Success and failure factors of adopting SAP in ERP system implementation

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Abstract:

Purpose
– Enterprise resource planning (ERP) systems are software packages that allow companies to have more real time visibility and control over their operations. This paper aims to investigate and analyze common circumstances that occur within most ERP projects, and determines the areas that are key to success versus those that contribute to failure.

Design/methodology/approach
– The study is based on a content analysis of published articles reporting SAP implementations in 44 companies.

Findings
– Identifies six common factors that are indicative of successful or non-successful SAP implementations. It has been found that the lack of appropriate culture and organizational (internal) readiness as the most important factor contributing to failure of SAP implementations in 15 companies. The presence of project management approaches and appropriate culture and organizational (internal) readiness are the most important factors contributing to the success of SAP implementations in 29 organizations.

Research limitations/implications
– The data analyzed is from secondary sources published in the press. Secondary reporting could increase objectivity; however, the weakness is that not all the factors might have been reported.

Originality/value
– Identifies factors critical to the success of SAP implementation

Keywords: Manufacturing resource planning | Critical success factors

Article:

Introduction

Enterprise-wide resource planning (ERP) system software packages are highly integrated, complex systems for businesses, and thousands of businesses are running them successfully worldwide (Koch, 1996). Even companies such as Hershey, JoAnn stores, Whirlpool and Samsonite that have suffered through classic disasters, acknowledge the software packages are able to handle the job. The systems are capable of functioning as advertised; however, companies run into costly and sometimes fatal difficulties with the implementation and subsequent maintenance of these packages.

According to The Gartner Group, 70 percent of all ERP projects fail to be fully implemented, even after three years (Gillooly, 1998). Typically, there is no single culprit responsible for a "failed implementation", and no individual reason to be credited for a successful one. Even the definitions of failure and success are gray areas, lending to interpretation. There are generally two levels of failure: complete failures and partial failures. In a complete failure, the project either was scuttled before implementation or failed so miserably that the company suffered significant long-term financial damage. Those implementations considered partial failures often resulted in tenuous adjustment processes for the company; creating some form of disruption in daily operations. In the same vein, an ERP success can be a complete success – one in which everything goes off without a hitch, or one in which there are few alignment problems, resulting in minor inconvenience or downtime. Frequently, these situational circumstances that have to be ironed out in the weeks and months after the "go-live" date are not severe enough to disrupt the daily operations.

There are dozens of vendors of ERP systems. However, the top five ERP system vendors are SAP, Peoplesoft, Oracle, J.D. Edwards, and Baan. SAP has been recognized as the leader with more than 50 percent of the market (Burns, 1999; Mabert *et al.*, 2000;Stratman and Roth, 2002; Vaughan, 1996). Hence, the current study has focused on SAP implementations as a leading example of ERP system implementation.

One of SAP's major strengths includes the extensive capability of the software's functionality. Perhaps two of its shortcomings are the complexity of the system and the resulting implementation. It is widely used in industries such as chemicals and pharmaceuticals (process industries), and also in oil and gas industries. By making a huge and ongoing investment in research and development, SAP continues to strive for increased dominance of the ERP market. Accordingly, developments are underway to gain strength in many other sectors of the economy. There are over 20,000 customers running the SAP software systems today; this equates to 20,000 "successful" implementations. Some of these were originally failures, requiring iterative attempts at making the software work as designed.

In order to determine factors that will indicate early on whether a project will be successful, or doomed to potential failure, 44 companies that implemented SAP were reviewed. These companies vary in size, industry and scope of implementation. The research methodology employed for the analyses was that of content analysis, which examines the content within published articles, and processes the information contained within them through qualitative processes. The companies analyzed implemented SAP between 1995 and 2000.

The next section provides a review of the literature on the implementation of ERP systems. The third section of paper describes the research methodology adopted for this paper. The fourth section elaborates on the findings and describes the factors that play a role in success or failure of SAP implementation. The last section draws some conclusions.

