

Keys to a successful Health Catalyst® data warehouse platform and analytics implementation

By Jared Crapo, Eric Just, and Dan Lidgard

“The most important step for a successful Health Catalyst platform installation — is a pre-step: identifying key personnel resources needed on your health system’s side.”

During the process of learning about the Health Catalyst® Late-Binding™ data warehouse platform and analytics solutions, we have found that many customers ask similar questions about how the process really works. Questions like:

- How does the data warehouse installation process really work?
- How quickly does it get installed?
- What roles and support are needed from my health system?
- What hardware and software is needed?
- What applications are included in the initial installation?
- What type of timeline should we expect?
- How can we be best prepared for a successful implementation?

These are all great questions. So, we thought it would be useful to produce a document that we hope will answer the majority of these and other common questions. The keys for a successful Health Catalyst data warehouse platform and analytics implementation are outlined below in step-by-step format.

At a high-level, we will include the technical steps for creating the Health Catalyst enterprise data warehouse (EDW) foundation, how to use analytics applications to transform data from the EDW into actionable information, and finally, the right timeline for deriving value from the EDW.

Client resources needed for a successful Health Catalyst data warehouse implementation

The first — and perhaps most important step for a successful Health Catalyst platform installation — is a pre-step: identifying key personnel resources needed on your health system’s side. When these resources are identified and made available ahead of time, we have seen the implementation accelerated at some amazing speeds. This will also mean ensuing projects have quicker success because your team is up-

Good planning at the beginning of a project goes a long way to ensuring you are pleased with the results. Early in the project, it's important to agree on the definition of success and schedule frequent assessments of progress toward that outcome.

to-speed. Likewise, when these resources are not available or easily accessible, we have seen unnecessary delays in the implementation that could have been avoided with some up-front planning.

So, before going step-by-step through the implementation process, we want to introduce the personnel required on your side. These resources all have critical roles in making successful and quick implementations possible.

Personnel requirements vary by the complexity of the implementation. The table below outlines a typical low-complexity installation and a typical high-complexity installation.

Low complexity	High complexity
Single EHR that exists in the Health Catalyst library	Multiple EHR extracts, some of which require new development
Health Catalyst-hosted solution	Client installs, configures and maintains server
Deploying primarily Health Catalyst Foundational and Discovery Applications	Deploying one or more Health Catalyst Advanced Applications

This summary chart, which we give to all our clients, outlines the four main client roles:

- Data Architect
- Source System Application Administrator
- Database Administrator
- System Administrator

The chart also indicates their responsibilities and how many of each is needed for typical low- and high-complexity implementations, including the percentage of full time equivalency (FTE).

Role	Requirement Complexity		Responsibilities
	Low	High	
Data Architect	1 @ 50% (of FTE)	2 @ 100%	<ul style="list-style-type: none"> ➤ Data architecture: <ul style="list-style-type: none"> > Data modeling/database design > Database development/tuning > ETL development > Metadata management ➤ Requirements analysis ➤ Workgroup team member ➤ Technical strategy (e.g., tools, processes) ➤ End user support and consultation ➤ Standards enforcement ➤ Visualization (BI) development ➤ Data analysis
Source System Application Administrator	1 per Source System @ 10%	1 per Source System @ 20-40%	<ul style="list-style-type: none"> ➤ Source system content expertise ➤ Data validation ➤ Access facilitation
Database Administrator	1 @ 20% for Month 1-2, 10% ongoing	1 @ 30% for Month 1-2, 15% ongoing	<ul style="list-style-type: none"> ➤ Database environment configuration ➤ Security policy implementation ➤ Database backup and recovery ➤ Database system performance management ➤ Database version management ➤ Database error management ➤ Database monitoring
System Administrator	1 @ 20% for Month 1-2, 10% ongoing	1 @ 30% for Month 1-2, 15% ongoing	<ul style="list-style-type: none"> ➤ Hardware installation and configuration <ul style="list-style-type: none"> > Storage > Server ➤ Operating system configuration and version management ➤ Networking management ➤ Support for the following environments: EDW, ETL, and visualization

Health Catalyst data warehouse technical implementation: A step-by-step guide

As part of this initial planning, we request a simple extract of data, typically from an institution's costing system. This data is loaded into a stand-alone version of our Key Process Analysis tool which does not require deployment of the data-warehousing platform.

