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A Process Change-Oriented Model for ERP Application

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Though the application of enterprise resource planning (ERP) systems has become widespread, many organizational experiences have shown that resulting outcomes fall short of expectations. Best-practice experiences, however, have proven that effective application is centered on an integrative approach that seeks to achieve a balance between certain key organizational elements. This article presents a novel process change management-oriented model that considers the key areas in ERP implementation, including strategy, business processes, structure, culture, information technology, and managerial systems. The model is grounded by empirical-based evidence drawn from a survey of various organizational practices with ERP implementation.

1. INTRODUCTION

Enterprise-wide information systems represent sets of business applications that allow for an organization-wide management of operations (Pawlowski, Boudreau, & Baskerville, 1999). These systems are currently widespread in the form of more application of enterprise resource planning (ERP) systems, which became one of the largest information technology system investments in the 1990s (Chung & Snyder, 1999; Sumner, 1999). ERP is defined (Nah, Lau, & Kuang, 2001) as: "a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information-processing needs" (p. 285).

It is also described ("DataQuest ERP: The new mantra for competitive edge," 1996) as:

> The finest expression of the inseparability of infotech and business. As an enabling technology as well as an effective managerial tool, ERP has made it possible for many organi-

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> zations worldwide to integrate at all levels and make reportability a given rather than an imposition. (p. 1)

ERP systems are seen as optimization and integration tools of business processes across the supply chain (within and beyond organizational boundaries; see Figure 1), implemented through modern information management systems (Stefanou, 1999). This integration provides visibility and consistency across business functions like manufacturing, finance, distribution, and project management. Moreover, ERP helps get the most benefits of databases and ensures that the system environment is built following an open system approach.

ERP is believed to provide an organization with several benefits, such as improving information quality and reducing costs through retooling common business functions, improving responsiveness and time-to-market through an effective structuring of operations, revamping old systems and processes, and improving integrity and availability of data across the business (Bancroft, Seip, & Sprengel, 1998; Slooten & Yap, 1999). However, many organizations implementing ERP have failed to achieve these significant benefits (Bancroft et al., 1998; Nah et al., 2001; Pawlowski et al., 1999). The reason is that the "implementation of ERP systems is complex, organizationally disruptive, and resource intensive" (Volkoff, 1999, p. 235), and many organizations (with technical mind-set) are not able to absorb such complexity (Pawlowski et al., 1999), which stems from the wide-scale organizational changes across various organizational dimensions (Bancroft et al., 1998; Volkoff, 1999). Stefanou (1999) stated that "…for the successful implementation of ERP packages under SCM practices, the required organizational change, through corporate culture transformation, is crucial" (p. 801).

In fact, the massive organizational changes involved in ERP implementation result from the shift in a business design from a fragmented, functional-based organizational structure to a process-based one served by an integrated system (Al-Mashari, 2001; Davenport, 1998; Mahrer, 1999). The process associated with this shift could therefore be lengthy, over budget, inconsistent, or result in incomplete installations of the system modules, and consequently, lower benefits than hoped for.

It is difficult to implement ERP because to do so successfully, one must adequately manage the rather complex process. Included in this process are organiza-

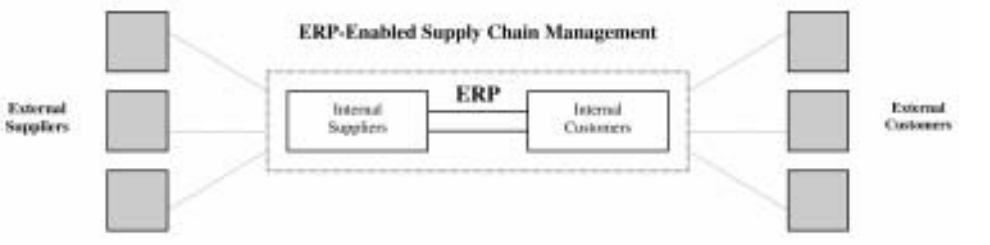

FIGURE 1 Role of ERP in supply chain management (modified from "Erpfans Enterprise Resource Planning (ERP)," 1999).

