The Promise and Challenges of Analytics Marketplaces in Healthcare

By Jody Ranck

Background:

Plug-and-play data analytics or finding ways to more efficiently export algorithmic models to use with large datasets has been steadily entering fields outside healthcare over the past two years. Data markets have been around for several years with offerings such as data.com (Salesforce), the Azure Marketplace, Factual, Socrata'sOpenData, Infochimps.com and DataMarket.com to name a few. These markets exist so that companies have the option of outsourcing parts of the data value chain to third parties who can extract insights.

Algorithmia.com is one example of a general marketplace for building and sharing algorithms and for making them available as a web service. We've seen over the years a number of data markets emerge and the next step in their evolution could also be in the direction of these new algorithmic markets. LexisNexis Health Market Science has another type of health data market with claims data in a national level warehouse containing data from all of the major payers totaling nearly 1.2 billion claims that have been scrubbed and anonymized. Clients have the ability to obtain market insights on referrals – market dynamics for facilities.

These early experiments in data markets helped organizations outside of healthcare realize that the monetization of data could mean sharing data *outside* of the organization had the potential to realize even greater return on investment. The logical progression of this trend is towards simpler ways of doing analytics and running a growing number of analytics on top of data to optimize algorithmic insights in a less expensive manner, as well as gaining access to best of class algorithms for solving particular problems. We are now just beginning to see this happen in health analytics with the rise of new analytics or algorithm markets that enable plug-and-play and curation of algorithms for use by third parties.

It has been noted that healthcare is beginning to enter the algorithmic revolution and a new, higher value-added set of services will be the next phase in the trajectory of health IT. Algorithms rather than data alone are the currency in the algorithmic revolution. Analytics-as-a-Service (AaaS) is the next wave.

We are already seeing this outside of healthcare as Amazon enters the fray with one of the dominant AaaS offerings that is also relevant to healthcare. This leverages the cloud and a flexible platform that can pull data from APIs into the platform and offer a more rapid way to enable companies to build analytics products or services.

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The underlying business model for AaaS is also designed to scale as organizations in the early stages of using analytics have datasets that may run a small number of algorithms. Over time, the needs of these organizations will naturally increase, driving a need to scale their algorithmic capacity by one or two orders of magnitude. This is where healthcare is headed in the coming years, but not without many challenges, namely trust in the cloud. In this Monitor we'll be taking a look at two approaches to markets in algorithms or plug-and-play analytics services.

Creating an Algorithmic Marketplace for Healthcare: Apervita Case Study

Apervita, a young start-up that recently received its Series A round of funding, has developed a platform that brings both data and analytics together in the cloud and enables clients to extract more insights from the data and lower the cost of doing so in the process (according to their own marketing information). They have essentially created a marketplace for analytics (algorithms). Their mantra of "democratizing health analytics" comes from offering an opportunity, via their platform, to access previously developed algorithms from a wide range of institutions and run these on your own data..

Using Apervita, subscribers have the ability to connect raw data or chained algorithms via an open API and do the following:

> Author and curate analytics such as a risk model or readmissions score that they think others may find useful. One can also convert a data set into a chart or data visualization and publish this to a dashboard

> Connect a data set to the platform and run the analytics throughout one's enterprise. This capability is useful for HCOs that would like to run several algorithms simultaneously and learn which one works best over time