Even though we present these steps sequentially, some of these activities overlap. It is always best to be looking ahead and preparing for the next step.

Step 1: Implementation planning

Good planning at the beginning of a project goes a long way to ensuring you are pleased with the results. Early in the project, it's important to agree on the definition of success and schedule frequent assessments of progress toward that outcome. It's often tempting to schedule a large project that delivers tremendous value at some far distant time in the future. We recommend more frequent milestones that deliver incremental value on regular basis. This approach makes it easier to keep stakeholders engaged and gives the teams more flexibility to incorporate adjustments in priorities and new objectives.

As part of this initial planning, we request a simple extract of data, typically from an institution's costing system. This data is loaded into a stand-alone version of our Key Process Analysis tool (<http://www.healthcatalyst.com/key-process-analysis-kpa/>) which does not require deployment of the data-warehousing platform. This tool gives the implementation team insight into which clinical processes have the largest opportunities for cost savings. This assessment of your data helps the team to plan and prioritize the subsequent milestones in the project.

Step 2: Deploy hardware

Your first decision is determining which hosting model to use. Generally, three are available:

- A Health Catalyst-hosted solution in the cloud. We would work to connect this HIPAA-compliant environment with your data sources.
- A Health Catalyst appliance hosted by you, the client. With this model, we purchase the base hardware, customize it, and install the appropriate software offsite. Then, we deliver this preconfigured hardware to your data center.
- A client-hosted solution. Many clients choose to purchase hardware and host it in their own data centers. In this model, we advise you on hardware requirements; then you purchase the hardware and set it up.

“Once you’ve received the hardware recommendation, if you’re buying the hardware, you should do so as quickly as possible. We have found that procuring hardware can introduce many delays, including waiting for a purchase order to be approved or waiting for the arrival and configuration of the hardware.”

Regardless of which model you choose, we work with your system administration team to understand the size and footprint of your environment. Health Catalyst needs to know vital statistics of key source systems, such as data volumes and the expected growth rate of those volumes. With this information in hand and through real collaboration with your teams, we can make an accurate hardware recommendation.

We have a quick caveat here. Once you’ve received the hardware recommendation, if you’re buying the hardware, you should do so as quickly as possible. We have found that procuring hardware can introduce many delays, including waiting for a purchase order to be approved or waiting for the arrival and configuration of the hardware. That is why we often collaborate with a client’s system administrator and make the hardware recommendation before even officially “kicking off” the implementation project.

Step 3: Technical kickoff meeting with the client and Health Catalyst deployment teams

As mentioned above, to keep the implementation on a fast track, we often start the discovery and hardware recommendation process before an official kickoff. The kickoff meeting ensures that the objectives are clear, and helps to ensure that our resources are coordinated and work from the same playbook.

We have two primary goals to accomplish in this initial session:

- Develop a timeline against major milestones
- Determine who is required to do what

Then, we demonstrate some of the tools we will be implementing so that everyone involved in the project can see the value the EDW can bring to the organization and how their particular roles will interact with the EDW toolset.

In addition to the executive sponsors of the project, all four of the client roles we introduced above should attend this kickoff meeting. We want to call out the particular importance of having each source system administrator attend. Attendance is critical because these are the individuals that will enable the next step in the process: obtaining access to the key data sources that will feed the EDW.

Step 4: Access source data

The fundamental purpose of an EDW is to aggregate data from disparate source systems into a single source of truth. Obviously,

“The fundamental purpose of an EDW is to aggregate data from disparate source systems into a single source of truth. Obviously, accessing the data from source systems is a significant part of the implementation process.”

accessing the data from source systems is a significant part of the implementation process. We recommend that the initial source systems include the core electronic medical record, the financial costing system, and the patient satisfaction system. These three systems align with the Institute for Healthcare Improvement's Triple Aim (<http://www.ihl.org/offerings/Initiatives/TripleAIM/Pages/default.aspx>).

Unfortunately, sometimes source system administrators are completely unaware that an EDW is being implemented until we, the vendor, request access to their system. These administrators are understandably wary of granting direct database access to their system for a project they've heard nothing about. Educating source system administrators about the EDW project well before we request access can ease this bottleneck and speeds the implementation process considerably.

