Follow the Money:
Putting the *E* in Enterprise Resource Planning Systems

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"Deep Throat," the government insider who guided the two Washington Post *reporters to uncover the truth behind the botched Watergate burglary, gave a key piece of advice: "Follow the money." Environment, Health, and Safety (EH&S) managers must have a well-developed understanding of their company's management information systems and accounting—the money trail. Armed with knowledge of information systems and reports, EH&S managers can see how decisions are made, who participates, what the major objectives are, and how best to influence management. Finally, if they can point out in common financial terms how EH&S programs add value to the business, EH&S managers are also better prepared to justify new programs or maintain essential resource levels when costs are being cut.*

This article points out a two-stage revolution in management thinking and the management information systems that support it. The march toward enterprise resource planning (ERP) is on. Unfortunately, EH&S issues have been for the most part left on the sidelines, given little consideration in the perspectives and information systems that are shaping this revolution. If your company has adopted or is in the process of adopting an ERP system such as software companies SAP or J.D. Edwards, it is important to fully understand the long-term implications for EH&S. The most immediate impact will be on the design of the environmental management information systems (EMIS).

WHAT GETS MEASURED GETS ATTENTION

Accounting reports have been around for thousands of years, and the double-entry bookkeeping systems still in use appeared about 500 years ago. By 1925, the basic framework for accounting had formed. In companies with single products, it functioned well. From the 1930s until the late 1980s, management information systems changed very little. Meanwhile, the nature of corporations, competition, and environmental impacts changed dramatically. Today there is a revolution underway, and within the next six months nearly all of the Fortune 500 companies will have completed fundamental changes to their management information systems. The Fortune 1000 and mid-size corporations are not far behind.

Accounting systems evolved since the 1930s to support decision-making by investors, not by line management, and certainly not by EH&S managers. Manual systems could support only one level of cost reporting, so external financial statements, required by the Securities and Exchange Commission, were chosen. Those reports were then jury-rigged for internal use as well. Rules on what gets measured and how it is counted were focused on financial statements, not process optimization or product pricing in complex contexts. The net results were that (1) business managers first decided how they would run the company; (2) working separately, the accountants designed systems and reports that satisfied external reporting requirements; and (3) managers made do with what information they could derive from the accounting systems that fed the external reporting system.

By the 1980s, the disadvantages of a single cost reporting system were widely recognized. For example, because available accounting information focused only on broad categories such as labor, raw materials, inventory, and overhead by department, products were incorrectly costed and priced relative to one another. EH&S professionals could see this distorted costing structure when, for example, wastewater facility "overhead costs" were equally distributed among process areas, even though one product from one process may have contributed 90% of the waste load. The information was perfectly acceptable for financial reporting purposes, but terrible for management decision-making support.

Managers needed to determine the real costs of activities and decision alternatives to better control operations and implement strategies. With the advent of powerful computer systems and the growing awareness of the potential benefits from improved costing of products and processes, information systems designers and accountants responded by revolutionizing the way costs were analyzed. By the end of the 1980s, the revolution was well underway. Activity-based costing (ABC) systems were designed to support a clear understanding of product and customer profitability and help prioritize areas for process improvement. Operational control systems were designed to enable process efficiencies.

A related management perspective, activity-based management (ABM), focused attention on the causes of costs and elimination of non-value-adding activities. For EH&S managers wanting to promote pollution prevention technologies, ABC and ABM represented a windfall opportunity because it enabled them to more easily communicate the

financial impact of environmental dimensions of particular products, activities, and decisions. But in cases where they did not understand the fundamentals of these measurement and information reporting systems, EH&S managers found themselves marginalized and shut out of the discussion when resource allocation and significant strategic decisions were being made.

ERP SYSTEMS EMERGE

Even before ABC and ABM were widely implemented, and certainly before EH&S managers forced their way to the table, let alone into the conversation, a second wave of revolution began to sweep through the ranks. By the early 1990s, a number of sophisticated management information system tools were implemented. These were custom-designed information systems, each serving a distinct part of the organization. However, the financial, human resources, operations, logistics, and sales and marketing systems generally did not "talk" to one another. Not surprisingly, businesses began to see the advantages of a *seamless integration* of all the information flowing through a company. Enterprise resource planning (ERP) systems promised that capability.

