ERP For Manufacturing Organizations –
The Benefits, The Risks, And How To Avoid The Risks

Arik Ragowsky[1]

[1]Wayne State University, School of Business Administration, Manufacturing Information Systems Center
(Aragowsky@aol.com)

Abstract

Manufacturing companies invest a lot of money in ERP systems. This investment may be as high as $200,000 for small companies, $600,000 - $800,000 for midsize companies, and up to several million dollars for larger companies. By investing so much, companies expect to get a significant return on investment. Nevertheless, despite these high expectations and huge investments, ERP implementations often fail. Based on a study of over 500 manufacturing companies, and interviewing software vendors and consulting companies, we found explanations for the high percentage of failure. It was found that there is a lack of understanding of the role and potential benefit to be derived by using ERP systems. Software suppliers (vendors as well as consulting companies) mislead manufacturing companies in a way that will increase the suppliers' benefits instead of the customers' (the companies that implement the software). In this paper we present the potential benefit a manufacturing company may gain by using ERP systems, the problems they may face in this process, methods to avoid these problems and to gain the full potential benefit.

1. Introduction

A manufacturing firm is a complex and dynamic organization in which different activities of many kinds are carried out in parallel. Among other things, these activities differ in the amount of information required to carry them out. At the same time the activities are tightly connected with each other. For example, an activity that is carried out in the sales department affects inventory planning, purchasing from suppliers, planning in the engineering department if a change has to be made for a specific order, and production planning. Each of these activities requires the appropriate information, and the outcome of the activity (beyond the physical outcome of the process) is a series of many and varied data printouts. In order to utilize this abundance of data in the efficient managing of the firm, the problems inherent in information processing must be understood:

- A proliferation of data but lack of information
- The difficulty in obtaining the information from the proliferation of data
- Choosing an efficient method of managing and presenting the information

Data is created throughout the organization. There is a need to collect all the data and make it available to every user who needs to access the data in order to generate information and present it in a useful way. One of the accepted methods throughout the world today of coping with the problem of information is the use of information technology, that is, the use of computerized information systems. It started with Computer Integrated manufacturing (CIM), then was developed to Material Requirement Planning (MRP), and was further developed to Enterprise Resource Planning (ERP).

The goals of this article are to present the importance of ERP, the potential benefit to be derived from using it appropriately, the reasons for failure in ERP implementation, and the way to avoid failure.

2. ERP - Concept and Potential Benefits

"Enterprise Resource Planning (ERP) systems is a generic term for an integrated enterprise computing systems" (Waston et. al. 1999). These systems help organizations to deal with their supply chain, receiving, inventory management, customer orders management, production planning and managing, shipping, accounting, HR, and all other activities that take place in a modern business. ERP is defined as a strategic business solution that integrates all the business functions, including manufacturing, financial, and distribution.

The first objective of ERP systems is to collect the data that is generated throughout the organization, to validate it, and to store it in a central database where all users can use it and generate accurate information for their needs. The database is the tool that integrates all the business functions and enables them to use the same data to generate information. When, for example, a sales person reports a customer's order, all other organizational functions that may be involved with the order (e.g., raw material purchasing, production manager, shipping) will be aware of it and will be able to react appropriately. In addition, by using a central database, each data item is entered only once to the system, everybody is using the same data, and there are many fewer mistakes.

By using this database, the ERP system can generate reports and documents such as financial reports, invoices, receiving and shipping documentation. All these activities are taken care of by the transaction processing systems

(TPS) of the ERP, the clerical part of the ERP. Contrary to popular opinion, the direct benefit provided to the organization by using this part by itself is limited. The cost of the clerical work in manufacturing organizations is relatively small. Hence, the cost reduction for these activities that may be supported by using ERP systems may not result in a positive return on investment—in many cases a very high investment. The real benefit that can be provided by ERP lies in using the collected data to generate information to be used for management activities and decision support purposes.

Decision support systems (DSS) are those applications that use the data collected and stored in the central database for providing information to users (usually at the mid and high management levels) to support their decision-making. They are able to retrieve the needed information for decision-making and conduct what if analysis. For example, managers can plan the raw material purchasing to shorten the time raw materials will be stored at the warehouse as a function of the needs (based on customer orders and the production plan), availability (what is available at the warehouse), and lead time of the suppliers.   If the organization has many suppliers, they may have different prices, different lead times and different quantity discounts. It is necessary to check the many possibilities before making a decision. In this case, a decision support system can help the purchasing manager evaluate the possibilities and make the best decision with respect to the time to buy the raw materials and from which supplier to buy, thus reducing the level of inventory at the organization's warehouse and obtaining the best price for the raw materials. Another example is changing production scheduling. The production manager has to schedule work orders based on customer requests on the one hand and the availability of raw materials, machinery and men power resources on the other. But after painstaking scheduling, a customer may change the order. It happens very often in the automotive industry. GM, Ford, and DaimlerChrysler change their releases very often, and the suppliers have to be responsive. In such a case, the production manager must find a way to provide an unexpected order for one customer without delaying other customer's order. A decision support system can help the production manager to conduct "what if" analysis (if prioritizing a new order, what will happen to the other orders, and so on) and to find the best solution. A good decision may save the organization a penalty of several hundred thousand dollars, to be paid to each of the Big Three for lateness.

