our own population health datasets at a person level and will help contextualise our pathways analytics (for delivery in 2025).

3.10 Better Decision Making

Better decision making will be achieved by drawing on the interlinked themes from this section of the document and via the realisation of the initiatives described within the next section. This will lead to a "Single version of the truth" policy with data that comes from an approved quality assured source with standards applied.

4 BUSINESS INTELLIGENCE SUPPORT OF STRATEGIC AMBITIONS & AIMS

In order to meet the ambitions and themes set out in this strategy there are several initiatives that will need to be implemented. These initiatives will truly transform business intelligence within Swansea Bay University Health Board. The high-level strategic alignment grid below and accompanying narrative indicate what these initiatives are and how they link to our Organisational Strategies Better Care Enabling Objectives.

Swansea Bay University Health Board Business Intelligence Alignment Grid

	Business Intelligence Initiative	Alignment to our Organisational Plan				
		Best Value Outcomes from High Quality Care	Digitally Enabled Care	Partnerships of Care	Excellent Staff	Outstanding Research, Innovation, Education & Learning
1	Establish Data Value and Literacy Programme	✓	✓	✓	✓	✓
2	Create New Enterprise Data Warehouse (EDW)	✓	✓	✓	✓	✓
3	Establish Advanced Business Intelligence Platform	✓	✓	✓	✓	✓
4	Acquire New Data Sources*	✓	✓	✓	✓	✓
5	Review of Technologies, Tools and Methods	✓	✓	✓	✓	✓
6	Recruit Staff with Advanced Analytical and Visualisation Skills	✓	✓		✓	✓
7	Establish Certificated Analytical Training Programme	✓	✓		✓	✓
8	Establish Governance Processes	✓	✓	✓	✓	✓
9	Generation of Business Intelligence Implementation Plan	✓	✓	✓	✓	✓

**includes data from Patient Reported Outcome Measures (PROMs), Patient Portal, Primary Care, Voluntary Sector and Local Authority*

4.1 BUSINESS INTELLIGENCE INITIATIVES

The completion of these initiatives will increase our business intelligence maturity by:

1. Delivering a new Business Intelligence Ecosystem.
2. Ensuring we have the right people with the right skills.
3. Driving home, the value of data and fostering a data literate workforce.
4. Making sure it all happens with the right engagement, processes and governance in place.

4.1.1 Establish Data Value and Literacy Programme

A key element in the delivery of our ambition for business intelligence within the organisation is the improvement of the organisation's data literacy and the value we place on data. The organisation will not realise the benefits from the business intelligence ambition set out here unless stakeholders act upon the insights produced. Use of the Business Intelligence Maturity Model from the Advisory Board highlighted that the current state of "Culture / Enterprise Data Literacy" within the organisation is in a fragmented state of maturity (appendix 1).

As well as having the right data presented in the right way the organisation also needs to be better at understanding and using data so that health care and planning decisions can be data-driven and based on evidence. We need to ensure our workforce:

- Understand the importance of data and how it can help them.
- Have confidence in their own ability to interpret and analyse data.
- Have confidence in the accuracy of the data that they use.
- Are encouraged to use, challenging and discus results.
- Understanding the pitfalls of data.
- Understand the important of timely and accurate data entry.

We need to tackle this problem through training, engagement and best practice and ensure that we have a joined up approach to delivering a structured data value and literacy Programme. It is envisaged that a number of areas within the Health Board will come together to work on this including Digital Services, VBHC, Finance, Transformation, Workforce and Occupational Development and Performance. We will also engage nationally with the Welsh Modelling Committee, National Data Warehouse and Business Intelligence Group and the NDR.

We also need to make sure that our business intelligence platform can support this area as much as possible. It must have data quality metrics, a fully integrated help system, only contain quality assured data and have tool tips (on screen popups) explaining the data and any pitfalls so the end users have confidence in its use.

The Digital Intelligence Department will support this by:

- Drop-in sessions at various sites for staff.
- Blogs (hosted within the Digital Intelligence Information Portal).
- General analytical training and dashboard training videos.
- Social media (@Business Intelligence SBUHB).

It is anticipated that the programme will be delivered during 2022 as outlined in the implementation plan timeline.

4.1.2 Create New Enterprise Data Warehouse (EDW)

The new EDW will ingest, process and store data for consumption within the Business Intelligence Platform. It will be fast, scalable reliable and support the addition of new data sources for automated feeds that are as close to real time as possible. Existing processes such as patient level matching of datasets will continue and new processing abilities such as linking patients to pathways for holistic, one system of care, views of data will be introduced. The EDW and associative technologies will allow us to embed artificial intelligence into our data pipeline.

