

Implementation of ERP Systems: Accounting and Auditing Implications

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1. Introduction

Technology plays a key role in today's business environment. Many companies greatly rely on computers and software to provide accurate information to effectively manage their business. It is becoming increasingly necessary for all businesses to incorporate information technology solutions to operate successfully. One way that many corporations have adopted information technology on a large scale is by installing Enterprise Resource Planning (ERP) systems to accomplish their business transaction and data processing needs. The company named SAP Aktiengesellschaft (commonly known as SAP AG in the business press) is currently the world market and technology leader in providing ERP systems. As such, this paper primarily discusses information technology implications based on the SAP system.

The remainder of this introduction provides an overview of ERP software in general, and a discussion of SAP's ERP software. Section 2 discusses major technological and accounting issues involved in the implementation of SAP and ERP systems. Section 3 discusses data and information integrity and audit issues in ERP systems. The final section provides a conclusion.

ERP systems and R/3

Enterprise Resource Planning (ERP) systems are software packages that use relational database technology to integrate various units of an organization's information system. ERP systems provide several separate, but integrated modules, which can be installed as a package for any organization (Scapens and Jazayeri 1998). Many large corporations use several different and separate information systems, often because they have merged with and/or acquired other companies with varied systems. An ERP system

integrates these separate information systems and results in improved data reliability and processing efficiency. ERP systems quickly became popular with large corporations that needed a seamless integration of their business, but are now frequently used by small to mid-sized companies. The excellent ability of ERP systems to simplify business transaction processing, eliminate work that adds little or no value, and simultaneously improve customer service are the main reasons for the outstanding success and popularity of these systems (Gibbs 1997). ERP systems have made legacy systems outdated and obsolete for many companies. For example, by implementing an ERP system, Owens Corning went from having over 200 legacy systems to fewer than ten (Scapens and Jazayeri 1998). The main obstacle to installing an ERP system is the cost; it can cost upwards of \$100,000,000 to implement a large-scale ERP system. However, an ERP system can provide significant benefits by improving information processing quality and thus management decisions related to business operations.

SAP's R/3, introduced in 1992, is the most used ERP system in the world. The R/3 software package is designed to allow businesses to effectively and efficiently operate a variety of business processes within a single integrated information system (Scapens 1998). The software is customizable using SAP's proprietary programming language, ABAP/4. R/3 is scalable and highly suited for many types and sizes of organizations and runs on six different platforms (www.sapfans.com). SAP's R/3 has been designed to be the best ERP system in the four areas of human resources, financial, supply chain management, and marketing. R/3 is also an international product, and meets the local fiscal, language, and tax requirements of most countries (Keeling 1996). The

R/3 software package is so popular that many people mistakenly believe that it is SAP's only product.

2. Technological and Accounting Issues

2.1. Implementation

Properly implementing an R/3 system is extremely important and it is a very long and expensive process. Large-scale, complicated ERP systems can often take twelve to eighteen months to be installed and operating. Any needed costs for consultants to modify or customize the system are extremely high, with rates at about \$150 to \$225 per hour (Mayer 1997). SAP AG offers a consultant education program to train individuals to implement and install each version of their ERP systems to help increase the supply of needed qualified programmers (<https://websmp206.sap-ag.de/ce>). The significant costs of acquiring and successfully implementing an ERP system indicate that it should be considered as a long-term investment, with careful planning to obtain all the available benefits of improved data processing.

Implementing the SAP software will often involve business process re-engineering. This is because SAP's R/3 ERP package is organized by the business processes of financial, human resources, supply chain management, and marketing as opposed to conventional functional areas such as production, sales, and accounting (Scapens 1998). This leaves a company desiring to implement SAP R/3 with two basic options: either reorganize itself to agree with the components of the software, or modify the software to comply with the current organization of the company. The structure of the R/3 package is extremely complex and not particularly flexible, so a significant

challenge with changing the software is that it will likely adversely affect performance across the entire system if not done properly. It is important to understand that SAP's R/3 was not necessarily developed for application by every company. Rather, R/3 was designed for manufacturing companies that have similar business processes (Osterland 2000). Therefore it is wise to invest considerable time and effort in evaluating if an R/3 ERP system is the right one for a particular company.