This is why it is so important to have each source system administrator involved in the project from the time of the kickoff meeting. These administrators will play a key role in the project, especially when it comes to data validation and helping ensure the data loads properly in the EDW. Though these administrators aren't necessarily analysts, they are very familiar with workflows and how those workflows can affect the data. This makes them a valuable source of insight and critical to the success of an EDW. The role usually turns into a data stewardship role which is a key part (http://www.healthcatalyst.com/healthcare_data_stewardship_data_rich_information_rich/) of empowering a thriving user base.

Step 5: Install platform

This is the step where we install our base EDW platform on your server or designated environment. This is a vendor task we have standardized, so it goes quickly. Ideally, this step of the process takes a week.

At this point, we begin to do a lot of knowledge transfer. We particularly focus on educating the data architects about the basics of how the core product works.

Step 6: Load data

With the base product installed, we are ready to unpack our metadata into the database structure and load the data for the source systems. The metadata defines how a source system's data will look and where it will reside in the EDW so that analysts will know how to query it. This important step can be significantly

In our experience, the most effective analytics application implementations occur in two phases. The first is installing the source marts and creating a platform for advanced analytics. And the second is installing analytics applications to run on that platform and working hand-in-hand with clinical and operation site team members.

hindered if a vendor spends too much time mapping portions of the metadata. Some vendors can take as long as two years to complete this process.

Really, this part of the process should go fairly quickly. We come prepared with tools that expedite metadata extraction and automatic transformation of that metadata to load scripts (ETL). Health Catalyst uses a Late-Binding™ approach (<http://www.healthcatalyst.com/late-binding-data-warehouse-explained/>) to organizing data allowing for a quick implementation and the flexibility to adapt to changing vocabularies and use cases. We have tools that turn metadata into the load script itself — essentially a metadata-driven ETL engine. Because of the efficiencies this introduces to the process, we are able to load source system data quickly into the EDW. We also include out-of-the-box data applications that will be ready for deployment to hundreds of users shortly after your key data sources are loaded. It isn't long before the data architects are able to delve into the data and kickoff-specific cost and quality initiatives.

Once you've accomplished these five steps, you've completed most of the technical implementation of the Health Catalyst EDW. Of course, the work isn't entirely finished at this point. Now that the EDW is in place, how do you turn all of that data into actionable information?

[Implementing Health Catalyst advanced analytics applications: Transforming data from the healthcare data warehouse into actionable information](#)

In our experience, the most effective analytics application implementations occur in two phases. The first is installing the source marts and creating a platform for advanced analytics. Getting the most out of our Health Catalyst EDW requires installing analytics applications to run on that platform and working hand-in-hand with clinical and operation site team members — the second phase of our applications implementation process.

Below, we briefly outline our recommended sequence for installing Health Catalyst analytics applications. Following this logical sequence helps key leaders, technologists, analysts, clinicians, and operational staff on the frontlines of care get the most out of the data so they can drive sustainable cost and quality improvements.

[Step 7: Install foundational applications](#)

Health Catalyst Foundational Applications (<http://www.healthcatalyst.com/foundational-applications/>) automate data distribution and data

With an infrastructure for provisioning and distributing data in place, your organization is ready to mine the EDW's data to prioritize your improvement efforts. Health Catalyst Discovery Applications do just that.

provisioning — the process of providing users with access to data. These applications put in place an efficient system of reporting and distributing data both internally and externally. They also provide dashboards and basic registries for a broad range of clinical and operational conditions.

We conduct a site assessment to identify opportunities that align with the applications we provide. These Foundational Applications constitute the analytics base for an organization. It's important to identify the application users, provide training, and assist in the data interpretation as needed. The Foundational Applications provide information about trends and patterns but are not designed to identify the root cause of these patterns. That level of sophistication is for a later step.

Step 8: Install discovery applications

With an infrastructure for provisioning and distributing data in place, your organization is ready to mine the EDW's data to prioritize your improvement efforts. Health Catalyst Discovery Applications (<http://www.healthcatalyst.com/discovery-applications/>) do just that. They allow your team to discover detailed patterns and trends within the data and pinpoint the areas you should focus on to achieve your cost and quality goals. This information, along with the site assessment indicating level of organizational readiness (<http://www.healthcatalyst.com/best-organizational-structure-healthcare-analytics>), can help to position projects that will help to make initial successful impacts.

