The effective application of SAP R/3: a proposed model of best practice

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Keywords

BPR, Benchmarking, Information technology, Implementation, Business strategy

Abstract

Although SAP R/3 has become widely utilised as a means to change IT systems and business processes, not all organizations embarking on its implementation have achieved their intended results. However, leading practices have demonstrated that success is essentially conditional on managing adequately the complex context of implementation, which necessitates organizational changes across various key areas related to strategy, business processes, IT, structure, culture, and management systems. This paper describes a proposed model presenting the implementation of SAP R/3 from an integrative and holistic perspective. The model is developed based on reported experiences of several best practice organizations. The central theme of the paper argues that at the heart of effective SAP R/3 implementation, a fully balanced perspective has to be taken. On the other hand, the exclusive focus on technical aspects, at the cost of change management elements, has proved to be far from successful.

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Introduction

Today, SAP, a software company based in Germany, has emerged as the dominant leader in client/server enterprise resource planning (ERP) systems and is now one of the most used standards to change business processes (Bancroft *et al.*, 1998). Originally, the demand for ERP systems was triggered by the advent of client/server computing, combined with the growing demand for business process reengineering (BPR) to address changing business imperatives (Earl, 1997).

SAP R/3 brings together several core business functions, such as accounting, inventory, and sales and distribution, into one integrated data model to provide for one-time data entry and the sharing of a fast, seamless access to one single facet of information (Rick, 1997). SAP R/3 was developed from the perspective of a corporation as a whole. Its design has distinguishably demonstrated several key concepts (Bancroft *et al.*, 1998), including:

- on-line system with no batch interfaces;
- one single database for all corporate data, without any redundancy;
- clear definition of a data model documented in a data dictionary;
- software functionality configurable to different customers' needs;
- client/server architecture; and
- best practice and standardised business processes.

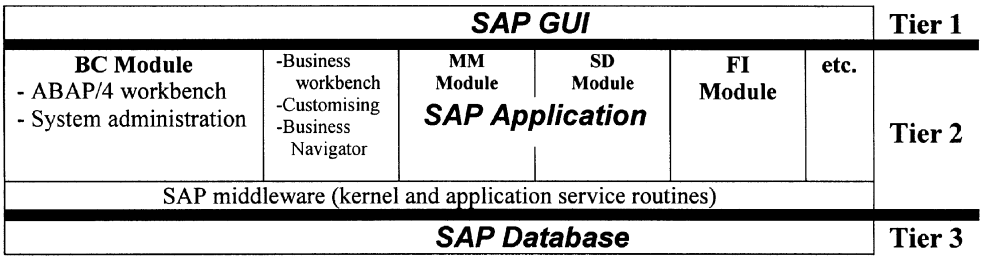
SAP R/3's architecture consists of three main layers of software (Figure 1). These are:

(1) SAP graphical user interface (GUI), representing the presentation layer;
(2) SAP application layer; and
(3) SAP database layer (Bancroft *et al.*, 1998).

These can be distributed according to specified structures and connected through a network to make them operate as a whole. The SAP GUI, which runs on the end-users' PCs in the business departments, has three main responsibilities:

(1) presenting all data to the end-users;
(2) creating all GUI components, such as windows and buttons, and taking on all user inputs; and
(3) communicating all user requests and inputs to SAP applications across the network.

Figure 1 SAP software architecture



Source: Bancroft *et al.*, 1998

The SAP application contains all the processing procedures for the business data represented by several software modules, such as finance (FI), sales and distribution (SD), material management (MM), and production and planning (PP) and many others. The SAP database is interfacing software, i.e. retrieving and storing, with a third-party database management system (DBMS) such as Oracle or Informix.

In describing the enormous benefits that the SAP software can bring to organizations, Martin (1998, p. 149) states:

> The appeal of such an integrated information system to big companies is clear. The sales force enters an order on a computer and the transaction ripples through the entire company. Inventory lists and parts supplies are updated automatically, world-wide. Production schedules and balance sheets reflect the changes. Best of all, every employee has just the information necessary for the job at hand. Feedback cycles are positive and fast. Salespeople can promise firm delivery dates and managers can gauge almost immediately the effects of decisions affecting credit terms, discounts, inventory or supply-chain management.