tional changes in many principal areas concerning strategy, technology, culture, management systems, human resources, and structure. The reason for the many failures that have occurred is that companies have concentrated exclusively on the technical aspects while ignoring the change management elements. This explains why researchers like Al-Mashari (2002) recommended the adoption of process change management (PCM) theories to understand the context of ERP implementation from a wider perspective, instead of looking at it from narrowly defined models such as the contingency factors model by Slooten and Yap (1999), Volkoff's (1999) structural model, an improvisational change model by Sieber and Nah (1999), Taylor's (1998) sociotechnical systems design, the sustainability and competitiveness model put forward by Ezingeard and Chandler-Wilde (1999), and Scott's (1999) software project risks framework.

By considering the multidimensional changes involved in ERP implementation, Al-Mashari (2002) found that the aforementioned theories lack comprehensiveness. Therefore, he proposed a PCM framework and identified various PCM constructs that belong to five groups of facets, as follows:

- Change management—commitment, people, communication, tools and methodology, and interactions.
- Project management—team formation and development, roles and responsibilities, external entities, and measurement of progress.
- Strategic planning—process redesign, process performance measurement, and continuous process improvement (CPI).
- Continuous process management—performance gap analysis, change justification, and project strategies.
- Technology management—software selection, technical analysis and design, and installation.

Although the aforementioned framework is beneficial in guiding ERP practice and research, it does not demonstrate clearly the relation aspects and the reconciliation mechanisms that synchronize the working of its essential elements. This article extends this framework by presenting an application model that aims to demonstrate the working and interrelatedness aspects of the five major ERP implementation themes. The model is described throughout the rest of the article and backed up by empirical-based evidence drawn from various sources and reported case studies.

2. OVERVIEW OF ERP APPLICATION MODEL

Kremers and Dissel (2000) stated that: "The value of an ERP system lies not so much in the product itself, but in its effective and efficient usage" (p. 54). In the following sections, the essence of the model discussed (see Figure 2) is that effective ERP implementation is, to a large extent, determined by how far the following key elements are taken into account and to what extent they are integrated:

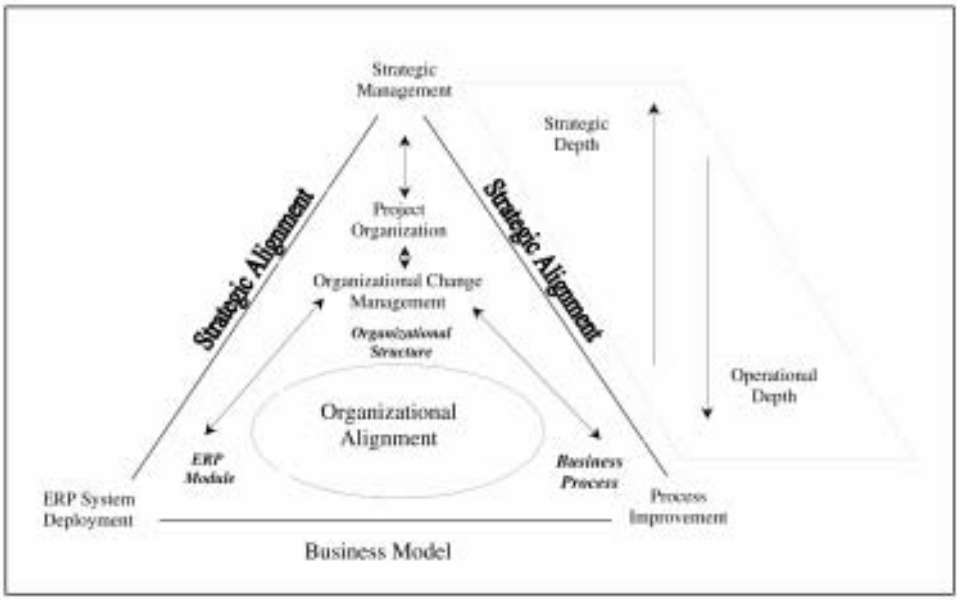

FIGURE 2 Integrative model for ERP application.