How do these applications help your organization prioritize?
They help:

- Identify areas of variation and waste (<http://www.healthcatalyst.com/the-best-healthcare-analytics-application-for-prioritizing-improvement-programs/>)
- Discover new cohorts (<http://www.healthcatalyst.com/improve-population-health-management>)
- Stratify populations (<http://www.healthcatalyst.com/Defining-Patient-Populations>)
- Pinpoint opportunities by payer mix (<http://www.healthcatalyst.com/surviving-value-based-purchasing-html>)
- Analyze readmission risk (<http://www.healthcatalyst.com/healthcare-data-warehouse-hospital-readmissions-reduction>)
- And more (<http://www.healthcatalyst.com/discovery-applications/>)

“

We recommend having a Guidance Leadership Team to provide direction so projects align with the strategy and goals of the organization. The other team we recommend is a Broad Implementation Team that will support the implementation or improvement processes identified by the work group team.

”

Step 9: Install Advanced Applications

With Health Catalyst Advanced Applications (<http://www.healthcatalyst.com/advanced-applications/>), you are able to implement, track, measure, and sustain the improvement initiatives you identified as priorities. These applications target a clinical process, such as a disease condition or procedure, or an operational support service, such as operating room workflow, pharmacy, etc.

The technology component of this implementation step includes the data mart, applications, and visualizations specific to the clinical process or support service. The clinical (or operational) component focuses on the identification of Aim Statements (<http://www.healthcatalyst.com/healthcare-quality-improvement-ignite-aim-statements/>), cohort definition (<http://www.healthcatalyst.com/Defining-Patient-Populations>), and data metrics to be included in the visualization. The work group team (<http://www.healthcatalyst.com/best-organizational-structure-healthcare-analytics>) also will identify improvement opportunities for either processes or outcomes. The number of participants is small, usually six to eight individuals. We recommend establishing permanent, integrated teams of clinicians, operations managers, knowledge managers, technologists, and analysts. These team members are recruited from among personnel on the frontlines of care and operational areas supporting the focus of the advanced application.

We recommend having a Guidance Leadership Team to provide direction so projects align with the strategy and goals of the organization. The other team we recommend is a Broad Implementation Team that will support the implementation or improvement processes identified by the work group team. The work group team uses a data-driven improvement process around the recommended themes provided by the Guidance and Broad Implementation teams. These frontline teams interact directly with the Advanced Applications — and turn insights from the data into better clinical and operational processes.

Implementing an EDW efficiently and effectively doesn't have to be overwhelming. We've just outlined a pragmatic and very achievable process that will set your organization on a course for real cost and quality improvement.

“The data warehousing team ends up spending lots of time trying to build consensus with clinicians for seemingly straightforward definitions like length of stay. The clinicians are frustrated, because a meaningful definition of length of stay might vary depending on the context of the care process.”

The right timeline for implementing the Health Catalyst data warehouse

It's now time for us to address a very important question: How long should this implementation process take (<http://www.healthcatalyst.com/timelines/>)? How long should it take your health system to derive value from an EDW?

Ultimately, an EDW has enormous potential to provide value measured in concrete cost savings. But for the purposes of this document, we'll keep our definition of value very simple — an EDW demonstrates value when the site's personnel can begin using data to do their jobs better.

The good news is that it does not and should not take long for the EDW to deliver this value to your organization — it takes months, not years (http://www.healthcatalyst.com/faster_clinical_data_mart_90_days/).

Why some healthcare EDW implementations are slow to deliver value

It's a well-known fact that many data warehousing projects require 24 to 36 months of implementation work before clinicians can get access to data. Why? Usually it's because these implementations require all data modeling to happen up front. They create a model for extracting data from source systems and binding it to business rules that must be completely defined very early in the EDW's development. This data model and associated business rules can be enormous in scope and complexity. The data warehousing team ends up spending lots of time trying to build consensus with clinicians for seemingly straightforward definitions like length of stay. The clinicians are frustrated, because a meaningful definition of length of stay might vary depending on the context of the care process. For example, if an expectant mother is admitted for observation, some analytic use cases should include the time in observation as part of the length of stay, other use cases should not. Without the context of an analytic use case, the early definitions built by the data warehousing team will often fall short of the ideal definition when they are later applied to an analytic use case. This early-binding approach brings with it some key risks:

