

YOUR GUIDE TO

MODERN ANALYTICS IN HEALTHCARE

OPERATE BETTER WITH
REAL-TIME INSIGHTS



ANSWERS IN DATA

Healthcare organizations struggle with several daunting issues that affect healthcare quality. Low unemployment, high demand for healthcare providers, and ever-changing healthcare epidemics are a few of the challenges facing healthcare industry leaders. Finding ways to optimize their workforce and workplace is imperative. For many organizations, Microsoft's data analytics resources are becoming essential to the process.

Healthcare Analytics covers a broad range of businesses and offers insights on both the macro and micro level. It can reveal paths to improvement in patient care quality, clinical data, diagnosis, and business management. When combined with business intelligence suites and data visualization tools, healthcare analytics help managers operate better by providing real-time information that can support decisions and deliver actionable insights.



QUALITY DATA IS THE BEST BUSINESS PLAN.

Value-based care models can be developed faster and more efficiently, helping use analytics to reduce cost. Through Microsoft's rich ecosystem of advanced data analytic tools and technologies, healthcare organizations are provided digital transformation opportunities to help control healthcare costs and improve patient care outcomes.

MODERN APPLICATIONS

HEALTHCARE BI SUITES TEND TO EMPHASIZE BROAD CATEGORIES OF DATA FOR COLLECTION AND PARSING: COSTS AND CLAIMS, RESEARCH AND DEVELOPMENT, CLINICAL DATA, ALONGSIDE PATIENT BEHAVIOR AND SENTIMENT.

The industry has been notoriously slow to adopt tools that automate data management. Additionally, it has become too complacent with piecemeal information, remaining blind to complete, sequenced patient journeys. With the rise of tokenization, linking patient-level data, at a scale required for machine learning, is more feasible than ever before.

Healthcare's big data infrastructure must pave the way to enable predictive modeling, blazing-fast queries, and the delivery of precise insights. The new standard in advanced analytics includes automation and tokenization, opening the door for healthcare institutions to benefit from meaningful and actionable insights at an unprecedented scale.

For hospitals and healthcare managers, healthcare data analytics provide a combination of financial and administrative data alongside information that can increase quality of patient care, better services, and improve existing procedures.

The first category assists administrators with identifying areas to reduce revenue leakage and streamline the patient revenue cycle.

Research and development are crucial aspects of healthcare, providing new innovative solutions and treatments that can be properly tracked, measured, and analyzed.

Clinical data is vital for administrators to determine what areas of their service need to improve and offer more granular information regarding treatment effectiveness, success rates, and more.

Finally, understanding what patients and clients are feeling and how they react to service and treatment is critical when working towards extending ever-improving services.



4 NEW STANDARDS

Automation and architecture

Breaking through interoperability barriers is critical to success, that's why the latest big data standard is to combine external data sets from many sources, including claims, clinical, lab, prescription, and social determinants of health (SDOH) data, and link the data at the patient-level. Such a vast data set enables far more nimble benchmarking and more precise trending and predictive modeling. Automating the ingestion and cleaning of big and dirty datasets is a non-trivial task where the application of machine learning and AI is essential. It requires a secure, HIPAA-compliant infrastructure with the ability to rapidly ingest new data from external sources, including your own.

Fast and precise intelligence

Closing the gap between analytics in healthcare and analytics in the consumer and banking industries does not stop with amassing vast, high-quality data sets. It requires an automated pipeline, capable of processing billions of claims and training hundreds of models on tens of millions of patient records in hours. Your insights are then always fresh and accessible, as the data is automatically ingested and cleaned, and the predictive models are refreshed in the background.

A next-generation healthcare analytics stack should also have an advanced grouper, which flexibly organizes data, so it can be cut and analyzed to answer seemingly endless business questions. As business questions arise, teams want to quickly self-serve by querying the data in user-friendly software and having it return precise insights on-demand.

Adaptive delivery

Any insight generated by big data is worthless unless it leads to a better decision. This requires insights to be delivered into the workflow through a range of visualizations and formats. You will need to align the most appropriate format (data portal, cloud-based software or mobile application) to the recipient and workflow.

Software applications

Ultimately, delivering analytics via configurable, user-friendly software applications is critical for team productivity. Enabling health plan teams to self-serve insights into referrals partners, network performance, and population risk, for example, can help them achieve value. Similarly, enabling an ACO team to self-serve insights into variations in care delivery or financial performance in value-based contracts can help them achieve success.



Drouin, Jean. "Healthcare enters the age of enterprise analytics." modernhealthcare.com, 1 Jan. 2021.