- Strategic Management—Providing qualitative and quantitative statements on benefits that are both strategic and tangible, justifying change, capturing best practices as well as enabling knowledge relating to all aspects of ERP implementation to be transferred, providing a description of a plan for change that ensures that it is aligned with overall corporate strategy, and ascertaining organizational principles and implementation approach (Cooke & Peterson, 1998; Francesconi, 1998; Nah et al., 2001; Simon & Fisher, 1998; Stevens, 1997).
- Process Improvement—Redesigning business procedures to ensure that the ERP software modules are accommodated within the entire business operation (Bancroft et al., 1998; Nah et al., 2001).
- ERP System Deployment—Covering sourcing ERP system, legacy systems migration, customization and configuration, and all other technical activities (Bancroft et al., 1998; Francesconi, 1998; Keller & Teufel, 1998).
- Project Organization—Defining many of the roles and responsibilities of internal and external entities in the implementation process; ascertaining ways of coordination and cooperation among them (Nah et al., 2001; Romei, 1996; Stevens, 1997).
- Organizational Change Management—Facilitating incorporation systems, processes, and structure that have been newly implemented into working practice; dealing with any resistance that may arise (Jesitus, 1997; Nah et al., 2001; Stevens, 1997).

The aforementioned core elements will then be studied and discussed, and their practical impact and interconnectedness will be demonstrated and supported by

representative examples taken from leading practice organizations. The model is in tune with Al-Mashari's (2002) PCM framework, where each element in the model has a counterpart in the PCM framework. The PCM framework is generic in nature and is based totally on Grover's (1999) taxonomy of process change factors. This article aims at providing an application dimension to this framework by demonstrating the relations between the elements.

As can be observed from Figure 2, there are two types of alignments important to ensure a fit between all elements of the model, namely, strategic and organizational. Strategic alignment works at reconciling the strategic vision with ERP deployment, process improvement, project organization, and organizational change management. This type of alignment finds support in the literature. For instance, Huizing, Koster, and Bouman (1997) stressed the need for alignment during organizational change between strategy and structure, systems, style, and culture. Klenke (1994) and Heiman (1988) based their discussion of IT-enabled organizational change on the Leavitt model that links technology to people, task, structure, and leadership processes. Kettinger, Teng, and Guha (1997) also used this model as a base for their discussion of business process change methodologies, techniques, and tools. On the other hand, the model demonstrates the necessity for organizational alignment to ensure that business processes, ERP modules, and organizational structure are well integrated at the operational level through a unified business model. This type of alignment finds support from the work of Henderson and Venkatraman (1993) on the alignment of IT with business for transforming organizations.

The following sections discuss the key issues in the ERP application process. The criticality of these factors is found to be widely supported by the current body of the literature and endorsed by practitioners and experts in the field.

2.1. Strategic Management

In ERP implementation, an organization goes through a major transformational change that must be planned strategically and implemented thoroughly (Bingi, Sharma, & Godla, 1999). Barrett (1994), Davenport (1993), Hammer (1990), and Mitchell and Zmud (1995) believed that strategic management in process change programs should aim at optimizing the use of business and IT resources by innovatively orienting the design of workflows and procedures around processes. This is particularly important in ERP implementation, where ERP systems themselves are process-based (Cooke & Peterson, 1998).

In ERP implementation, the process of strategic management starts with identifying the drivers for changes in business and IT systems and their expected benefits, both strategic and operational (Cooke & Peterson, 1998; Stevens, 1998). This process helps people realize the need for change, promotes their interest and dedication to it ("Just in Case," 1998), and ensures adequate change scope and direction (Cooke & Peterson, 1998; "Just in Case," 1998). In describing the driving forces behind British Aerospace implementation of R/3 ("British Aerospace Airbus takes off with R/3," 1999), Chris Brautigam, the supply chain and manufacturing process project manager, stated:

> Our main reason for installing the R/3 system was to introduce some real change and associated business benefits to the company and to enable Airbus to compete more effectively with Boeing. Our ongoing thrust is to run the best possible processes and use a first-class infrastructure to assist us in doing so. R/3 will enable our business processes, simplify the systems architecture, reduce complexity, and provide better operational ability. (p. 1)

