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ERP SYSTEM SOLUTIONS FOR SMALL COMPANIES: READINESS & SELECTION

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ABSTRACT

Over the past decade almost all of major businesses in the US have implemented Enterprise Resource Planning (ERP) systems to run daily business operations. However, a complex ERP system, if not implemented properly, can easily disrupt, or sometimes cripple, the flow of the manufacturing and other operations. While large organizations are in a unique position to implement a good ERP system, most small companies cannot afford the acquisition and implementation cost of a big name ERP system. Therefore, smaller organizations rely on vendors with affordable, but not necessarily proven, ERP systems. To help small businesses avoid implementation problems and system glitches after ERP implementation, two proactive initiatives are recommended, ERP readiness and ERP selection. This article organizes a checklist for each initiative so that small companies are better prepared to overcome implementation challenges and their expectations are more aligned with the norm of an ERP implementation.

INTRODUCTION

According to the U.S. Chamber of Commerce (www.uschamber.com), small business is defined as "In terms of eligibility for federal small business programs, it is based upon industry (defined by NAICS code, similar to SIC code) and employee and revenue size. As a general rule: 500 employees for most manufacturing/mining and $6 million in annual receipts, for non-manufacturing." This study adopts this definition and focuses on the selection and implementation of an ERP system for small companies. Up until a few years ago, the focus of ERP vendors was on the large companies and ERP systems were unaffordable by the smaller companies. However, the situation has changed significantly and recently small companies are getting much needed attention from ERP vendors.

Despite the failure of many Internet and related startup businesses in recent years, the influence of small companies on the entire economy is getting stronger with more people than ever employed by them. Small companies with fewer than 50 people are experiencing double-digit growth, while large companies that employ more than 1,000 workers are

experiencing only single-digit growth (Chapman, Ettkin & Helms, 2000). According to U.S. Small Business Administration, "America's 25 million small businesses employ more than 50 percent of the private work force, generate more than half of the nation's gross domestic product, and are the principal source of new jobs in the U.S. economy". The US Census Bureau reported that more than 380,000 US manufacturing firms have fewer than 500 workers. These companies employ more than 12 million people, over 65% of this country's manufacturing workforce, account for more than $185 billion in payroll and produce over half of all US-manufactured goods (Chalmers, 1999).

Many companies, especially small ones, either depend on manual system or old legacy systems to run their daily operations and find it difficult to improve operational efficiency, lower inventory level, reduce cost, use real-time information for decision making, and communicate with customers and suppliers electronically. A software system designed to improve business processes and promote best practices will make companies more agile, competitive and better able to meet the challenge of competitors. Realizing the importance of information technology, small companies are increasingly feeling the pressure to use specific application software to run business or replace their existing systems with new and more reliable ones, such as the enterprise resource planning (ERP) system.

The historical growth in the sales of ERP applications has come from large, Fortune 1000 multinational corporations. This market has been highly penetrated and has experienced a significant slowdown after years of continuous double-digit growth. Currently, more than 60% of Fortune 1000 companies have implemented core ERP applications for manufacturing, finance and human resource management (Zheng, Yen & Tarn, 2000). The combined cost of software and implementation is prohibitively expensive for most small companies. This problem has seriously limited the market potential of the ERP system and motivated ERP vendors to focus on marketing strategy geared toward small and medium size companies. To penetrate this relatively untapped market segment (Taylor, 1998), ERP vendors are developing packaged products with component-based solutions instead of a full ERP implementation to meet the needs of organizations with different sizes. In general, packaged products have a modular approach which allow quick customization of the software according to the need of the customer and a speedy installation at a lower cost (Zheng et al., 2000) resulting in affordable ERP systems for small companies.

