Integrating People, Processes, and Technology

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Introduction
As the petroleum industry enters a new era of knowledge-based exploration and production, companies are seeking the Holy Grail of enterprise-wide integration. In this business environment, it's easy to become hypnotized by the seemingly limitless potential of information technology.

But technology is only part of the ultimate integrated solution. In this paper, we'll explore the "softer" people and process issues that impact an energy company's ability to perform effectively in this new era.

The Hierarchy of Integration
Landmark started with one technology—a 3D seismic workstation—in one functional area: geophysical interpretation. As we expanded our product line to cover the full oil field life cycle—geology, mapping, reservoir engineering, drilling—we quickly realized we had to move from a functional view of the industry to a process view. We had to understand how to help our customers use these technologies in more integrated ways. But that increased the challenge almost exponentially. Why?

As E&P companies approach the task of integration, they typically go through four phases, which we call the Hierarchy of Integration (Figure 1). Level One involves integrating all of the relevant technical, operational, and business data, making it readily accessible to users in digital form. That's not an easy task. Most companies accomplish this in one area at a time. Only then can they move up to Level Two of the hierarchy. The second level entails integrating the workflow within a particular group such as geology and geophysics, production engineering or drilling.

Once that has been accomplished, they can move up to Level Three—integration of operational processes across different groups. That presents an even greater challenge. In fact, we believe most of the new technical and organizational innovations in our industry will take place in the "white space" between existing operational groups. For example, how can we better integrate reservoir engineering with geology?
Drilling with the earth model? The surface with the subsurface? Despite progress made in recent years, tremendous productivity gains can still be made in the gaps between various parts of the organization. We call those gains the “Revolution in the White Space” (Figure 2).

Finally, Level Four of the hierarchy is about enterprise-wide resource allocation. Achieving that level of integration will enable oil companies to make business decisions based on the collective wisdom of the entire virtual organization, including partners and suppliers. The potential value of integrating all four levels is enormous. As a company ascends each new level, productivity gains should increase not just linearly, but geometrically.

The Three Pillars of Integration

After working with clients around the world, Landmark’s observation is that there are not fully Integrated Enterprises in the industry today. Most companies are still at Level One or Two. They have “islands of integration,” at best. That is, they may have integrated geology and geophysics or the drilling functions, but no one has successfully integrated across the entire organization. Why is it so hard? Why aren’t we moving faster?

Looking at Landmark’s own internal efforts has helped us better understand the difficulties oil companies face. We’ve found that integration is as much about people and process as it is about technology. But very few companies, Landmark included, have focused in a balanced way on all three of these issues. And that is probably why most E&P organizations still have only islands of integration.

Enterprise-wide integration demands that we pay almost equal attention to three essential elements, which we call the Three Pillars of Integration (Figure 3). The first pillar involves Process and Function; the second, Team and Individual; and the third, Technology as Enabler. We’ve chosen the metaphor of three pillars deliberately. It expresses our belief that if any one of the three is missing, the Integrated Enterprise will not stand up.

Landmark consultants have learned this from experience over the last two years. Our rapidly growing professional consulting group works directly with customers to implement integrated solutions. Few users understand the workflows required to share data among applications used by various
disciplines. So our consultants spend a lot of time training people in new ways of working with technology. But as we get more involved with customers, we continually encounter social and organizational bottlenecks—the other two Pillars of Integration. If we can’t help solve these problems, our customers are not going to achieve the productivity gains they expect from our technology.

To better understand the “soft” technologies necessary to deal with these issues, Landmark has begun working with experts in the field. One of those experts is The Rummler-Brache Group, a consulting firm that specializes in organizational, process, and human performance issues.

**Process and Function**

For over 15 years, The Rummler-Brache Group has worked with corporations in many industries to clarify the vital relationship between Process and Function. It is important to realize that, despite the power of process management and process improvement, functions will never go away. Processes deliver the value to the customer, but functions are needed to support them. There will always be some tension between the two, but the center of gravity in a company must begin to shift from function to process.

In the oil business, for example, reservoir management is a complex process fundamental to the company’s bottom line. But it must be supported by specialized functions such as seismic interpretation, petrophysics, reservoir modeling and simulation, economic forecasting, directional drilling, workover and completions engineering, and production accounting. Defining the process does not eliminate the need for, say, the Drilling Department. It does, however, require each function to adopt a wider view of the business.

To better understand process and function, consider two different views of any organization—one vertical, the other horizontal. The vertical view is represented by the traditional organization chart (Figure 4). It illustrates hierarchical reporting relationships among various internal functions. For example, Exploration departments used to be divided between geologists and geophysicists, each of whom reported to a District Manager. The Production department consisted mostly of engineers. In this view, people manage each of the boxes on the organization chart, but there’s no way to manage the critical “white spaces” between them. Nor is there any indication of how work actually gets done, or why.

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*On The First Pillar—Process and Function:*

George Boykin: Evolving into a process-based organization—implementing processes that are loose so you get creativity, and yet are tight so they’re standard-ized and you’re using only the best—is our challenge for the new millennium.