To ensure full alignment, ownership, and responsibility for planning and budgeting each targeted benefit area throughout the ERP implementation cycle, a broad vision has to be continuously maintained (Cooke & Peterson, 1998; Stevens, 1998), addressing particularly the areas in which their improvement promises immediate direct impact ("Just in Case," 1998; Stevens, 1998). Davenport (1993) believed that this vision should be shaped through external orientation based on customer research and competitive analysis, whereas Carr (1993) and Zairi (1995) asserted the needs for continuous learning to highlight performance gaps and improvement areas, and Eriksen, Axline, and Markus (1999) considered this process an effective way for knowledge transfer.

An application strategy should contain a full description of the who, what, where, when, why, and how issues related to all change details (Martin & Ching, 1999), depending on the scope of improvement and the business level at which a particular ERP-related change occurs. Items that an ERP strategy may describe include, for instance: implementation objectives; implementation philosophies, methodology, and scale; project management style and time-plan; organizational change management policies; a top-level ERP deployment plan; and a performance assessment scheme (Al-Mashari, 2001; Bancroft et al., 1998; Cooke & Peterson, 1998; Gibbs, 1998). Table 1 outlines some organizational strategic management practices in the context of ERP implementation.

Prior to instigating SAP implementation, Eastman Kodak Co. (Stevens, 1997) had a strong case for change. The company wanted to reduce into one integrated system its 2600-plus fragmented software applications, 4,000-plus systems interfaces, and 100 programming languages, all running on a mainframe-based environment. These were seen to be both an impediment and an opportunity for the business process reengineering (BPR) efforts then being undertaken. Kodak wanted the integrated system to operate on a common set of global corporate data and be based on state-of-the-art languages and for that reason selected SAP R/3 for world-wide implementation across all their business lines.

Owens Corning, a $3 billion world leader in building material systems, embarked on a 2-year initiative, Advantage 2000, as part of its attempt to attain a leading position in the global marketplace. The purpose of Advantage 2000 was to reengineer its global operations and implement SAP R/3 systems (Anita, 1996; Martin, 1998; Romei, 1996; Stevens, 1998). The company's goals included achieving $5 billion in sales by the year 2000; strong trademark recognition; continued improvements in productivity; and expansion into new products, applications, and markets. They also aimed to achieve a 6% productivity improvement per year and wanted to reduce the cost of raw materials by 1%. Another aim of Advantage 2000 was to standardize and globalize the company's business processes, with an em-

Table 1: Organizational Strategic Management Practices in Enterprise Resource Planning (ERP) Implementation

Strategic Management Practice	*Organization (Reference)*
Carrying out gap analysis exercise to examine how other companies manage business and information technology	Farmland Industries Inc. (Jesitus, 1998)
Communicating goals and long-term perspectives, focusing on public mission, and ensuring high-quality standards and security	ETH Zurich (Mahrer, 1999)
Defining vision as to operate using single business model supported by one global set of configured code for entire company	Kodak (Stevens, 1997)
Examining financial processes in comparison to several large companies in different industries	Lucent Technologies (Francesconi, 1998)
Defining set of qualitative statements specifying targeted benefits in each business unit	University of Newcastle-upon Tyne ("University of Newcastle SAP announces move into higher education market with Newcastle University contract win," 1997)
Justifying implementation from operational excellence perspective, and focusing on cutting cost of core transactions-processing systems	Monsanto (Sumner, 1999)
Defining case for change as building integrated material planning and production control approach	Consumer products company ("SAP case study 2: Consumer products," 1999)
Creating guiding principles and strategic vision relating to integrity, flexibility, and effectiveness of business environment	University of Nebraska (Sieber , Saiu, Nah, & Sieber, 2000)
Defining set of implementation assumptions relating to approaches to thinking, working, controlling, and modeling	Lucent Technologies (Slooten & Yap 1999)
Developing strategy along four major dimensions (growth, global ordering administration, financial reporting, and process redesign)	Bay Networks ("Technology strategies, The perils of ERP," 1999)
Basing selection process on features of high degree of integration, robustness of software architecture, level of service, and experience in similar telecommunication companies	Telecom EIREANN ("Telecom Eireann and SAP accelerate transformation," 1999)
Adopting a three-phase approach involving supply side, demand side, and supply–demand integration	Geneva Pharmaceutical (Bhattacherjee, 1999)
Considering ERP platform critical for next decade infrastructure	Threads (Holland & Light, 1999a)

phasis on the aspects of speed, simplicity, responsiveness to customers, empowerment of employees, teamworking, and a paperless work environment.

