

# The Digital Petroleum Engineer: Carpe diem!

Mehrzad Mahdavi, SPE, Vice President Enterprise Security Solutions, Schlumberger

The digital age has dawned. When it comes to information technology (IT), many think the oil and gas industry has been slow to seize the day. But the truth is we embraced IT early on, beginning in the 1950s with reservoir simulation. Since then we have researched, developed, and deployed many additional technologies and applications, with most recent efforts toward full realization of the digital oilfield.

Although we have made progress, our industry is at a crucial juncture and needs more than incremental steps; we need a major transformation. It is time to take a deep breath and take the plunge into total emersion, to be like fish in water.

Computing technology is no longer the question; it is here and progressing faster than you can say “real-time data transmission and communication.” Now we need people with the right skills and vision to use the technology to transform our work. We need digital petroleum engineers.

This editorial defines a digital petroleum engineer in the energy industry, describes some roles for the digital petroleum engineer, explains why such a profession is necessary, and lays out the challenge for industry, academia, and SPE for making the profession a reality—now.

As the Chairperson of the SPE Information Technology Technical Section (ITTS), I have the honor of authoring this editorial. However, the ideas are based on many discussions over the years with many esteemed colleagues, especially those quoted below who are either members of the ITTS or advisers to the group. They have contributed significantly to the discussion and this editorial.

## Who is a Digital Petroleum Engineer?

In the early days of industry software development, oil and gas professionals were teamed with IT professionals. While we have had some success with this approach, our industry also has a reputation for slow technology uptake.

IT is an integrative technology, so it only makes sense to take advantage of this catalyst and develop new roles around it. Because we can link systems from the different disciplines, the technology itself helps to transform the work processes and break down the traditional silos that emerged when, before IT, we had to break down complex problems into their smaller component pieces to solve them. Now IT is allowing us to integrate those smaller pieces together so that we can analyze, optimize, and resolve the whole.

At the very basic level a digital petroleum engineer combines IT knowledge with oil and gas content. Of course, we have many people in the industry now who have both of these skill sets. But the bottom line is we need more—and we need them now. We also need to clearly define the skills required to be a digital petroleum engineer, how a person can acquire those skills, the roles they can play in the industry, and a clear career path and opportunities.

“We are envisioning the digital petroleum engineer as a profession much like a project manager,” explains Donald Paul, former Chevron Vice President and Chief Technology Officer, who recently retired after 33 years of service. “Like a project manager, there is a body of knowledge, and perhaps even a certification process. It is not a separate academic discipline, but it integrates the knowledge based in the foundation of the existing disciplines of IT combined with the oil and gas disci-



**Mehrzad Mahdavi**, SPE, is Chairperson of the SPE Information Technology Technical Section and is Vice President, Enterprise Security Solutions, for Schlumberger, where he is leading the company's initiatives in IT security. With more than 25 years of oil and gas experience, the first half of his career he concentrated on oilfield services technology and the second half on combining information technology and oil and gas content. His current focus is developing best practices for securing the digital oilfield.

A holder of five patents, Mahdavi is a contributing author to Larstan's *The Black Book on Corporate Security* and has published numerous articles. He has also chaired several international SPE conferences on IT and the digital oilfield. Mahdavi was the 2008 recipient of the Information and Management Award given by the SPE Gulf Coast Section, and was voted one of the top four most influential technology executives in the oil and gas industry for 2007 by *Upstream Technology* magazine. He earned a BS degree in electrical engineering from the University of Illinois and an MS degree and PhD from the University of Michigan in nuclear science.

plines, such as petroleum engineering, geology, geoscience, and others.”

IT knowledge for a digital petroleum engineer can include: programming, networking, system architecture, hardware (networking hardware and sensors, gauges, and instrumentation of the digital oilfield), data capture, storage, and transmission.

“Digital petroleum engineers will understand the full capabilities, potential—and limitations—of IT, and be the leaders in using it to transform our work and meet the energy challenges facing our world,” says Paul.

According to Iraj Ershaghi, Director of the Petroleum Engineering Program at the University of Southern California (USC), “We have had many discussions about whether it is better to teach an IT professional how to drill a well or teach a petroleum engineer more about IT. Ultimately, we are talking about a hybrid of these skill sets.”

