BY ELISABETH PENA

DATA MANAGEMENT

INTEGRATING

As new technologies allow for
the generation of more data than ever before,
**IT IS CRUCIAL THAT
THE PHARMACEUTICAL INDUSTRY
DEVELOP DATA-MANAGEMENT STRATEGIES**
to translate data
into actionable information
that can be used to drive business decisions.

BETH EVERETT

THE KEY CHALLENGE THAT REMAINS IS THAT PHARMA HAS BUILT STOVE-PIPE, ISOLATED SYSTEMS that were never engineered or developed architecturally to be integrated or have data integration.

The pharmaceutical industry is expected to spend 42% of its 2004 IT budget on new technology, targeting investments on supply-chain and integration projects that are core to business consolidation and globalization, according to AMR Research. Although not a budget priority in 2003, analysts expect that in 2004, 20% of pharmaceutical manufacturers will prioritize enterprise application integration investments. That compares with just 13% among all other manufacturers. This reflects an industry priority, which is to tackle one of its key challenges — silos. The industry's tendency to work in silos is counterintuitive to enterprisewide data-integration efforts, with individual business units commonly gathering and storing information in different formats, applications, and systems. This creates redundancies in information and costs the industry time and money. Enterprisewide data-integration efforts that begin at the silo level and work toward companywide integration are expected to be a part of the IT strategy of many pharmaceutical companies this year.

ACROSS THE ENTERPRISE

Integration Challenges

EVERETT. Enterprisewide data integration will be slow to come because the pharmaceutical industry has many legacy systems. A lot of data models are very isolated. Integration was not thought of when these systems were put into place. Vendors had very little impetus to think about data integration, and the industry has had a lack of really good technology to support integration. The barriers include: history, organization, lack of business drivers, lack of vendors providing integration, and not having the right tools in place. We are at a real turning point, but those are the historical barriers that have left the pharmaceutical industry with one view of the customer.

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DATA integration

RON CALDERONE

When I present an idea to management I try to present the rationale behind the decision from a business standpoint. **I DON'T TALK TECHNOLOGY, I TALK BUSINESS.**

TONY ROSSI

OFTEN THERE IS A LACK OF A COHERENT DATA IDENTIFICATION SCHEME. This quickly causes larger enterprise integrations to come unhinged as it raises data integrity, validity, and migration issues.

PARENT. Many of the larger pharmaceutical companies have had to develop applications that fit individual business models, so they have a lot of proprietary systems that make it very difficult to integrate, upgrade, or go to the next level. Somebody may have brought in a solution that solved a particular problem but it caused another problem with data integration.

RAJENDRAN. The pharma industry has developed its businesses via a large number of home-grown systems because effective commercial off-the-shelf enterprise systems to handle the data volumes and the business rules have not existed in the past. These home-grown systems are becoming antiquated. As market conditions regarding technology and consumer expectations have evolved over the past 15 years, there are a significant number of data sources, such as regulatory and compliance-related data, marketing programs, and consumer-centric related data that now have to be integrated into the plethora of legacy systems. This is a monumental task for phar-

Turning to IT to Solve Pharma's Growth Issues

COST PRESSURES AND COMPETITION FROM OVER-THE-COUNTER DRUGS, BIOTECH, AND GENERICS THREATEN THE HIGH-SALES MARGINS THAT FUEL THE PHARMACEUTICAL INDUSTRY'S GROWTH. This is resulting in a priority shift from sales-based growth supported by thousands of sales representatives to global cost containment, consolidation, productivity, and integration in the business back office. New products and product extensions are the lifeblood of a pharmaceutical manufacturer's growth. Analysts at AMR Research expect future budget allocations in integrated new product development and introduction processes as a part of product life-cycle management.