An enterprise-wide integrated system supports instantaneous collaboration among business functions using shared information. In the past, functions did not communicate with one another, in part because the information demands for such sharing were insurmountable. A well-designed ERP system can accept a sales order in Tokyo, check inventory, schedule production, order the inputs (including personnel with the right skills), update records, produce the invoice, and initiate distribution, down to when the truck will arrive to take the product away (all in five languages, if needed).

SAP AG, a software company based in Germany, was among the first system developers to identify the demand for company-wide systems. Sales rose rapidly from around $500 million in 1992 to more than $5 billion in 1998. The systems offered by SAP and its competitors—Oracle, PeopleSoft, J.D. Edwards, and Baan—are both new and profoundly complex. There are basically two alternatives for implementing these systems: configurable or changeable. The configurable systems declare that they incorporate "best business practices," and the company needs to configure its enterprise and processes to utilize/match those practices. The alternative is a changeable system, with which the company identifies its own core competencies and best practices and gets the system framework, which the vendor helps modify to fit the company's practices.

The complexity of either type of system makes modifications costly, and implementing even an unmodified system can cost $50 to $500 million. Another crucial aspect of ERP systems is that they push a company toward full business function integration, even though some specialized or unit segregation may provide competitive advantage. In the past, business managers decided what they wanted to do, then built the systems to fit. With a fully integrated system such as SAP's R/3, the business may need to be modified to fit the system.

ERP TRACK RECORD

Success at implementing ERP systems has been mixed. Whirlpool, Dell Computer, Applied Materials, Dow Chemical, FoxMeyer Drug, Union Carbide, and Allied Signal have experienced difficulties.[1] Allied Waste Industries announced that, as soon as it completes the proposed acquisition of Browning-Ferris Industries, Inc., it will abandon a new $130 million system based on SAP R/3 software. Waste Management, Inc., also cancelled its SAP plans after spending $45 million on an expected $250 million project.[2] W.L Gore & Associates, the maker of Gore-Tex brand fabrics, recently sued PeopleSoft over a costly software installation, and Hershey Foods experienced significant financial losses over the troubled startup of its new system.[3]

However, companies such as Elf Atochem, Owens Corning, Hewlett-Packard, and Monsanto have had favorable experiences. One source of their success is a rigorous early evaluation of all of the potential business and human resources implications. For example, these systems force companies toward a more centralized, uniform structure. This direction is very compatible with a shared service structure, but in highly decentralized corporations implementation can be traumatic. If management views the adoption of an ERP system as simply another technology upgrade, it is headed for problems.

These systems, like any computer system, are only tools. They cannot fix fundamental problems with organizational behavior or strategy. What makes these systems "smart" is the care that went into their design: the best practices, assumptions, and options incorporated. Tailoring an ERP system to a company requires the selection of the best modules and the right specific configuration options. Then the real work begins, with a huge set of human resources and change management issues. The key to success is forged at this stage.

IMPLICATIONS FOR EH&S

For EH&S management in U.S.-based multinational corporations, the current situation is less than ideal. For example, the system that dominates the market today, SAP, was developed with few EH&S considerations explicitly built into the original architecture. This has profound implications because modification of the basic package is discouraged on all levels—technical, behavioral, and fiscal. As mentioned above, if the system drives the business, EH&S considerations will be driven to the fringe, unless EH&S managers step boldly into the process from the beginning.

The first EH&S module was a material safety data sheet (MSDS) enhancement that has since been supplemented by a number of additional modules, including product safety,

dangerous goods management, occupational health, and industrial hygiene and safety. These components are being extended to include waste management and other modules for SAP, with support from TechniDATA GmbH in Germany and Enterprism Solutions, Inc., in the United States.[4]

Significant EH&S system integration needs remain. "More potentially useful information [e.g., cost information for EH&S activities] is imbedded within these systems, but the current reporting is not as robust and the systems lack full functionality for EH&S needs, compared to custom or freestanding EH&S legacy systems," says Bob Bollinger of EH&S Consulting. The problem then becomes one of inclusion. While the need is clearly there, the current inflexibility of these enormously complex systems is a formidable barrier, especially after a system rollout. At least the problem is being recognized: more than 250 people representing more than 70 companies attended SAP's EH&S information day in Philadelphia, PA, in February 1997.[5]

DEVELOPING OR MODIFYING YOUR EMIS

If EH&S considerations are to come into play, EH&S managers must learn the language, grasp the problem, and call for inclusion. EH&S module add-ons are always possible, but if key EH&S information is not captured in the overall system architecture, you may be shut out. Even with the changeable ERP systems, EH&S must be incorporated from the very beginning. Otherwise, the huge startup and amendment costs may prohibit significant later changes to the original system architecture such as would be required to add the EH&S dimension. To state the obvious, it is the perspective of the finance and accounting departments which dominates or controls information systems departments.

