



The Impact of Verifiable Data Quality in Today's Exploration Cycle

Richard Johnston and Dwight Smith, Schlumberger Information Solutions

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This paper was prepared for presentation during the 11th International Congress of the Brazilian Geophysical Society held in Salvador, Brazil, August 24-28, 2009.

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In today's exhausting search for oil and gas the targets are getting tougher to locate and more difficult to commercially produce. There are far fewer drilling opportunities and areas available for drilling – and the competition is fierce.

Today's advances in data quality and information management can help the time strapped geoscientist increase the quality of their interpretation/prospect generation and reduce the decision time that may be required to identify and commit to a prospect.

There are tools and processes now available to the industry that can be used to create a quality environment through automation and best practices, such as the environment created in the Gulf of Mexico operations at Chevron.

Introduction

According to Dag Heggelund, President of InnerLogix, there are many organizations in the quality management "space", specifically Six Sigma, who have verifiable historical findings of the quality – productivity relationship.

Rate	Sigma	Selection Size	Resource Cost
69%	2	-	40%
93.3%	3	10	30%
99.38%	4	112	20%
99.98%	5	3466	15%
99.9997%	6	231049	<10%

Figure 1 – The relationship of defect rates to productivity

Figure one shows the impact of defective data on the productivity of the users of that data. Heggelund goes on to say that data quality is not just a measure of *accuracy*, but also *trustworthiness* and *accessibility* – in other words, the data consumer has the data in the application and trusts the data so they begin their core business immediately.

Note the impact of data that is 20% defective – at least two days each week are spent with data issues – the average user working to get back to the "trusted" state. There are stories of users, working with some 600 wells in a project, who run into defective deviation surveys – the reference for the survey was incorrect. The geologist

then spent the next 3 weeks validating the data – getting the deviation survey data to a point where he regains the trust in the data.

Geoscientists	
Should be doing:	Should NOT be doing:
Interpretation	Data gathering
Evaluation	Project setup
Prospect generation	Data management

Here lies a significant challenge – how does a company get to the Five Sigma level (basically 99.98%) in today's dynamic data environment?

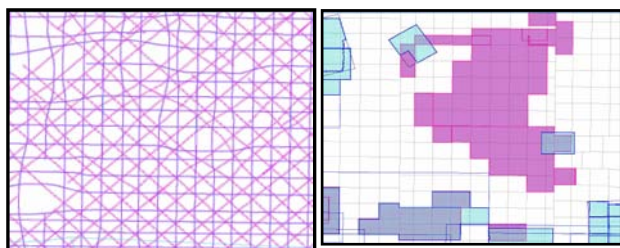
Wells Chevron

From a wells prospective, the geological and geophysical (G&G) community of Chevron North America E&P Company, Gulf of Mexico works with huge amounts of well data that is stored in approximately 100 project databases, ranging in size from 200 to 17,000 wells. This highly active region presents major challenges for the data managers and IT professionals who are responsible for maintaining data integrity and synchronicity across the computer systems of all project stakeholders.

Although project and master data from Chevron, Texaco, and Unocal was consolidated after the companies merged, the Gulf of Mexico Data Management group desired further streamlining to alleviate the many resource- and time-intensive tasks being performed manually. The painstaking job of tracking down and then correcting data issues, such as missing wells and wellbores, was creating a growing resource allocation problem. It was also becoming more difficult to keep information in sync with the steady stream of new well data entering the master database from various vendors and government agencies, in addition to the data being loaded by G&G community members into their project databases. Some process improvements were developed in-house using the existing software, but a great deal of effort continued to be spent on non-standardized procedures that yielded only incomplete results.

Seismic

As mentioned above, today's advances in data quality and information management can help the time strapped geoscientist increase the quality of their interpretation/prospect generation and reduce the decision time that may be required to identify and commit to a prospect.



Example GIS display showing overlapping 2D and 3D project data from multiple companies. Project from different legacies are shown as different colors.

At the core of these decisions may be new processes that are applied to old data, which may be the only source of data available for previously developed prospects. In the Gulf of Mexico for example old 3D seismic surveys are being merged with new surveys to increase the azimuth coverage for a particular feature. As the previous data has already been acquired the cycle time and the cost are both greatly reduced as the company may not need to acquire a new survey. We shall look at how two companies have applied new quality and information management techniques to increase their agility and competitive capabilities. These same functions may also increase the value of a company that is process of evaluating a other influence on how we apply

A mid to large independent in the USA with exploration and production efforts in the onshore and offshore had two compelling events that had occurred. The first was an acquisition that had recently been made which has some overlapping assets with their existing portfolio. They need to find overlaps, merge interpretation projects and also prepare unwanted acreage for divestiture. The second was a desire to increase their portfolio in the deep water gulf of Mexico, but their exiting geoscientists were very busy working on existing prospects and they did not have the time nor inclination to increase staff.