> Publish and sell one's algorithms on the Apervita marketplace that allows for some recuperation of development costs as well as ensuring IP protections for the underlying code.
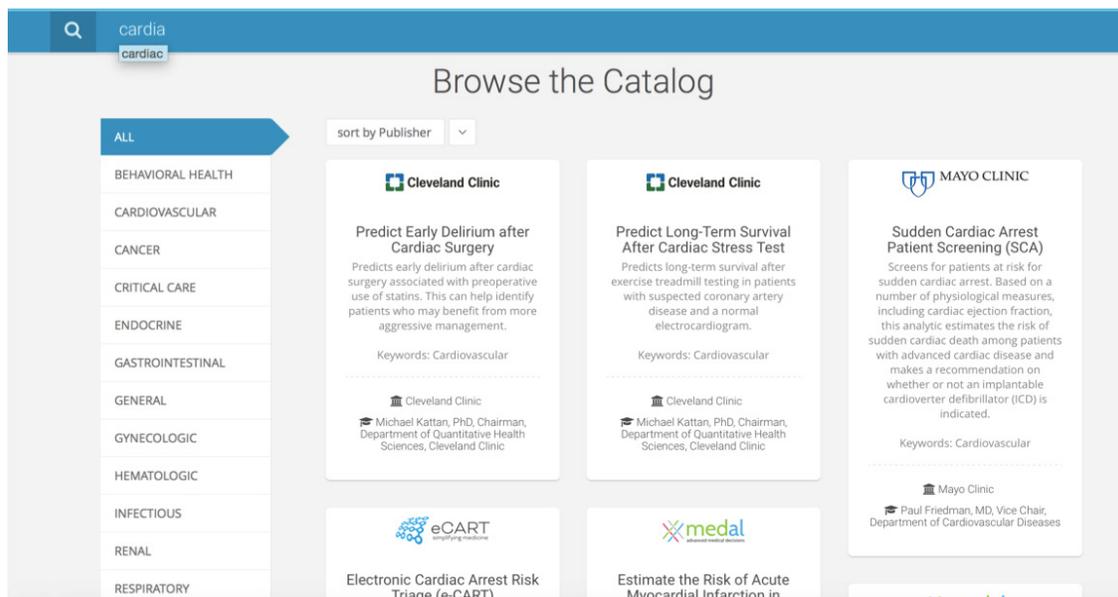

Figure 1: The Apervita Catalog

The Apervita platform in built on a concept basis within a NoSQL environment so the data that is imported is abstracted into the concepts. This allows greater flexibility and the ability to leverage standard data sets and run analytics at scale without needing to have a pre-set structure for the data to use the platform. Rather than using a standard ontology the system works by not requiring a data structure ontology until an environment for integrating the data exists. The system is a little more challenging with mixed data sets such as when a lot of device data is used.

One of the larger clients using the Apervita platform is Cleveland Clinic where they have developed a large number of algorithms for predictive models across behavioral health and a number of diseases. Offering these algorithms in the Apervita marketplace it offers Cleveland Clinic and others to monetize their algorithms via the Apervita platform.

Mayo Clinic also recently announced that it will offer a range of its own analytic algorithms on Apervita. Apervita is collaborating with Mayo Clinic to develop an additional marketplace for health measures used for performance evaluation and reimbursement in value-based care models. The health measures marketplace enables publishing of both standard and custom health measures that HCOs will be able to use at a fraction of the cost of what it would take to develop their own measures.

During a recent briefing with the executive team of Apervita, they stated that in the near future they will add the ability to allow users to provide feedback on specific algorithms in the Apervita marketplace. The company also readily admitted that a key challenge they face is convincing healthcare executives on the security of cloud computing and data governance. These issues will be a challenge for Apervita until they can clearly show that the benefits of accessing best-of-breed algorithms outweighs these risks.

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Orion Health: Enabling Analytics on an Open Platform

Over the past year and a half or so, clinical network management (CNM) vendor Orion Health has been building a platform to support plug-and-play analytics across the provider, payer, and government spectrum of clients. The difference here is that the platform is not only an analytics platform, but rather a comprehensive platform that offers tools for entire pathways and workflows. They built the platform to plug the gap that exists between HIEs and analytics systems.