Enterprise resource planning systems

An effective business strategy centers on an aggressive, efficient use of information technology; for this reason the ERP systems have emerged as the core of successful information management, and the enterprise backbone of the organization (Nash, 2000a, b). A successful ERP system will streamline processes within a company and improve its overall effectiveness, while providing a means to externally enhance competitive performance, increase responsiveness to customers, and support strategic initiatives (Sandoe *et al.*, 2001). The benefits of ERP systems, once the pains of implementation are over, appeal to companies.

There are many factors to be considered in making the decision of whether to implement an SAP system or not. The technical aspect is not the only factor that needs to be considered; unfortunately many companies have not seen this until it was too late. The financial commitment is substantial; therefore, chief executive officers and senior executive teams must be deeply involved. Simply put, ERP is not intended for every business. When considering the decision to invest in an ERP system, a business case must be developed to provide an understanding of ERP, and to formally assess the benefits that the company – as an individual entity apart from its competitors – can expect to achieve. The analysis must consider not only the obvious cost/benefit analysis, but also the non-financial factors. Non-financial benefits include information visibility and flexibility (Sandoe *et al.*, 2001). A more complete listing of tangible and intangible benefits is provided in Table I. ERP implementation costs are incurred in three areas: software, hardware, and personnel. The personnel (or the human resources) cost is by far the largest and most expensive, but at the same time has been the area given the least amount of consideration. The software and hardware costs are often easily quantifiable; however, the "human" cost is not (Davenport, 2000).

There have been a few papers recently published on the factors contributing to ERP implementation. Dong (2001) proposed a conceptual model exploring the impact of top management on enterprise systems (ES) implementation. Aladwani (2001) described an integrated, process-oriented approach for facing the complex social problem of workers' resistance to ERP systems. Huang and Palvia (2001) proposed ten factors (at the national/environmental and organizational level) concerning ERP implementation by making a comparison of advanced and developing countries. The national/environmental factors identified by them are economy and economic growth, infrastructure, regional environment, government

regulations, and manufacturing strengths. They also noted that information technology maturity, computer culture, business size, business process re-engineering experience, and management commitment are the organizational level factors. Huang and Palvia (2001) did not categorize the factors into those that contribute to success and those that contribute to failure.

Nah *et al.* (2001), based on a study of earlier papers (most of which were normative/prescriptive in nature), identified 11 factors that were critical to ERP implementation success. The 11 factors noted by them are

1. ERP teamwork and composition;
2. change management program and culture;
3. top management support;
4. business plan and vision;
5. business process re-engineering and minimum customization;
6. effective communication;
7. project management;
8. software development, testing, and trouble shooting;
9. monitoring and evaluation of performance;
10. project champion; and
11. appropriate business and information technology legacy systems.

Tangible benefits	Intangible benefits
Inventory reduction	Information visibility
Personnel reduction	New/improved processes
Productivity improvements	Customer responsiveness
Order management improvements	Cost reductions
Financial cycle improvements	Integration
Information technology cost reduction	Standardization
Procurement cost reduction	Flexibility
Cash management improvement	Globalization
Revenue/profit increase	Supply/demand chain
Transportation/logistics cost reduction	Business performance
Maintenance reductions	Dismantling inefficient legacy systems
On-time delivery improvements	

Table I.
Tangible and intangible benefits of ERP systems

None of the above papers were based on any primary empirical data (in the form of survey or case research) or secondary data (content analysis of reported cases or survey studies). Themistocleous *et al.* (2001), based on a survey of 50 respondents, underscored the need for integration of existing systems with ERP applications in ERP implementation. Stratman and Roth (2002)through a questionnaire survey of 79 North American manufacturing users of ERP systems identified eight generic constructs (strategic information technology planning, executive commitment, project management, information technology skills, business process skills, ERP training, learning, and change readiness) that are hypothesized to be associated with successful ERP adoption. However, the works of Nah *et al.* (2001), Themistocleous *et al.* (2001) and Stratman and Roth (2002) do not focus on factors of failure.