The seismic data management process using the Schlumberger solution also protects the investment they have in seismic survey data. This particular company had near \$500,000,000 in seismic assets. These valuable assets where many times lost or their location unknown so they were never utilized in new prospect generation through the application of new processing or attribute generation techniques.

Method

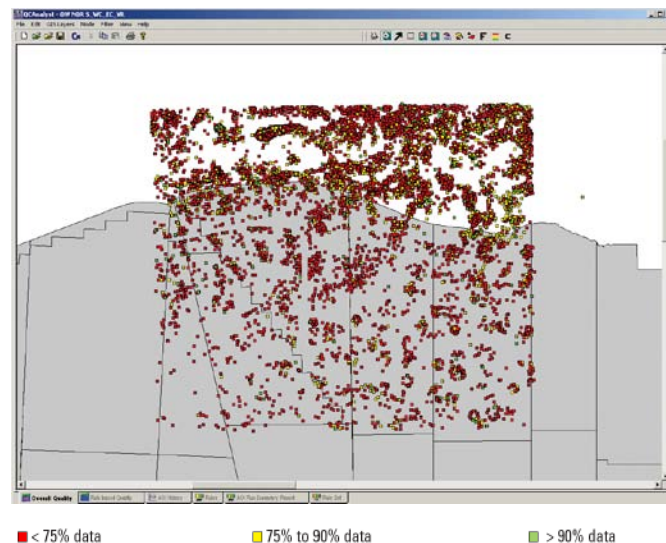
From the wells perspective, to meet Chevron's quality and productivity expectations, the Data Management group decided to look for newer QC technologies to complement the software already in place. These would preferably be from the same vendor and able to deliver organizational gains in time efficiency and data accuracy while minimizing any impact on resources. A major goal was to be more proactive in finding errors, correcting them, and keeping project data in sync with the most up-to-date well data in the master database—rather than waiting until a data request was received.

Implement automated software

Schlumberger Information Solutions (SIS) recommended the new, cutting-edge QCPro bundled software package with QCSync and QCLogix capabilities to supplement existing InnerLogix applications and help achieve full DQM automation.

Upon implementation, these tools provided the extensive functionality that Chevron NA required in the Gulf of Mexico region, enabling its data analysts to define their own "pass" rules, based on five standard measurement categories:

Completeness, consistency, validity, content (parent/child relationships) and uniqueness rely on the software to automatically find errors, correct them according to predefined rules, and update projects with high-quality well data quickly view all failures in various formats (maps, reports, graphs, etc.) run assessment and correction jobs on a regular basis easily verify location-specific data online (zoom in on an exact area and compare master data against project data) remotely monitor interpreters' activity (modifying, adding, or deleting data) perform fewer manual tasks (i.e., when reviewing "failed" data at the back end of the automated correction process).



QCAAnalyst map showing that initial overall project data quality was less than 75% before rule-based analysis and cleanup were performed.

Having implemented a seismic data management system to manage data in their projects and their incoming SEG Y data they were able to ingest over 200 projects containing nearly 25,000 lines and surveys in a matter of days. They could then determine the overlap and merge the overlapping projects from their new and old acreage. This allowed the geoscientists to quickly extend the scope of their interpretations, high grade their interpretations results.

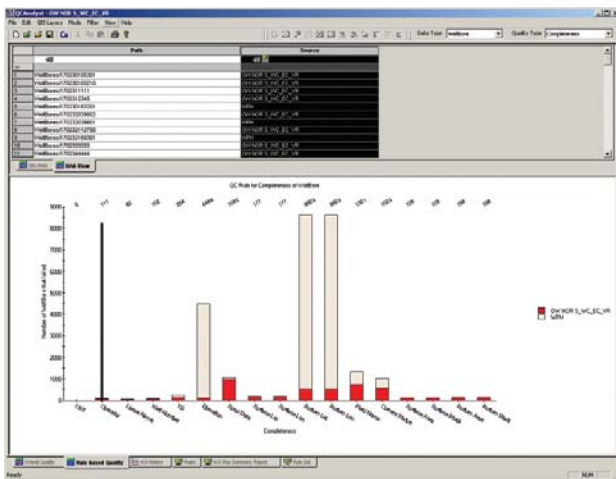
In addition to seeing overlap, the company was able to see what data was available in the areas where they planned to divest properties. The system allowed them to quickly identify those target projects, pull them off the production systems and then move them into a data room

type environment where they could be show to prospective buyers.