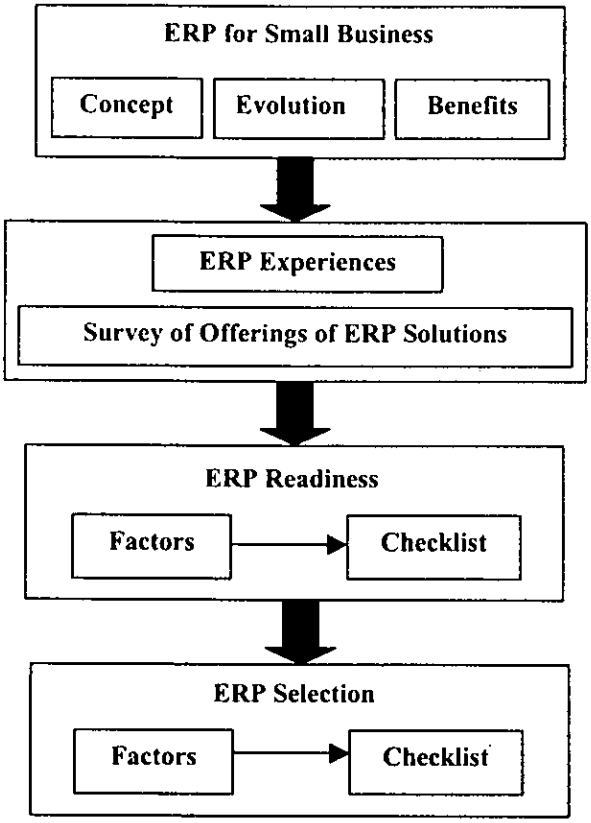
Irrespective of the size, each company must justify the necessity of the new software by assessing its potential benefits and then, if the software is affordable, identifying whether the company is capable of a smooth implementation or not. In this research, the authors provide a framework to identify the ERP readiness, analyze the relevant factors that need to be considered during the software selection process, and discuss the ERP implementation challenges, all in the context of a small organization.

RESEARCH FRAMEWORK

The process of ERP selection and implementation requires at least a preliminary understanding of the ERP process, an understanding of the characteristics that made it a dominant player in the business software industry and an understanding of the tangible and intangible benefits that can be derived from an ERP system. This study starts with a review of existing literature on the concept and evolution of ERP systems, and then provides ERP implementation experience of several small companies. After examining the ERP implementation challenges, a review on currently available ERP products marketed by both large (e.g., SAP, Oracle, PeopleSoft etc.) and small vendors is presented. Since most of the small companies are just starting to embark on an ERP system, it is recommended that each company should evaluate its resources and business needs in order to figure out whether it is

ready for the system or not. After careful evaluation, if a company decides to purchase an ERP system then the management should follow a selection guideline to facilitate their search process. In support of these two recommendations, two checklists are organized for helping small companies determine ERP readiness and ERP selection. Figure 1 shows the research procedure.

Figure 1 - Research Procedure Model



CONCEPT AND EVOLUTION OF ERP

Kumar and Van Hillegersberg (2000) define ERP systems as configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization. In this sense, ERP systems are designed to integrate business functions and allow data to be shared across many boundaries and divisions within the company. For example, a customer service department of a company would have access to information being used by its sales and marketing divisions. This ability to share information gives businesses increased flexibility and allows them to operate more efficiently than before.

An ERP system is an integrated set of application software modules such as accounting, distribution, marketing and sales, material requirement planning (MRP), human resources, logistics and more. Instead of concentrating on specific functional areas separately, these modules work as an integrated unit by bringing the visibility of real-time information to all departments and thereby focusing on business process as a whole. Typically, ERP systems

include a single repository of data, and all business processes occur seamlessly within a single information system.

Today's ERP systems are an outgrowth of materials requirement planning (MRP) systems. MRP systems were developed in the 1970s largely for manufacturing concerns and were initially designed for the time phased work order and purchase order release system which, for many companies, eventually lead to reduction of inventories, improved customer service and better production efficiency. As these systems evolved (e.g., MRPII in the early 1980s), they began to incorporate financial control and measure, master production scheduling and capacity planning. ERP has extended the reach of the planning system to include the entire enterprise, from marketing to product development, and to achieve total organizational excellence through integration (Mabert, Soni, & Venkataramanan, 2000).

The main reason that small manufacturers are eager to apply ERP systems to run daily operations is because ERPs are instrumental in improving business processes such as manufacturing, inventory procurement, sales and distribution. According to Smith (1999), "Implementing an ERP system is often the catalyst for small and midsize manufacturers to examine and improve competitive capability." Furthermore, many small companies would like to get away from spreadsheet-based system or manual filing procedures in order to implement much more interactive and efficient software like an ERP system. A spreadsheet-based system or a manual system is error prone since data validation and data integrity check are non-existent and deriving necessary information for decision making or simply getting real time information is very time-consuming and frustrating. An ERP system cuts duplication effort, imposes standards across the company, speeds order delivery and gives management a snapshot of what the company is doing at any particular moment (Tuynman, 2000). After all, more and more customers and vendors are requiring speedy exchange of real-time electronic information. Effective communication and information exchange among departments such as production and sales within a company is also vital for the survival and, of course, for the growth of the company.

