Byte Me!
How Geoscience Data Architecture Can Help You

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Abstract

Background

Over the last couple of decades, the geological and geophysical disciplines within the oil and gas industry have witnessed many technological changes that showcase the evolution of Information Technology (IT). Large mainframe computers have been replaced by Unix based workstations or personal computers (PCs) using a Linux or Windows based operating system. Rather than hand timing seismic sections as was the case twenty years ago, interpretive software now permits the accurate timing of seismic profile sections and the posting of values onto a map. Programmed with the capability to facilitate the manipulation of the data and extract additional information, the interpreter now uses interpretive software to measure properties of the seismic data and to provide a better quality understanding of the sub-surface. Data that was normally provided in hardcopy form is now provided digitally from various service companies through secured internet portals or FTP sites. Well-log data can be transmitted via a satellite network to the desktop of the geologist. Access to data, reports and information via the internet has permanently changed how people handle, store and retrieve data and information and the knowledge derived from it. Gone are the central libraries and the library professional within oil and gas companies that faithfully archived this information. Even communication between people or business units is now facilitated readily by e-mail. Documents are routinely attached to correspondence rather than photocopied and couriered to the other party. Information technology has clearly altered how business is conducted and how people conduct their work.

Information Technology

During this time period, spending on informational technology ballooned as companies who viewed technology as a strategic advantage, invested capital and human resources to ensure their competitiveness. Most corporations created entire IT departments that focused upon

accessing this technology. As the potency of IT increased, so did its ubiquity. An article written by Nicholas Carr, entitled IT Doesn't Matter, published in the Harvard Business Review magazine in May of 2003 encapsulates the evolution of information technology. In what has been described as a seminal piece, Nicholas Carr contends that it is not the ubiquity that provides strategic value but its scarcity. He contends that what defines a competitive advantage is the ability to do something that a competitor cannot do. As informational technology becomes more common and accessible, the strategic value of IT decreases. Proprietary technology and internal strategic advantage gives way to infrastructural technology with shared open access as an integral part of doing business. The lack of standards provides an entity possessing a proprietary technology a competitive advantage, whereas the presence of industry standards for an infrastructural technology, levels the playing field and equalizes things for most companies.

Carr contends that as an infrastructural technology, IT simply transports, processes and stores data and information. IT has progressed from a proprietary technology twenty years ago to a commodity that is easily and readily accessible. As information technology spreads, the cost of acquiring the technology drops, standards evolve and the strategic advantage to a corporation diminishes. In the July 2003 edition of the Harvard Business Review magazine, just two months after Carr's article, a rebuttal by John Seely Brown asserts that IT by itself seldom provides strategic differentiation. It provides the opportunity, possibilities and option to separate oneself from the competition. Companies that act upon these possibilities will differentiate themselves from their competition. Although the technology may be ubiquitous, the insight to harness its potential is not evenly distributed. "Companies that mechanically insert IT into their businesses without changing their practices… will only destroy IT's economic value". For this reason, Brown contends that IT spending has seldom lead to superior corporate financial results. As Carr asserts, IT has become a negative enforcer that has become a cost of doing business. To be without it would mean to be uncompetitive. Brown contends that the competitive advantage in today's IT environment is to know how to harness its capabilities and change the way of doing business by establishing new business practices. However, the ability for IT to create economic value and the insight to organize technological components into value adding architectures is in short supply. Brown contends that competitive advantage is maintained by those who successfully do just that. They harness today's technological capabilities, thereby truly leveraging technology.

Current Implementation in the Oil and Gas Industry

Within the oil and gas industry, IT departments and software vendors expounded the utopian solution of IT applications. IT applications and system hardware were sold as panacea solutions to maintaining corporate competitiveness. Maintaining competitiveness was portrayed as the requirement to obtain enhanced functionality with ever faster hardware, equipped with operating systems that facilitated computational speed and data transfer. This utopian dream quickly evaporated as corporations realized that data format, data transfer, file import and export, hardware compatibility, operating system compatibility and even employee education, and were all factors in deploying information technology effectively. The competitive advantage of IT was no longer access issue for those who could afford it; it had become an implementation problem. With geophysicists preferring the Unix platform and geologists working with PCs, a hardware disparity quickly evolved. For years, the industry solution was to contour the resultant maps similarly, using a light table and overlay method to correlate and integrate the two data sets.

Recent developments in personal computers have provided geophysicists with the computational speed and capacity to perform these calculations on portable laptop computers. Varied data formats, vendor specific data file structures, and a lack of standards hampered the inter-connectivity of software and data.

What is Geo-Science Data Architecture?