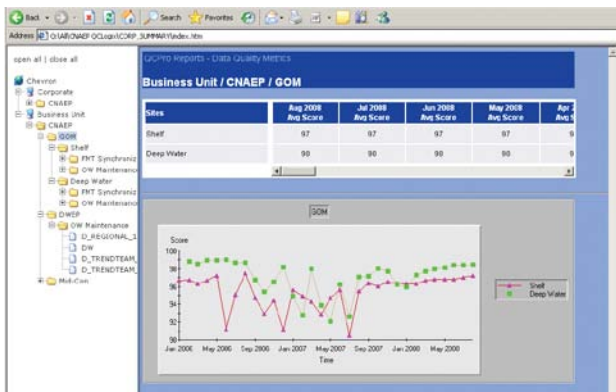
Results

Chevron is now able to perform automated QC analysis of data with improved reliability and near real-time synchronicity, which has led to higher-quality data in both the master database and in multiple project datastores.

The impact on resources has been positive, freeing personnel to focus on reviewing data at the back end when something is missing or in need of human intervention to ensure completeness and accuracy. The manual correction process has been simplified by automating some of these tasks, which has also allowed reallocation of Chevron resources to other areas where their expertise is needed.



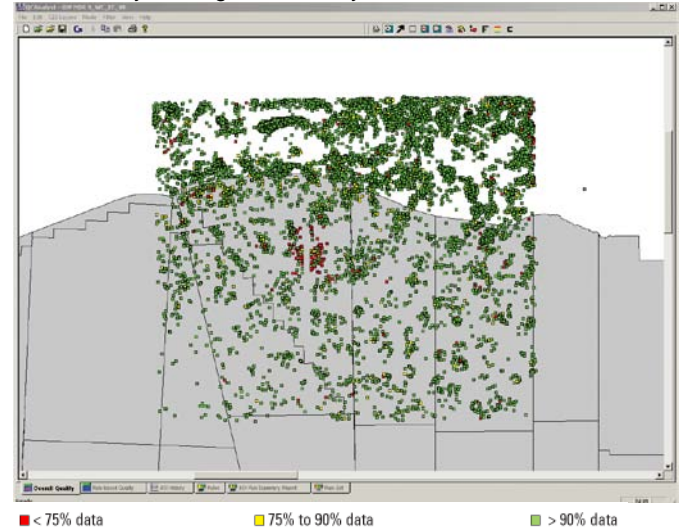
QCAlyst graph showing number of failures (issues) identified by Chevron-defined rules for wellbore data completeness.



QCPro report summarizing data quality metrics (%) over time for Chevron data cleanup projects.

In addition to standardization of data across the user community, the most significant gain was the high level of accuracy resulting from the implementation upgrades, which has increased the interpreters' confidence in the data they receive after it has been analyzed and

corrected by QCLogix and QCSync software.



QCAlyst map showing significantly improved overall data quality (greater than 90%) after issues were corrected.

For the independent company the new seismic and project data management solution, now allowed them to take only a few hours to find overlaps and extensions, it also allowed them to locate the valuable associated data volumes (field, processed, AVO, etc) so additional processing could be done. They could better management their new merged environment and they were also certain that the data from the divested properties where no longer sitting on their systems, which could open them up to litigation.

Conclusions

Through the use of today's data quality management and sophisticated information management systems a company can increase they competitiveness against its peers, reduce risk and protect valuable company assets. These processes can be incorporated into today's geosciences workflows and in many cases work transparently behind the scenes, potentially without the knowledge worker even knowing they are there. Unlike many other types of systems the best data quality management and information management systems are generally not seen and simple provide the users with the required information at the right time and with a known and reliable level of quality.

"The checks and balances of these integrated QC tools are really great. We have been able to quickly resolve validity issues and have seen a significant increase in the accuracy and reliability of our data. Even the interpreters are amazed!"

Michael Underwood
IT Data Analyst
Chevron NA E&P Company

Acknowledgments

Michael Underwood, IT Data Analyst, Chevron E&P Company, 2008

Dr. Dag Heggelund, President, InnerLogix, Schlumberger Information Solutions, 2008