Kodak (Stevens, 1997) established a global Lotus Notes architecture to achieve the aforementioned, which captures best practices and disseminates them to team members globally. Furthermore, Kodak's knowledge management system identifies and shares all internal day-to-day learning globally with all employees, includ-

ing information about SAP (e.g., scripts, test conditions, roles and responsibilities, white papers, approaches to problems, and notes of meetings).

Eastman Kodak also illustrates how implementation strategies can be developed and clearly stated. The company identified and specified a number of guiding principles that determined its approach (Stevens, 1997), including reengineering the business processes before commencement of the SAP project. Other guidelines included developing one global set of configured code for the entire corporation, enabling Kodak to use one single business model, developing a business model to reflect how the company wanted to conduct its business and not be tied to what was possible via an existing piece of software, creating a global design and configuration that would enable them to save time and money by rolling out one system to the various divisions worldwide, and setting up an implementation review board comprising senior managers of business units and major organizations. This board would control the phases, review the deliverables, and give approval to proceed. Finally, the company wanted the information systems' function to be structured to combine various sections of expertise, such as business management and software application and infrastructure, as well as senior representatives from Anderson Consulting and SAP, Kodak regional program offices, and local support teams.

2.2. Process Improvement

Unlike other functional system applications, the application of ERP aims essentially to improve business performance through supporting the integration of the various business processes across the different functional areas (supply chain) and beyond organizational boundaries. This integration facilitates the design of an organizational structure that allows for efficient information flow within the organization itself, as well as between the organization and its suppliers and customers (Laughlin, 1999). This feature of ERP presents a great opportunity to transform a business to an integrative, cross-functional, and customer-oriented design. Such a transformation through tools like BPR and CPI is found to be the most powerful method for business improvement (SAP Software, 1996). An ERP system enables BPR, because it provides a full, integrated environment that uses a common IT infrastructure and is built on an open systems' architecture, thus enabling data sharing and communications to support all business processes (Bhatt, 1996; Broadbent, Weill, & St. Clair, 1999; Tony, 1995). Both business situation and degree of improvement desired by an organization are the determining factors for deciding when BPR should take place in ERP implementation (Bancroft et al., 1998). However, it is repeatedly advised that BPR is best implemented following the ERP model (Slooten & Yap, 1999). In BPR implementation, it is important that a systematic and structured methodology is followed, integration is established with other ongoing process improvement initiatives, and a business-centered performance measurement scheme is developed and adopted. Table 2 outlines some organizational process improvement practices in the context of ERP implementation.

As its first step in commencing its BPR efforts, Owens Corning established a global supply-chain view to fit all its business unit improvements (Anita, 1996;

Table 2: Organizational Process Improvement Practices in Enterprise Resource Planning Implementation

Process Improvement Practice	*Organization (Reference)*
Modeling and redesigning business processes according to one's global system	Textiles PLC (Holland & Light, 1999b)
Measuring performance through business process flexibility lost, human resources, and financial systems integration	ETH Zurich (Mahrer, 1999)
Categorizing business processes into supply and demand groups, where processes in each group's redesigned and two groups integrated	Geneva Pharmaceuticals (Bhattacherjee, 1999)
Defining measurement procedure to detect deficiencies in processes performance	Alevo (Welti, 1999)
Using R/3 as a tool to streamline government administrative procedures, change business processes, and cut costs	State of Kentucky (Henry , 1998)
SAP R/3 selected after performing business process reengineering (BPR)	Monsanto (Sumner, 1999)
Carrying customer-focused research for measuring performance and using Activity Based Costing-based tools to understand cost	Lucent Technologies (Francesconi, 1998)
Combining SAP implementation with BPR	Threads (Holland & Light, 1999a)

Bancroft et al., 1998; Romei, 1996), and this approach enabled many design teams to work in parallel. It also resolved integration issues across process boundaries. Each process team used a standard BPR methodology, received global benchmark data, and was supported by experts in the R/3 environment and the specific business processes that were being implemented.