Geo-science data architecture is the design of geological, geophysical and petrophysical information workflows and the interaction of databases and various application software packages to facilitate data interpretation and ultimately the retention of the knowledge derived from the analysis of information. It is the ability to accurately store the data, readily access it, derive information from it and then retain the knowledge learned. Database management practices will assert responsibility and accountability for the initial capture of data, emphasizing the accurate and complete population of the database. Data architecture is much more than data management. Data architecture is a management system that contains practices, policies and procedures that facilitate this progression or workflow. Data architecture is an umbrella that spans numerous IT issues as illustrated in Figure 1. It encompasses data management, hardware and software issues, operating systems, system security and back-up, information analysis, knowledge retention, result presentation, system integration, data file transfer and the like. It is a context that re-frames IT issues and captures the breadth of issues associated with facilitating data workflows for the end user. Figure 2 is an example of a geo-science digital workflow chart that classifies software by functionality through the interpretive process. It is through this process that data becomes information and ultimately knowledge. Streamlining workflows within an organization will lead towards less confusion, faster cycle times, higher productivity and less frustrated personnel.

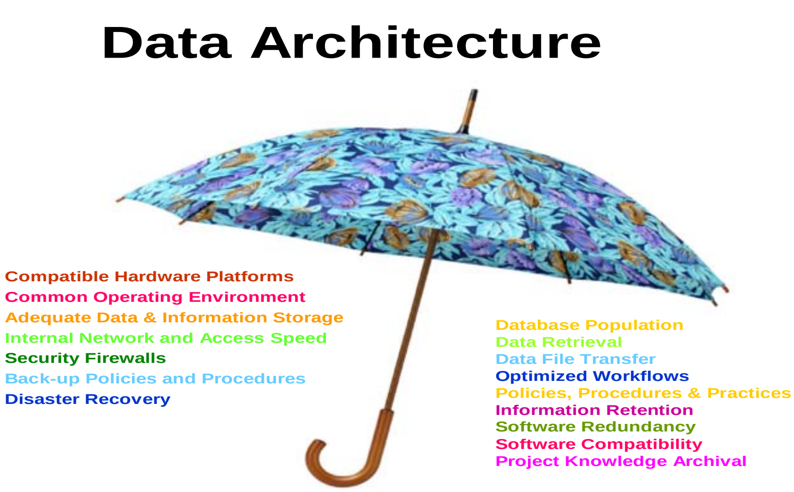

Figure 1. The Data Architecture umbrella covers numerous Informational Technology issues which are best viewed in a broad context as many of these elements are inter-related.

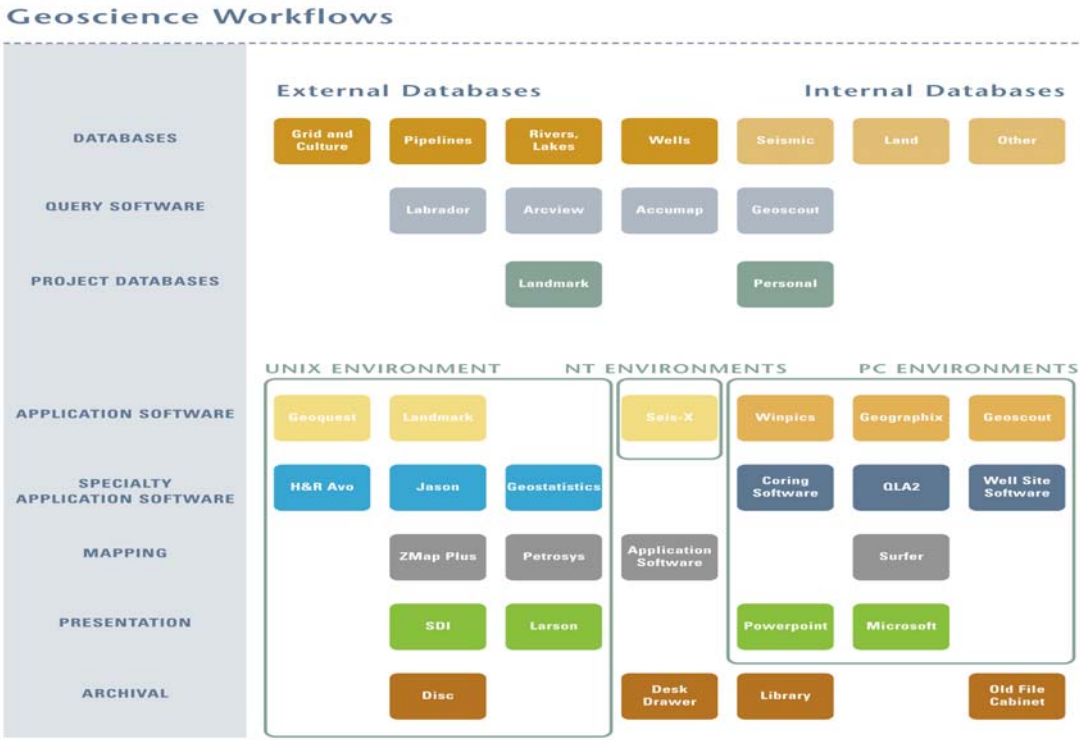

Figure 2. A geo-science workflow chart that classifies software by interpretive process as data evolves into information and ultimately knowledge.