Carefully planning the installation of R/3 is extremely important because problems can and will occur during and after the implementation. As an example of a more serious case, Hershey Foods Corporation attempted to go live with their new SAP system and had nothing but trouble for three months. The delay in successfully operationalizing their R/3 system drastically cut Hershey's revenues and profits for the year. There are several other cases similar to Hershey's experience. However, Amoco Corporation successfully implemented R/3 in all 17 of its business groups without any significant problems (Osterland 2000). ERP experts say that one of the keys to a smooth and relatively trouble-free installation is to do as little customization as possible of the ERP software. The experts also recommend developing performance measures for the system, having close control over the ERP consultants working with installation, and maintaining control over internal politics (Osterland 2000). The key is full support by all members of the company and strong teamwork within the implementing body.

2.2. Information Technology Issues

The five key items to consider when selecting an ERP system are functionality, price, hardware platforms, the RDBMS (relational data base management system), and the installed base (Dance 1996). Functionality deals with the availability and ease of

installation of new modules and updated applications. SAP upgrades their product frequently, which makes the R/3 system very appealing by providing a company the opportunity to improve their current R/3 system.

As discussed previously in this article, the costs to initially purchase and install an ERP system are substantial, with the cost of SAP's R/3 system being as high as \$100 million. After the system is installed, upgrades will be necessary within a few years in order to maintain current information technology capabilities. However, very frequent upgrades to the ERP system can be as expensive as the original implementation. For example, SAP's newest application designed to make the R/3 ERP system interface effectively with the Internet is expensive and difficult to implement.

SAP's R/3 is very versatile, as it will operate on six different platforms, including the recently added Microsoft NT. The RDBMS of the ERP system primarily deals with the programming language upon which the system operates. SAP uses their own proprietary language for the RDBMS, known as ABAP/4, which essentially requires that companies use SAP trained personnel, but it also offers more flexibility than do generic programming languages. The installed base refers to the viability and financial strength of the company seeking to implement SAP. Installed base is an important factor in selecting an ERP system because the system must be efficiently implemented and the significant costs of the system must be recovered through improved and more efficient operations (Dance 1996). Recovering these costs will usually require many years and thus a company needs to have significant resources to invest in an ERP system that are not required for other aspects of operations.

The R/3 package includes several very attractive features. First, it has a three-tier client/server system. Providing three tiers offers scalability and easier adaptation to the specific needs of large companies and fast-growing companies (Dance 1996). SAP's R/3 is available in 14 different languages (German, English, Spanish, etc.) and also incorporates multiple currency features that provide essential information processing capabilities for multinational corporations. R/3's modules are organized by the functional areas of financial, human resources, supply chain management, and marketing. While information is entered separately for each specific module, the modules are fully-integrated and provide real-time applications. This means that data entered into one module is immediately and automatically updated and reflected in all of the functional areas. R/3 is composed of a single, virtual file structure with no subsystems (Gibbs 1998). In addition, SAP has released "MySAP.com" which is software that provides for data interaction and processing connections with the Web (Piven 1999).

However, the powerful capabilities and complexity of SAP R/3 do make it cumbersome to work with in some ways. Any large-scale ERP system, R/3 included, is challenging to keep updated in today's fast paced business environment. Technology can significantly change in a matter of months, but it requires over a year to implement R/3. The primary reason that R/3 is difficult to maintain at a current technology level is that SAP has designed an intricate and complicated product to meet the needs of very large companies. That is, SAP has not reduced its enterprise-focused frameworks to smaller components that can be effectively used by midsize companies with fewer resources, which is another limitation of R/3 (Piven 1999).