2.3. ERP System Deployment

The ERP deployment represents a critical and expensive stage (Gibbs, 1998) in the application process, as it deals with the installation phase of system software modules. In fact, the effectiveness of ERP depends on the degree of alignment and fit between various application elements (strategy, structure, process, system modules) in the deployment process (Bancroft et al., 1998; Buck-Emden, 2000). This involves activities of defining detailed technical plans, addressing issues of contracting with suppliers for outsourcing the software package, analyzing current IT infrastructure, designing new architecture for ERP, customizations, transition and migration, testing, and maintenance (Welti, 1999). A key to success in this process is to follow an integrative approach that ensures that business strategies are reflected in the ERP business model adopted and that an auditing scheme is firmly established along the deployment cycle stages to allow for necessary corrections and repositioning to be made (Keller & Teufel, 1998). Central to this approach is the appropriate selection of adequate ERP architecture that aligns with the organizational, technical (network, database, web-enablement), and managerial (decision-making

style, data ownership, end-users' skills) capacity (Chan, 1999). Table 3 outlines some ERP system deployment practices.

2.4. Project Organization

The business-wide coverage and functional-crossing nature of ERP application enforces the contribution of all entities (internal and external) involved in this process from different sites and levels (Cooke & Peterson, 1998). It is therefore imperative that a well-defined project organization and administration procedures and networks are developed effectively (Bancroft et al., 1998). This involves designing a full profile of what and how different roles and responsibilities will be allocated and shared among project members before, during, and after the ERP implementation (Welti, 1999). In particular, leadership style (Berrington & Oblich, 1995), forms and means of communication and dispute resolution mechanisms (Davenport, 1993), project teams' structuring and training (Barrett, 1994), and performance appraisal (Guha, Kettinger, & Teng, 1993) are essential elements in defining an appropriate ERP project organization. Table 4 outlines some project organization practices in the context of ERP implementation.

Table 3: Enterprise Resource Planning (ERP) System Deployment Practices in ERP Implementation

ERP System Deployment Practice	*Organization (Reference)*
Selecting implementation partner based on track record of similar projects, project management skills, technical skills, support capabilities, and cost effectiveness of quotation	Consumer products company ("SAP case study 2: Consumer products," 1999)
Making decision to select R/3 system based on assessment activity carried out at each campus	University of Nebraska (Sieber, Siau, Nah, & Sieber, 2000)
Successfully transiting 137 mainframe applications, 86 different databases, and 7 platforms to one integrated enterprise system	Farmland Industries Inc. (Jesitus, 1998)
Basing selection on realizing need to leverage existing PCs and LANs, conduct on-line transactions and queries; and implement Electronic Fund Transfer, EDI, and Internet capabilities	State of Kentucky (Henry, 1998)
Using three groups of strategic criteria relating to technical, system and company issues	Manco (Al-Mashari & Zairi, 2000)
Placing emphasis on designing business processes by making use of interactive business processes modeling techniques for configuration	ComputerCo (Gibson, Hollard, & Light, 1999)
Replacing accounting, assets management, cost control, and payroll systems with integrated system and interfaces for master data	RTL Television (Bancroft, Seip, & Sprengel, 1998)
Ensuring readiness of network infrastructure to migrate to R/3 environment	Owens Corning (Romie, 1996)
Implementing "big bang" SAP for chemical SBU, and then rolling it out for the rest of SBUs	Monsanto (Sumner, 1999)

Note. SBU = strategic businss unit.

Owens Corning (Anita, 1996; Bancroft et al., 1998; Romei, 1996) used the consultants to facilitate early process design and to provide technical training, particularly on the SAP components and the client/server. To optimize the consultants' technical expertise to acquire new internal capabilities, Owens Corning used the concept of knowledge transfer to ensure that their employees acquired all the necessary skills by the end of the project.