These data will be made directly available to advanced certified users (such as analysts, finance partners and managers) within the organisation in the form of data cubes, creating a cube DataMart. These cubes will have pre-programmed quality assured content and calculations will be performed within them to help foster one version of the truth. Standard users (those without certification) will still be able to access the underlying data via existing published reports via the business intelligence platform. These users will also be able to request new automated self-service reports for delivery by the platform as well as making use of the ad-hoc information request service run by expert analysts in order to find answers to questions.

The new EDW will also support the new National Data Resource (NDR) by providing data to it and accepting data from it. The NDR is a ten-year programme run by DHCW that will take data from clinical information systems and data warehouses from all health boards and rusts in Wales to allow for a national joined up data store for analysis and research.

It is anticipated that the EDW will be delivered during 2023 as outlined in the implementation plan timeline.

4.1.3 Establish Advanced Business Intelligence Platform

An advanced business intelligence platform with some advanced functionality will be launched during 2022. By 2025 the platform will meet the ten themes in the previous section. It will be scalable, sustainable, cost effective, easy to use and quick to develop applications in. It will deliver hindsight, insights and foresight via the use of advanced analytics to end users with a host of data visualisations, pre-programmed measures and KPIs being made available. The platform will allow users to see high level views of data in visualisations such as tables and charts and then allow them to highlight areas of interest and to drill down into the data to understand what has happened (where appropriate to patient level). The platform will allow intelligent flagging using artificial intelligence in order to highlight key changes in the data to alert users to where they need to focus their attention.

Trained certified users will be able to create their own reports containing a number of visualisations using quality assured data from the EDW.

The Digital Intelligence Portal will act as a point of access to the platform.

4.1.4 Acquire New Data Sources

New data sources will be added to the EDW such as data from our patient flow system, patient portal and PROMS systems. We will also work with our services to review existing data feeds and look for opportunities to augment those data with new data items that add value. Our Clinical Services Plan references how Primary Care Clusters can help us to achieve all seven of our Clinical Service Plan ambitions. In order to perform analytics, surrounding our cluster transformation plans we will need to work toward acquiring data from our constituent GP practice clinical systems. We will also work with our local authority colleagues through the West Glamorgan Partnership in order to provide analytics on initiatives such as Home First.

It is widely accepted that around 80% of data in an organisation is unstructured, such as clinic letters, e-mails and free text entries within IT systems. These data hold much potential in healthcare and could greatly strengthen what is known about our patients and services especially when combined with existing structured data. We will create a new data resource for the storage of these unstructured data for analysis alongside our EDW to increase our analytical capabilities. This “data lake”, can then be used directly by our business intelligence platform or be transformed into structured data for use within our EDW depending on what processing is needed. We will also work with industry and Swansea University to bring in data from our clinic letters and other documents stored electronically via natural language processing. Finally, we will bring in data from our diagnostic monitoring devices and with consent from patients, data from their patient portal. This Internet of Things (IoT) data, as described by the Advisory Board, is an emerging field for analytics which in time can help us to understand our patients and their outcomes and will be a power addition to exiting data sources such as PROMS, PREMS and activity data.

The acquisition of data will be an ongoing process far beyond the delivery timeline for this strategy however it is anticipated that the majority of the datasets discussed in this document will be delivered by 2024 as per the implementation plan timeline milestone relating to ND/CDR.

4.1.5 Review of Technologies, Methods and Tools

The infrastructure needed to meet our business intelligence ambitions has already been reviewed by our Digital Intelligence Department in conjunction with the wider Digital Services Directorate, DHCW and representatives from the All Wales Business Intelligence and Data Warehousing Group.

Ongoing reviews will be performed with the right stakeholder membership including industry and academia. A review cycle and process will be embedded as part of the proposed governance structure surrounding business intelligence with the establishment of the new Architectural & Tools Group. Details of this group can be seen in the governance section.