PHARMACEUTICAL COMPANIES ARE EXPECTED TO KEEP THEIR 2004 CAPITAL IT BUDGET FLAT, BUT THIS PORTION OF THE IT BUDGET STILL REPRESENTS A SUBSTANTIAL AMOUNT OF NEW TECHNOLOGY DOLLARS THAT WILL BE INVESTED IN 2004. Analysts project a reshuffling of pharma IT dollars to more a strategic spend on areas such as supply chain and integration projects that are core to business consolidation and globalization.

WITH AN IT BUDGET THAT'S 5% OF REVENUE, PHARMACEUTICAL COMPANIES SPEND BOTH A HIGHER PERCENTAGE OF REVENUE AND MORE ACTUAL DOLLARS ON IT THAN OTHER MANUFACTURERS. Higher budgets result from the complexity, regulatory compliance, and globally distributed nature of pharmaceutical operations, which are largely still fragmented. But most leading pharmaceutical CIOs do have IT portfolio management high on their priority list, according to AMR Research. IT portfolio management is expected to be on the agenda during the next two years as the swamp is drained to show actual IT operating costs, outsourcing trends intensify, and IT cost-cutting measures are prioritized to support the business.

ABOUT 32% OF FRAGMENTED BUSINESS DEPARTMENTS IN PHARMACEUTICALS STILL FUND FUNCTIONALLY ORIENTED IT BUDGETS COMPARED WITH 28% ACROSS ALL MANUFACTURING. Pharmaceutical companies ultimately must move toward an IT strategy that drives the budget for an integrated IT infrastructure across business functions as they harmonize business data and consolidate global supply chains.

ma CIOs who have to integrate data from different home-grown and commercial off-the-shelf systems that run on various platforms, databases, and technologies.

GRYGIEL. One of the challenges, particularly in research and development, is the number of disparate data systems. In manufacturing, for example, there has been a standardization of systems, such as SAP, which provide enterprise management of manufacturing information. This hasn't happened in research and development. As a result, one of the biggest challenges is that there are a number of data systems doing a lot of different things within R&D. There are a lot of systems that are not compatible and that generate data and information, and somehow this information has to be aggregated in such a way that scientists can make reasonable decisions about whether to push a new drug forward or to kill a project.

MURPHY. In our industry, there is a lot of data — there's public data, the data companies buy, and the data companies generate. The real issue, and probably the biggest challenge, is trying to find systems and products that allow companies to combine those three types of data. Also, in this industry we have to keep data a long time. From a day-to-day perspective, the biggest challenge is getting data into systems that allow us to collect the variety of data in a timely manner.

HUSTED. Pharma companies have accumulated myriad technologies, packages, and tools, mostly on a project-by-project basis not at an enterprise level. Integrating all of these technologies and bringing them on line in an open-architecture environment is naturally a challenge. Similarly, data architecture functions have often been performed at a project level. This creates some challenges when we try to create enterprisewide integration. This is especially true when we try to create a shareable master data repository, which must be done to share transactional data.

PARENT. Another real issue is taking one pharma company's IT and integrating this with the IT environment of another company. Companies really have to evaluate and define the best practices that can be used across all businesses to bring them together.

GRYGIEL. Alliances, joint ventures, partner-ships, mergers and acquisitions are accelerating, posing another challenge to integration. As companies merge, the number of systems doubles. Additionally, there is the need to integrate information coming from a contract research organization, a contract manufacturing organization, or from a small biotech company. Companies need to integrate not only the information inside their four walls, but data coming from their partners. If the information can't be integrated, the value of the partnership or alliance goes down dramatically.