The selection process for a new system or even a major EH&S module addition can take months and involve a number of consultants and sub-system contractors. Therein lies another problem. The roles and responsibilities for each consultant and contractor must be very carefully spelled out. Otherwise, there may be finger pointing as to who is ultimately responsible for system problems, as Hershey Foods recently learned.[6]

Ground-up designs can be very costly and fraught with de-bugging problems, regardless of the added challenges and opportunities brought on by existing ERP systems. However, if you get what you need—and only what you need—in the form that is most useful, then the cost of ground-up designs can be justified and competitive. Ground-up designs are also amenable to incremental implementation, allowing for an evolutionary system that can address issues in progression (e.g., prioritized according to the most critical, availability of funds, or best understood).

The approach taken by a number of companies using an ERP system architecture is to upgrade their existing EH&S systems to be compatible with the ERP system at key interface points. Where an upgrade is not practical, they may custom-build modules or purchase commercial systems that are "compatible" with the ERP system. There are a number of software vendors, such as Essential Technologies, Inc. (the parent company of Enterprism Solutions), and Quantum Compliance Systems, Inc., which are "SAP-certified" at various levels using compatible file configuration and transfer specifications, or "business framework architectures." Approximately 60% of

ADVISOR CHECKLIST

Building the *E* into an ERP System

1. Do the foundation work (for example, strategic plan, EMIS, and metric systems) first! An EMIS comes close to the end, not at the beginning of, the development of an EH&S management system.
2. Map current information systems, system objectives, and deliverables.
3. Don't let the systems requirements drive EH&S policy.
4. Establish point contacts at *a sufficiently high level* in both the information system and accounting departments.
5. Design and review your plan with independent experts in four areas: (1) strategic, (2) accounting, (3) functional practicality (that is, industry benchmark), and (4) system practicality.
6. Ensure that the roles and responsibilities are clearly laid out, especially the contractual obligations and deliverables of outside contractors and consultants. Act *before* any finger-pointing develops over systems problems
7. Form groups to support the input process, but establish clear leadership lines. Someone has to make the final cuts and decisions.
8. Focus on the data really needed. Collect only the important and critical information or you will lose credibility.
9. Build upon existing data systems and reporting formats that have proven to be effective and are already well understood by employees. For example, incorporate familiar forms into the new system.
10. Reporting "down the organization" is as important as feeding information to management.
11. Check the EH&S safeguards. For example, if an enterprise system has accelerated new product cycle times, make sure that EH&S reviews are still done before the introduction of new raw materials.

EMIS developers claim some degree of ERP system compatibility.[7] Add-on custom modules may not be completely satisfactory, but under the current state of ERP system development, they are generally the most cost-effective and robust. Anheuser-Busch used this approach of modification plus custom system design to link their EH&S information systems to the company's SAP-based system. Chris Spire, group director, Safety & Environmental Assurance, reports that even though the EMIS system is contained in Lotus Notes, SAP is utilized to obtain financial, human resources, maintenance, and purchasing data. All of the EH&S cost data are obtained from SAP, whether expense or capital, as are revenue data from byproduct sales.

Spire provides additional insight to Anheuser-Busch's system design: "Through the activity-based cost accounting system, we are able to charge utility usage data to the specific manufacturing processes. Personnel data from the SAP human resources module are utilized by the accident and injury database that tracks safety data and provides analysis for this statistical safety database. The preventive maintenance program in the SAP maintenance module is utilized as a component of the process safety management program and the EHS management system, although not directly linked to our other EH&S databases. Our purchasing department utilizes the Lotus Notes-approved chemical database as a check before purchasing new chemicals. These data are provided to them through a link to the intranet. Chemical purchase quantities are taken directly from SAP. We are continuing to look for opportunities to link data from SAP such as utility usage and production volumes into our primary EH&S databases."