Umble and Umble (2001) expressed their views on 14 success factors (definition of business goals, establishment an executive management planning committee, thinking of implementation as research and development, use of cross-functional teams, stocking implementation teams with the best and smartest workers, alignment of everyone's interest by giving mid-level management

hands-on responsibility, constant communication with teams and end users, excellent project management, choice of partners, extensive education and training, management with data, measurement of the right things, establishment of aggressive achievable schedules, and no fear for change) and nine failure factors (top management failure, poor project management, lack of education and training, people do not want new system to succeed, unrealistic expectations about implementation, inaccurate data, attempt to automate existing redundant or non-value-added processes, mismatch between the business and ERP system selected, and technical difficulties can lead to implementation) in ERP implementation. It appears that the work of Umble and Umble (2001), though normative/prescriptive for failure and success of ERP implementations, is not based on a systematic analysis of ERP implementations in different organizations.

In summary, the review of the literature shows that there is not much of research done on identifying the factors of SAP implementation success and failure based on the content analysis of published articles and books. That is the main thrust of the current work.

Research methodology

The primary purpose of this research is to find out the factors that contribute to success and failure in adopting SAP. Content analysis has been be used to infer from published articles the factors that lead to success or failure for an ERP project, specifically SAP implementations. Content analysis is "fundamentally empirical in its orientation, exploratory, and predictive in its intent" (Krippendorf, 1980). This research technique is often used to determine the bias between two sides of an issue (for instance, labor unions versus manufacturers), to determine quantitatively whether readers can and are being influenced by the manner in which an article is written, or even where it is placed in a publication. The facts of a successful or unsuccessful implementation are fairly straightforward – the project succeeded or it did not as measured by financial standards, or by operational standards. Content analysis was used on this level as a tool to analyze the material and make recommendations that will provide knowledge, new insights, and a practical guide to future actions (Krippendorf, 1980). This content analysis is not to sway the reader into forming an opinion of the outcome, only to indicate specific factors that relate to the outcome.

The data generating and data reduction methodology involved analyzing textbooks, journals and magazine articles for information related to companies that have implemented SAP software. Companies that implemented SAP between 1995 and 2000 period were analyzed. Articles were chosen through a library database, using search keywords of SAP, ERP, SAP success, SAP failure, and implementation. Companies were removed if the supporting articles only detailed what happened after implementation or gave no details surrounding the success or failure. Data inference centered on mapping and analyzing the factors stated within published articles. The analysis phase involved determining the frequency of particular factors from within the entire population. The structure of the research allowed for a company to cite more than one factor relating to success or to failure. In all, more than a 100 articles and books were searched. A sample of those includes Atkinson (1999), Business Wire (2001), Campbell (1999), Jesitus (1997), Levin (1998), O'Brien (1999), Osterland (2000) and Wheatley (2000).

The content analysis showed that SAP implementation successes accounted for two-thirds (29 in absolute number) of the companies studied, and failures accounted for the remaining one-third (15 firms). Failed implementations are often more difficult to research, as companies tend to keep problems hidden from public view as much as possible to avoid embarrassment and/or potentially serious financial repercussions. The factors were categorized into six logical groupings.

Factors and findings from content analysis

Before beginning an ERP implementation, that is even before a vendor is chosen, much planning and thought must go into the process. By utilizing the methodology of content analysis, it was possible to identify terms that occurred within the research, and quantify their frequency. The companies evaluated within this research were mapped against the criteria, and inferences are drawn based upon the information.

All the factors were lumped into six logical groupings. These factors either led to the success of an implementation project, or to its failure. As all factors listed within an article were evaluated, one would expect companies to often identify more than one factor as being primary to success/failure. The companies and relative data are listed in Tables II and III.

As one would expect, more than one factor was listed as contributing to the outcome of a project. The 44 companies listed a total of 81 occurrences of these factors. For the 29 firms where SAP was "successfully" implemented, the six factors were listed 60 times and the in the 15 firms where SAP implementation was "unsuccessful" the six factors were listed 21 times. Table IV shows a listing of each factor, and its relative percentage of frequency. The following paragraphs elaborate on the six factor groups.