2.3. Application of Accounting Functions in the ERP System

Financial and managerial accounting tools in SAP R/3 are contained in the financial accounting (FI) and the controlling (CO) modules. The General Ledger function in the FI module provides a comprehensive record of all information needed for external financial reporting. The accounting data is complete and accurate because the SAP system fully integrates all business transactions that were entered from all the operational areas of a company. In addition to the FI and CO modules, the SAP system includes the Investment Management (IM), Sales and Distribution (SD), Materials Management (MM), and Human Resources (HR) modules.

Management accounting tools in SAP R/3 are cost center accounting, internal orders, product costing, activity based costing, profitability analysis and profit center accounting. Some applications of these tools are:

- Analyzing an organization's overhead costs according to where they were incurred within the organization. Planning, collecting, and settling costs of an organization's internal jobs and tasks.
- Developing different types of cost estimates for a particular product or subassembly, such as standard cost, future cost, tax cost, or commercial cost estimate.
- Planning the cost of products before an order to commence manufacturing is placed.
- Assigning costs incurred in an organization to the activity units within the organization.
- Activity-Based Costing.
- Evaluating profit or contribution margin based on an organization's market segments. These market segments can be classified according to products, customers, orders or any combination of these, or strategic business units, such as sales organizations or business areas, with respect to an organization's profit or contribution margin.
- Working with two different types of cost drivers, activity types and statistical key figures.
- Understanding the differences of primary cost elements, primary revenue elements, and secondary cost elements.

An Example of Using the Standard Hierarchy

The standard hierarchy is the central cost center hierarchy created in the system and acts as the one repository for all cost centers. Starting from the standard menu, following are the steps needed to access the cost centers for technical services:

SAP standard menu → accounting → controlling → cost center accounting → master data → standard hierarchy → display (transaction code: OKENN). Enter the controlling area and click the enter button → 3000. Find H3000 for Company 3000 - USA and click the arrow to the left of the cost center. Click on the details button to expand the section of the window where the details for cost center groups are displayed. Once the cost center groups are displayed, click on the expand arrow in front of H3400 Technical Services and click on the expand arrow in front of H3410 - Technical Services to obtain all of the cost centers for H3410 Technical Services.

2.4. Impact on the Accounting Profession

SAP R/3's accounting features are modeled on German approaches to accounting, and thus they are well-organized and very efficient in processing accounting information and providing accounting statements and financial reports (Scapens 1998). As stated previously, R/3 offers multiple currency features and a three-tier system that is capable of meeting very high demands from the accounting system for either transaction processing or financial reporting (Dance 1996).

SAP was the first to implement integrated treasury capabilities. This attractive feature allows a corporate treasury department to function as an in-house bank by automating the control of cash flow, investment trades, and portfolio management

(Xenakis 1997). R/3 provides check writing capability in its Accounts Receivable component which very few other programs offer. Additionally, there is equal access to all data in the system. This means that personnel can access financial data directly from a computer screen rather than physically meet with the treasurer, controller, or some other similar person. In other words, R/3 offers real-time, immediately updated reporting. R/3 also provides for a "single data entry point" where the data entered from any location is instantly sent to all other appropriate modules in the ERP system. Another time-saving feature is that end-of-period closes are shortened dramatically from days or weeks to hours since subsidiary ledgers no longer need to be closed prior to closing the general ledger (Gibbs 1998).

The advent of ERP systems has affected the role of accountants and it is a role for which accountants need to be prepared. ERP systems are definitely changing the work environment of accountants today. Implementing an ERP system requires a reengineering of prior business structure and changes in general operating methods. A CPA mentality is necessary to understand and communicate the value added by ERP systems, and it requires significant technological knowledge to implement them (Covaleski 2000). Accountants have a solid understanding of business, but today they must also embrace the efficient technology available from ERP systems. If accountants learn about ERP software and how it works they can greatly assist companies in improving the management of their operations. For example, in many cases, older styles of internal controls no longer apply and the accountant can greatly assist a company in developing new controls to work with an ERP system.