Tom Hamilton: We’re learning to work in teams and truces more easily than we’re learning how to lack the whole process together, when it involves different groups inside an organization. And it gets much more complicated in this age of alliances, where we’re putting different cultures together.

Andrew Armour: A number of collaborative projects we have going with companies now are on the basis that we can learn more effectively together than separately.
The second, or horizontal view, makes it possible to manage an organization as a true system. This view includes three components not depicted on a typical organization chart: customers, who are the reason the organization exists; suppliers and partners, who are also part of the system; and process, which links suppliers across the internal functions to the customer (Figure 5). To get the best performance out of an organization, the horizontal process must be carefully defined and managed. That makes it possible, then, to manage the white space on the organization chart. Many petroleum companies are still struggling to identify their customers and define their core business processes. This has become especially complex in an era of increasing alliances among E&P organizations, academic institutions, technology suppliers, and oil field service companies.

There are really three levels of performance that companies must align and manage. One is the organization level—goals, strategy, structure, and measures. Second is the cross-functional processes that deliver value to the customer. And the third level is the individual job and performer. Historically, when organizations run into a serious business problem, they start at the bottom and try some combination of "train and blame," or cut jobs. If that doesn't work (and frequently it doesn't), they move up to the top level of the organization and restructure. Often the net effect is: fewer people, the same amount of work. Most companies never quite get to the process level in the middle.

Processes are really the fly-wheel of the business. There can be no permanent improvement without serious redesign of processes. Nevertheless, organizations cannot design adequate processes until they clarify their overall corporate strategy. Processes must align with the strategy or they'll eventually fail.

Then, for any particular process, it's necessary to specify what must be produced, who must produce it, and when. However, in most creative and professional roles—for example, subsurface analysis and interpretation—it is not necessary to specify how the job should be done. As long as people are not treated like robots or their jobs overdefined, a well-defined process actually unleashes creativity.

In the end, every process is created and implemented by people. People do all the work. And that brings us to the second pillar of integration: Teams and Individuals.
Team and Individual

In most oil companies, asset teams are rapidly becoming the norm. Often, however, individuals experience a sense of conflict between the team’s goals and their own interests. Sometimes in their enthusiasm for reorganization, companies forget a basic truth about human beings: We are all individuals. We learn as individuals. We’re responsible for our individual behavior. Sometimes we must act as part of a team, and learn new behaviors. But we’re still individuals.

Every individual in business is part of a larger system, whether or not they are part of an official “team.” There are many ways to make the work environment more conducive to productivity, without putting all of the burden on the individual. But that requires a clear understanding of what Rummler-Brache calls the Human Performance System (Figure 6).

As mechanistic as it might sound, the individual performer is the first and most fundamental component of the system. Every individual – geologist, geophysicist, engineer, database administrator, accountant, and receptionist – is bombarded with a range of inputs. For every input, the organization expects some type of output. And, for every output, there will also be consequences – positive or negative. A basic behavioral law states that people will do things that lead to positive consequences, and avoid things that lead to negative consequences. Finally, there must be a feedback loop from the consequences back to the individuals, letting them know exactly when they’re off target, and how to get back on target.

So people reside in a system of inputs, outputs, consequences, and feedback. What would help an individual to be more productive in such a system? Clear expectations about what to produce and when; an understanding of how to do the work; the proper tools and resources; the physical, intellectual and experiential capacity and capability to perform the tasks required; appropriate consequences; and timely feedback on performance.

That’s the Human Performance System as it applies to an individual. How does it apply to a team? A standard approach is to throw a bunch of people into a room, call them a team, and say: “Figure it out.” In most cases, that just won’t work. The key to success is establishing very clear expectations of what everyone on the team is supposed to do. That brings us back to process.

Especially when the “team” involves an alliance among internal groups, external partners, and service companies, a cross-functional process map
On The Second Pillar—Team and Individual:

Andrew Armour: The foundation of our success has been teamwork between our scientists, engineers, and business people. But knowing how to do it intuitively may not be enough as the company grows. It’s important to examine how you get that collaboration to work every time, in every location.

Tom Hamilton: Some groups of people with very diverse backgrounds could work together and make tremendous breakthroughs without any problems. While other people, who were equally bright and good, could get nowhere. It’s still an enigma to me.

David Jenkins: Teamwork is a different style of working from the way people were normally brought up, particularly at university. The way you got ahead was very much how well you could do. One way to appear better than others is to have more information. But in teams, you must genuinely want others to be successful. Then what you’re thinking is: How can information be used best by the enterprise?

George Boykin: Once more, this is an exciting, invigorating, wonderful industry to work in. We’ve gotten the absolute best out of command-and-control and the absolute best out of teamwork and empowerment. Now where do we go from here?

is essential. It clarifies what has to be done, and in what sequence. Roles within the team should be specified. Also, appropriate consequences to support the team process must be found. Unfortunately, many organizations talk teams but continue to reward individual performance.