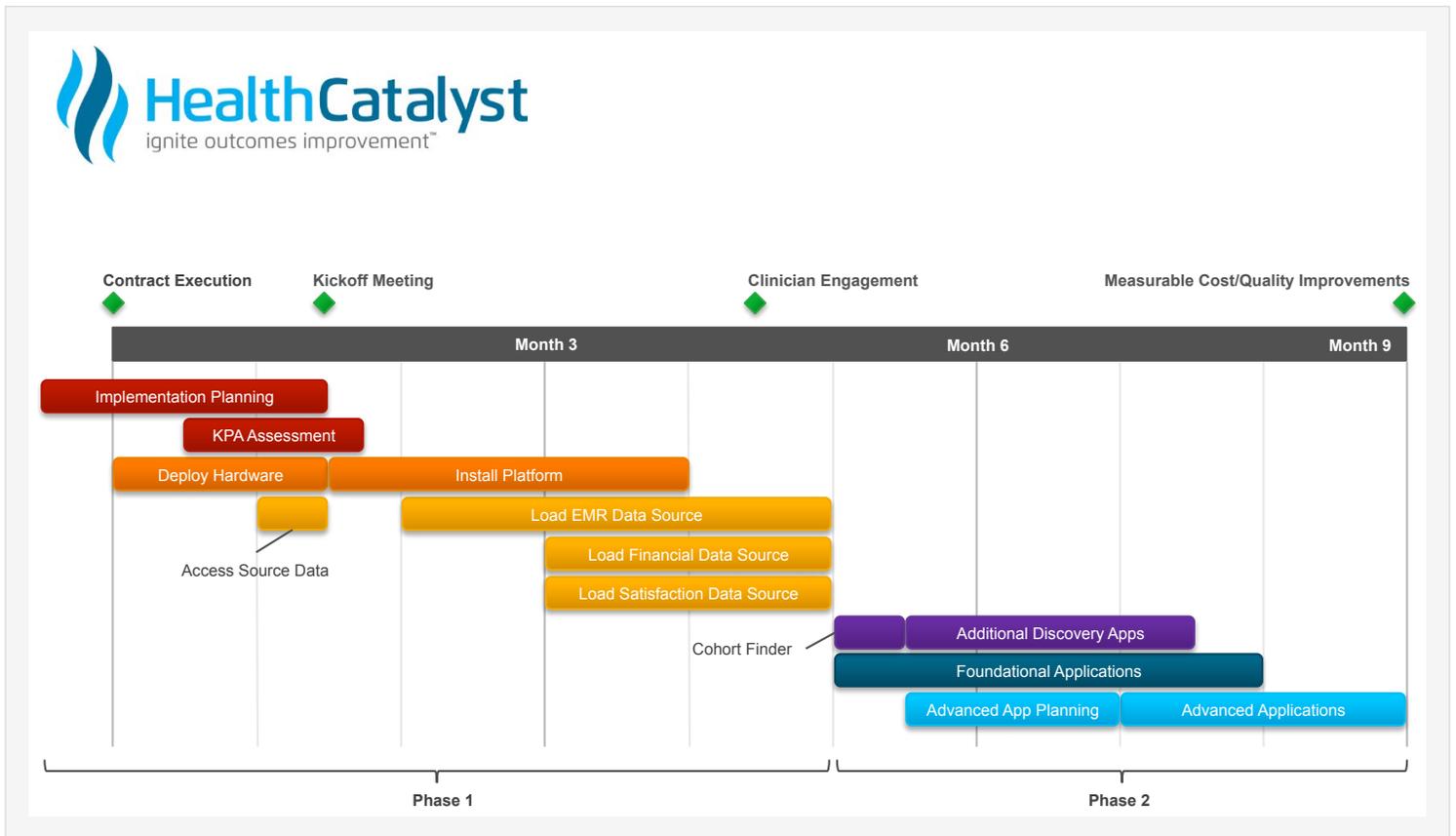
- You'll likely have difficulty keeping business leaders focused on how your project can deliver value. It's simply hard to keep people who are expecting value focused on a project for that long with no measurable return. It's easier to keep them involved when you're incrementally delivering business value along the timeline.