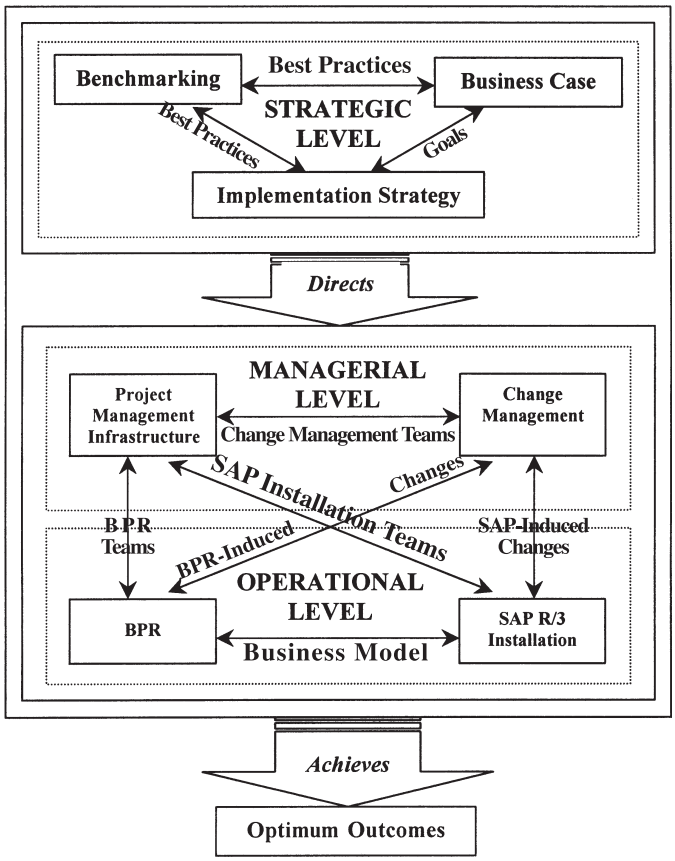
However, not all organizations embarking on SAP R/3 implementation realise these benefits (Bancroft *et al.*, 1998). Rather, they experience lengthy delays in rollout, budget overruns, inconsistent or incomplete installations and, therefore, lower benefits than hoped for. The reason is that, unlike many software installations, SAP R/3 implementation is a difficult undertaking in that its success necessitates managing adequately a complex context, which involves organizational changes across various key areas related to strategy, technology, culture, management systems, human resources, and structure. The exclusive focus on technical aspects, at the cost of change management elements, has proved to be a major source of failure.

While arguing that SAP R/3 is an effective technology for improving IT systems and business processes, and drawing on a critical study of reported experiences of several best practice organizations, this paper proposes a model for the effective deployment of SAP R/3 based on an integrative view (Figure 2) and discusses how it can be appropriately positioned.

Overview of model

The model discussed in the following sections is based upon the premise that effective implementation of SAP R/3 is greatly

Figure 2 Proposed holistic model for SAP R/3 implementation



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determined by the extent to which certain key elements are comprehensively considered and fully integrated.

The major roles of each core element of the proposed model (Figure 1) are described in Table I. The core elements are then scrutinised in the remaining sections and their working impacts and interconnectedness are illustrated with supporting representative examples from a number of leading practice organizations.

Elements of SAP R/3 implementation model

Business case

Developing a strong business case is a prerequisite for successful SAP implementation. An evaluation study of 120 SAP projects shows that 70 per cent were initiated with a business case (Stevens, 1998a). A global survey reveals that 92 per cent of the responding companies develop business cases for SAP implementation (Cooke and Peterson, 1998).

A solid business case is beneficial in that it controls a project's scope (*Industry Week*, 1998b) and ensures that it is firmly tied to business-specific results (Cooke and Peterson, 1998). It also helps to convince people of the need for change, and thus builds their receptivity and commitment to it (*Industry Week*, 1998b).

A business case must be clearly defined at the corporate level and cascaded down to all execution levels (Cooke and Peterson, 1998) so that ownership and responsibility for each targeted benefit area are secured, particularly in terms of planning and budgeting (Stevens, 1998a; *Industry Week*, 1998b). It should fit within the broader vision of the company (*Industry Week*, 1998b) and allow an equal comparison with other competitive investments (Stevens, 1998a; *Industry Week*, 1998b).

Developing a business case should always be a continuous task that starts with a conceptual vision and evolves towards a more detailed operational measure until the SAP project is completely rolled out (*Industry Week*, 1998b). To justify launching a project, a business case should initially target areas of an order-of-magnitude and immediate direct impact which, in turn, could help make a commitment to achieving rapid return-on-investment (ROI) (Stevens, 1998a; *Industry Week*, 1998b).