**CREATE A SINGLE
SOURCE OF
TRUTH.**

USE CASE SCENARIO

Spartanburg Regional Healthcare System (SRHS) has been serving their community for 90+ years. With over 700 physicians and 9,000 employees, their mission is to provide excellence in health in several counties in North and South Carolina. More than a dozen facilities provide a broad range of essential and comprehensive healthcare services. SRHS is self-funded and must continually look for new and innovative ways to increase the quality of patient care while keeping costs at a minimum.

With that end in mind, the Enterprise Intelligence (EI) team at SRHS began to explore solutions for delivering data quickly, accurately, and efficiently to a wide range of stakeholders in their organization. These stakeholders include hospital physicians, report users across different business units, C-level decision makers, and more. The EI team realized the need for added support after an increase in demand and interest in the Power BI toolset, with multiple Proof-of-Concept solutions deployed, and various teams and individuals leveraging Power BI desktop for ad-hoc reporting.

3Cloud worked with the EI team to develop a strategic approach to deploying Power BI across the organization, which will drive long-term success for corporate BI, ad-hoc reporting, and self-service analytics.



Our client had a lot of data and analysis happening, but for all their efforts, they were finding that their analysts were producing reports with competing views of the truth for how the organization and its doctors and patients were doing.

Katy Young, 3Cloud Consultant for
Modern Business Intelligence

SOLUTION DESIGN

3Cloud worked with SRHS to define the desired results of their Power BI adoption:

- User satisfaction realized through a consistent, well-designed platform and user experience
- Increased business productivity from automated reporting
- Expanded reporting capability to compliment standard clinical solutions

Together, a three-part engagement was designed to achieve these goals.

2 - Best Practices

Partnering with SRHS’s finance department, 3Cloud completed a makeover of one the original Proof-of-Concept solutions, which converted a set of existing Excel-based reports into Power BI. These reports serve an essential business function, allowing finance team members to track and analyze general ledger data and profit loss statements. 3Cloud converted the data model to adhere to best practices in dimensional modeling by leveraging a star schema. Several measures were rewritten to improve accuracy and efficiency. These best practices were shared with both the finance and EI teams to enhance their skills and set them up for long-term success.

Power BI Monitoring Solution

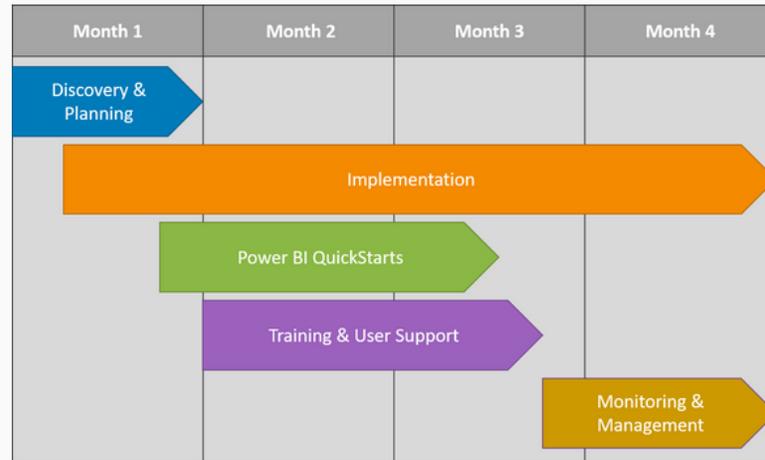


1 - Adoption Framework

3Cloud and SRHS worked to define their overall approach to leveraging Power BI as a tool for both IT-Managed and Self-Service BI. Through collaborative sessions with members of the EI team, IT, and other business units, four primary guides were created to define the foundation for SRHS’s Power BI Adoption and serve as lampposts as the platform footprint grows over time:

1. Power BI Governance Guide
2. Power BI Deployment Guide
3. Power BI Security Guide
4. Power BI Gateway Administration Guide

Power BI Adoption Stages



3 - Power BI Monitoring/Auditing

As a healthcare provider, the ability to audit activities in the Power BI service is paramount. To meet compliance standards, SRHS staff need to be able to provide detail regarding who accessed which datasets and when. They also need to track export, distribution, and sharing activities as part of their data governance and security standards. To achieve these goals, 3Cloud deployed a monitoring and auditing solution designed to capture Power BI tenant inventory, Power BI tenant activity, and gateway health data.