ELDRIDGE. In an ideal world, there would be an integrated information system used corporatewide to maintain and get information
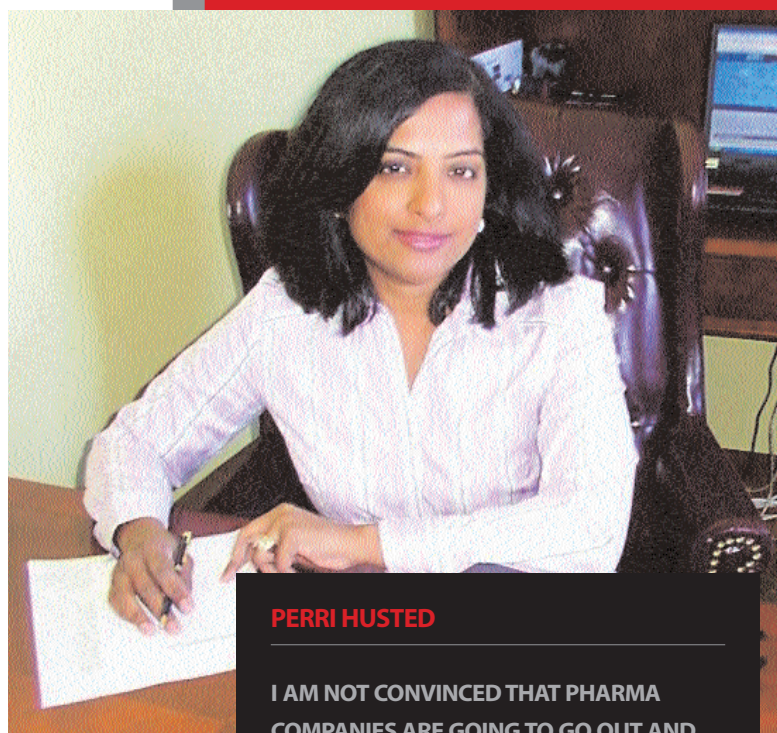
about any business entity, whether it is a key opinion leader or a drug or a clinical trial. Most pharma companies aren't there yet. So there are parts of the business that are running off spreadsheets and little applications. That is how silos grow. People in an individual area have to solve individual problems and don't want to tackle the potentially huge undertaking of integrating with a large and established legacy system.

MARTIN. The challenge is not developing vertical efficiencies. The challenge is developing horizontal effectiveness to bring products to market and dealing with customers. Therefore, data integration to improve the ability of a company to make trade offs across vertical business units is going to require a lot of data harmonization across the different business silos.

CALDERONE. I try to avoid establishing silos. The data being acquired and stored in our databases are corporate data, not sales data or marketing data or finance data or regulatory data.

ROSSI. Pharma companies tend to be very silo oriented, whereby each particular organization has a set of metrics, a budget, priorities, and goals it needs to accomplish from a business standpoint. And, individuals fund and drive those directives in the way that they see fit. They are not provided mechanisms or forums to determine what information other business units might have that could be useful or what information they have that could be useful to others in the organization.

EVERETT. Now that budgets are tighter, management needs to understand the importance of architecture. We are not telling managers what to do in their business, but we emphasize that they need to come to us and ask if a solution fits with the company's architecture. This way we can determine how we are we going to integrate different solutions.

HUSTED. While not unique to pharma, there is very often a very siloed architecture or organizational structure within the business community. Everything is product driven and function driven. Many times, IT organizations align themselves to the very same silos to serve their clients better. It is critical that the data-management function be a centralized enterprisewide function even when other IT functions are aligned to a business unit. Functional and product silos have been difficult to overcome in many CRM implementations where the application has to deliver a customer focus to a user community that has a product focus or a functional focus. These silos will continue to be an impediment to data integration across the enterprise and it is essential to have a centralized data-management group to traverse the path of delivering enterprisewide integration on the important data entities and yet meeting the needs of individual business units.

MORAN. When working with the typically siloed pharma organization, the "enterprise" agenda is certainly to be respected but direct value has to be delivered to the stand-alone business unit as well. Whether the big picture integration agenda is ever fully achieved or not, the return on integration investment — the business case for undertaking the effort — needs to be realized at the departmental level. The realities of business are that five-year plans will be rewritten at the end of year one.

Creating Data Standards

VOGEL. There are so many sectors that a company draws information from. It's like working with a Rubik's Cube. As one turns the

Top 2004 Emerging Technology Investments

	PHARMACEUTICALS	TOTAL MANUFACTURING
Enterprise application integration	20%	13%
Wireless technology	20%	11%
Web services	12%	5%
Internet/Web-based EDI	8%	5%
Data warehouse	8%	8%

Source: AMR Research Inc., Boston. For more information, visit amrresearch.com.