The Orion Health platform is built on open source tools including Apache's Cassandra, Spark and Elastic Search. Cassandra will serve as the data lake for the Orion Health platform within their Amadeus Data Engine. With Elastic Search, Orion Health and its customers are able to build patient registries with all of the longitudinal data around a patient including clinical, claims, and patient relationship data and have ad hoc querying capabilities through the interface. On the algorithmic side, Apache Spark – which is Hadoop compatible but some believe is the next evolutionary step beyond Hadoop – offers strong machine learning (ML) integration. Apache Spark has most of the relevant ML libraries for logistic regression, linear models, naïve Bayes, and clustering, making it easier to run other algorithms. The platform employs a rich set of APIs that can support algorithms in any base language. Many of their clients with more advanced analytics capabilities, such as the large payers, are including algorithms that they have internally developed and will prefer running their algorithms on the Orion Health system.
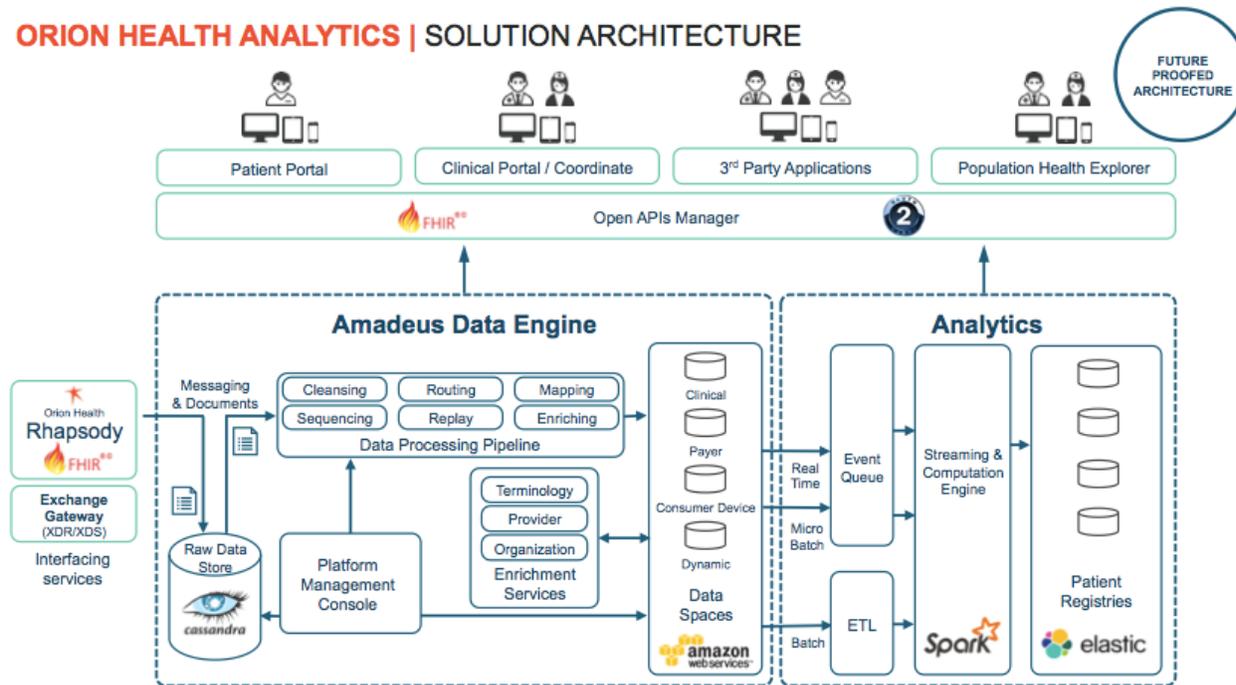
Figure 2: Orion Health's Analytics Architecture

The technology stack for the open source platform is designed to be modular and integrate with or plug into diverse interfaces. HCOs can extract patient registry data into the platform and run exploratory statistical analyses from a cloud-based R-Console. More sophisticated modules for quality measures or clinical pathways can also be built upon the platform. On top of Apache Spark there is a thin layer for orchestration.

Orion Health has developed their own Medicare Shared Savings Program measures in-house as well as a number of other simple modules to help clients get started. More sophisticated clients with informatics resources can build more advanced modules on top of the Orion Health platform for their own population health management analytics needs. The Population Health Explorer module can extract data from clinical data, payer data, consumer device data and customized data spaces for new cohort building and data exploration. New libraries of different measures can be integrated within the user interface for care coordination or numerator and denominator driven performance measures as well.