SMALL COMPANIES' ERP EXPERIENCES

ERP system delivery and implementation is generally considered to be complex, costly and highly problematic (Tuynman, 2000; Doyle, 2000a; Stedman, 1999a). According to Gartner Group's survey, 58% of the 1,300 companies surveyed in Europe and in the United States indicated that the ERP installation time matched their expectations and about the same percentage of companies expressed their satisfaction over the post-ERP installation performance (Tuynman, 2000). In the same survey, only 26% of the companies rated their overall IT projects as successful which reflect the fact that the failure rate of ERP implementations are significantly less than the failure rate of all IT projects combined. The survey results may be an indication that the companies are more careful, thorough and methodical in ERP implementation since the consequences of a failed ERP implementation project has far greater ramification to the overall performance of the company than most other information technology (IT) projects.

Eshelman, Jurs and Taylor (2001) research how a small manufacturing company overcame effectively the challenges of its ERP implementation. They convincingly point out with examples that the implementation challenges such as data conversion, temptation to take shortcuts, lack of resources, and fear of change can be dealt with effectively if a company is aware of these challenges prior to implementation and put a good faith effort to solve them.

However, not all companies face the same challenges and the importance of each challenge may vary from company to company. Take a distributor and manufacturer of hockey-related

products and equipment as an example (Doyle, 2000b). This firm implemented a Swedish ERP system on AS/400 on time and under budget. The main concern of the company was the compatibility of its business process with the ERP solution due to the fact that over-customization of the software is costly and could complicate the implementation process and lead to an unsuccessful ERP project. The firm's project team identified 20 elements as key to their successful ERP implementation including the requirement of executive commitment, a realistic project schedule, an experienced project manager, and a positive attitude toward change.

The roadblock to building an ERP infrastructure is seldom attributed to the performance or capability of the software itself. An e-mail poll shows that most companies view cost, planning and training among others to be the main concerns associated with an ERP project (Romeo, 2001). The results of the failed and not-so-successful ERP projects indicated over-expectation, inadequate pre-installation preparation, poor business process mapping, lack of planning, and insufficient user training as the main reasons for undesirable outcomes, not the applications (Stedman, 1999b). A company regardless of its size must be ready for an ERP implementation project since it involves a significant amount of money and highly skilled manpower from almost all departments in the organization.

SURVEY OF OFFERINGS OF ERP SOLUTIONS FOR SMALL BUSINESSES

Non-Web Based ERP Solution Providers

ERP vendors are approaching small companies through different ways to meet their specific needs while making ERP affordable to them. While prominent vendors such as SAP, PeopleSoft and Oracle are offering traditional (non-web) as well as Web based solutions, others are bidding to gain attention of small companies with cheaper, non-web mini-ERPs. Important information regarding smaller vendors along with their products (e.g., non-web mini-ERP) is provided in Table 1.

Web-Based ERP Solution Providers

Oracle, PeopleSoft and SAP are the most popular Web-based ERP solution providers. Oracle Corporation (www.oracle.com) is the world's second largest independent software company. With annual revenues in the billions, the company offers its database products, tools and applications, along with related consulting, education, and support services. PeopleSoft (www.peoplesoft.com) started in the mid-1980s with the human resources application. Today, PeopleSoft operates in more than 140 countries and offers a variety of software solutions such as Human Resource Management (HRM), Customer Relationship Management (CRM), and Supply Chain Management (SCM). SAP (www.sap.com) employs nearly 30 thousand people in more than 50 countries and offers more than 20 industry solutions. SAP is one of the world's largest independent software suppliers overall.

ERP vendors have recognized that the incremental shift from client-server to web-based architecture brings organizations the opportunity to enhance interactions with their customers, suppliers, and employees. Therefore, ERP vendors are increasingly looking to the Internet to increase profitability by making customer and vendor transactions faster and better.