GARY WEDIG

Billions of dollars can be saved if improved access to data can reveal drugs that are not going to be efficacious or safe, which then can be terminated early in the research cycle. DATA INTEGRATION ALSO CAN LEAD TO THE IDENTIFICATION OF DRUGS THAT MAY END UP BEING BLOCKBUSTERS.

cube, the information takes a different angle from one unit to another. This makes it extremely challenging because a company has to dynamically classify information to make sure that it keeps up with the speed of the research and tackles all the moving parts.

PARENT. The concept of common computing environments is important. If a company has multiple sites all over the world, some of these sites may have local preferences for the types of software they want to use, which in and of itself will start to cause data-integration issues. If two sites within the same organization can't share their data, this results in soft costs. Those soft costs represent the cost of the Ph.D. chemist or biologist having to become a computer scientist or waiting while somebody else in another part of the organization helps him or her integrate the data, which can be significant and can divert scientists from their primary purpose. There are lost opportunities in the research arena because of data-integration issues.

MURPHY. Within an organization, there have to be standards. For many pharma companies, including ours, a lot of R&D happens in Europe. So the starting point for many of our products is in Europe. The clinical operations are in the United States and in Holland, and sales are regional. There is a challenge of coming up with standards and processes that allow companies to track back to documents through a historical pattern. We establish standards in cooperation with the IT department and the QA department, but we also have to involve the legal department and the R&D department. We have a cross-functional group to establish standards. We've come up with standard templates to make some of the data entry easier. We also use multilanguage systems within our global systems. We store most of our data in English, but we do allow multiple language options if the data are going to be used locally.

GRYGIEL. The biggest roadblocks aren't necessarily technology based. One of the roadblocks is planning what information needs to be captured and how it needs to be categorized. The other roadblock is standardization through an organization, from multibusiness units and departments. If companies want to show information throughout the enterprise,

the different business units have to start agreeing on how the information is categorized or tagged. For example, one unit may use a chemical structure for the name of the new compound. Another might use a project ID. Another may use the final product name. That's a simple example, but without standardizing how a company tags the information, it's virtually impossible to pull all the data together.

MURPHY. Much of the data that people in preclinical are interested in aren't the same that people in clinical, manufacturing, or sales and marketing are interested in. Certainly, there are subsets of data that are needed throughout the organization. That's another challenge. Data requirements change during the life cycle of the product. It requires a significant amount of time in the different functional areas to figure out what the data requirements are and how data are to be stored, especially data that may have a life of 10 years or 15 years.

CALDERONE. It is important to have a larger vision of where a data-integration initiative is going, be able to describe that vision, and stick to that vision. A company can get there in small steps, but there needs to be an understanding that information is corporate information and not individual silo information. There need to be standards and a consistent, simplified platform to achieve that vision. Success comes from a combination of the two; success requires having a broader vision and understanding that there need to be little steps to achieve that vision.

Developing Best Practices

EVERETT. Integration is not something a company does just once; it is an evolutionary process. A company's needs, business perspectives, and technologies are going to change. From an enterprise-architecture perspective, a data-integration strategy, including how that strategy should be implemented, has to be created and managed.