Table II.
Factors contributing to success of SAP implementation

				Factors						
				A	B	C	D	E	F	
Company	Industry	Number of employees	Revenue (sales) ($)	Adequate testing	Dealt with organizational diversity	Project team, management support, and consultants	Internal readiness, and training	Planning, development, and budgeting	Worked with SAP functionality, and maintained scope	T# factors
Accugraph	Software manufacturer	Not available	22 m						X	1
Amoco	Oil industry	Not available	33 bn		X	X	X		X	4
Bioproducts	Animal foods and biological products		100 m		X				X	2
Chevron	Petroleum/chemical company	53,621	43 bn		X	X	X		X	4
Colgate-Palmolive	Consumer products manufacturer	38,300	9 bn					X	X	2
Dow Chemical	Chemical manufacturer	50,000	26 bn				X			1
Earthgrains	Bakery products	Not available	300 m			X	X	X		3
Eastman Kodak	Photography, digital imaging products manufacturer	78,400	14 bn	X					X	2
Farmland Industries	Cooperative – farmer owned	Not available	10 bn	X	X	X				3
Fujitsu Microelectronics	Semiconductors	Not available	978 m			X	X			2
Gillette	Personal care products	35,200	4 bn	X			X			2
GTE	Telecommunications	Not available	Not available			X				1
Home Depot	Home improvement	Not available	45 bn			X		X		2
Keebler	Cookie and cracker manufacturer	Not available	Not available			X	X		X	3
Lockheed Martin	Aeronautics group (capital goods)	126,000	25 bn		X	X		X	X	4
Lubrizol	Chemicals manufacturer	4,390	1.8 bn				X			1
McKesson	Health care management	Not available	42 bn			X			X	2
Mead Corp	Pulp and paper products manufacturer	Not available	2.5 bn				X	X		2
Merisel	Computer products distributor	570	2 bn				X		X	2
Morrison Knudsen Corp	Engineering/construction	Not available	1.6 bn			X	X		X	3
Owens Corning	Building material/composite systems manufacturer	20,000	63 m			X			X	2
RayoVac	Battery manufacturer	3,110	703 m						X	1
Reebok	Footwear, apparel manufacturer	6,000	2.9 bn			X				1
Solutia	Chemical manufacturer	10,200	3 bn		X		X			2
Bay Technology	Networking equipment	Not available	Not available		X				X	2
ElfAtochem North America	Chemical manufacturer	Not available	11 bn		X					1
Boston Beer	Brewery	355	191 m			X				1
Thermacore	Thermal management systems	Not available	Not available		X				X	2
Compaq	Computer manufacturer	70,100	42 bn					X	X	2
Count				3	9	14	12	6	16	60
Percentage of total factors				5.00	15.00	23.33	20.00	10.00	26.67	100

Allied Waste Industries	Solid waste services	28,000	5.7 bn				X	X		2
EI Dupont	Petrochemicals (manufacturing)	71,735	29 bn		X					1
FoxMeyer	Pharmaceuticals (distribution)	Not available	5 bn			X				1
Nash Finch	Food wholesaler (services)	7,304	297 m					X		1
Sobey's	Canadian grocery chain	Not available	89.1 m						X	1
Unisource	Utilities (services)	1,203	7 bn		X		X	X		3
Waste Management, Inc.	Solid waste services	Not available	12 bn					X		1
JoAnn Stores	Fabric retailer	Not available	Not available				X			1
PetSmart	Pet supply retailer	9,779	2 bn				X			1
Samsonite	Luggage manufacturer	7,150	784 m				X			1
Snap-On Tools	Tool manufacturer	14,000	Not available				X	X		2
Whirlpool	Home appliance manufacturer	61,000	10 bn	X						1
Bristol-Myers Squibb	Pharmaceutical and healthcare products manufacturer	44,000	18.2 bn	X						1
Hershey	Chocolate/candy manufacturer	14,300	4 bn	X			X			2
Ikon	Office technology	39,600	4 bn				X	X		2
Count				3	2	1	8	6	1	21
Percentage of total factors				14.29	9.52	4.76	38.10	28.57	4.76	100.00