The most lucrative aspect of the hosted ERP solution for small companies is the value a leased ERP package brings to the company. For example, leasing is cheaper than purchasing or building an ERP system (Harney, 2000). The implementation is faster and easier. In addition, software upgrade is done automatically and there is no need to hire and train extra staff for ongoing maintenance and technical support associated with in-house ERP solution. On the

other hand, outsourcing ERP helps smaller companies conserve cash flow by paying off investments over longer periods.

Table 1 - ERP Providers (Non-Web Based)

Vendor	Important Information	ERP Modules/Functionality
Compiere, USA Product: Compiere ERP & CRM http://www.compiere.org/	Compiere is a 100% pure Java solution based on Oracle database technology. However, some application functionality is implemented as PL/SQL.	Quote to Cash, Requisition to Pay, Customer Management, Partner Management, Supply Chain, Performance Analysis
ERPlite, Canada Product: ERPLite http://www.erplite.com/	The system is Microsoft Operating System compatible and is capable of exchanging data with Access, Excel, ODBC, XML, text files, Quickbooks, Peachtree, Agile, Quickbase and most other databases	Inventory Control, Bills of Materials, Purchasing, Receiving, Sales Order, Shipping Order, MRP, Production Scheduling, Master Production Schedule, Routing, and Serial/Lot Number Tracking
Intuitive Manufacturing Systems, USA Product: Intuitive ERP http://www.intuitivemfg.com/	Intuitive ERP uses only Microsoft technologies and platforms such as, Microsoft Visual Basic for Applications, Microsoft Access as the user interface for forms and reports and Microsoft SQL Server as the database	Plan, Buy, Make, Sell, Inventory, General Ledger and Customer.
Ganak Infonet, India Product: Invento http://www.inventoerp.com	The system uses Visual Foxpro 6.0. It also offers the flexibility of upgrading to higher end platforms like Client-Server technology with RDBMS back end.	Sales, Purchase, Inventory, Production and Finance
Resonance Technologies, India Product: Resonance Mini-ERP, Clinic Monitor Source: (Business Line-India, 1999)	Resonance Mini-ERP uses Microsoft Visual Basic for front-end user interface and Access, Oracle or SQL Server as the backend database.	Distribution Systems, Production Scheduling and Financials

The unique characteristic of an application service provider (ASP) is that it permits hosting of almost any software. This enables ERP vendors to offer ASP-based solutions and provide essential modules. All three big ERP vendors' strategy is to offer their vertical markets with standard hosted solutions and target high tech manufacturers, startup companies, and companies with rapid growth. Hosting ERP is appealing since it provides scalability and easy integration along with evolving IT infrastructure and a smaller investment. For example, Oracle focuses on small-to-medium companies with revenues from $50 million and up. It specializes in high-tech industry and e-companies but also offers ERP solutions to service organizations like education. Oracle offers its fee-based service for the Oracle Release 11 application suite and all ASP components (except network cost) since Oracle data centers

provide ASP facilities and its partner Qwest Communications provides network support. Oracles Business Online hosting service uses Oracle's FastForward program, which typically deploys in one to six months and permits no source code customization.

PeopleSoft takes its strictly leased solutions for the core ERP modules (human resources, financial, manufacturing and distribution) to companies with annual revenue less than $250 million. PeopleSoft's ASP partners, Corio and USI provide all implementation, integration, service and support. Corio claims "end-to-end" support while USI offers service level agreements (SLAs) guaranteeing 99.9% network and application availability (Harney, 2000).

Like Oracle and PeopleSoft, SAP also offers hosted ERP solutions to those vertical customers who are at the high end of the small-to-medium market zone; e.g., manufacturing (high and low tech), automotive supply, and retail and utility companies. SAP's ASP partners such as, Interpath, EDS, Applicast, Qwest and eOnline are responsible for specific Accelerated SAP (ASAP) modules and ASP components. This ASP-based ERP product, ASAP, offers manufacturing, financial, sales, distribution, enterprise and human resources modules among others.