ELDRIDGE. Enterprisewide application integration is a huge undertaking, the challenge is sizing it down into manageable chunks. One strategy we have used is to start in an individual business unit and use modeling techniques to help the clients understand their data and processes. Once we know that,
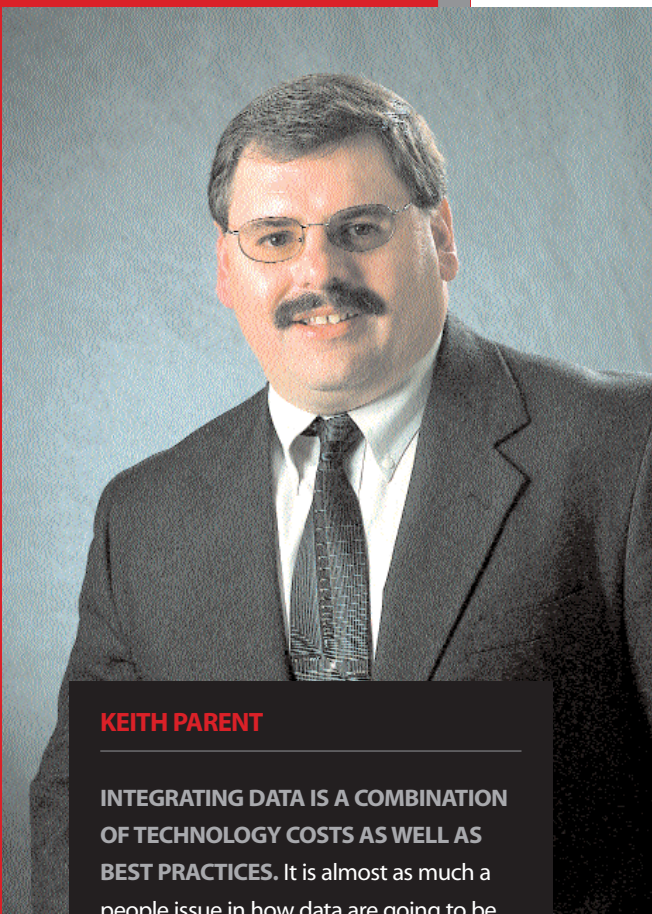
we can take a step further and look at what they have for IT systems. The next step is to map the business objectives from the model to the IT systems that support them. Once this is in place, integration strategies can start to be implemented. By doing this at a business-unit level it is much more manageable than trying to tackle the entire corporation.

ROSSI. Often high-level architecture groups are in place to assist enterprise integration. They tell individual business groups they are setting up an organization team that is going to oversee "their" efforts to make sure things are done in a certain way, and this builds barriers. These architecture groups are more successful when they are working hand in hand with the business units to show how the data and IT components will fit into the broader business picture.

CALDERONE. One of the challenges Reliant is wrestling with is developing a good metadata solution to provide a good definition of the data in the databases and to identify the source of the data, who the data owners are, and when the data were last updated. I am interested in having an impact analysis so when a data element or database structure is changed, we can identify all of the impacted systems.

RAJENDRAN. Data-integration projects should not be focused only on technology. Companies should ensure that the right platforms for solutions also are selected. Legacy systems, if they can be replaced, should be replaced with more open commercial off-the-shelf systems. Typically such applications provide either out-of-the-box data-integration techniques or simplify the integration process.

EVERETT. At Organon we are embracing an enterprisewide data integration architecture. There is no affordable way to do point-to-point

integration or to integrate without an architecture. The architecture becomes important to having a framework that provides a lot of other benefits other than data integration and application integration.

MORAN. It is important to incorporate and respect both IT and business perspectives as an integration effort is considered, planned, and implemented. Technology can enable business-process improvement but a change-management program designed to drive the adoption or use of the improvement is just as important for realizing the value of the initiative.

HUSTED. Business partners looking at data integration from a business perspective don't immediately see the value when we talk about data modeling, semantics of data, data standardization, and other technical reasons why a company should work on data integration. But if one focuses on the business decisions that take that data as an input and realize that the decision is going to be good or bad depending on the quality of the data that goes in, the business is more receptive. That is a different focus that will emerge. As we focus on quality of business decisions as a function of the quality of data that has been used, we will no longer talk about data management for the sake of data management, but rather for improving the quality of business decisions.

RAJENDRAN. Pharma companies should start adopting more commercial off-the-shelf systems that run on open operating platforms via Web services and XML to ease the pain of data integration. The industry is being led by the behemoths, such as Microsoft and IBM, in a standardization effort. Hence, a large number of independent software vendors are dancing to the same tune regarding the use of Web services and XML as the core strategy so their products are compatible with an open platform strategy.