From commencement, Kodak (Stevens, 1997) was determined to understand the system they were developing and to be capable of supporting it themselves in the

Table 4: Project Organization Practices in Enterprise Resource Planning Implementation

Project Organization Practice	*Organization (Reference)*
Adopting "superusers" concept by forming teams of specially trained managers from various departments to meet regularly and share developments on all aspects of implementation	IMC Global (Plotkin, 1999)
Coordinates roles of Siemens and SAP, which together provide technical guidance on implementation, with Lake West Group, which takes care of business process reengineering (BPR) side of project	Jo-Ann Stores Inc. ("Jo-Ann stores weaves an enterprise system," 1998)
Bringing together internal and external expertise into a partnership with top management from all business units	Textiles Plc (Holland & Light, 1999b)
Scheduling R/3 systems' implementation into number of releases to measure response of users and maintain control of system	Information management shared services at Bristol–Myers Squibb (Cooke & Peterson, 1998)
Developing some measures to estimate anticipated impact of BPR efforts, but these measures fell by wayside as efforts proceeded further	Manco (Al-Mashari & Zairi, 2000)
Forming many full-time teams from its worldwide business, representing all subjects, to customize SAP system	Owens Corning (Bancroft, Seip, & Sprengel, 1998)
Measuring project results through annual sales reports, operating costs, net income, and total assets	Geneva Pharmaceutical (Bhattacherjee, 1999)
Setting weekly meetings and issuing regular project newsletters	Threads (Holland & Light, 1999a)
Involving project managers in all phases of SAP implementation	Samsung Heavy Industries (Bancroft et al., 1998)
Setting up number of well-planned postimplementation projects to keep momentum of improvement	Alevo (Welti, 1999)
Ensuring top management commitment to company's plan to exceed customers' expectations, achieve growth targets, and maintain industry leadership	Owens Corning (Anita, 1996; Bancroft et al., 1998)
Developing partnership model, in UK, with employees of parent company, in South Korea, to set up R/3 environment	Samsung Heavy Industries (Bancroft et al., 1998)
Ensuring strong commitments made by team leaders to operate under extensively reduced budgets	Lucent (Francesconi, 1998)

future. For this reason, minimum third-party support was used and the result was that leaders within Kodak were the ones who best understood it.

2.5. Organizational Change Management

In ERP application, the changes in business processes have to be complemented with organizational changes in structure and management systems (Pawlowski et al., 1999). The effective management of such changes minimizes possible opposition of the new ERP environment. The absence of an adequate organizational change management attitude can easily result in a total failure of the entire ERP initiative (Bancroft et al., 1998), regardless of how competent the organization is technically. Evidence has shown that organizational change has to be managed prior to, during, and after ERP implementation (Cooke & Peterson, 1998).

Organizational change management concerns all human, social, and cultural alignment techniques (Carr, 1993). This requires the support and commitment of top management and involves several activities (e.g., revision of reward systems, communication, empowerment, people involvement, training and education, creating a culture for change, and stimulating receptivity of the organization to change, among others; Bancroft et al., 1998). Table 5 outlines some organizational change management practices in the context of ERP implementation.

3. CONCLUSION

The effective application of ERP requires attention to the key elements discussed earlier and their interconnectedness and integration. Figure 2 illustrates this dynamic relation through a proposed model based on an integrative perspective. This article argues that at the heart of effective ERP application, a full integrated and balanced perspective has to be taken. In particular, this article proposes that the following approach, if adhered to, would most likely yield the desired outcomes for optimum performance:

- Strategic Management—Determining objectives and guidance on how the ERP system can be best applied. This is achieved through identifying change drivers, performance gaps through scanning leading practices, and defining implementation approach and plans.
- Process Improvement—Determining how business function should be designed into processes that are in line with the ERP architecture.
- ERP System Deployment—Dealing with the technical issues of transforming legacy systems into the ERP system environment.
- Project Organization—Defining a profile of all roles and responsibilities of all parties involved in the ERP application process.
- Organizational Change Management—Considering the soft side of change needed for effective ERP application.