4.1.6 Recruit Staff with Advanced Analytical and Visualisation Skills

Whilst our new platform will have AI and advanced analytical functions built into it we will require skilled individuals to work in this area who are able to perform advanced analytical functions within our EDW before the results are presented to the platform or expert users for use. In order to perform these advanced analytical functions, we will require analysts, data scientists and a statistician who are able to clearly understand and address specific problems and apply the right methods and tests to answer questions. They will need to work with advanced tools such as Python, R, NoSQL, PIG and TSQL, C# to obtain the correct analytical output and produce the best visualisation. Using the right visualisations for specific types of analysis will allow us to clearly convey messages back to the end users, in the simplest form and in line with our Data Literacy Programme. The inclusion of Business Intelligence Partners with many of the above skills who will also act as a direct link to our SDGs and will further enhance the delivery of advanced analytics by ensuring requirements are understood, developed ensuring coproduction with the SDGs and other stakeholders.

Currently there is much competition for staff with these skills and a salaries are much higher within the private sector. In order to recruit the additional member of staff required for our ambitions within the strategy the organisations digital intelligence department will engage further with the NDR work stream that is looking at how we address this whilst also exploring options with our partner university for possible recruitment pipelines.

4.1.7 Establish Certificated Analytical Training Programme

As part of the Business Intelligence Implementation Plan, we will establish a two tier knowledge, skills and abilities certificated training programme:

1. Establish an analytical training program for advanced end users of the Business Intelligence platform and EDW. Candidates who pass these tests and assessments and with sponsorship from their line managers will be allowed to access to the Cube DataMart to produce their own analytics directly.

2. A separate tier of ongoing certification introduced for the Digital Intelligence team and other advanced analysts for continued professional development. This will ensure that:
    a) Skills are maintained
    b) We innovate and use the latest tools and techniques

c) Foster organisational transparency and confidence.
d) Maintain a high standard of ad-hoc information service

Both courses will be produced with consultation from the Welsh Modelling Collaborative (WMC) and the Welsh Government skills and capabilities review programme, part of the NDR programme.

We will work with these partner organisations to undertake a skills and capabilities review programme that builds on the work already done by the NDR programme. This will further identify the specific skill gap and analytical resource shortage that is known to exist within Wales.

It is anticipated that this two tier programme will be established by March 2023.

4.1.8 Establish Governance Processes

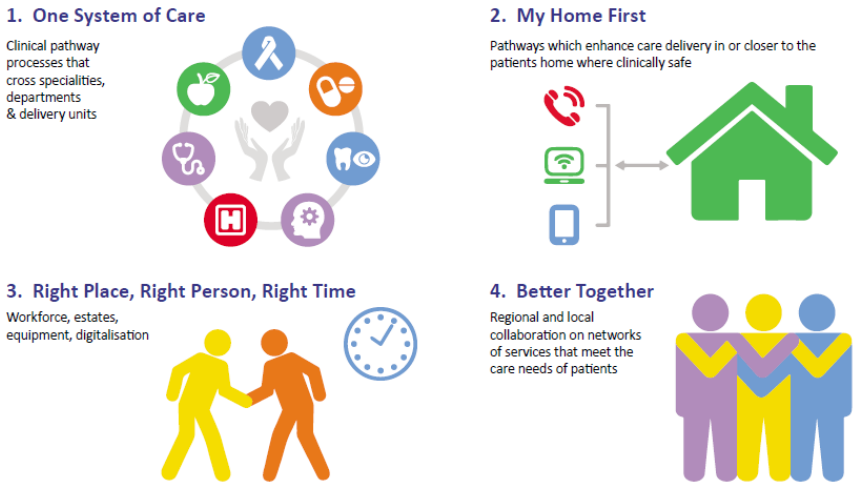
In order to achieve our ambitions new governance processes and groups have been established at the time of publishing this report there are however some technical groups that are yet to be created. The newly created groups and processes are detailed in the governance section of this report along with those yet to be created.

4.1.9 Business Intelligence Implementation Plan

A Business Intelligence Implementation Plan/Timeline has been produced to drive forward and deliver the ambitions and initiatives outlined within this document. It has involved engagement with stakeholders within this organisation and some of our partners so that views captured directly feed into the deliverables of the plan.

4.2 ALIGNMENT TO THE ORGANISATIONAL STRATEGY

By 2025 we will have embedded support for the ambitions set out within our organisational strategy into our new business intelligence Ecosystem. There is also strong alignment to the four Clinical Service Plan's Planning principles given their alignment to the Organisation Strategy.