Orion Health's approach to an algorithm marketplace is somewhat different from the Apervita example. Their approach is to use an API layer that serves as an app store that offers APIs and Analytics APIs and is not solely concerned with algorithms. In the future the plan is to build a clinical pathways forum. As a CNM vendor first and foremost, their view is that the platform must be able to support the entire care pathway and not just analytics.

Viability of the Solutions in the Marketplace

Will marketplaces for algorithms take off in the current environment? One window is through the lens of value creation for the firm and relative strength of the uniqueness of datasets vs algorithms as the key differentiator. The larger, more sophisticated providers such as Cleveland Clinic and Mayo appear to be eager to share some of their algorithms in the marketplace so if you're a startup or smaller provider group that has access to a lot of good data, but lack the data science chops, purchasing algorithms to run on your data or engaging with one of these platforms could be a very attractive way to accelerate your own internal data analytics offerings. It appears a bit to soon to know whether markets such as Apervita will result in fractionation of pre-packaged solutions that include EDW, modules, and algorithms. The answer will likely lie in just how good those algorithms are in the marketplace, how rich an ecosystem can Apervita and others create, how easy or not these algorithms be replicated and the overall willingness of smaller HCOs to leverage the expertise of their bigger, more advanced brethren.

Trust in Cloud Computing

HCOs remain quite distrustful of the cloud for their current computing needs, particularly when PHI is involved. Storing patient data on another company's servers is still a headache for most CIOs despite the existence of both public and private cloud options as well as hybrid approaches. Greater transparency on security requirements from the host side of the cloud can help build trust with clients but this can still be a tough road to hoe. Encryption and two-factor identification can help prevent unauthorized access, another major security concern in healthcare, but a spate of recent hacks and the potential penalties associated with breaches of PHI leave most HCOs extremely cautious.

On the Apervita platform, the way subscribers execute a program is to load their data into a secure workspace on the Apervita cloud. Many HCOs have balked at this approach. Therefore, Apervita provides a workaround wherein an HCO's data is only resident on the Apervita platform for a set period of time, set by the HCO, to run the analytics algorithm(s) and then expunged from Apervita servers. This approach is somewhat familiar to HCO CIOs has this has been common practice with centralized or hybrid HIEs.

The current state of health data is such that integrating data into the platform in some cases does require a fair amount of additional work, according to the team at Orion Health. When you focus on the entire clinical pathway it can be a challenge to package the solution to run across workflows, attributions, reports and measurements.

As Apervita's community of algorithm-users grows, it will be interesting to watch the marketplace to see how the conversation and feedback on the relative strength of algorithms unfolds. The platform can handle running multiple algorithms simultaneously so that one can learn over time which algorithms result in the best results, a huge benefit of scale if they are successful in growing this community.

Orion Health's "Analytics Plus" approach can integrate the analytics into clinical workflows and may be better suited for HCOs who need a common platform to invoke across a number of organizations. Payers and large HCOs, e.g. Anthem or CHI, can capitalize on the Orion Health platform by using their own internally generated algorithms and building an analytics package that can be rolled out to other Blues or provider orgs within their network.

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Summary

While these two examples for different models of algorithm markets are in the early days, they do offer important new options for providers, startups or smaller players who may not have the data science chops for developing robust algorithms in-house. One additional model that may enter this market from the margins is the IBM Watson approach to building an eco-system of collaborators who can tap into the analytics engines of Watson via APIs. While the business models are very different, this is another way of extending the platform potential of Watson while gaining access to ever widening datasets that can further the development of the Watson analytics capabilities. Smaller providers are struggling with EHR implementations and integrations such that the analytics offerings may suffer and the analytics markets could be a more cost-effective way to compete and bring their in-house capabilities up to the level required for evolving VBC market conditions.

Source: https://www.himss.org/files/HIMSSorg/content/files/CloudComputing-WSHIMA042012-LG.pdf

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