SUMMARY RESULTS



Key Performance Indicators

- A month-over-month increase in actively used workspaces across multiple business units
- A month-over-month increase in Apps deployed from workspaces across multiple business units
- Increase in licensed Power BI Pro users each month, quarter, and by end-of-year
- Increase in report views from both corporate and self-service sources
- 95% of refresh operations completing successfully (gateway and dataset health)

Using Power BI Admin APIs, the Power BI Activity Log PowerShell commandlet, and Gateway logs, data is extracted, transformed, and loaded into a SQL database for staging and storage. Three distinct Power BI reports use these datasets to allow SRHS Power BI administrators to monitor and track changes in their environment over time. In addition to auditing, the SRHS team is using the activity data to help drive Power BI adoption.

As SRHS's Power BI Adoption gains traction, a user base of nearly 700 people is expected to begin utilizing the tool. Setup of a well-governed solution ensures that SRHS realizes maximum return on their investment – reducing data collection and manual reporting processes for 700 users is no trivial feat. As more and more Power BI datasets are created by SRHS's skilled data modelers, more analysts across the business will be able to create insightful, actionable reports used to increase patient outcomes while keeping costs at a minimum. Additionally, the foundation of SRHS's Power BI solution has opened the door for AI functionality, enabling even more enhanced BI reporting.

One year later, SRHS has seen vastly increased demand for data and analytics exposed through the Power BI tool. The EI team is considering an expansion to Power BI Premium to support this surge in users and use cases. Together with 3Cloud, SRHS is actively exploring new ways to support and train their data modelers, report authors, and end users as they continue to leverage Power BI for critical decision making.

POWER BI ADOPTION

Discover value, align the team, and develop your Power BI deployment and governance strategy.

Successful Power BI

Implementations have the potential to transform the way organizations access and analyze data from all aspects of their business. This QuickStart and Planning engagement is a starting point for organizations looking to maximize their Power BI investment with outside expertise.

Our **3Cloud's Framework for Modern BI** is built upon our team's experience helping over one-hundred clients utilize Power BI as an enterprise reporting and self-service BI platform. This 2-4 week engagement begins with a Modern BI Vision workshop to first understand an organization's current state and goals. The workshop uncovers and addresses challenges that organizations face with modern BI deployments: from data modeling, report design, and data refresh; to content distribution and the end user experience. As an outcome of the workshop, 3Cloud will provide a tailored outline of how your organization might address these challenges with a strategic Power BI Deployment Roadmap.

AT A GLANCE

3Cloud's Power BI Catalyst approach can:

- Define key performance indicators for Power BI adoption success.
- Set data governance and security standards.
- Establishes an approach for content distribution and life cycle management.
- Deliver Power BI training for data modelers, report authors, and end users.
- Launch an internal Power BI Community with tailored support and instructional content to support long-term adoption success.
- Enable Power BI activity monitoring and auditing – critical to meeting healthcare industry compliance regulations – using a tailored solution designed to capture Power BI tenant inventory, activity, and gateway health data.
- Deliver rich data visualization and rapid reporting through Power BI.



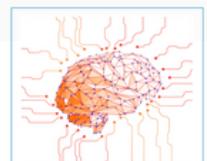
MBI Vision



QuickStarts



User Support & Resources



AI Augmentation



Governance & Strategy



Architecture & Security



Performance & Scalability



Monitoring & Automation

MODERN CAPABILITIES

Two Microsoft Azure resources – **Azure Machine Learning** service and **Azure Databricks** – can advance the development and utility of predictive healthcare models. When using them in combination, a healthcare organization can see faster returns on data-driven initiatives and gain deeper insights.

Predictive models provide the data-driven and technology-enabled forecasting that can successfully address many of the predictive needs of healthcare organizations. However, a key bottleneck in predictive model development is the time and organization required to work through the iterative model development process. Several important steps in the model development pipeline can become time and effort-intensive processes; they include feature engineering and selection, algorithm selection, tuning of model parameters, model performance evaluation, and the cyclical process of working through all the combinations of these features, algorithms, parameters, and evaluation metrics.

Building predictive models for, let's say, patient demands (e.g., length of stay in the hospital) begins with gathering historical health records and running the data through as many of the permutations of the machine learning pipeline as necessary to achieve optimum results. This is where **the Workspace feature** in Azure Machine Learning (AML) service comes into play.

Specifically, the Workspace feature available in the AML service provides a well-designed organizational structure for the building of predictive models. A key capability of the AML Workspace is its ability to reduce the time to develop predictive models by providing a space that organizes model development (model experiments) and the evaluation of model performance (model metrics).