The benefits of a properly selected and implemented ERP system can be significant. Inventory holding costs can be reduced (on the average) by 25 to 30%; raw material costs can be reduced by about 15%. Lead time for customers, production time and production costs can be reduced as well, and so on (Gunn, 1988; Schlack, 1992). The benefits described above can be very significant. Yet, as will be described below, these benefit are conditional, not guaranteed.

The cost of implementing these software packages can also be quite high. Software, incremental hardware, training and implementation support may cost $200,000 for a smaller comp any (approximately $10M annual sales), $600,000 to $800,000 for midsize companies (approximately $40M to $70M annual sales), and up to several million dollars for larger companies. "It is estimated that businesses around the world are now spending $10 billion per year on ERP systems." (Davenport, HBR July-August 1998, p. 122.)

3. Implementation Failure

Despite these high expectations and huge investments, ERP implementations often fail. The *New York Times* ran an article on "Software That Can Make a Grown Company Cry" (November 8, 1998) telling about problems with ERP implementations. Allied Waste Industries purchased an ERP software package from SAP America, a major ERP software vendor, but discontinued its use after finding it too complicated, too expensive, and a poor value in terms of added functionality (*Wall Street Journal*, Wednesday, June 9, 1999). By doing so they lost over 40 million dollars. Hershey Foods Corp. installed an ERP application earlier last year, and by mid-September the candy-making giant was having trouble pushing orders through the new system. The glitches resulted in shipment delays and incomplete orders during the busy Halloween season.

Many companies that feel they have not received a significant return on investment with ERP may be the victims of an illusion: They may have assumed that since clerical activities can be standardized in software, all other activities can be standardized as well. This illusion is one that some software vendors, as well as some consulting companies, foster. Kevin McKay, president of SAP America, said that "enterprise software can connect and automate all the basic parts of a company: sales, payments coming in and going out, inventory, and all other sorts of accounting function." (*Wall Street Journal,* Wed., June 9, 1999). The fact is that while clerical activities in different companies can be standardized cheaply and efficiently (and therefore profitably for the producer and vendor), the information needs and the contribution of the information for management activities and decision support may be different for different organizations. Consequently, the benefit different organizations may gain by using the ERP systems for these purposes may be different.

In the case of raw materials purchasing, the purchasing manager has to examine a large quantity of data in order to compare the suppliers and make the best purchase with respect to price, lead time, etc. The manager can reduce purchasing cost by 10%-15% by using computerized decision support systems to support such decisions. This figure may justify buying a sophisticated purchase order IS application (a decision support systems). However, if the rate of raw material cost relative to the total production costs is low, then even if the firm makes the best decision concerning raw materials purchasing, the decision will have little impact on cost reduction. For instance, if the material cost is 5% of the total cost of the product, the savings will amount to 0.75% (15% times 5%) of the cost of the finished product. In this case, a decision support system that helps the purchasing manager to compare and evaluate more suppliers in order to get the lowest cost is

not particularly valuable. Consider, for instance, the project management application, a decision support systems application. If a manufacturer produces to suit specific and unique customer orders, and if an order takes a long time to produce and involves several stages, that manufacturer will probably benefit substantially from the project management application. On the other hand, a repetitive manufacturer with long production runs (often months or years, based on a blanket purchase order from the customer) will likely obtain little benefit from this application.

A stream of research conducted by the author of this article involving over 500 manufacturing companies has shown that while the benefit provided to manufacturing organizations by using transaction processing systems related to ERP is almost uniform (regardless of the organizational characteristics), the benefit provided by decision support systems is highly dependent on organizational characteristics such as number of suppliers, number of production line, type of products, and number of levels in the bill of materials.   Different organizations will gain different benefits by using these applications. Hence, a software package that suits some organizations may not suit others; and some information systems applications that are beneficial to some manufacturing companies, may not be beneficial to others.

 The true value an ERP system can provide to a company is the information management capability provided at all times to key decision makers in the various processes. Supporting the decision processes with updated and reliable information will lead to better decisions. Some of these decisions (based on the organizational characteristics as mentioned above) may support the organizational performance very significantly. However, using an expensive ERP system for standard clerical assignments only (e.g., bookkeeping, simple inventory management, invoices, payroll and check printing), is a very poor investment, given the high cost of such systems. Hence, a great deal of study and planning needs to be done before selecting and implementing an ERP system as will be described below.