Each customer is unique and has different priorities and objectives. In addition, budget and contracting requirements influence the timeline of each project. At the beginning of the project, Health Catalyst will begin a collaborative implementation planning process resulting in a timeline tailored to each project.

- Your business needs could change in two to three years. It is no easy task for healthcare organizations to anticipate everything they will want to do or measure with the EDW two or 10 years down the line. The early-binding approach locks you into a data model that is very difficult to adapt to changing business needs, use cases, and vocabularies.

Health Catalyst timeline for short time-to-value

Now it's time to discuss how long an implementation should really take. Each customer is unique and has different priorities and objectives. In addition, budget and contracting requirements influence the timeline of each project. At the beginning of the project, Health Catalyst will begin a collaborative implementation planning process resulting in a timeline tailored to each project. Here are Health Catalyst-recommended timelines, based on our experience with many successful customer implementations.



Some projects will have a longer timeline than shown above. Key factors that can lengthen the timeline include multiple sources of clinical data that must be brought into the warehouse and differences

“ You may wonder why it takes longer to install applications than it does to do the heavy lifting of actually creating the EDW. It’s because these steps aren’t just a matter of installing software; they’re a matter of getting people interacting with the data to drive change in the organization. ”

in the configurations of source data system. Incredibly, some projects can be accelerated, with the initial phase completed in 90 days (http://www.healthcatalyst.com/success_stories/iu-health/). This often takes other EDW vendors two years to accomplish.

The second phase deploys the applications that enable end users to access data and improve care (discussed above). These include:

- Health Catalyst Foundational Applications
- Health Catalyst Discovery Applications
- Health Catalyst Advanced Applications

As you can see in the timeline graphic, within the first nine months from implementation kickoff, you should be able to have your Foundational Applications installed, your Discovery Applications installed, and advanced clinical improvement projects well underway.

You may wonder why it takes longer to install applications than it does to do the heavy lifting of actually creating the EDW. It’s because these steps aren’t just a matter of installing software; they’re a matter of getting people interacting with the data to drive change in the organization. This process involves:

- Using data to identify where to focus your quality improvement efforts
- Establishing cross-functional teams — including an analyst, data architect, clinical sponsors or operational sponsors, and a knowledge manager — for the care or operational process you want to target
- Setting concrete, measurable goals (<http://www.healthcatalyst.com/best-clinical-interventions>)
- Defining the cohort and identifying the metrics
- Rolling out clinical interventions throughout the organization
- Measuring progress and tweaking the process as necessary (<http://www.healthcatalyst.com/best-way-measure-clinical-interventions>)
- Then, repeating the process again in the spirit of continual improvement

Changing the way care is delivered in a particular care process doesn’t happen overnight, but you can see incremental, measurable improvement throughout the development.

“The Late-Binding™ approach speeds your implementation by spreading the data-binding activity across the life of the project and coupling it with the actual users of the data engaged in a meaningful project.”

This cycle of improvement never stops (<http://www.healthcatalyst.com/sustain-healthcare-quality-improvement>); there are always more opportunities. You can continue to add Advanced Applications to target additional clinical processes, refine how they work for your organization, and add metrics.

What makes quick Health Catalyst EDW implementation possible?

How is it possible to install an EDW so quickly when so many implementations take two to three years? The secret is a Late-Binding™ approach to structuring your EDW data model. Instead of doing all of your data modeling up front — a huge undertaking — a Late-Binding™ architecture allows you to spread the data-binding activity over the life of the project and synchronize it with the business value you're pursuing. In other words, you don't have to define how to use specific kinds of data (http://www.healthcatalyst.com/success_stories/population-registries-kick-start-rapid-cycle-clinical-process-improvement/) until you're ready to reap some business value from doing so. Because the Late-Binding™ approach doesn't require you to map every piece of data into an enterprise-wide data model up front, implementation goes much more quickly.

This Late-Binding™ model isn't just fast and flexible; it's also incredibly effective. Here's an example we come across frequently that illustrates why. In improvement projects focused on Women and Newborns departments, most organizations find that they don't capture gestational age consistently in their core EHR. In some places, it's measured in months; in others, weeks. Sometimes, it's measured from the moment of conception and other times from the last menstrual period. Sometimes, the data is even entered as free text.

