Charting a New Course in Seismic Imaging

With his training in electrical engineering as a foundation, **Eldad Weiss**, Chief Executive Officer of Paradigm, has taken a methodical, logical approach to growing his business from a niche provider of graphical imaging software to a global provider of exploration and production (E&P) data management solutions.
Under the leadership of Eldad Weiss, Paradigm has grown to become the world’s largest transnational technology company focused on developing and deploying software for all stages of the oil and gas industry’s E&P processes. However, it may surprise some to know that Paradigm’s beginnings in the 1980s were not tied strictly to the oil and gas industry, but instead to the larger arenas of imaging processing and the graphic arts.

“We were a division of Scitex, a company that pioneered the development of technology advances for prepress software, which was the forerunner of the image-and-page-editing software that is available nowadays,” says Eldad. “Many major periodicals were using this software, and still are today, with the goal of creating better, sharper images.”

Eldad was still at university studying electrical engineering when he went to work in the prepress industry, and he helped his company find other application areas for their technology. “We started in the textile- and rug-making arena, in which we were tasked with figuring out how to take a design created on paper and convert it digitally into something that could be woven into rugs,” he says. “We also worked with the printed-circuit board industry, investigating how to create and optimize the process of making printed circuit boards for various electronics applications.”

But it was mapping that opened the pathway into oil and gas. “We were providing technology – software, hardware and plotters – to help mapmakers print higher quality maps. We realized that it was a pretty natural transition to the exploration segment of the oil and gas industry, which at the time was challenged with producing higher-resolution, 2D seismic plots on paper,” Eldad says.

Replacing Colored Pencils!

In 1984, Eldad and his group began supplying large drum plotters to the industry, and soon transitioned into supplying software to automate and computerize seismic plotting activities. “The first order of business was to mimic the manual process of producing seismic plots in the computers. In the 80s, much of this work was still done with paper and pencils, different colored pencils for each horizon you were interested in plotting,” says Eldad. “In those days, you might be interested in picking up to 12 different horizons, which translated to 12 different pencils. Now, there are requirements for thousands of horizons! Clearly, the paper and pencil approach was not sustainable.”

Eldad’s company became the first to provide software that would plot seismic data graphically, but had to overcome both technical challenges and people’s attitudes toward working with computers in this field. “You have to remember that this was the 80s, when computer-aided seismic interpretation was in its infancy,” Eldad says. “We had to answer the question of why, given the high overhead costs of computers and technicians, people would even do this kind of work on a computer. This might sound strange given our current perspective, but it was a prevalent point of view back then.”

Another obstacle involved how to interact with computer systems to manipulate the graphical data for optimal usage. “The concept of a mouse did not exist, so we brought trackballs in and figured out how to interface them with the computer, which was a first in this arena,” Eldad says.

With these challenges effectively addressed and the software gaining greater industry acceptance, Eldad began to set his sights on broadening his company’s exploration offerings. “We were not the domain experts in interpretation of the data, but rather in converting the industry’s requirements into a computer-aided, graphical representation of the data that they could use to work more effectively.

“We realized that moving from strictly computer-aided graphical design to computer-aided exploration support was a logical and natural evolution for our company,” he adds.

Adding a New Dimension

During this time period, many of the operators using Eldad’s services were in the early stages of transitioning from 2D seismic mapping to 3D, which presented formidable challenges.

“We were one of handful of start-ups at the time who were trying to answer the fundamental question of how best to interpret 3D data sets,” Eldad says. “Because there were not true 3D seismic data sets available to work with, we used data from the University of Houston’s Seismic Acoustic Laboratory [SAL] Model, which recorded seismic objects submerged in a large swimming pool in an attempt to mimic what true 3D seismic data might look like.”

With this data as a starting point, Eldad and his colleagues worked to develop better interpretation solutions. Measurement concepts evolved from in-line to cross-line and then to various integrations between the two. Eventually, the concept of the time slice, which was not even a consideration in 2D seismic, was developed.

Eldad next set his sights on moving from interpreting in a time domain – the typical recording realm for seismic data – to depth. “Depth is a more natural interpretation realm to work in, and so we pioneered the concept of giving the interpreter the flexibility to do their work in both time and depth through our flagship product called GeoDepth,” he says.