GRYGIEL. Companies are looking beyond a point solution. In the past, business owners were allowed to pick best-of-breed point solutions and put those in place regardless of whether the functionality overlapped with other enterprise systems. We're seeing companies really driving toward enterprise platforms and that, in itself, is standardization. We see many companies driving toward com-

pliance platforms that manage compliance within research and development and manufacturing, as well as within financial and legal functions. Companies are looking at systems that can manage all of these areas and not at multiple point solutions. This makes data integration much simpler. The fewer systems in place, the better off pharmaceutical companies will be.

MURPHY. Typically, in my job, we talk about data integration or we talk about best practices, usually it's one or the other. I'm not sure the two can be taken as one. Typically, with enterprise systems, each has strengths and weaknesses, but I wouldn't say that any one is going to provide best practices in every area. We have to make some decisions. In some areas, the choice might be data integration, sacrificing the very best of best practices so the system doesn't have to be customized. Historically in IT, we've had a philosophy of being best of breed in terms of interfacing and integrating on the back side, or we go to an integrated system that doesn't necessarily provide best practices in every area.

Determining ROI

GRYGIEL. In the past, companies were, in some ways, not concerned about return on investment, or ROI could be a multiple year return. Now, companies are saying they need to have a ROI in 12 months to 18 months. They don't want to talk about solutions unless software companies can work with them on a return on investment. Any improvements to systems have to have a ROI analysis. What makes the data integration piece difficult is that the benefits might not be to the individual business owners but to the people at the "c-level" or executive VP level of the organization. This is where executive sponsorship — the CIO and the CTO — becomes important, because for a vendor it's very difficult to go to a business owner and say, "we want to do a better job of integrating your information with another department's information, and it's not going to provide you with an immediate value, and it's not going to provide the other department with any immediate value, but it's going to provide someone else in the organization with a huge return on investment."

WEDIG. There is continued pressure to keep down IT costs, but at the same time there is an expectation of more benefit and more deliverables from IT. And yes, technology can deliver some of these benefits, but some of the expectations are quite challenging. Companies should approach this dilemma by identifying what the vision is within a particular arena, develop the strategy and strategic goals, identify business plans that include those goals, and then identify and estimate the investment to get there and apply it to a rigorous cost-benefit analysis.

VOGEL. ROI can be computed in a very easy way, by evaluating the amount of time it takes people to search for information and consolidate that information in a usable way. At the end of the day, they have the daunting task of pulling all this information together, and this is a significant waste of time and investment. If a company finds a solution that allows people to classify and cross reference various sources through one gateway, which is flexible enough to allow them to slice and dice dimensions of information, it is a very exciting value proposition.