4.2.1 Best value outcomes from high quality care:

The new platform and EDW with its accompanying data will:

- Allow us to focus our services on outcomes that matter to people using data drawn from our own population for evidence.
- Help us to monitor, model and understand how we can eliminate unwarranted waste, harm and variation, to maximise efficiency and productivity. With analytics to support VBHC, efficiencies costs and outcomes.
- Share that the highest standards of patient safety and quality of care are achieved and where they are not for us to understand why, how and when in order to improve them.
- Ensuring we can perform almost real time ongoing measurement of our citizens care to ensure that care is provided to people in places that are safe, welcoming and efficient.
- Support our Clinical Service Plan planning principle "One system of Care".

4.2.2 Partnerships of Care: It is anticipated that by 2025 we will have strengthened our partnerships regionally with the West Glamorgan Partnership, our Primary Care Clusters and others and have data sharing arrangements and processes in place locally and with the NDR. We will:

- Have a platform capable of analysing matched patient level data for the analysis of integrated care services across different organisations creating a truly holistic view of care.
- Analyse Best Value outcomes from high quality care with less organisational boundaries.
- Share analytical self-service and automated content including KPIs with our partners.
- Work together across organisational boundaries to develop metrics for new initiatives such as Hospital to Home and Cluster Transformation Projects.
- Support our Clinical Service Plan planning principle "My Home First".

4.2.3 Excellent staff: In order to have a workforce that meets our service needs and lead and support change we need to:

- Ensure QSIR analytics and data are made available to our workforce
- Provide outcomes data that show staff practicing at the top of their competence
- Make our workforce more data literate and comfortable with using data.
- Support our Clinical Service Plan planning principle "Right place, Right Person, Right Time".

4.2.4 Digitally Enabled Care: The platform will enable the organisation to become data driven and allow for the ingestion of data from our new digital products for analytics, further supporting "Right place, Right Person, Right Time".

4.2.5 Outstanding Research, Innovation, Education and Learning: We will establish further relationships with Swansea University to help us progress our natural language processing ability. They will gain access to our data for research purposes to augment the data already provided via DHCW into the SAIL databank that come from our existing data warehouse.

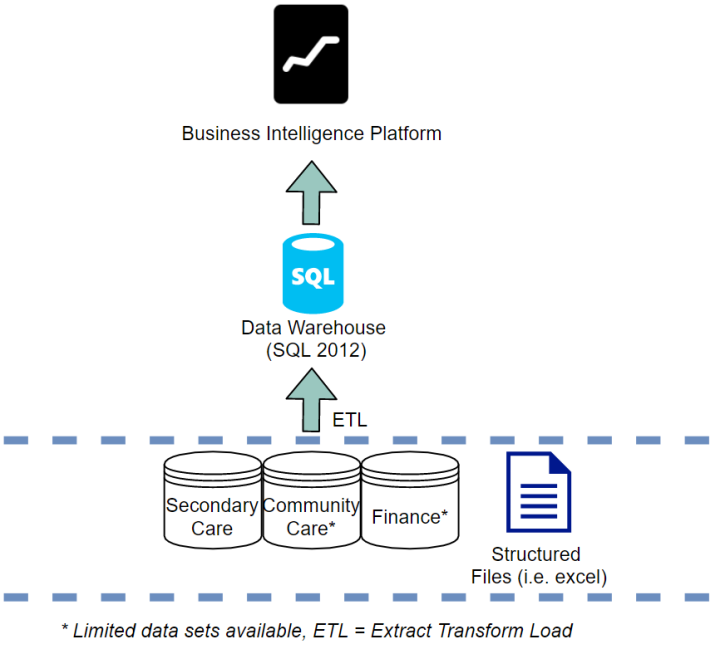
NLP derived data from research studies that use our data can then be brought back into our EDW and automated for use in ongoing analytics. These models will also be automated to provide continuous feeds. These data will be invaluable for outcomes and discovering new things about our patients that our current systems do not capture such as patients living alone, comorbidities, family histories in addition to research findings. Will also work with industry to enable cohorts for clinical trials. All of this work will support all four Clinical Service Plan Planning Principles.