Table III.
Factors contributing to failure of SAP implementation

				Factors						
				A	B	C	D	E	F	
Company	Industry	Number of employees	Revenue (sales) ($)	Adequate testing	Dealt with organizational diversity	Project team, management support, and consultants	Internal readiness, and training	Planning, development, and budgeting	Worked with SAP functionality and maintained scope	Number of factors
Allied Waste Industries	Solid waste services	28,000	5.7 bn				X	X		2
EI Dupont	Petrochemicals (manufacturing)	71,735	29 bn		X					1
FoxMeyer	Pharmaceuticals (distribution)	Not available	5 bn			X				1
Nash Finch	Food wholesaler (services)	7,304	297 m					X		1
Sobey's	Canadian grocery chain	Not available	89.1 m						X	1
Unisource	Utilities (services)	1,203	7 bn		X		X	X		3
Waste Management, Inc.	Solid waste services	Not available	12 bn					X		1
JoAnn Stores	Fabric retailer	Not available	Not available				X			1
PetSmart	Pet supply retailer	9,779	2 bn				X			1
Samsonite	Luggage manufacturer	7,150	784 m				X			1
Snap-On Tools	Tool manufacturer	14,000	Not available				X	X		2
Whirlpool	Home appliance manufacturer	61,000	10 bn	X						1
Bristol-Myers Squibb	Pharmaceutical and healthcare products manufacturer	44,000	18.2 bn	X						1
Hershey	Chocolate/candy manufacturer	14,300	4 bn	X			X			2
Ikon	Office technology	39,600	4 bn				X	X		2
Count				3	2	1	8	6	1	21
Percentage of total factors				14.29	9.52	4.76	38.10	28.57	4.76	100.00

Factor 1: worked with SAP functionality/maintained scope

A crucial part of working with the SAP functionality is the ability to streamline operations. When implementing a system, many organizations fail to specify their organizational objectives. Job skills are raised by the requirements of the new, post-implementation company. Idiosyncratic

ways of doing business, which were manageable, although most likely inefficient, under the "old system", are no longer tolerated. Companies that do not understand these issues early on will face serious problems (Davenport, 2000). Successful companies have recognized the importance of "cleaning up" their operations, which will allow them to implement "vanilla" SAP – with minimal customization.

Even though the so-called "vanilla" approach is adopted by two-thirds of implementing companies, some customization will always be required in order to meet individual needs (Themistocleous *et al.*, 2001). The key, it appears, is to know just how much to customize. Colgate-Palmolive, a $9 billion consumer products manufacturer, implemented SAP in 41 countries in 1998. Installing an integrated computer system at this level of magnitude would be a daunting project for anyone. A direct quote from Ed Toben, CIO of Colgate-Palmolive, puts the plan into clear terms: "This is complicated stuff, you have to do anything you can to simplify it" (Stedman, 1999). The ability to implement SAP with minimal customization requires assistance from several other factors, primarily streamlining operations and re-engineering the business – both of which will help the organization to run in a more straightforward manner. Thorough planning is also a close partner, as it is threaded through the plans from scope to budgets.

Scope is the initial "blueprint" of an implementation plan. Within this original plan, budgetary and resource needs are established. During the course of the project, it can be easy, often transparently so, to become so involved in details that additional responsibilities or requirements are added or affected. Suddenly, but often too late, the realization comes that the project is a victim of "scope creep". The ability to maintain scope is closely related to planning, and it is possible to achieve for companies both large and small. Colgate-Palmolive Company also listed scope maintenance as a factor to their success (Geishecker, 1999). Maintaining scope is just as important for small companies as it is for large organizations. The approach for "rolling out" their implementation is another very important consideration under the SAP functionality/scope umbrella.

Much has been said about "big bang" approaches and gradual rollout of modules within a company. There is no evidence that any one way is better than another as a whole; however, one approach will be better for companies on an individual basis. There have been many widely publicized "big bang" successes, and many failures. The same is true for gradual (phased) rollouts, although these generally are not headline-grabbers. Chevron, a $43 billion oil giant, attributes a phased rollout to their success. They successfully implemented SAP and replaced over 250 legacy systems on a global basis using the phased approach. By implementing gradually, they were able to catch any "bugs" before moving forward, thereby avoiding any catastrophic, system-wide problems (Geishecker, 1999). Amoco, Merisel and Owens Corning are examples of other companies who chose to take a gradual rollout approach, and who consider the decision a contributor to their success. Home Depot has successfully implemented several modules around the world, and utilized the phased rollout approach (Mearian, 2000). The phased rollouts take longer to complete, and are more expensive due to the additional time commitment; however, the approach does offer a reduced business risk (Davenport, 2000). Only one of the companies analyzed cited SAP core functionality as a problem. Sobey's, an $89 million Canadian grocery chain, did not feel SAP could handle its requirements, and prematurely abandoned the

implementation process. For the most part, companies, even the ones who experienced miserable, expensive failure, agree that SAP will perform as advertised.