There is no practical reason to clean up this gestational age problem in the EDW until you're actively trying to engage obstetricians to lower your C-section rate, schedule elective inductions, or manage the labor process. It's hard to get clinician attention to resolve the definition problem when there's nothing on the horizon that will deliver value from the effort.

In the Late-Binding™ approach, you don't try to resolve the question of gestational age until you kick off an improvement project directed at Women and Newborns. At that point, OB physicians and nurses are sitting there with you, looking at the data, and seeing how it's measured in so many different ways and different places. They are motivated to resolve the issue because they need the data

“ We hope this document answers the most common questions about implementing our Health Catalyst platform and analytics applications. Following these keys to success will help us get your health system up and running toward improving the delivery of care faster and more effectively. ”

for the project. This is one key to why the Late-Binding™ approach is so effective: you can do data modeling knee-to-knee with the people who are using that data and will get immediate value from the project.

In short, the Late-Binding™ approach speeds your implementation by spreading the data-binding activity across the life of the project and coupling it with the actual users of the data engaged in a meaningful project.

Summary: Keys to a successful Health Catalyst implementation

A successful Health Catalyst data warehouse platform and analytics implementation can be done quickly and effectively with the right planning. Identifying key personnel resources from your side is an important pre-step. An implementation plan that defines success and schedules frequent progress assessments ensures that you will be pleased with the results. In the beginning, we use a simple extract of your data, though the stand-alone version of the Health Catalyst Key Process Analysis tool, to plan and prioritize milestones for clinical process improvement. You choose a hosting model and together we deploy the hardware. This is followed by, or simultaneous to, a technical kickoff meeting with our deployment teams to develop a timeline and determine who does what. Next, we access your source data and work with your source system administrators to provide insight into workflows and how those workflows affect the data. Installing the base EDW comes next, and we begin to do a lot of knowledge transfer. Finally, to conclude the technical implementation, we load the data using tools to expedite the ETL process. Next comes the analytics applications implementation, occurring in two phases. We install the source marts and create a platform for advanced analytics. Then, Health Catalyst works hand-in-hand with your clinical and operations teams to get the most out of our applications. We can accomplish this milestone in as few as nine months, although each client is unique and has different priorities and objectives. And, of course, the cycle of improvement never stops; you can always add applications and metrics to tackle more opportunities.

We hope this document answers the most common questions about implementing our Health Catalyst platform and analytics applications. Following these keys to success will help us get your health system up and running toward improving the delivery of care faster and more effectively.

Your health system will have questions specific to your organization and your circumstances. We are happy to answer those in person. Contact us through our website, <http://www.healthcatalyst.com/>, or browse our Knowledge Center (<http://www.healthcatalyst.com/knowledge-center/>) for a plethora of information we've compiled about the transformation of healthcare, the latest in healthcare information technology, and more. 📌

About the authors



Jared Crapo joined Health Catalyst in February 2013 as a Vice President. Prior to coming to Catalyst, he worked for Medicity as the Chief of Staff to the CEO. During his tenure at Medicity, he was also the Director of Product Management and the Director of Product Strategy. Jared co-founded Allviant, a spin-out of Medicity, that created consumer health management tools. In his early career, he developed physician accounting systems and health claims payment systems.



Eric Just joined the Health Catalyst family in August of 2011 as Vice President of Technology, bringing over 10 years of biomedical informatics experience. Prior to Catalyst, he managed the research arm of the Northwestern Medical Data Warehouse at Northwestern University's Feinberg School of Medicine. In this role, he led the development of technology, processes, and teams to leverage the clinical data warehouse. Previously, as a senior data architect, he helped create the data warehouse technical foundation and innovated new ways to extract and load medical data. In addition, he led the development effort for a genome database. Eric holds a Master of Science in Chemistry from Northwestern University and a Bachelors of Science in Chemistry from the College of William and Mary.



Dan Lidgard joined Health Catalyst as a data architect in November 2011. He started his career with the Boeing Company in Seattle, Washington. He enjoyed 15 years with Intermountain Healthcare with the majority of that time as a supervisor and data architect on the data warehouse team. Dan has also been a Director of Systems Development at Myriad Genetic Laboratories and an Enterprise Data Manager at the University of Utah. He holds a Bachelor of Science in electrical engineering from Michigan State University.