5 FUTURE STATE OF BUSINESS INTELLIGENCE AND GAP ANALYSIS

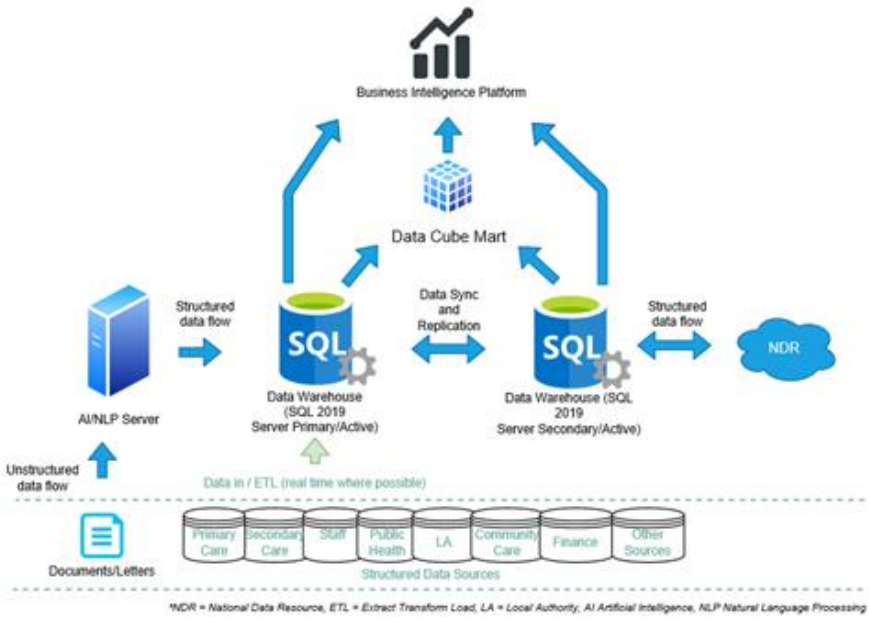
5.1 PLATFORM & INFRASTRUCTURE (ARCHITECTURAL BLUEPRINT)

The current infrastructure along with the proposed future state required to meet the ambitions set out within this document can be seen below. The current gap is also highlighted between the current state and future state with benefits shown.

Architectural Current State



Architectural Future State



Current Architectural Gap

Business Intelligence Environment	Current State	Future State
Real Time Processing*		✓
Patient matching	✓	✓
Pathway Matching		✓
Data Cubes accessible by end users		✓
Business Intelligence platform in use**	✓	✓
EDW capable of advanced analytics		✓
Enterprise wide solution		✓
Interactive reports available on mobile devices		✓
Support AI functions and unstructured data		✓
Disaster recover (DR) and Business continuity (BC)		✓
NDR Support		✓

** Where required within minutes, ** the existing platform is complicated to develop in and missing many advanced features*

6 DATA QUALITY

We need to ensure that the data that we use is of good enough quality. If data are inaccurate, inconsistent or incomplete then our potential for making ill informed decisions is greatly increased and will harm the value we place on data and our data literacy.

In order to ensure good quality data we will introduce a Data Quality Committee who will have the oversight and authority to:

- Make changes to workflows and data entry processes.
- Ensure entry rules are followed.
- Link in with national data quality groups and ensure national standards applied.
- Create adapt and maintain policies and guidelines.

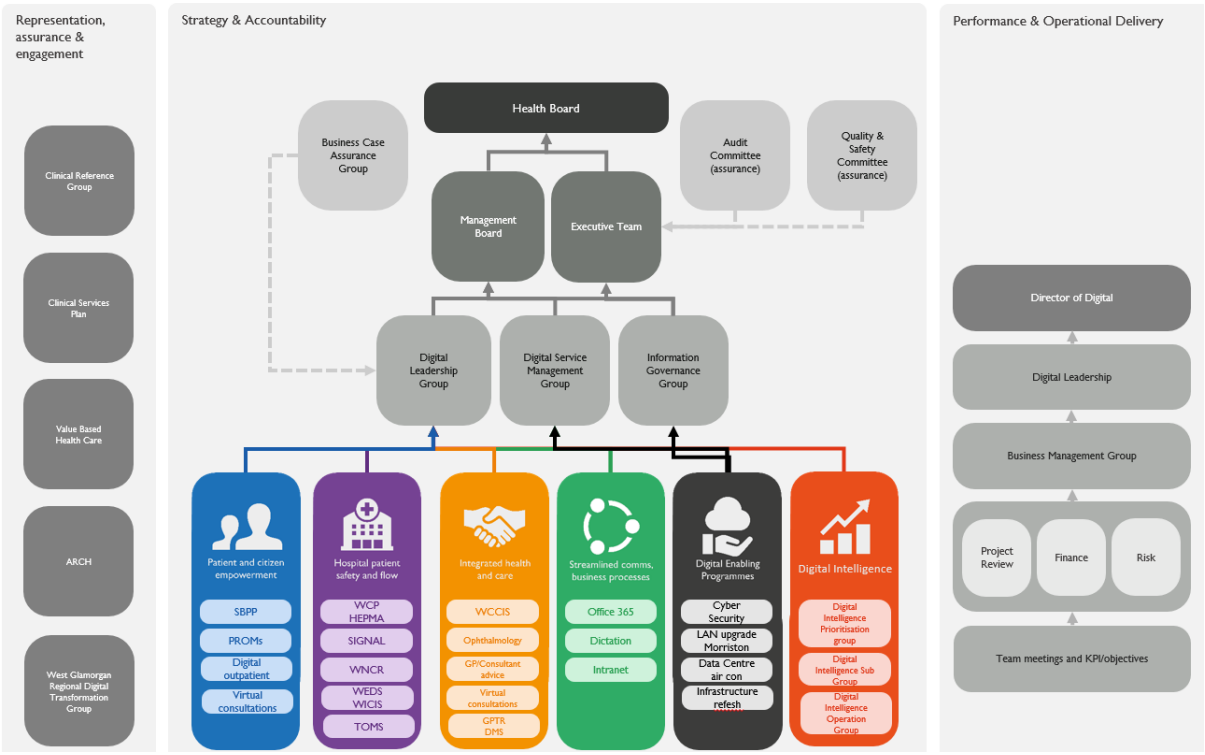
- Maintain the overarching Health Board Wide Data Quality Policy.