Factor	Percentage identified for Success ($n = 29$) (percent)	Failure ($n = 15$) (percent)
Worked with SAP functionality/maintained scope	55.17	6.67
Project team/management support/consultants	48.28	6.67
Internal readiness/training	41.38	53.33
Deal with organizational diversity	31.03	13.33
Planning/development/budgeting	20.69	40.00
Adequate testing	10.34	20.00

Table IV. Frequency of factors reported by the "Successful" and "Unsuccessful" implementation firms

Factor 2: project team/management support/consultants

The successful project team is cross-functional, consisting of the most knowledgeable people in the organization (Nah *et al.*, 2001). The team, at all times, must be dedicated solely to the project, and have no other responsibilities within the company. Lockheed Martin, a leading aeronautical group, stated one of its keys to success was "assembling a team capable of making and executing" the changes required (Stedman, 1999).

A successful implementation is only achievable when high-level executives have a strong commitment to the project (Davenport, 2000). The attitude of senior managers will affect not only the flow of funds and information to the project, but also the subordinates view the project, its future impact upon the company as a whole, and its impact upon the employees as valued and capable individuals. Fujitsu Microelectronics, an international manufacturer of semiconductors, successfully completed its ERP implementation within ten months. They attribute success in part to top management support (Zerega, 1997). During the entire project, company management provided substantial incentives to team members, and ensured that internal communication channels were open at all times. GTE completed an 11-month integration not only on time and within budget, but also without the aid of an outside consulting firm. Again, top management was a primary factor cited for their success (Caldwell, 1998).

Senior management at Farmland Industries showed its support of the process by providing bonuses to employees and consultants. The project members were charged with ensuring that not only technical goals were met, but also that the "people" element and business changes were taken care of at the same time (Davenport, 2000). Farmland had the foresight to understand that an ERP system was not only a significant technical change, but also a massive cultural change.

As stated earlier, and reinforced with these examples, the ERP software can be designed to work perfectly well, but lacking top management support, the project is destined to fail. Senior management has the authority and responsibility to support the project internally through incentives and bonuses, and externally through maintaining open and effective communication channels and a reassuring, positive attitude. By constantly exposing the positive benefits and results of such an endeavor throughout the implementation process, success is much more likely to occur.

Factor 3: internal readiness/training

The "people element" and training aspect of an ERP implementation have historically received the least amount of attention. The paradox of this is that when this factor is ignored or downplayed, primarily because it does not have the largest quantifiable benefit, expenses are greatly increased in the long run. By treating resource training with little regard and financial support, it is not hard to realize the reality of delay, confusion and financial ruin that may result. Some companies insist on assigning a fixed cost or percentage to the training effort, regardless of need or variable conditions. This mistake has certainly been the root cause of many failed implementation attempts. Fortunately, it has also been a source for others to learn from such experiences and avoid repeating the mistake.

The people element must be handled on two levels. At one level, employees must be trained on the new system in order to use it to continue day-to-day operations. The second level is educational exposure. Managers must know and understand the implications of the system, and must come to a consensus about the changes that will take place. If they agree that change is necessary and possible, they can be charged with disseminating this information to their subordinates. If managers are not in agreement or collaboration, then there will be no "enthusiasm", or buy-in, and there may even be active resistance (Davenport, 2000). The reinforcement of a "team environment" is critical to the overall success of an ERP implementation. Members of the project team should be encouraged to support each other and work toward common goals. This also leads to a "cross-pollination" effect, resulting in a more collaborative and self-sufficient mix of talent and responsibilities.

Not unexpectedly, the most common failure factor reported was that of "readiness for change". Implementing an ERP system completely changes the culture within an organization, and many companies have found themselves hard pressed to accomplish this successfully. Unisource, a $7 billion corporation, scuttled its implementation plans due to "internal problems". The company was unable to deal with the levels of cultural change that would have to take place in order to be successful under an ERP system (Stein, 1998).