WHY BUILD?

Data scientists can work from many Python-supported environments (e.g., their local machines, data science virtual machines, Azure Notebooks, or cloud-based compute resources) and use their favorite open-source machine learning libraries. Azure Databricks is an Apache-powered, unified analytics, cloud-based computing resource. A **custom version of the AML service SDK** has been created specifically for Azure Databricks. The combination of these Azure resources provides data scientists with added functionality to their machine learning experimentation, testing, and model evaluation processes.

BEST PRACTICES



Azure Machine Learning

The Workspace feature within the AML service provides a well-structured DevOps utility that reduces the data scientist's workload of having to track each permutation of selected features, **chosen algorithm**, parameter selections, and model evaluation.

The support features within the AML service extend beyond model development support. By ingesting clean training data and building the modeling pipeline automatically, the automated machine learning feature within the service takes control of the development process, further reducing the time and effort involved in model development.

The screenshot shows the Azure Machine Learning Workspace interface. The top navigation bar includes: Experiments, Compute, Models, Images, Deployments, and Activities. The main content area is titled "Welcome to your new Workspace" and contains two sections:

- 1. Getting started**: "Create your first experiment in Azure Notebooks to be able to view and track metrics." with a button "Open Azure Notebooks".
- 2. Done getting started?**: "Once you run the Azure Notebook, you will be able to view the data from the experiment in the Experiments page." with a button "View Experiments".

Below this is a section titled "What's possible with AML?" with the text: "Using Azure Machine Learning service, you can track your models as you build, train, deploy, and manage them at cloud scale." This section features four icons and their corresponding descriptions:

- Run & Monitor Experiments**: Submit Experiments for training and automatically track their progress and view logs.
- Register Models**: Save scoring logic operations into models to create Docker Images and Deployments.
- Build Images**: Quickly create Docker images that encapsulate models, scripts, and any associated files.
- Deploy Models**: Send scoring requests to web services in Azure Container Instances, Azure Kubernetes Service, or field programmable gate arrays (FPGA).

The diagram below the screenshot illustrates the automated machine learning process. It shows three input boxes on the left: "Dataset" (with a grid icon), "Optimization Metric" (with a bar chart icon), and "Constraints (Time/cost)" (with a dollar sign and stopwatch icon). These three inputs are combined (indicated by plus signs) and feed into a central box labeled "Automated Machine Learning" (with a cloud and gear icon). An arrow points from this central box to a final box labeled "Machine Learning Model" (with the AML logo icon).

Healthcare organizations can use targeted predictive models to achieve tangible outcomes, such as higher staff morale, **improved patient care**, and lower healthcare costs. Models that provide accurate predictions (e.g., patient demand) and clear actionable insights (e.g., appropriate staffing schedules, purchase of sufficient medical supplies) position healthcare organizations for increased efficiency and the delivery of high-quality care in today's cost-competitive markets. Predictive models such as these can be developed by capitalizing on the speed and organization of model development with Azure Machine Learning service's Workspace and the analytic power of Azure Databricks.

3CLOUD'S MODERN DATA PLATFORM

The 3Cloud Modern Data Platform (MDP) Jumpstart is a proven approach that helps clients evolve from the traditional data warehouse to a MDP in Azure. This engagement features the core activities to guide your journey. With consulting services from 3Cloud, we'll help you achieve the agility and elasticity necessary to tackle today's data-fueled business challenges.

Our motto is "Strategic Vision, Tactical Action". We begin each engagement with our **Launch Stage** featuring a workshop to explore current technologies, review best practices and patterns, and translate key business use cases. We then validate the findings by building a pilot solution that yields tangible evidence of outcomes for both IT and business stakeholders.

We then move into the **Scale Stage**, focusing on tactical execution and implementation, governed by the strategy vision outlined in the workshop and proven in the pilot. During this stage we'll deliver production ready solutions featuring modern data capabilities in Azure, from data lake hydration to data governance and security.

We will focus on iterative delivery of a modern data platform that satisfies the data demands of all stakeholders across your organization.

As your organization gains increased data availability and user adoption, our **Realize Stage** will help achieve stable and supported growth. We'll help you add new data sources, enhance data models, and add new modern BI and AI capabilities.



#1 LAUNCH

Uncover value, align the team, build the business case, evaluate and de-risk technology with collaborative workshop to discuss strategy, planning, and solutions to make it tangible and real.



#2 SCALE

Production-ready, cloud-first solutions on Azure, proving the value to business stakeholders through Use Case iterations that deploy platform features and data sources and types.