The organisation already has several subject matter experts in the areas that they work and in the data that they use from national and local management information systems. These subject matter experts will need to be identified and brought into our governance processes to create data stewards for primary and secondary data use. These additional duties will have a resource implication and new roles may need to be created where they do not already exist or whereby services are not able to release resource.

7 GOVERNANCE

It is essential that we have a mechanism for aligning Business Intelligence priorities to the Health Board's ambitions and strategic initiatives, determining the best way to achieve goals, prioritising the allocation of resources, and monitoring and measuring performance, progress, and compliance. As such a new Business Intelligence governance model has been embedded within the Health Board's Digital Services Governance Model. New groups and roles have been created in order to meet our business Intelligence ambition with membership and terms of reference agreed, with additional groups to come online during 2022 as detailed on the next page.

Overarching Digital Services Governance Structure with Embedded Digital Intelligence: showing the Business Intelligence Governance Elements



Digital Leadership Group (DLG) – *In place*

- Focus on strategy and monitoring execution, progress and compliance

Digital Intelligence Strategic Group (DISG) - *In place*

- Meet quarterly

- Have a strategic focus with membership made up of the Chief Operating Officer, SDG Service Directors, senior clinicians, finance and digital intelligence staff.
- Report directly to the Digital Leadership Group.
- Reviews work packages which have been fed into it by the Digital Intelligence Prioritisation Group (DIPG)
- Ensure alignment to the organisational strategies and plans.
- Manage overall strategic direction and overall project tracking.

Digital Intelligence Prioritisation Group (DIPG) - *In place*

- Report directly to DISG.
- Determine work packages for the forthcoming month
- Resolve issues and escalate where appropriate to the DISG.
- Membership comprised of the deputy Chief Operating Officer, Operational Service Leads, Clinical heads, Finance Partners, Digital Services Assistant director and Digital Intelligence Leads.

Digital Intelligence Operational Group (DIOG) - *In place*

- Report directly to DIPG.
- Meet weekly to manage work packages.
- Resolve issues and escalate where appropriate to the DISG.
- Membership comprised of Digital Intelligence Leads/operational staff and analysts.

Data Quality Committee (DQC) - *delivered during 2022*

The Information Governance Committee will:

- Be IT-led but not IT focused
- Increase access to well-governed data to empower operations stakeholders to use data to inform all decisions and service improvement initiatives
- Initially focused on practice short term needs to establish momentum.
- Make data quality the imperative of the group to deliver actionable insights and intelligence
- Ensure system end users have roles as either data stewards or subject matter experts
- Adopt a balanced approach to immediate needs and future requirements
- Have the authority to institute changes to workflows, resolve data quality conflicts and develop complex data acquisition strategies designed to support the strategic clinical and financial optimisation of the Health Board
- Make changes to workflows and data entry processes.
- Ensure national standards are followed and local feedback given to national groups
- Ensure entry rules are followed.
- Create adapt and maintain policies and guidelines.
- Maintain the overarching Health Board Wide Data Quality Policy.
- Ensure outputs feed directly into the MDM – Master Data Management tools and processes.
- Maintain the information asset register