Switching to continuous, real-time reporting using an ERP system is a tremendous change compared to issuing financial statements annually, quarterly, or monthly. Many CPA's welcome this transition, but some are hesitant to adapt. It is obvious that accountants must invest much time and energy to become proficient in working with ERP systems. When working with companies that use ERP systems, innovative auditing techniques and advanced consulting skills will become the norm, particularly where collaborative efforts are essential within a firm (Gibbs 1998). Many auditors use "independence" as a reason to avoid involvement in ERP, but auditors can maintain their independence and be actively involved in the implementation and operation of a client's ERP system (Glover, Prawitt, and Romney 1999).

3. Data and Information Integrity and Audit Issues

3.1. Risk and Control

Whether a company uses a basic manual data processing system or an extremely complicated computer-based data processing system, controls are needed to reduce the risk that the information in the system is inaccurate, false, or has been manipulated. Accountants can greatly assist companies in developing appropriate controls, and can use new technology to significantly strengthen the control environment (Gibbs and Butler 1997). Improved controls will greatly benefit the company since better controls will make it more likely that management's goals will be achieved.

Accountants and company management need to be aware of the risks involved with an ERP system. A very common problem encountered during implementation of the ERP system is eliminating traditional controls without replacing them with new effective

control measures (Bui 1999). SAP R/3 includes many control features such as screening access to data files, validating users, and limiting authorized users to a specific set of transactions. (Gibbs 1997). In addition, R/3 offers tracing capabilities that can seamlessly follow a transaction throughout the system and identify what happened at each step. SAP also includes Business Workflow, which enables smooth, automatic transaction flows, which improves customer service as well as improving business controls (Gibbs 1998).

Specific controls provided by SAP are discrepancy reports and reconciliations of outputs to source documents or data. SAP creates a numbered document for each transaction, and once a document is created, it cannot be erased. This creates an audit trail that allows all entries to be traced and verified. The SAP accounting modules include several built-in discrepancy reports that highlight possible problems with document output. One report lists instances in which invoice numbers have been assigned twice. Another reports on gaps in document numbering. Reconciliations are facilitated in the SAP system through such reports as the posting totals reports, which would allow the user to compare batch totals from source documents with the system posting totals for batches.

Recently, SAP has partnered with PricewaterhouseCoopers to develop software that incorporates controls that comply with the Sarbanes-Oxley Act (SOA). This new software will give CFOs and CEOs the ability to determine the true effectiveness of their internal controls. The software will allow the user to generate the necessary internal control documentation, as well as to perform scooping, remediation and signoff.

However, all of the wonderful control mechanisms available in R/3 are effective only if they are set up correctly. Many of the controls must be "turned on" and the entire ERP system must be properly installed in order for the controls to function properly. Therefore, during implementation it is imperative that a formal approval process for the system design work be established. The accountant must be part of the design process to ensure that the ERP system operates as it should.

In an ERP system, many employees in various parts of the company may be authorized to enter data concerning company activities. This increases the risk that the data entered lacks integrity (i.e. is not accurate) because it is very difficult to assign specific responsibility to any one employee for the authenticity of all data entered.

Because data is shared across the modules of an ERP system, some traditional control activities are no longer needed. For example, the integration of data means that typically there is no longer a need for reconciling or adjusting entries. This requires adaptation by accountants to understand and work successfully with the functions of the ERP system. The integrated nature of an ERP system also creates a formidable risk of business continuity. Since the entire system is linked together, the company's success is dependent upon the ERP system operating efficiently and effectively. In a sense the system is the company's life. If the system goes down for any reason then the company will be unable to process a single transaction (Gibbs 1997). To keep the system operating properly, security management procedures need to be reviewed on a regular basis. The reviews should include thoroughly examining new and modified user profiles as well as access authorization changes (Gibbs 1998).

Billing is typically a very high-risk area for a company, as billing has significant potential for errors and manipulation. In the R/3 system, most billing activities occur in the Sales and Distribution module. The Sales and Distribution module includes the components of authorizations, customer master file record creation, credit checking, sales order creation, delivery, and invoicing.