Many companies have been guilty of making simplistic assumptions of how an implementation will affect the culture within their organization. Culture changes do not occur magically, and must be handled with the utmost care and precision (Davenport, 2000). These changes directly relate to the human cost element, or human psyche. If people are not ready or willing to change, change simply will not occur. All managers must be charged with the responsibility of controlling worker anxiety and resistance to the ERP system (Aladwani, 2001).

Factor 4: deal with organizational diversity

Organizations have many cultures. Individual branches of the same organization have their own ways of doing things, and each function/department operates with different procedures and business requirements. Not unexpectedly, the larger, more global companies cite their diversity as an obstacle to success. Individual units and groups are often companies of their own right, and do not wish to be assimilated into one corporate culture. "Re-engineering" of the business is required here, both on the "people" level, and on the operational level. This organizational

diversity differs from factor #1 (worked with SAP functionality/maintained scope) in that the company changes its culture, not just its processes.

Farmland Industries, a $10.7 billion farmer-owned cooperative wanted to ensure that their endeavor would be successful. Before launching their implementation, they interviewed over thirty other SAP users, in an attempt to "learn from the mistakes of others". The knowledge gained allowed them to re-engineer their business before beginning the process, and resulted in a successful implementation (Stedman, 1999). It appears to be more critical for large, diverse organizations to re-engineer their processes and remove idiosyncrasies – both cultural and procedural – before taking on a project. Amoco ($33 billion, oil/petroleum) and Chevron ($43 billion, oil/petroleum) painstakingly re-engineered their companies. The concept of re-engineering the business is not simply to fit the software. Before any company can be linked effectively to world-class supply chains, their internal processes must be world-class (Ptak, 2000). Chemical giant E I DuPont, scuttled its SAP implementation after determining that its organizational units were too diverse, feeling that it would be too difficult for them to attempt to re-engineer their processes (Koch, 1996). On the other hand, it is possible to overcome this problem. Many large companies, Amoco and Chevron, for example, successfully re-engineered their business and overcame the problem of organizational diversity.

Factor 5: planning/development/budgeting

Planning a sophisticated ERP project should not be taken lightly or with little forethought. As mentioned before, there are enormous potential costs associated with such an undertaking. In addition to the high costs paid out before the go-live date, there can and have been major expenses incurred by companies that were unable to fully develop a comprehensive plan. Planning should be closely identified with maintaining scope during an implementation. Cost overruns and developmental delays are costly, sometimes fatal results of ineffective planning. Home Depot, Lockheed Martin, and Mead Corporation are some examples of companies that attributed their success to planning. Lockheed planned a well-equipped team to do the implementation, allowing them to make a solid plan for achieving their stated goals. Mead Corporation, a large pulp and paper manufacturer researched the notorious Hershey Foods implementation in an effort to learn what they would need to do differently in order to succeed, or more specifically, to avoid failing. Consequently, Mead successfully implemented nine separate modules simultaneously within their operations (Shaw, 2000).

Developmental delays with ERP implementations were more of an issue during the Y2K readiness period, and some companies in the midst of an implementation were forced to scuttle the operations and make quick fixes to their legacy systems. For example, this was a primary issue with Nash Finch, a national food wholesaler (Mearian, 2000). Delays, however, can cause any operation to be scratched if the senior managers feel they should no longer, financially or otherwise, support a project that may never get off the ground within a reasonable period of time. Developmental delays can also lead to resource attrition, which in turns affects the learning curve and completes the vicious cycle by creating additional obstacles to obtaining cut-over. Knowing this, Fujitsu Microelectronics successfully completed their well-planned implementation in ten months. Projects are demanding, not only on the company, but also on the employees on the team (Zerega, 1997).

Implementations can become very costly, despite all efforts at developing a solid plan. Unisource (Stein, 1998) and Snap-On-Tools (Wilder, 1998) attribute this to part of their failure. Waste Management, Inc. found the unexpected costs too much to handle, and subsequently retired their ERP implementation project. Many projects, especially failed ones, find themselves over budget, some by as much as 189 percent. Only one-sixth of projects are completed on time and within budget (May, 1998).