MURPHY. One of the biggest challenges is balancing cost and technology. One of the things we don't do well in IT is postaudit our projects. If we don't follow up and find out if we delivered what we said we were going to deliver, there's no history to base the next project on. So we get the same questions over and over. One thing I've learned is that the questions today are the same questions I was asked 35 years ago. And I still can't answer them. I can tell a business person, yes we can do this. But if the people using the system don't change the way they do things or aren't careful about the integrity or accuracy of the data, then the system is not going to work. People make mistakes, so safeguards have to be built into systems to try to detect problems.
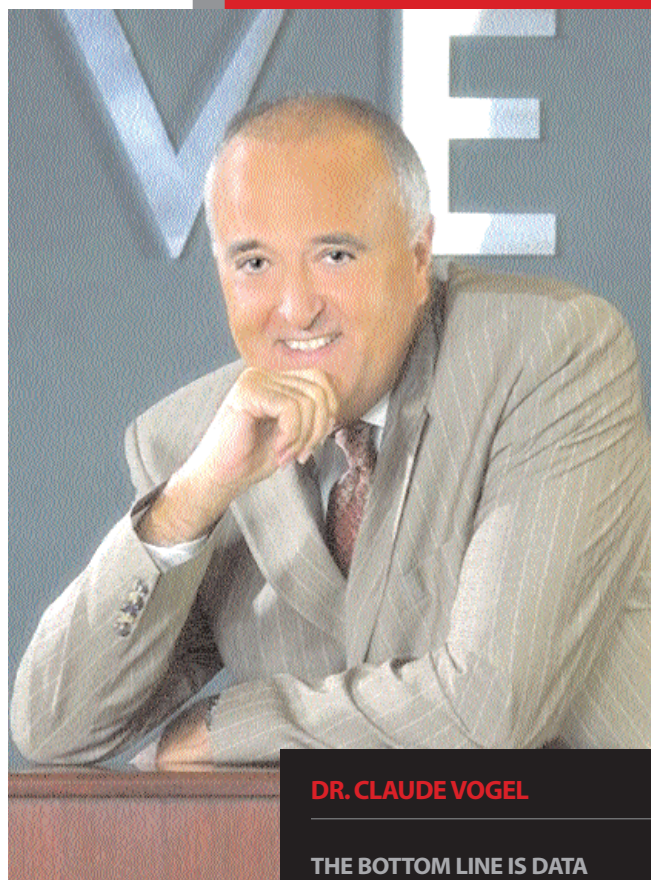
DR. CLAUDE VOGEL

THE BOTTOM LINE IS DATA INTEGRATION IMPROVES THE GLOBAL PRODUCTIVITY OF RESEARCHERS because they can integrate information faster and that consolidation should impact the discovery process.

TOM MORAN

THE REALITIES OF TODAY'S BUSINESS ENVIRONMENT DICTATE THAT ANY BIG PICTURE, ENTERPRISE-INTEGRATION AGENDA HAS TO PROMISE MEASURABLE PERFORMANCE IMPROVEMENT AND VALUE at the functional operations level and not just offer net value at the corporate level.

Management Buy-in

CALDERONE. If a CIO goes to his or her management and speaks technology, he or she is not going to get management support because management doesn't understand the technology component. CIOs need to translate what a technology means to the business and show how those data have a broader use than what was originally envisioned.

ROSSI. Without a doubt, when a company attempts to bring data together through enterprise integration, it has to have an empowered champion who has enough support to say why it is important and explain the derived value. Without such a champion, individual business units will use their budget dollars to derive value from a particular data set without the focus on the enterprise picture. This champion must have visibility across the business units so that each area of localized integration can contribute back to the enterprise model.

WEDIG. An integrated data environment needs to be infused into the organization by management, and the IT people need to help by seeding this type of thinking. Then top management has to say, "this is the answer for our organization and this is where we are going." And top management needs to say this frequently.

HUSTED. Management buy-in is absolutely critical as well as the recognition that data are nothing more than snapshots of the business reality. As management begins to understand better that data contribute to decision making at every level of the organization, it would follow that we need to ensure that critical data are cleansed, integrated, and standardized to create information that can be used to run the business. Once that happens, enterprisewide data integration will get the management support that it deserves.

EVERETT. Management is absolutely critical because otherwise independent technical and business people do what independent business people do, which is to do their own thing. The goal is that when senior management hears the word architecture come out of our IS group's mouth, they think business advantage and savings, not because we talk a lot about it, but because we have proven results.

HILL. The main barrier to entry for integrated solutions is management buy-in. There is still reluctance from upper management to buy in to a very strict M.O. for data management. In some cases, companies don't have a CIO or a CTO.

GRYGIEL. The CIO and CTO positions are extremely important. Another position to add, which was in vogue a number of years ago and is starting to come back, is chief knowledge officer. These individuals are key in a number of aspects. First is their role in keeping up with the latest technology, educating the business owners, and suggesting how technology can be applied to the business. The business owners who we work with — heads of manufacturing, heads of R&D, heads of discovery — don't have time to focus on information technology. Their focus is on their particular business and goals. Another important role of CIOs and CTOs is to drive integration standards and to make sure that as systems are purchased they are evaluated on their ability to get information in and out. They also need to make sure that these systems are based on standards. These folks also drive the organization's categorization of information. This needs high-level support, because implementation has to go across global business units.