Acquiring Expertise

By this stage, the company, which had branched off from its parent under the name Paradigm, aimed to increase its footprint to include seismic processing, further interpretation, petrophysical analysis and drilling software.

“We were aiming to turn Paradigm from a niche provider of time-to-depth conversion and depth migration into a full solution company, which was accomplished through the methodical process of acquiring and integrating companies with key technological offerings,” says Eldad.

“Personally, I have found this process to be very rewarding and exciting.”

Successfully integrating any new company into an existing organization presents unique challenges, but Eldad is proud of the way Paradigm has accomplished this as seamlessly as possible. “We integrate new companies in a way which respects their people’s work ability, history and contribution.”

This strategy includes the concept of maintaining people at their existing locations, rather than relocating them or shuttering their R&D centers. “We want our new employees to maintain their excitement and enthusiasm for their products, but at the same time, get them thinking about how this benefits the entire Paradigm organization,” says Eldad. “We’ve done very well with this approach, which is evident from the fact that many of these folks are still with us.”

Most recently, Paradigm acquired French software provider EDS, which developed the SKUA modeling software. SKUA, an acronym for Subsurface Knowledge Unified Approach, is a technology platform that provides fully 3D structural, stratigraphic and reservoir models with multi-resolution capabilities. “As an engineer, I was quite impressed with the...
quality of the SKUA solution, and I think it has high potential to improve the industry’s performance. While the product came out in 2008, it really took us until late 2010 to develop it into the full offering that it is today,” Eldad says.

This time period to develop a technology into a fully realized product, a process that Eldad calls “productization,” is not unique to SKUA, and in fact most of Paradigm’s products go through the same methodical and rigorous process. “There is a big difference between announcing that you have a great new technology and actually making it a useful product that can help an operator achieve their goals,” says Eldad. “Only by testing a product on a massive scale can you identify issues and then work to solve them to optimise the product. It requires a thorough evaluation process that factors in scale, security, performance assurance and data quality. I feel that our ability to productize a technology has been a major benefit for the companies we bring in.”

Industry Challenges Persist
While seismic processing providers have made significant strides in helping operators make better drilling, completion and production decisions, Eldad believes significan
t work remains in several key areas.

“An ongoing frustration for me is that even today, some software offerings provide solutions for the general interpreter that do not take them much farther than the traditional ‘paper and pencil’ approach,” he says. “The industry should examine how to truly create a – and please mind the pun – working paradigm for how seismic data is interpreted.”

Eldad acknowledges that much progress has been made, but adds that the industry is still fundamentally mimicking many of the procedures developed in the 1980s, rather than rethinking them, even though the underlying computing environment has changed so dramatically.

“In my opinion, the technologies currently at our disposal are ahead of the workflows, procedures and application software that have been developed,” he says. “We have invested in our new Paradigm 2011 release and in our fundamental integration software to enable new workflows. But providing a technology is one thing. We really need industry leaders and management to encourage their people to take advantage of new processes and workflows.”

Shifting to new workflows will require moving from the traditional interpretation task of manually picking a line and creating maps to a search-engine approach, in which the interpreter makes their decision based on the best interpretation available from the computer. “Advances in our software solutions should be able to provide multiple models and scenarios to the interpreter, such that their job will become selecting the right scenario, rather than the mundane task of picking and creating a scenario.”

Data management is another area that requires some fundamental changes, according to Eldad. “Advances in data storage and computing technology have given us the ability to access vast amounts of data, but this requires some fundamental rethinking. Having all this access blurs the lines of what constitutes project data, an individual’s data and corporate data.”

Proper data management also means assuring that security safeguards are in place – a complex undertaking in a large-scale, collaborative project with multiple service providers and operators involved – and developing better user interfaces and analysis methods that identify unsafe drilling and production events early to mitigate their impact.

And what lies ahead for Eldad and Paradigm? “We will keep looking to develop and acquire interesting technologies that continue transitioning geoscience from a work of art to a full engineering process that presents various scenarios, evaluates the risks of each scenario and allows an informed engineering decision to be made. I’ve enjoyed using my engineering background to contribute to this transition.”

Eldad Weiss and the Paradigm team at SEG 2010 this year.