ERP IMPLEMENTATION CHALLENGES

Small businesses face many ERP implementation challenges. When it comes to implementation, companies of all sizes share common goals: a quick and smooth implementation that does not disrupt business processes with post implementation system glitches (Fichman & Moses, 1999). Smaller companies having limitations in terms of money, experience, skilled manpower and understanding of ERP face implementation challenges that often are far more serious than those faced by large companies. Because large companies are better prepared with cash, skilled implementation teams and partnerships with one or more third party consulting firms, they are better equipped to meet the challenges. Many research studies have contributed to the exploration of ERP implementation challenges (c.f., Taylor, 1999; Markus, Tanis & Fenema, 2000; Jeffery & Morrison, 2000; Siriginidi, 2000; Jiang, Klein & Chen, 2001; Romeo, 2001). In this section, the potential challenges are summarized and possible courses of actions are suggested.

- Minimizing implementation time and cost: ERP projects have a reputation for consuming large amount of time and money and the challenge is how to minimize both implementation time and cost which are difficult to come by for a small company. Therefore, in order to minimize implementation time and cost, it may be necessary for key team members in smaller companies to attend training programs arranged by the vendor or its partner on implementation framework or on implementation model that includes steps such as scope, data conversion, business process mapping and parallel testing of the old and the new system. Involvement in pre-implementation training programs is a way to resolve process and data mapping conflicts thereby streamlining the implementation process. Rapid implementation tools [e.g., Computer Aided Software Engineering (CASE) tools] and templates for fast and easy configuration should be used whenever possible.
- Incremental implementation vs. all-at-once implementation: Project managers, researchers, programmers and software methodologists all have advocated incremental approaches to project management, development of software or implementation of complex software packages (Fichman & Moses, 1999). Because along with other benefits, it requires less implementation time than the traditional all-at-once implementation approach. However, in those situations where the software is not modular or cannot be divided into smaller integrated components or the internal business

process doesn't allow incremental implementation, an all-at-once implementation may be the only option.

- Selection of the right implementation partner: Time and IT resources are often in short supply in small companies. Therefore, in many cases, small companies have no choice but to assign implementation responsibilities to the software vendor or a third party implementation partner. However, the challenge is selecting the right implementation partner. Implementation partner's level of experience with the Client-Server architecture (LAN, server, operating system etc.), database, RDBMS, selected ERP system and implementation process need to be assessed during the selection process. Romeo (2001) states the risk of picking someone who sounds great during the sales pitch but has a tough time to perform later on. Above all, having smooth communications and a good understanding between the company and the implementation partner is a must.
- Resources allocation: Due to the small size of IT departments in small companies, allocation of resources for ERP implementation is a big challenge. Unless both the implementation process and the post implementation maintenance contract are given exclusively to the vendor and/or the implementation partner, a sufficient number of employees (IT staff and end users) should participate in the implementation process for the successful implementation of the ERP system and also to carry on post implementation maintenance operations.
- Resistance to change: A pressing issue for companies undertaking ERP implementation is to convert the psychology of employees from resenting to welcoming the change. It is not uncommon to see smaller companies relying on a manual or a very inefficient legacy system to run daily operations. Therefore, going from a manual or an obsolete system to a sophisticated ERP system is a significant change for many employees and it is quite normal that they feel threatened because a new enterprise system changes almost everything familiar; e.g., the way the data entry screens and reports look, how to enter and access data, and the complex manner in which day-to-day business is performed on the new system (Taylor, 1999). Management can take proactive measures such as educating employees about the new system and providing pre-implementation training programs so that they understand the usefulness and the necessity of the new system towards increasing productivity and enhancing the competitiveness of the company.
- Meeting expectations regarding ERP implementation time frame and system glitches: An ERP system is complex and contains lots of checks-and-balances which are put in place to maintain data visibility, integrity and accuracy across the system. Some functions may require extra steps, however unlike old legacy systems, data duplication is avoided and data, once entered into the system, can be viewed by all users of the system. Management and users alike should understand that during and after implementation, system glitches may occur and the new system may make some employees unhappy. However, all efforts must be made to eliminate major system glitches and to motivate people to exhibit patience and determination when glitches occur. As emphasized by Taylor (1999) and Jiang et al. (2001), cooperation and open, honest communications among all parties (vendor, managers, project leaders, users, implementation partner) are the keys to educating users in this matter.
- Applying business process profiling and mapping: The complexity in ERP systems requires a thorough understanding of the business process flows such as generating a customer order, assigning raw material to the shop floor, transferring material from one warehouse to another, and then mapping the processes to configure ERP functions. Companies who fail to map business processes to the ERP functions properly may end up with an inefficient system (Eshelman et al., 2001; Doyle, 2000a). One way to face the challenge is to educate and train employees so that they understand the core ERP concepts; e.g., how various functions in different modules such as manufacturing, financial and marketing work in harmony to make data visible for all users.