Architecture and Tools Group (AaTG) - *delivered during 2022*

- Share knowledge skills, guidance and expertise around BI tooling and its use within various departments within the Health Board.
- Ensure that the latest technologies are reviewed for use within the Health Board using a structured review process and utilising research such as the Gartner Magic Quadrant for Analytics and Business Intelligence Platforms (Appendix2).
- Ensure linkage with Swansea University and other partners, including DHCW and their National Data Resource initiative, All Wales Business Intelligence and Data Warehouse group, Welsh Modelling Collaborative and Advanced Analytics Group to drive innovation.
- Find cost effective/cost neutral ways to use the latest technologies where a clear benefit can be identified via a benefits realisation process.

Artificial Intelligence Group (AIG) - *delivered during 2022*

- Provide guidance on the use of AI and NLP installations here in Swansea Bay
- Prioritise projects and resources
- Ensure outputs are streamed into our EDW
- Ensure representation from academia and industry
- Escalate any issues to the DISG

8 RESOURCES

The delivery of the business intelligence ambition and initiatives outlined within this document can lead to better health, better care, better lives and reduce unwarranted variation, waste and costs. However, there will be resource implications associated with the delivery of this strategy's Business Intelligence Ecosystem.

The Digital Intelligence Department spends a considerable amount of staff resource with "keeping the lights on" with activities such as:

- Submission of statutory returns
- Performance monitoring
- Submission of commissioning datasets
- Dashboard maintenance
- Data Warehouse maintenance
- Freedom of Information requests
- Answering ad hoc information reporting requests

The BI team is well positioned to manage a significant element of this strategy from a workforce perspective, with funding having been made available for additional staff resource in the form of Business Intelligence Partners to support close working with SDGs. In order to increase the organisation's Business Intelligence maturity and deliver on the contents of this strategy there may however be a need for increased funding relating to hardware and software across the Digital Services Department – this may or may not create the potential for further staffing costs.

There may also be resource implications for delivery units depending on their requirements going forward and for the development of roles such as data stewards and releasing time for Subject Matter experts to collaborate on business intelligence projects.

9 ASSESSMENT: HOW WE MEASURE OUR SUCCESS

We will measure our success by ensuring the delivery of a new advanced business intelligence environment and supportive ecosystem. The ecosystem will be established by building on existing work and levels of business intelligence maturity and leveraging skills and capabilities from our existing workforce and domain experts. To deliver on our plans we will listen to our stakeholders and take the opportunity to work with our partners from Swansea University, West Glamorgan Partnership, DHCW, the Welsh Modelling Collaborative and others.

By 2025 we will have:

- Contributed to each of the Better Care Enabling Objectives
- Increased our Business Intelligence Maturity
- Delivered on our Business Intelligence Initiatives
- Built a new Business Intelligence Environment
- Produce reports on ecosystem usage and introduce KPIs that demonstrate the effectiveness of the services offered.

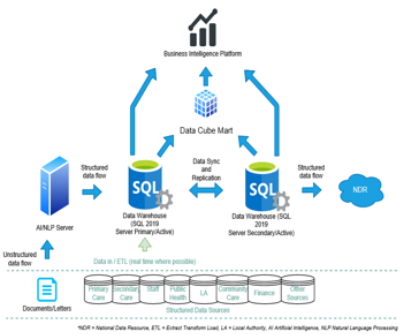
Successful Business Intelligence Ecosystem

Contributing to our Organisation's Better Care Enabling Objectives	
Best Value Outcomes from High Quality Care	✓
Digitally Enabled Care	✓
Partnerships of Care	✓
Excellent Staff	✓
Outstanding Research, Innovation, Education & Learning	✓

Business Intelligence Initiatives	
1	Create New Enterprise Data Warehouse (EDW)
2	Establish Advanced Business Intelligence Platform
3	Acquire New Data Sources*
4	Review of Technologies, Tools and Methods
5	Recruit Staff with Advanced Analytical and Visualisation Skills
6	Establish Data Value and Literacy Programme
7	Establish Certificated Analytical Training Programme
8	Establish Governance Processes
9	Generation of Business Intelligence Implementation Plan

Evidencing the Delivery Of

New Business Intelligence Environment



Increased Business Intelligence Maturity	
Intelligence Process	✓
Advanced analytics	✓