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LEARN FROM OTHERS

Implementation of EMIS is a major challenge and commitment of resources. If the wrong direction is taken at the beginning—even during a system redesign or upgrade—the entire effort can wind up taking longer and consuming more resources than ever anticipated. The notion of advanced information management systems can be alluring, but those who hear this siren song may end up with systems that are too complex and require too much unnecessary data to "feed them." The benefits of their enhanced power are offset by the annoyance they create at the level where the data are gathered. A partial list of potential problems is in the sidebar. These cautions serve to emphasize that the planning phase is crucial and that real-world experience is absolutely essential to efficient and eventually successful implementation. Not only must consideration be given to the end users' needs, but a new dimension has been added—the "technology needs" of the ERP system must also be considered. System development input should be from at least four areas:

1. **Strategic**—One can encounter numerous problems when selecting EMIS performance metrics and reporting frameworks for either management or external stakeholders. Literally, it is possible to create new legal liabilities for your company with an EMIS system. The author has written extensively on this subject.[8]
2. **Accounting**—EH&S managers are rarely trained as accountants, and vice versa. Bridging the gap between the EH&S world and the ERP should be facilitated by someone such as the co-author, who is an accountant and is knowledgeable about both environmental accounting and ERP.

Typical EMIS Implementation Problems

- Attempting to implement a complex EMIS too rapidly.
- Assuming EMIS can be implemented from the bottom up.
- Initiating an EMIS before the groundwork is properly laid with the strategic plan, EMIS, and metric systems.
- Using a committee approach that overpowers the system (i.e., seeking input from everyone, but not providing a mechanism to quickly make needed, final cuts).
- Undervaluing independent advice, "reinventing the wheel," and repeating the same mistakes.
- Failing to independently verify software vendor claims.
- Locking out key individuals (that is, disregarding or not seeking input from certain individuals or sectors of the organization. For example, not seeking input from plant managers when developing the EMIS for the EH&S audit system.)
- Failing to properly integrate the EMIS into the business information management system.
- Insufficiently tailoring the information to the type of stakeholder (for example, providing electronic delivery when paper reports may be more appropriate).
- Improperly integrating the record retention policy with the system.

3. **Industry Benchmarks**—Some of the best, most practical advice comes from your industry peers. The EH&S Software Development Group (EH&SSDG) was formed in 1993 to exchange information on software development. Originally associated with the American Society for Testing and Materials, EH&SSDG has recently been re-established under the National Association of Environmental Managers as a working group (*http://www.naem.org*).
4. **EMIS Specialists**—EMIS is highly specialized and complex. It is also a field undergoing a lot of transition. A number of companies provide specialized assistance and advice, independent of the system developers. For example, Bob Bollinger of EH&S Consulting (bbollinger@ prodigy.net) provides design assistance and system evaluation advice. Donley Technology (*http://www.donleytech.com*) has been analyzing and reporting on the environmental software industry since 1988 and provides a variety of custom services. The company is a clearinghouse for environmental software information, publishing the *EH&S Software News Online,* the *Environmental Management Information Systems Report,* and more recently, a free virtual library of online databases of information and downloadable EH&S software, accessible at *http://www.EH&Sfreeware.com.*

Another way to ensure that your EMIS will be comprehensive, forward–looking, and sympathetic to the real challenges you face is to use a provider with a strong environmental foundation. For example, Daryl Beardsley of Environmental Business Strategies (darylb@alum.mit.edu) specializes in systems designed from an environmental engineering and management viewpoint rather than a software developer's perspective. This approach better ensures that form follows function and that the EMIS is not an entity unto itself.

CONCLUSIONS

One of the most pervasive problems faced by EH&S managers is "not being at the table" when key decisions are made, a point repeatedly emphasized in the "EH&S Advisor." The rise of ABC, ABM, and environmental accounting principles predates the recent rapid rise of ERP systems. Yet the leading software suppliers did not integrate EH&S aspects of these practices directly into their original designs. An add-on modular approach is currently being taken to make up for system inadequacies. This certainly is not the most desirable approach, considering the enormous potential that ERP systems hold for life cycle assessment, pollution prevention, and a host of other critical reporting issues.

It is imperative that you understand the management information systems in your organizations—*follow the money!* If your company has or is about to move toward an ERP system, or for that matter, to make any changes in its accounting structure, be at the table and ensure that EH&S functionality is being built in from the initial planning stages onward. The time to do this is when the organization is first discussing installation, regardless of the choice made between configurable or changeable systems. If your requirements are not built into the system, your concerns will never be recognized and your issues will never be measured or incorporated into reports. Hence, EH&S issues will not figure prominently in later business decisions.

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