- Data Migration: Data profiling and mapping requires examination and understanding of legacy data sources and then creating specifications (mapping) for migration of data from source to target. The challenge is to extract, scrub, transform and transport data while maintaining data integrity. In many small companies, business processes are performed manually or data comes from a homegrown proprietary system and then needs to be extracted, cleansed, and converted. This requires ample time and patience.
- Avoiding rushing in ERP implementation: Too often, small companies restricted by limited resources and driven by a strong desire to minimize disruptions to the business, set an arbitrary completion ("go live") date and do not allow time for adequate testing. Rushing for the finish line, in the case of ERP implementation, is never a good idea, because going back and trying to repair or apply patches to fix implementation problems is a difficult, time-consuming and costly task.
- Avoiding temptations to add functionalities to the core ERP package: To add or not to add functionalities to the original code is an issue which arises normally during the implementation process. Most vendors do not allow clients to modify source code of the ERP system just because it is difficult for the vendor to upgrade the client's system to the new version and provide maintenance once the system has been modified. Most vendors, however, allow clients to develop peripheral applications, add new databases and functionalities to the menu structure if all the additional codes are kept in directories that are separated from the original source code directories.
- Arrangement of adequate training programs: The importance of training cannot be overstated (Stedman, 1999a; Eshelman et al., 2001; Romeo, 2001). The challenge for implementers are two folds; first, training end users so that they know how to use the system to carry out daily operations, and second, training IT professionals so that they know how to maintain, identify and solve system glitches.
- Developing a comprehensive strategy for testing: A basic requirement for the successful implementation of any software package is that it passes the acceptability test by its end users. For an ERP system to be acceptable it requires rigorous and thorough testing. A single transaction might be responsible for creating or updating multiple records in different tables. Therefore, the company needs to develop a comprehensive test management strategy that can be used to guide the test and verification of all system functions. For small companies with limited human and financial resources, it may be advantageous to have implementation partners conduct an initial phase of testing and then have the end users test the system before the "go-live" date.

RECOMMENDATIONS

After exploring the benefits of ERP, learning small companies' ERP experiences, surveying offerings of ERP solutions for small businesses, and examining ERP implementation challenges, the authors identify the critical criteria that influence the outcome of an ERP implementation in a small enterprise setting, and further recommend two checklists to assist the company in examining its ERP readiness and selecting its ERP system solution.

ERP Readiness Factors and Suggested Checklist

There are two options open to a business, developing ERP from scratch or purchasing a turnkey solution. When it comes to the selection and implementation of an ERP system, the ideal candidate would be economical and user friendly, require less implementation time and minimal business process reengineering, and provide a measurable benefit in terms of return-on-investment (ROI). Small companies constitute a relatively new but promising market segment in the ERP arena (Doyle, 2000a; Doyle, 2000b).

In addition to possessing a smaller ERP budget, other criteria unique to small companies are small IT staff and a preference for cheaper servers and a familiar operating system instead of more costly and complex systems (Nairn, 2000). Given the complex nature of an ERP system and its costly implementation prospect, it is essential for a company to find out its financial, technological and human resources strengths before embarking on an ERP system implementation.

Considering the limitations of resources and lack of necessary IT knowledge regarding ERP, the issue of ERP readiness applies differently for smaller companies than for the larger corporations. As discussed before, large corporations are better prepared to absorb unexpected financial requirements during the implementation process than their smaller counterparts. In a large corporation, since the Chief Information Officer (CIO) makes IT related decisions, his or her total commitment in the ERP selection and implementation process is necessary. In smaller companies, on the other hand, the commitment has to come from the chief executive officer (CEO). It is expected that smaller companies would migrate from a manual or from a legacy system to an ERP system. If the migration is from a legacy system, then the company should identify whether the legacy system can be replaced entirely by an ERP system. This is because the cost to keep both systems up and running could be prohibitively high for small companies. As one of the major challenges, the resistance to change among employees is also expected to be high when the move is from a manual or from a legacy system to an automated system. In order to be ready for an ERP system, the employees must be ready to embrace the change.