If installed properly, an SAP R/3 system offers tight control over the billing process. The key to SAP's billing cycle is the authorizations function, because it controls every user's ability to create, modify, and delete transactions. Each user has an authorization profile that defines which specific records that user can access, as well as whether the user can display, change and/or delete information. Thus data errors and irregularities in billing can be significantly reduced by limiting the responsibility that various employees have in the billing process.

A customer master file record includes basic information for that customer, including credit, sold-to, bill-to, payer, and ship-to information. The customer master file record must be established before SAP R/3 can process a sale to a customer. Most of this master file data is copied into sales documents. This means that the accuracy of the customer master data directly affects the reliability of the reported amounts of sales revenue, cost of goods sold, accounts receivable, and cash receipts.

There are three major risks concerning customer master files: (1) a customer file may be created without proper authorization; (2) duplicate files may be created; and (3) onetime customer files may be created and then used to bypass other controls (Attaway 1999). To control these risks, a company should do the following:

1. Require that customers be properly approved before establishing a customer file.

2. Customer master file creation and modification are handled through the R/3 authorization function that requires the approval of the credit manager and customer service manager.
3. All orders to onetime customers are automatically blocked for shipment and can be released only by an employee independent of order processing.
4. A one-time customer report is frequently generated by the R/3 package and examined by the appropriate manager.
5. Review a sample of changes to customer master files for proper authorization.
6. Separate the function of creating or modifying customer master files from the functions of processing sales orders, deliveries, billings, and cash receipts.
7. Print the “ship to” and “sold to” address listings and examine them for duplicates.

Doing credit checks is essential to prevent sales from being made to customers who are unlikely to pay within a reasonable time. SAP R/3 performs automatic credit checks by using data from the financial accounting and sales and distribution modules. R/3 can check a customer’s credit for both orders and deliveries, and considers their accounts receivable balance and the amounts from open orders, open deliveries, and open billing documents. Checking a customer’s credit at the time of the sales order is preferred, since pulling the inventory items and generating shipping documents would not occur if the credit limit had been exceeded. It is also suggested that only credit department personnel be authorized to create and change credit limits or remove credit blocks.

R/3 includes useful controls for sales order creation, as it allows management to establish authorized prices and discounts for each customer and each product. Sales orders with unauthorized prices or discounts would not be allowed without proper management override. After the sales order is processed, R/3 next creates the delivery order based on the information in the sales order. Once the delivery order is created, the

goods are pulled and the shipment is scheduled. At the point of shipment, a shipping employee enters in the R/3 system that the delivery order has been shipped. This last step in the delivery function initiates the billing process in SAP R/3. The billing component then uses the information from sales and shipping documents, such as quantities and prices to produce the invoice. When the invoice is created, the financial accounting module is automatically updated to reflect the amount owed by the customer (Attaway 1999).

Like billing, accounts payable is a high-risk area for an organization. Key concerns are preventing unauthorized and fraudulent payments. The accounts payable component of SAP R/3 contains four types of transaction blocks that make it much less likely that improper payments will occur. These transaction blocks are as follows:

1. The audit block compares the data in the R/3 system regarding vendor's invoices to determine if there is an accompanying purchase order. A block is placed on payment of invoices that do not have a related purchase order. The block requires that the invoice be reviewed and released payment by an employee other than the one who entered the invoice information.
2. The receiving block tests for agreement between the purchase order, the receiving report, and the vendor's invoice. Any discrepancy creates a block that can only be removed by an employee independent of those who entered the information recorded from those documents.
3. The vendor block deals only with newly created vendor master file records. The vendor block requires that an employee other than the one who created the new vendor master file verify the amounts owed before any payments are made to the new vendor.
4. A manual block is used to prevent payment while any outstanding issues are being resolved. A manual block can be implemented either at the time of invoice entry or afterward, and it can be removed by the employee who initially blocked the transaction.