Factor 6: adequate testing

System testing has proven to be the key element of success for some companies, and a direct cause of failure for others. The Gillette Company endured five months of rigorous testing procedures before their successful go-live date (CIO, 2000). Eastman Kodak completed what at the time was the largest implementation on record, attributed testing as a primary factor for their success (PR Newswire, 2001). After months or years of development, it may be feasible to assume that both team members as well as executive management are tired of dealing with the project and just want it to be completed. The result of this myopic thinking, however, is that testing is reduced or ignored, and "red flags" are disregarded. Whirlpool Corporation, for example, attributes inadequate testing as its single reason for an unsuccessful- and costly-implementation. In an attempt to meet their deadlines, red flags were ignored. Whirlpool gambled on its testing program by reducing the amount of time needed in an effort to avoid the "wrath" of senior executives. Furthermore, Whirlpool executives admitted that to complete adequate testing and fix any problems would have delayed go-live by only one week. Consequently, these "red flags" reappeared at go-live creating inventory and delivery problems, and costing the company more financially in the long run (Collett, 1999a, b). This also proves the importance of another success factor – top management support. Unrealistic fears of delaying the "go-live" dead line indicated that senior executives were not completely "in tune" to the importance of completely testing the implementation; even that resulted in a slight delay. Hershey Foods stated that their rush to complete the implementation in order to be "ready" for their busiest time of year, in addition to other issues that essentially doomed the project early on, caused their massive, highly publicized failure (Geishecker, 1999).

Conclusions

Six factors were identified for success and failure of SAP implementations in this paper. It has been noted that the primary factors (working with SAP functionality and maintained scope, and project team/management support/consultants) for successful implementation of SAP are different from the primary factors (inadequate internal readiness and training, and inappropriate planning and budgeting) that contribute to failure of SAP implementation. Hence, it can be noted that the factors that contribute to the success of SAP implementation are not necessarily the same as the factors that contribute to failure. This points out that management should be focusing on one set of factors of avoid failure and another set of factors to ensure success.

The main regret in ERP implementations seems to be that there was not enough time and attention devoted to the internal readiness factor and their changes during the implementation

process (Davenport, 2000). This is true for all companies that have had implemented an ERP system, whether it is SAP or any other vendor.

Management support and commitment is a primary strategy necessary to create the environment necessary for a successful introduction of the changes brought about by an ERP system (Aladwani, 2001). As noted, worker resistance and readiness for change were the primary reasons for implementation failure. It is absolutely imperative for companies to be responsive to their "internal customers" while they are creating systems that will help them deal more efficiently with "external customers".

Implementing an ERP system is one of the most challenging projects any company, regardless of size, can undertake. Success does not come easily, and those who implement only for an immediate return on investment are in for a rude and expensive awakening. It is clear that most companies implement ERP systems just to stay competitive. The process has to be part of the business objective, and it has to be clear that a successful "go-live" is not the brass ring. This fateful date, set early on in project planning, cannot be viewed as the end goal or even the end of the project, but rather only a milestone along road to the true goal – realizing the benefits (Davenport, 2000).

The current research does have its limitations. The data analyzed is from secondary sources published in the press (in the form of books and articles). Secondary reporting (as opposed to self-reporting) could increase objectivity; however, the weakness is that not all the factors might have been reported. The articles/books studied might have reported status of the ERP system (in the form of SAP) implementation at a particular point in time. The organizations that may not have successfully implemented SAP may have been successful at a later point in time with appropriate modifications in their respective implementation strategies. Hence, it is necessary that longitudinal studies (over a longer period of time) at each of the organizations should be undertaken.

While this research project was limited in scope, it became apparent through analyzing the literature that factors leading to success or failure are complex and do not occur alone. They are actually intertwined with one another, and at many times, are hard to separate or isolate. Rather than list the ways to approach a project, and individualize each point, it would be more feasible for a company to understand that it takes the whole system to complete an implementation through diligent research. While one or two criteria were recognized more frequently in this paper, a complete and thorough examination must be indelibly considered prior to undertaking the task of implementing an ERP system.

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