On the technology side, since most ERP systems are based on the client/server (C/S) platform, smaller companies have to be ready to enter into the world of 2-tier or 3-tier C/S architecture and at the same time recruit skilled professionals to work as a Database Administrator (DBA), Network Administrator, Software Developer and/or System Administrator. In addition, a thorough understanding of data profiling and mapping is required for the successful movement and transformation of data from source to target. Small companies with manual systems may require training in data profiling and mapping. Users of legacy systems need to know how to clean data since a legacy database may have many irregularities (Romeo, 2001). Employees with the knowledge of business process and work flow are needed since a thorough knowledge of the various business processes is imperative for proper parameter (global and local) setting during implementation process, which thereby ensures the efficient use of the system. A company lacking the knowledge of how parameters in an ERP system work should work closely with the system provider to set the value of important parameters correctly. In Table 2 we provide a checklist to identify the readiness of a small company for a new ERP system. In general, the higher the number of checked items on the list, the better prepared the company is to procure and implement an ERP system.

ERP Selection Factors and Suggested Checklist

An important step in selecting a proper ERP system is to identify business needs and set proper expectations by mapping software selection to business process. In the selection process, a number of important factors need to be considered and identified properly with respect to the current and future priorities. A typical selection process involves the evaluation of vendors' products at the initial stage. Siriginidi (2000) suggests financial stability, size of the company, stability of the product and the implementation support as the criteria to be used

Table 2 - ERP Readiness Checklist

Factors	Readiness Checklist
ERP budget	• Adequate IT budget is available. • Financial strength (liquidity) to absorb unexpected financial shocks: The company is financially strong.
Top management commitment	• The CEO is committed. • The CIO is committed. • The CEO/CIO is ready to release appropriate resources in a timely manner.
Resources	• Number of legacy systems. (The less the better) • ERP will replace all legacy system(s) [Cost to keep both systems up and running could be prohibitively high for small companies]. • The company is familiar with the (C/S) architecture. • Resources are available to fill Database Administrator (DBA), Network Administrator, Software Developer and/or System Administrator positions.

Assess the intensity of resistance	• Move is from a manual system to an ERP system (Expect high Resistance).
	• Move is from a legacy system to an ERP system (Expect moderate to high Resistance).
	• End users willingness to embrace change:
	  • Low
	  • Moderate
	  • High

Understanding	• Level of understanding of data profiling and mapping is adequate. • At least one employee has received training on data profiling and mapping in the past. • At least one employee is knowledgeable in data cleaning procedures (legacy databases may have many irregularities). • Organized data repository is available.
Knowledge of global and local parameter setting	• One or more implementation members understand the organizational structure. • One or more implementation members understand the business practices and work flows. • One or more implementation members are familiar with the ERP parameter (global and local) concept.

to select the initial pool of vendors. The incorporation of implementation time and cost in vendor selection is essential since smaller companies cannot afford to get engaged in a lengthy implementation process, the cost of which may be more than five times the cost of the software itself (Scheer & Habermann, 2000). A lengthy and costly implementation process is one of the major reasons behind ERP dissatisfaction (Kumar & Van Hillegersberg, 2000). The direct correlation between ERP and the cost is that the more complex the ERP system is,

the higher the cost to procure and implement the system. Like any other selection process, vendors should provide references of a number of satisfied clients who have recently implemented their ERP systems.

The reality is that a selected ERP system is going to stay with the company for sometime and for that reason the management must make sure that the system is robust, flexible and has the potential to support the organizational objectives and future growth. Small companies may not need all of the modules available in an ERP system. Component-based products are available so that a company can decide which modules and how much it can handle at one time. As Taylor (1999) suggested, vertical industry focused products are best suited for companies with small IT departments. Many smaller companies are prepared to purchase one of the numerous ERP systems available in the market only if it could be tailored to their more modest needs (Nairn, 2000). In case a modular product is not available, the application software must be able to support a high percentage of current processing needs so that the requirement for customization and therefore maintenance is minimized.