As we have seen, in order to support their sales, some software vendors claim that most manufacturing companies have identical information needs-- hence, their software is good for every organization. A related problem is that sometimes software vendors try to force companies to change the way they operate to fit the software, as Kevin McKay, the president of SAP America, said (*Wall Street Journal*, Wednesday, June 9, 1999). McKay's argument is that the software is a business improvement device; fitting the business to the software will improve the business. It is important to remember that, an **information system is a tool, not a goal**. That is to say, information systems should support the business management, operation, decision-making, and performance; and not vice versa. If a specific ERP package does not support the organizational processes, the company should look for a package that does.

Another related problem is linked to the way the success or failure of an ERP implementation is measured. Many software vendors define a successful implementation as one that was completed within time and budget limits. This is not necessarily true. An ERP implementation may be completed within these limits, yet, because of selecting a wrong package, or implementing the wrong application, it will contribute very little to the organizational operation and performance. The organization **should not** consider this as a successful implementation.

The critical element in a successful ERP implementation is the correct selection of the software package and applications. An ERP system simply purchased "off the shelf" cannot be expected to work well. Because of the large number of software vendors and available packages and features, a thorough analysis of a company's organizational characteristics and needs must first be conducted. Significant benefit from ERP systems is gained only by studying these organizational characteristics and carefully coordinating them with an appropriate ERP package. This is accomplished by a detailed analysis of all aspects of a given company, achieved through interviews with the managers and the users involved in key manufacturing and support processes. For this purpose an organization cannot use standard questionnaires, since companies are different from each other. In order to get significant results, the systems analyst has to ask the managers and the users at the organization many questions about his/her job and responsibilities. The systems analyst has to understand every activity the organization performs in detail. The systems analyst has to understand what happens in any case, why, when, and how. In addition to selecting an ERP system that will meet the company's specific needs, this process educates company personnel about the benefits and limitations of the software, thus avoiding implementation failure due to false expectations of what the system is intended to achieve.

A very common way to conduct the organizational study is to use consulting companies. Some consulting companies prefer to use structured questionnaires in order to conduct the organizational study. By using these questionnaires they do save time, and consequently, reduce their costs. Yet, as mentioned above, they cannot in this way study the organization well enough. Even worse, the author of this article saw a few cases in which consulting companies used the same consulting report for different organizations after replacing the organizational name by using the edit function of a word processor. Sometimes, they even charge a very small amount of money for the consulting project, knowing that they will get a commission fee from the selected software vendor, or they will conduct the training and the implementation where they will make a lot of money. The author of this article has provided expert consultation services for manufacturing companies that, for substantial sums of money, purchased and implemented ERP software packages based on the recommendations of consulting companies. Shortly after the implementation, the manufacturing organizations realized that the ERP packages which the consulting companies had recommended, did not suit their needs, although their needs had not changed. When using a consulting company for the analysis and the software selection, the buyer needs to ascertain that the consulting company has no alliances with software vendors. Although an "allied" consulting company may say they know one ERP package better, such an alliance rarely works to the advantage of the buyer.

The consulting company should escort the buyer through the process. They should conduct, in the buyer's presence, a very thorough set of tests for different ERP systems, demonstrate the differences among them, identify the system that will suit the buyer's individual needs, and be involved in the contract negotiation. In order to avoid a

conflict of interest, the consulting company should not conduct the training and the implementation. These activities should be provided by the software vendor. Any claim by a software vendor and/or the consulting company that the consulting company is certified with the software should alert the organization.

4. Conclusions

ERP is a very important tool for operating and managing organizations. It is obvious that it is necessary for every organization to collect and maintain its data in order to create and present useful information when needed. This information can help managers better perform their duties, improve decision-making, and support the organizational performance. Yet these benefits are not guaranteed. Depending on organizational characteristics, different organizations may or may not gain the expected benefits. In order to make sure what ERP package to select and what information systems applications to implement, it is necessary to conduct a thorough analysis of the organization and a thorough evaluation of ERP packages. It is important to realize that not all organizations are similar. One ERP software package **CANNOT** support all organizations. Different packages will suit different organizations. A successful ERP implementation should be measured by the contribution to the organizational performance, and not by completing it on time and within budget limits. By following the steps presented in this article, an organization can avoid a failed ERP implementation.

References

[1]   Waston, E.E. and Schneider, H. February. "Using ERP Systems in Education," *Communications of the Association for Information Systems,* Vol. 1. (1999).

[2]   Gunn, T. "People: The Primary Resource in World Class Manufacturing," *CIM Review,* 4 (3)   (1988), 6-9.

[3]   Schlack, M. "IS Has a New Job in Manufacturing," *Datamation,* 38 (1992), 38-40.

[4]   Davenport, T.H. "Putting the Enterprise into the Enterprise Systems." *Harvard Business Review,* July-August, 1998, pp. 121-131.

[5]   Deutsch, C. H. "Software That Can Make A Grown Company Cry," *New York Times*, 1998, p. 8.

[6]   Bailey, J. "Trash Haulers Are Taking Fancy Software to the Dump," *Wall Street Journal*, June 9, 1999.