#3 REALIZE

The long-term, strategic value from the MDP program for the business, driving the business impact of new technology with implementation, support, and training.

3 FACTORS TO CONSIDER

THINKING ABOUT ANALYTICS FOR YOUR TEAM?



1. Identify Solvable Problems

Take care to make sure you are pursuing a solution to something that is a solvable problem. How can we recognize solvable problems? One key indicator is that variation exists in outcomes across locations, regions, providers, treatments, and other differentiators. Where these exist, analyses can identify the drivers for the differences, and work to uniformly optimize all outcomes. Another indicator is when others' outcomes are better than yours – it signals that potential improvements are possible; and you have the opportunity to leverage your own data and analytics to follow (and improve upon) their lead.



2. Don't Just Think, Act!

What does success look like to you? It isn't enough to just deliver data and information. Gathering data across systems, analyzing that data, and then trumpeting insights doesn't do much toward affecting real-world outcomes. The solution should envision pushing those insights back into your processes (human and technical) and monitoring outcomes for the impact of your efforts. With this end-to-end view of the problems, you will more often need to develop end-to-end solutions that have real-world impact.



3. Invest Strategically

A solution's value should be weighed against the cost of pursuing other initiatives based on organizational bandwidth. Funding decisions can be initially based on delivery team estimates. Time is an important consideration when deciding which health analytics efforts to pursue. The longer an initiative takes, the less likely it will produce promised outcomes. Finally, another important factor is strategy. Special consideration should be given for solutions that align with current organizational strategy.

IN CLOSING

In summary, health analytics efforts require scarce organizational resources that must be allocated to initiatives based on both cost and health outcomes. When we have a specific problem that is known to be solvable, the right approach to affecting real-world outcomes, streamlined decision processes, and robust, competitive funding practices, then our health analytics investments will more often yield the positive results for our patients and our communities that they promise.

Deploying a healthcare analytics suite can help healthcare providers **leverage data for insights in several areas of operations**. One major area where using analytics can optimize efforts is the management of hospital and foundation donations and grants.

For many healthcare providers, donations are the basis of their yearly budgets, so organizing and tracking expenses and activity is vital for setting appropriate goals. Moreover, it can help track donor engagement, retention, and previous contributions.

Another area where healthcare data analytics shines is providing hospital administrators with information that allows for optimal physician scheduling. In this situation, healthcare analytics gives a birds-eye view of physician records, patient histories, and needs to ensure the right doctor or professional is deployed to the patients most in need. These systems can also be used to improve patient satisfaction and expedite the healing process.

For insurance companies, healthcare analytics suites provide an easier and more granular approach to track existing claims, clients, and premiums. With better real-time measurements and historic visualizations, insurance companies can adjust policies, monitor open claims, and present better prices for services.

WE CAN HELP!

3Cloud solutions areas are able to:

- Uncover value, align the team, build the business case, evaluate and minimize risk.
- Work across departments and teams to enable the adoption, build, and deployment reports needed.
- Receive on-going support and enhancements, embracing Power BI and self-service analytics as a long-term, strategic program.
- Build a foundation for all data using our proven approach.
- Migrate and modernize your traditional data warehouse solutions using Microsoft Azure.
- Light up modern BI capabilities, serving the needs of data consumers across the organization.
- Enable AI and machine learning for digital transformation initiatives.
- Identify challenges and/or opportunities that are the most urgent and/or valuable to tackle.
- Determine challenges root causes and uncover the business and technical capabilities needed to address them.

Health and Life Science Resources

ABOUT 3CLOUD

**DRIVING
BUSINESS
IMPACT
THROUGH
CLOUD SCALE
ANALYTICS.**

We spend each day helping people like you get the answers they need from data. Whether that's through building tools and solutions that provide easier access to data, or creating data models that are easier to understand, our experienced team of experts make sure you get more insight from your data - helping you get more done with less.

We focus on solutions, not billable hours, and our 'roll up your sleeves and get to work' attitude gets your project done right, the first time. Our unique 3Cloud framework gives us an approach that guides our efforts, reduces risk and creates a better experience for you.

We strive to be the best data and analytics consulting firm in the industry. Our "think big, but start small" philosophy helps our clients embrace data as a strategic asset, and using our 3-stage framework, we create roadmaps, build solutions, and deliver value across organizations.

HAVE QUESTIONS OR WANT TO DISCUSS YOUR NEEDS?



**Call for more information.
Ask a question via email.
Contact us to learn more.**