For transaction blocks to be most effective all of the blocking capabilities in R/3 must be implemented; the system must be configured to use these features. In addition,

authorization to remove blocks must be limited to appropriate management since otherwise unauthorized employees could release potentially improper payables for actual payment. This means that management must have a thorough knowledge of the process used by R/3 to block payables processing as well as the steps necessary to release blocked items.

3.2. Audit Issues

Careful planning and analysis is necessary for a CPA firm to properly perform an independent audit of an entity's financial statements. Some of the key items necessary to effectively perform an audit are obtaining a thorough understanding of the client's industry and business, performing an assessment of the risk that material misstatements are included in the financial statements, the collection and evaluation of sufficient and competent evidence, and thorough supervision by the CPA firm partners of all work performed by assistants. The process of the CPA firm satisfying each of these key items will be similar whether or not the client has an ERP system. Thus, the remainder of this section will focus on how a client using an ERP system would have a significant impact on the audit approach.

As indicated in earlier sections of this article, implementing an R/3 system will require that a company make significant changes to their internal control procedures. Auditing standards require that the independent auditors must obtain a sufficient understanding of the client's internal control system in order to adequately plan the audit and to determine the type, timing, and extent of tests to be used to gather evidence (AU 319).

The AICPA, in AU 319.06, defines internal control as a process designed to provide reasonable assurance that the company's objectives in three areas have been achieved: the reliability of financial reporting, the effectiveness and efficiency of operations, and compliance with laws and regulations. The AICPA further states in AU 319.07 that an internal control system has five components: control environment, risk assessment, control activities, information and communication, and monitoring. Perhaps the two most important components that an independent auditor should evaluate in an ERP internal control system are control activities, and information and communication. Control activities are the procedures that protect the company's assets and prevent falsification of accounting records, for example requiring two signatures on issued checks. Information and communication is the timely identification, collection, processing and reporting of relevant data in a useful format such that employees can effectively meet their responsibilities. Since information and communication processes and control activities are the essential focus of an ERP system, it is extremely important that the independent auditor completely understands and documents how the ERP system collects and processes data as well as the actual controls implemented within the ERP system.

In addition, auditing standards require that the auditor evaluate each of the five components of internal control within the context of how the client collects, transmits, processes, maintains, and accesses information (AU 319.15). The auditor can only adequately perform this evaluation by having a very thorough understanding of the details of the client's ERP system. The auditor must specifically know how the client uses each module of their ERP system to collect, process, and transmit information to

appropriate employees within the company as well as the controls in place over input and access to data and controls over changes to the data files and the particular features of the ERP software.

The auditor's assessment of the reliability of internal controls is much more critical for a client with an ERP system than it is for a client that maintains a traditional information system. This is because the auditor will probably not be able to rely exclusively on substantive testing to collect the sufficient competent evidence needed to issue an audit opinion regarding a client with an ERP system, as most of the client's information is maintained in electronic form where information is susceptible to falsification or alteration which would only be detected with strong controls in effect (AU 326.14). This also means that the auditor will need to heavily rely on computer-assisted audit techniques to gather and evaluate the evidence for substantive testing.

4. Conclusion

SAP has become the leading provider of ERP systems by providing a very powerful and comprehensive product in its R/3 software package. However, R/3 is costly, complex, and not easily modified by the user. In considering whether to implement an R/3 ERP system, a company must compare the benefits of very efficient and effective information processing with little duplicated effort to the significant monetary costs of up to \$100 million dollars and a huge time commitment of thousands of employee hours needed to successfully implement the system. R/3 is complex due to its capabilities, which when properly applied can provide companies with tremendous data processing benefits.

SAP R/3 is organized with the concept that a business operates as a series of processes, which means that the company implementing R/3 may have to change and reorganize itself to properly fit with R/3 and use it effectively. R/3 offers powerful accounting capabilities but accountants must learn the details of the R/3 system well to provide quality services to clients that either currently have or are considering obtaining an R/3 system. Auditors must also understand the R/3 system extremely well in order to perform a proper audit of a client that uses an R/3 data processing system.

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