Table 5: Organizational Change Management Practices in Enterprise Resource Planning (ERP) Implementation

Organizational Change Management Practice	*Organization (Reference)*
Following careful transition process for people, aiming to reduce anxiety resulting from possible layoffs	Du Pont & Co. (Stevens, 1998)
Succeeding in changing mindset of users from focusing on functional domains to understanding wide range of information and operations belonging to other departments	Canadian food manufacturer (Volkoff, 1999)
Lacking trust between people, so managers become reluctant to share information with each other for fear of losing control over jobs	Battco (Stefanou, 1999)
Getting employees updated through organizing focus groups, publishing newsletters, and making use of e-mail messaging systems and web technologies	GTE (Caldwell, 1998)
Increasing amount of information sharing through establishing "cross-lateral" teams representing various functional areas	Cable Systems International (Stefanou, 1999)
Communicating project scope, objectives, and activities to people involved	Monsanto (Sumner, 1999)
Establishing competency center responsible for knowledge management and transfer, and creating global configuration and standards	Kodak (Stevens, 1997)
Putting huge investment into training and re-skilling employees on R/3 environment and methodology	Monsanto (Sumner, 1999)
Playing role of integrator and leader of major strategic alliance initiatives bringing together suppliers, customers, and consultants	Du Pont & Co. (Stevens, 1998)
Critical to include representative from each business line at level of personnel in SAP implementation efforts as early as possible	Amoco (Jesitus, 1997; "A massive lube job," 1998)
Major decisions on SAP made by strategy group consisting of representatives from top management, human resources, manufacturing, marketing, consumer imaging unit, and shared services. Group members' commitment very obvious, well positioned, and felt	Kodak (Stevens, 1997)
On-line training because it is cost-effective, allowing groups of 500 or more to view same materials and to receive consistent and private feedback messages on performance	Amoco (Jesitus, 1997; "A massive lube job," 1998)
Development of shared-services model where similar or redundant functions performed within individual business units are combined to increase efficiencies	Lucent (Francesconi, 1998)
Definitions of roles, responsibilities, and reporting procedures	Kodak (Stevens, 1997)
Use of collection tools such as surveys, communications sessions, and conferences to keep doors of communication open for everyone	Lucent (Francesconi, 1998)
Development of series of "job-impact-analysis" documents, reviewed by implementation teams, and then by middle managers to force them to get involved and thus minimize their resistance	Amoco (Jesitus, 1997; "A massive lube job," 1998)
Adopting operative management and "down-to-earth" approach	ETH Zurich (Mahrer, 1999)
Change management through leadership enrollment, communication, training, performance management, and practice	Monsanto (Sumner, 1999)

This model provides a foundation for further empirical studies across several dimensions, including scrutinizing the dynamic interaction between various implementation components and determining the implementation variables upon which a particular approach can be selected for a particular project context. Also of particular interest is the alignment process in the context of ERP application. Another interesting area concerns the development of techniques that help make appropriate implementation decisions.

Indeed, the significant development in information, telecommunication, and networking technologies (e.g., EDI, Internet, Mobile Networking, ERP, Customer Relationship Management Systems, etc.) has opened up innovative possibilities for many organizations to re-evaluate their networkability and coordination mechanisms within and across their business boundaries. Although the terms *networking* and *integration* have been strongly shaped by the focus on information and communication technologies, their applications have rapidly evolved to cover broader aspects related to managing relations, processes, and transactions along the organizational supply chain. This has been coupled with a real departure from a functionally based modus operandi to one that is based on agility, flexibility, responsiveness, and mass customization. However, this total shift cannot be effectively achieved unless other modern management tools (e.g., business reengineering, process management, supply chain management, knowledge management, change management, etc.) are embraced in a complementary and integrative manner. Clearly, for an organization to operate with a truly networked and integrated infrastructure, a holistic, business process change has to take place. This transformation involves the challenging task of reconciling both technological and organizational imperatives in one unified strategy and the changing of business architecture to reflect the new roles, responsibilities, and relations that would serve the new fabric of the transformed organization. It is becoming more evident that the winners in the current and future digitally based, globally oriented competitive market will be those who excel in such an integrated transformation.

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