The Bigger ROI

MARTIN. The biggest business challenge for the pharma industry is to improve the efficiency of new product development. We all know the number that gets bandied around from the Tufts study — almost $800 million and 10 years to get a product to market. The issue of data integration is a significant component of these numbers because pharma companies operate in silos. To improve the effectiveness and efficiency of new product development and market introduction, cross-functional integration is required. Because of all these silos, the context of data and the cleaning of data are challenges that the industry has to deal with.

MORAN. The efficiency equation in the pharmaceutical industry is a function of intel-

RODDY MARTIN

DATA INTEGRATION IS NOT A CHALLENGE; the real challenge is the integration of business processes using islands of data.

ligent decision-making, timely execution, and effective cost management. Developing and bringing a single drug to market is frequently quoted as an $800 million undertaking. But when you peel back the layers of that $800 million, it has less to do with the activities that directly map to getting that single drug to market and more to do with recovering the collective costs of portfolio R&D and the inefficiencies that exist inside the life-sciences and pharmaceutical industry. It doesn't take $800 million to get a drug to market; it averages $800 million, per successful product, to pay for all the productive failures and counterproductive inefficiencies that have come before, and are expected to come after, the specific drug reaches market.

WEDIG. The challenge to enterprisewide data integration is what to do with all of the data and how to transform data into information that is digestible by the human mind and more importantly how to transform that information into actionable knowledge that can be used to make business decisions as well as scientific decisions. If we don't figure out how to automate the relationships, the integration of all these different pieces of data will be pretty much useless.

MARTIN. The challenges pharmaceutical companies face are so huge that it is very difficult to determine real priorities that contribute to business performance. When a company is focused on delivering a safe product to the consumer on time to meet demand, it needs a set of integrated systems and clean data to have one version of the truth. Otherwise, it can't make the trade-offs that it has to make when servicing customers. That is the challenge that the pharma industry will move toward addressing in the next two years. Companies have survived on huge margins until now, but that's not going to be the case forever.

GRYGIEL. We're no longer talking about a person in discovery being able to pop out leads faster. We're talking about the VP of research and development being able to make better, faster decisions to get products to market faster.

High Expectations

WEDIG. Within the pharma industry, people have a pretty good idea of what they want as

far as data integration goes. The ideal would be to track all of the data regarding a particular drug compound from its inception all the way through postmarketing activities. If a company had that information integrated into a database then that knowledge could be applied to similar compounds. There is much discussion in the industry about how to achieve this.

CALDERONE. There is going to be a lot more focus on data integration this year. This has been a major problem that corporations have been facing, and they are looking for vendors to be able to provide solutions.

VOGEL. Enterprisewide data integration is clearly something that is happening now. We see all of our customers working very hard to put taxonomies together and try to build technology at the work space level. The evolution of search engines is going to impact the world, pharmaceutical companies included.

GRYGIEL. Rather than looking at enterprise data integration as the nirvana of having systems that are directly connected, companies need to look at information flow. Information that is generated in discovery moves to research and development, and that information moves to manufacturing. There is a life cycle of the information, and rather than connecting the individual systems together, companies are looking at how to get that information to flow and how to provide access to that information. The majority of companies are looking for ways in which they can warehouse the information in a central repository. In other words, what's important is how those individual systems feed into a central repository where people can have access to the information rather than trying to create a very elaborate Web platform of connected systems. ✦

PharmaVoice welcomes comments about this article. E-mail us at feedback@pharmavoice.com.

PRASHANTH RAJENDRAN

DATA INTEGRATION THAT CAN BE CREATED AND MANAGED RELATIVELY EASILY leads to reduction in IT costs, faster and informed decision making, and increased revenue.

JOHN MURPHY

INFORMATION IS THE INTERPRETATION OF THE DATA, which is more of a business function than a technology function.