Experiences reported by best practice companies show how the business case for SAP implementation can be developed to address both the organizational vision and the operational measurements. Examples of these companies are Eastman Kodak (Stevens, 1997), Amoco (Jesitus, 1997; *Industry Week*, 1997), Lucent Technologies (Francesconi, 1998), Farmland Industries (*Industry Week*, 1998a; Jesitus, 1998), Jo-Ann Stores (*Chain*

Table I Description of model key element roles

Model element	Major roles in SAP R/3 implementation	Supporting studies
Business case	Provides qualitative and quantitative statements on both strategic and tangible benefits Justifies change and builds consensus on objectives	Cooke and Peterson (1998), Stevens (1998a)
Benchmarking	Captures best practices and enables transference of knowledge related to all aspects of SAP R/3 implementation	Stevens (1997), Francesconi (1998)
Implementation strategy	Describes plan for change that ensures alignment with overall corporate strategy Determines organizational principles and approach of implementation.	Cooke and Peterson (1998), Simon and Fisher (1998)
Project management infrastructure	Defines various roles and responsibilities of both internal and external entities in the implementation efforts and determines forms of co-ordination, and co-operation among them	Stevens (1997), Romei (1996)
Change management	Facilitates the insertion of newly implemented systems, processes and structure into the working practice, and deals with resistance	Stevens (1997), Jesitus (1997)
BPR	Redesigns business procedures to accommodate SAP software modules within the entire business operation	Bancroft *et al*. (1998)
SAP R/3 installation	Involves all technical activities, such as sourcing SAP applications, legacy systems migration, customisation and configuration	Bancroft *et al*. (1998), Francesconi (1998), Keller and Teufel (1998)

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Storage, 1998), Battco (Bancroft *et al.*, 1998), Owens Corning (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996), Samsung Heavy Industries (Bancroft *et al.*, 1998), Du Pont (Stevens, 1998b) and Digital Equipment Corporation (DEC) (Bancroft *et al.*, 1998).

Before embarking on SAP implementation, Eastman Kodak Co. (Stevens, 1997) developed a strong case for change. The company has about 2,600 fragmented software applications, more than 4,000 systems interfaces and 100 programming languages, all running on a mainframe-based environment, presenting both an impediment and an opportunity for the BPR efforts that were already being undertaken. Kodak wanted to reduce all these applications and interfaces down to one integrated system, based on state-of-the-art languages and operating on a common set of global corporate data. Therefore, SAP R/3 was selected for world-wide implementation across all Kodak's business lines.

As part of its efforts to secure a leading position in the global marketplace and to achieve its vision for the year 2000 and beyond, Owens Corning, a $3 billion world-leader in building material systems, embarked on a two-year initiative, Advantage 2000, to reengineer its global operations and implement SAP R/3 systems (Martin, 1998; Stevens, 1998a; Romei, 1996; Anita, 1996). Among the ambitious goals the company has defined are the following: the target of $5 billion in sales by the year 2000, strong trademark recognition, continued productivity improvement, and expansion into new products, applications, and markets. Other goals are a 6 per cent productivity improvement per year and a 1 per cent improvement in the cost of raw material acquisition. Advantage 2000 includes redefining Owens Corning's business processes to be more standardised and global, with an emphasis on speed, simplicity, responsiveness to customers, empowerment of employees, teamworking, and creation of a paper-less work environment.

Benchmarking

Benchmarking highlights the negative gaps in current performance and recommends appropriate actions to be taken in all business areas in order to bring the overall performance to the levels of the best-in-class organizations (Zairi, 1992). Through a comprehensive gap analysis, benchmarking can play a significant role in shaping the strategic direction to be taken for change introduction using SAP R/3, as it helps identify and prioritise areas of change, and makes informed decisions about the degree of change to be introduced. Benchmarking works essentially at capturing both external and internal best practices related to all aspects of SAP implementation, and enabling the transfer of knowledge across strategic, managerial and operational levels.

Companies like Farmland Industries (*Industry Week*, 1998a; Jesitus, 1998), Lucent Technologies (Francesconi, 1998), Kodak (Stevens, 1997) and Owens Corning (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996) use benchmarking to inform their strategic directions and capture the world-class organizations' experiences. Farmland Industries Inc., a $9 billion US regional cooperative owned by 1,400 local cooperatives representing 500,000 farmers, planned to implement SAP R/3 and reengineer its entire business and supply-chain system so that it remains a leader in the agriculture and foods industries well into the coming century (*Industry Week*, 1998a; Jesitus, 1998). The primary guiding principle for its efforts is to move from a separated set of business units into one integrated environment that uses standardised business processes. Therefore, it began a benchmarking exercise in 1992 to see how other agricultural companies, as well as those outside its industry, were managing similar business and IT activities.