On the technology side, an ERP vendor should provide specifications such as bandwidth, CPU, memory, storage space for workstations and servers as well as the operating system platform most suitable for the respective ERP system. Some databases do not work smoothly with certain applications and a tech audit may be necessary to identify if the existing database platform will run efficiently with the chosen ERP software (Romeo, 2001). An ERP system that comes with a pre-defined "reference model" to reflect the new customers functional style and business practice may be preferable to others that do not come with reference models. Custom modification of the system source code may be an option to reduce the gap between the system capability and the business practice. However, the source code may not be provided to the customer. On one hand, custom modification allows the customer to enhance the capability of the system, but on the other hand, too much modification leads to a complex system difficult to support and virtually impossible to upgrade to the newest version of the software.

Smaller companies, due to lack of adequate IT personnel, may have to rely on consultants for the implementation of an ERP system as well as user training. Therefore, the availability of consultants and partners who have proven implementation records and who have successfully integrated the ERP system into several enterprises should also be considered while selecting an ERP system. Likewise, a company must inquire about the quality of the training programs offered by the vendor or its partner(s). Many software application packages failed to meet expected ROI because employees failed to acquire full benefit of the system due to lack of proper training.

Table 3 provides a checklist for identification and selection of an ERP system. It is suggested that the higher the number of checked items on the list, the better the software is for the company.

CONCLUSION

Today's competitive environment requires access to real-time information, a business must have an ability to compete and thrive in this information age. As opposed to tedious manual systems, direct access to information such as material cost, labor cost, overhead cost as well as real-time information in related to sales order provided by an ERP or a comparable software system can help the management of a small business to determine the profitability quite accurately and efficiently. The obvious question is, what are small companies that lack the sophistication of an ERP system to do in that situation? Clearly, the need is to have an

enterprise business application that meets the processing need, size, budget, resources and objectives of the business. After the need is assessed, the guideline for determining ERP readiness for small companies and the guideline for the ERP selection process applicable for small companies presented in this article can be used to help small businesses justify and conclude their decisions of ERP acquisition.

Table 3 - ERP Selection Checklist

Factors	Selection Checklist
Vendor record	• Vendor is financially stable and the size of the company is reasonable. • The ratio of number of satisfied clients to the total number of implementations is high. • References of satisfied clients are available. • Level of implementation support from the vendor or from third parties is expected to be high. • The product is stable.
Cost: Software and implementation	• Software cost is affordable. • Implementation cost is manageable. • The ratio of the software cost to the implementation cost is reasonable (the industry norm about 1 to 5).
Organizational objective and growth potential	• Capability of the system aligns with the overall organizational goal. • Capability of the system aligns with the company growth potential. • ERP is flexible enough to incorporate future changes (ready to accept change).
Required modules to support internal business processing needs	• Necessary functions required to run daily business are available in the system. • The system is granular, component based. • The product is vertically focused? (Vertical industry focused products are best suited for companies with small IT departments). o The software is scalable.
Percentage of current processing need meet by a particular application software	• The application software is able to support a high percentage of current processing need. • The requirement for customization is minimum. • The system maintenance cost is manageable.
Computer and network infrastructure.	• Adequate network infrastructure is available and bandwidth to access the application in a timely manner is supported. • CPU, memory, storage space of PCs (workstations), server(s) and other hardware requirements are affordable.
Database and operating platforms	• Database platform, operating system and the chosen ERP software are compatible. • Data retrieval and control are efficient.
Implementation time	• Expected implementation time is reasonable. • Expected system downtime, if any, is very short.

Factors	Selection Checklist
Consultants and implementation partners	• Consultants or implementation partners who know the system are available. • Consultants have proven implementation records. • Consultants have successfully integrated the ERP system into several enterprises.
Training programs	• Effective training programs are available through the vendor or by its authorized implementation partner, or by independent consultants. • Training programs are designed to garner full benefit of the system.
GAP analysis and availability of "reference model"	• A method to do a GAP analysis to compare the ERP systems capabilities against the customer's business requirements is available through the vendor. • The ERP system comes with a pre-defined "reference model" to reflect the customers' functional style and business practice.
Availability of source code	• Source code is available to implement custom modifications of the core system. • Source code is available but custom modifications of the core system are not allowed.

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