USC currently offers several programs to cultivate digital petroleum engineers in traditional students and mid-career professionals. USC offers a master of science in petroleum engineering that focuses on smart oilfield technologies. For those whose careers or lifestyles do not allow such a time-intensive commitment, a four-course certificate program is also available.

As IT has rapidly developed in the past 25 years, many industry professionals have been fortunate enough to evolve through a career path that has allowed them to combine and capitalize on their interest in both the industry content and IT. Eric Kocian, the SPE ITTS Digital Engineer Subcommittee Chairperson and the Upstream Engineering Manager for ExxonMobil Technical Computing Company, counts himself in that group.

“Starting out as a petroleum engineer in 1981, software use was very limited and mainframe based. Personal computers were in their infancy. But with the emergence of IT and its value in solving the oil and gas industry’s complex technical problems, new career opportunities have emerged,” he says.

Currently, many job titles exist that are filled by people embodying the skill set of a digital petroleum engineer. Some examples include:

- User support engineer, who promotes the integration of technical applications, data, and work flows.

- Software engineer, who defines, executes, and stewards the technical application development process.

- Engineering architect, who develops technical principles and models that describe the enterprise’s future state and enable its evolution.

But as we near the end of the first decade of the 21st century, our industry faces daunting challenges—challenges for which IT can provide not only significant solutions but revolutionize how we work. It is not enough to let people merely find their way into these roles. We must chart a roadmap, steward the process, and identify new roles to provide the kind of transformation that these challenges demand.

### Why Now?

Forces are converging—reliable technological advancement, rising worldwide energy demand, and industry demographics—that make now the time to formalize this role. The industry has and is capitalizing on advances in digital and information technology to improve business performance through systems standardization, integration, and automation. These efforts help realize gains in both efficiency (e.g., reductions in process time and costs) and effectiveness (e.g., optimizing recovery or adding reserves) and also help address broader industry challenges, such as more complex and remote assets (arctic, deepwater, and tight gas), the “big crew change,” and attracting talent.

Computer technology is nearly ubiquitous, perhaps completely so for the generation coming up. Communications and networking technologies such as the Internet, Voiceover Internet Protocol, instant messaging, and social networking that began as novelties (perhaps of more initial interest to teenagers and twenty-somethings) have become robust, reliable tools for conducting business. Indeed, many upcoming engineering students do not know life without these technologies and fully expect them as part of their working world.

With unprecedented global demand and a large percentage of senior professionals nearing retirement, the industry is at a critical juncture. An innovative, high-tech image of the industry provides new opportunities for attracting the young and computer-savvy talent we need.

SPE’s ITTS was founded in 2006 with one of its original stated goals of “promoting establishment of a new profession combining information technology and oilfield technologies, including curricula and training.” It is the work of this technical section and its members’ recognition of the convergence of these other forces that are propelling the idea of making the digital petroleum engineer a reality for the energy industry.

### Challenge for All

The realization of a digital petroleum engineering profession presents challenges for academia, industry, and SPE. The challenge for academia is to develop innovative new programs and ways to educate and inspire students about the high-tech global energy business without compromising the time needed to learn fundamental engineering principles. Innovative programs, such as those offered at USC, which offer courses outside of the standard curriculum and bring current industry experts into the classroom, are crucial to success.

The industry, both service companies and operators, must help to attract, train, and develop digital petroleum engineers, establishing clear career paths and goals.

As always, we look to SPE to continue providing the forum for discussion and development of the digital petroleum engineering profession, as well as leadership, education, certification criteria, and outreach.

### What is Next?

In the future, it is likely that digital petroleum engineers will be as visible in every company as project managers are today, and swimming effortlessly like fish in the digital sea. But to achieve that, we must chart the course now. This editorial makes some suggestions for how to proceed, but we do not see these as the only answers. We would like your feedback and input. Become a member of the SPE technical section (it is free for SPE members). As a section member, you have access to IT discussion boards where you can contribute your thoughts on the concept of the digital petroleum engineer. A more detailed article or SPE paper based on this initial editorial is planned for the near future and will also incorporate input from the discussion board. **JPT**