Finally, tools and resources particularly suited for teams are necessary—and that includes Technology, the third Pillar of Integration.

Technology as Enabler

The Information Age and all the technology it has introduced—from the Internet to shared databases, client-server systems, and computers on every desktop—truly enables us, both as teams and individuals, to implement more effective processes. For one thing, information technology enables connectivity. It connects people with people and people with data, which has great potential for improving productivity. Yet there’s so much technology and information available today, it also has the potential for creating chaos.

How do we manage all that information? And what role does technology play in our vision of the Integrated Enterprise of the future?

As companies begin to move up the Hierarchy of Integration—from Data to Workflows to Operational Processes to Resource Allocation—they also ascend a kind of Hierarchy of Interaction. At each higher level, the number of interactions among people and data increase geometrically. At Level One, individuals may have hundreds of interactions, mostly with their own data. But by the time an enterprise integrates across the entire virtual organization at Level Four, interactions may reach literally into the millions.

The Internet is a good example of the promise and pitfalls of so much connectivity. Have you ever gone off in search of a single piece of information on the Web and ended up six hours later with everything but the information you were looking for? The Web is not well organized yet. That’s why search engines are necessary. As inadequate as they may be at present, search engines provide formal ways of creating processes that enable individuals to manage millions of potential interactions on the Internet.

As oil and gas companies ascend the four levels of integration, it will become even more vital to marry technology with process and people.

In the Rumlner-Brache Group’s experience, process definition and design must always precede the application of information technology.
Reversing the order can create a disaster—technology in search of something to do. In any organization, a well-defined process acts as a search engine for the right technical and business data. The process identifies the decisions that need to be made, the best team of people to make those decisions, the functions they need to perform, and finally the tools and data each individual requires. So processes provide the context for converting data into information, information into knowledge, and knowledge into wise business decisions.

Technology alone cannot achieve that. For the most part, data and information can be stored on a server but knowledge resides in people's heads. Sometimes we get the impression that oil industry managers hope information technology will somehow capture all that knowledge, and they won't have to worry about people any longer. But in a true learning organization, people are learning new things every day. Knowledge, unlike data, is never static.

Therefore, it is better to think of technology not just in terms of storage and retrieval, but also connectivity. To create value, connect the experts across the organization—indeed, across the world. Technology can enable creative people to share knowledge even from remote locations, and collaborate more effectively in those horizontal processes that deliver ultimate value to the marketplace.

**The Real Power**

Tom Hamilton, Chairman, President, and CEO of EEX Corporation, has spent years redesigning business processes, building multidisciplinary teams, and implementing integrated technologies. We conclude by sharing some of Tom's observations about the Three Pillars of Integration:

"Technology has been such a buzzword in this industry. A decade ago, companies tried to set themselves apart through technology. Technology was very much at the core of their strategy. But technology is now so common and so available that it has become an enabler, not a differentiator."

"So the issue today is: How do you organize people and processes to let your organization take advantage of the integrating aspects that companies like Landmark have put into today's technology? They've gotten all the various disciplines talking to each other digitally. And that provides a platform for the human element in this equation to begin communicating and to begin integrating."

"That's where the real power is,"

**On The Third Pillar—Technology as Enabler:**

George Boykin: We don't write anything down. We don't institutionalize processes. Everybody has them in their head. It's really kind of scary, because if you lose those people, you lose that intellectual capital.

David Jenkins: You have this hierarchy of data, information, knowledge, and wisdom. Data and information can be codified, held on servers and retrieved. Knowledge resides in people's heads. So if you're after knowledge, you need to communicate with people. It is essentially helping that connectivity.

Tom Hamilton: E-mail lets you connect people with people, and people with data. It lets information go laterally, not just vertically up one silo and back down another. Essentially it's a time-bomb inside an old, typical hierarchical organization.
About the Authors:

Robert P. Peebler has been president and chief executive officer of Landmark Graphics Corporation since 1992. Previously, he held executive positions including chief operating officer, president of Landmark's seismic products division, and vice president of marketing. Before joining Landmark in 1989, he was president of his own marketing/management consulting firm. He was also employed in the oil field services business for 18 years. Mr. Peebler graduated from the University of Kansas with a degree in electrical engineering.

Geary A. Rummler, Ph.D., founded The Rummler-Brache Group in 1981. Since 1995, he has been a board member of the American Society for Training and Development. Previously, he was president of Kepner-Tregoe Strategy Group, co-founder and president of Praxis Corporation, and director of the University of Michigan's Center for Programmed Learning in Business. He has published numerous articles and books, including Improving Performance: How to Manage the White Space in the Organization Chart with co-author, Alan P. Brache (1990). Dr. Rummler received his MBA and Ph.D. from the University of Michigan.
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White Paper
Special thanks to the industry executives interviewed for this paper:

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Tom Hamilton, Chairman, President, and CEO, EEX Corporation
David Jenkins, Chief Technology Advisor, British Petroleum plc