Mineral Discovery 2.0

Businesses that harvest Big Data to solve previously impossible challenges have emerged as leaders in a highly competitive and evolving global economy. Over the past few years, the amount of data generated by consumers and sensors has exploded. Harnessing the right insights from this data generates enormous competitive advantage. Most data-driven analysis to date has capitalized on the sheer volume of data, the opportunity today is in joining disparate data sets from a variety of sources, to generate actionable insights and additional value.

Analytics on truly Big Data, data sets that are great in volume *and* great variety *and* generated at high velocity, is challenging, as the data environment is extremely chaotic. There's no "one size fits all" concept in Big Data, as data is stored in a variety of formats, with different underlying data store, analysis and visualization technologies. When needs arise for cross-cutting analysis or for analytical methods not supplied by any one individual system, the overall analytical process is severely limited. Organizations that successfully overcome this "variety challenge," are positioned to be game-changers. Much like the blending of data sources to generate new value, the blending of expertise through partnerships and collaborations to execute on new use cases, appears to be the most effective approach.

One such collaboration taking shape is between an early-stage advanced data science startup out of MIT with a new mineral discovery company, Quantum Pacific Exploration (QPX). The goal is extremely ambitious: discover world class mineral deposits by fusing domain experts (e.g., geoscientists) with machines (e.g., Artificial Intelligence) through a disciplined, data-driven, decision making platform to significantly improve the rate of success to find large mineral deposits.

Discovering large mineral deposits is very difficult, the success rate of the industry today ranges from one discovery in every 300 to 1,000 potential targets[(1)]. Unlike current mineral exploration methods, which largely depend on an experts' skillset, and can be somewhat described as choosing blindly, a data-driven approach, merges data as varied as aerial imagery, geophysical readings, geochemistry and lithology to extract the specific evidence required for decision making. Decisions in this business have very high-stakes and are in the millions of dollars.

Composable Analytics got its start at Lincoln Laboratory, a secretive MIT research lab tucked away off campus to conduct advanced research on defense and security technologies. Founded by two MIT researchers and CSAIL affiliates, who immediately saw the broad applicability of their newly developed technology, the company has quickly grown to a multi-disciplinary team of talented software and data engineers who are developing a cohesive visual analytics ecosystem based on the concept of dataflow programming.

QPX was born out of the Israeli high-tech and intelligence ecosystem with a mission to transform the way natural resources are discovered. It has grown into a global corporation, with research and corporate headquarters in Boston and mineral discovery operations in Chile, a country with enormous mineral endowments.

The collaboration between Composable and QPX formed at MIT, facilitated by the MIT Computer Science and Artificial Intelligence Laboratory's Alliance Program and QPX's appetite for ground-breaking collaborations with universities, high-tech startups and research centers around the world. Composable and QPX team set out to build a new, data-driven discovery platform built on QPX's methodology of

merging geoscience with non-traditional data sources and Composable's dataflow technology for simplifying and automating big data analytics.

"With Composable Analytics, we created what no mineral exploration company has, a discovery platform that fuses big data with artificial intelligence and codified human knowledge designed for effective business decision-making."

Yair Frastai, VP R&D

Over the course of half a year, with frequent visits across the equator between Cambridge, MA and Santiago, Chile, the team systematically mapped the QPX methodology into Composable's visual analytics platform. An analytical workflow for the discovery process was generated, in software, consisting of all the required processes for discovery. Each process, from data mining to data ingestion, cleansing, joining, filtering, pivoting, and exploitation was automated as an integrated workflow, a natural way to express a business process that maps well within the visual analytics platform that employs a data-flow-based programming methodology. Each process is represented as a dataflow, a directed acyclic graph with modules at the nodes. Dataflows can span the entire data analytics stack, performing the extraction, transformation, loading, querying, visualization, and dissemination jobs. Modules have inputs, perform an execution step, and then produce outputs. Modules can perform advanced analytical functions, to facilitate the fusion and exploitation of data

The final product allows QPX, through a pre-defined methodology, to integrate and process Big Data in order to generate the evidence required for decision making. It provides QPX with ability to test thousands of complex hypotheses in a matter of seconds (previously it took weeks) and at a scale 1,000X more than what a human expert could accomplish.

"Working with a forward-thinking organization like QPX has allowed us to demonstrate that, through technology, we can shift from a reliance on people and manual activities to automated, intelligent optimization."

Andy Vidan, CEO, Composable Analytics, Inc.

The new discovery platform developed through this collaboration is fully operational. The team achieved its 'proof of concept' in Chile, where it successfully identified multiple copper systems at depth. The focus is to further strengthen the Artificial Intelligence capabilities of the platform while scaling to new regions and into new commodities.

Notes:

(1) "*Estimating Historical Probabilities of Discovery in Mineral Exploration*" by Stephen B. Bartrop & Pietro Guj; http://www.cet.edu.au/docs/default-source/newsletter/june_newsletter_09_web.pdf?sfvrsn=8