APPENDICES

Appendix 1: The Advisory Board's Business Intelligence Maturity Model

Highlighted areas shows the Swansea Bay University Health Board State of Maturity

	Fragmented	Enterprise Perspective	Advanced Analytics	Intelligent Process Automation
BI Architecture	Limited, dominated by departmental point solutions.	Centralised infrastructure and strategy, departmental solutions are integrated into an enterprise strategy.	Advanced algorithms analyse and enrich data and publish insights back to centralised infrastructure. Some insights embedded into core workflow applications.	Tight integration with core workflows. Algorithms make decisions in many repeatable core operational processes.
Data Sources / Data Currency	Limited to data available within the point solution silo.	ETL[2] combines data from high-value primary sources[3] such as EMR,[4] revenue cycle, and other key operational systems.	ETL incorporates secondary[5] sources, unstructured data (e.g., narrative text, genomes, images), and may incorporate unconventional external sources (e.g., social media, IoT[6]). Increased emphasis on near real-time data for some sources.	Emphasis on real-time data and calculation to drive automation in operational processes.
Use of Analytics	Departmental reporting.	Enterprise KPIs,[7] operations analysis, population health surveillance.	Demand projection, population risk projection, contract simulation, process optimisation, research.	Clinical protocol automation, resource scheduling optimisation, procurement automation.
Analytical Techniques	Descriptive statistics (counts, sums, averages).	Ad-hoc drill-down, self-service BI, simple trend projections.	Knowledge discovery, natural language processing, statistical classification and projection.	Business and clinical goal optimisation, decision modelling, constraint programming.
Data Models	Limited, single-purpose models.	Shared, reusable models.	Unstructured data, late binding of models.[8]	Decision modelling, business constraints, justification for actions.
Data Governance	Limited or no governance, localised decisions about use and usability of data.	Common policies and standards, centrally-managed priorities, shared documentation, focus on data quality and consistency, basic MDM.[9]	Advanced MDM, semantic data normalisation, source system change control and monitoring.	Active supervision of decision algorithms, periodic performance review and adjustment of goals.
Tools	Independent choices for departmental needs; redundant products.	Centralised platform providing ETL, database management, reporting, and visualisation.	Advanced statistical analysis, data mining, text analytics, big data platforms, advanced MDM.	Rules engines, deep integration with operational applications (including EMRs).
Skills	SQL,[10] Excel, basic data modelling, basic visualisation.	In-depth knowledge of physical and logical data modelling, descriptive statistics.	In-depth knowledge of statistics, data mining, text analytics, advanced MDM.	Optimisation, rules engines, process engineering.
Culture / Enterprise Data Literacy	Value of data under-appreciated. Decisions based on limited or no data.	Champions emerging, growing emphasis on data governance and data-driven decisions.	Broad-based data literacy, models inform strategic decision making, active identification and pursuit of analytics opportunities by senior leaders.	Confidence in advanced decision support and automation of operational processes.
BI Governance / Organizational Structure	Local control.	Core BI team or centre of excellence. Departmental analysts coordinate changes with core team.	Resources harmonised between central core and federated stakeholders. Strong governance process in place.	Active collaboration by process stakeholders in development of decision models.

Developed by Jim Adams, Meg Aranow, Emie Hood, Dale Sanders, and Greg Kuhnen.

1) Red cells indicate the primary distinguishing characteristic of each maturity phase
2) ETL = Extract, Transform and Load, a class of tools for moving and manipulating data between disparate systems
3) Primary sources are those captured directly by the health system or partner as a part of operations
4) EHR= Electronic Health Record
5) Secondary sources are those captured by processes external to the organisation's direct relationship with the patient. Socioeconomic data, geographical data and social media are all examples.
6) IoT = Internet of Things
7) KPI – Key Performance Indicators
8) Later binding is sometimes referred to as "schema on read"

Appendix 2: The Gartner Magic Quadrant for Analytics and Business Intelligence Platforms

Appendix 3: The Eight Caldicott Guardian Principles

1. Justify the purpose for using confidential information.
2. Don’t use personal confidential data unless absolutely necessary.
3. Use the minimum necessary personal confidential data.
4. Access to personal confidential data should be on a strictly need-to-know basis.
5. Everyone with access to personal confidential data should be aware of their responsibilities.
6. Understand and comply with the law.
7. The duty to share information can be as important as the duty to protect patient confidentiality.
8. Inform patients and service users about how their confidential information is used