The case of Lucent Technologies illustrates how benchmarking can be used as a strategic tool to guide the entire transformation effort at different levels of SAP implementation (Francesconi, 1998). Throughout 1994 and 1995, Lucent began a benchmarking exercise that compared its costs against those of the best-in-class firms. Together with an outside consultant who manages a database containing current data on financial processes for more than 1,100 companies, Lucent's representatives compared the company's financial processes to those of 22 large companies in different industries with revenues ranging from $5 billion to $90 billion and with staff sizes of up to 15,000 employees. The comparison shows that Lucent's costs were considerably higher than those of several companies, and that

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inefficiencies were primarily centred in the staffing and systems areas. Benchmarking also revealed that the most efficient organizations were functioning at no more than 1 per cent of total revenue. Therefore, Lucent's mission was to reengineer systems and processes with SAP R/3 to meet its primary goal of making the cost of the corporation no more than 1 per cent of revenue. Lucent also performed a benchmarking exercise at the process level, where each financial process owner began doing extensive research through professional organizations, consulting firms and publications, in order to identify industry best practices for each financial function, namely, accounts payable, payroll, accounts receivable, inventory and measurement.

Benchmarking can also be established inside organizations themselves as a means to recognise internal best practices and allow their circulation. Kodak (Stevens, 1997) demonstrated this by establishing a global Lotus Notes architecture that enables best practices to be captured and distributed to team members around the world. All internal day-to-day learning is identified by Kodak's knowledge management system and is shared globally among all employees. These daily knowledge acquisitions include information about SAP, such as scripts, test conditions, roles and responsibilities, white papers, approaches to problems, and notes of meetings.

Implementation strategy

Building an implementation strategy is essential for SAP projects (Cooke and Peterson, 1998) as it guides the alteration of tasks and workflows into integrated processes. An effective strategic discourse will determine how SAP can be implemented and the related change successfully absorbed by the organization concerned. A recent survey reports that those responding organizations which had no implementation strategic plan reported poor outcomes 90 per cent of the time (Cooke and Peterson, 1998).

Building an implementation strategy for SAP R/3 needs to be strongly based on both the business case developed and the results of the benchmarking exercise. It should also ensure a full alignment with overall business strategy. An effective strategy should contain definitions for several aspects related to implementation (Bancroft *et al.*, 1998; Cooke and Peterson, 1998; Gibbs, 1998), as shown in Table II.

The "do-it-yourself" SAP implementation strategy at GTE, a telephone operations group, demonstrates the independent approach in implementing SAP R/3 (Caldwell, 1998). GTE realised that it had sufficient tools and expertise for data migration and integration, and therefore chose not to go to any third parties for implementation. This strategy worked well for GTE and implementation was completed within time and budget.

An illustration of how implementation strategies can be developed and clearly stated is seen in the case of Eastman Kodak. It defined a number of guiding principles that determined its approach (Stevens, 1997). Some of these strategic principles were:

- The business processes were to be reengineered before the SAP project started.
- As Kodak operates as one large business with lots of shared services, one global set of configured code was to be developed for the entire corporation, enabling Kodak to use one single business model.
- A business model was to be developed to reflect how Kodak wanted to conduct its business, and not what was possible through the availability of some given piece of software.
- A global design and configuration was to be created to allow Kodak to save time and money by rolling out one system to the various divisions world-wide.
- An implementation review board of senior managers of business units and major functional organizations was to be formed to act as gatekeeper of the project's phases, review deliverables, and give approval to proceed.
- The information systems function was to be structured in such a way that it combined certain expertises, namely business management, experts in software application and infrastructure, senior representatives from Anderson Consulting and SAP, Kodak regional programme offices, and local support teams.

Project management infrastructure

An effective SAP R/3 project necessitates a wide participation from people in different business units and from different managerial

Table II Strategic considerations in SAP R/3 implementation

Mission statement
Well-defined multi-level implementation objectives
Implementation guiding principles that describe how the organization wants to go about the entire implementation effort
Approach to implementation, whether step-by-step or "Big Bang"
Scope of implementation, whether by business process, SAP module, business-line, site, or country
Project plan, describing major phases of implementation, time frame of each, and expected outcomes
Change management strategies related to leadership, communication, rewards systems, training, structure, etc.
Expected implementation barriers and approaches to overcome them
Project management infrastructure, describing roles and responsibilities of both internal and external entities in implementation
Reengineering strategy, defining methodologies, techniques and tools to be used in positioning newly redesigned processes
High level technical strategy, providing a top-level view of SAP architecture and describing how organization intends to go about sourcing and migrating to SAP modules
Auditing and measurement system by which progress can be continuously monitored against plan, and benefits in all dimensions can be measured by set of pre-defined performance indicators

levels, as well as the involvement of external parties such as consultants and customers. This critical demand falls most heavily upon a strong project management infrastructure (Bancroft *et al.*, 1998; Cooke and Peterson, 1998) that:

- defines procedures for team formation and development;
- provides a clear description of roles and responsibilities at all stages of implementation;
- determines forms and channels of co-ordination, co-operation, and decision-making among all participants;
- prevents any possible conflicts that might hamper the efforts;
- audits team performance, and identifies any management biases early on; and
- ensures a disciplined and structured project leadership.

One representative example of how SAP initiatives are managed in leading companies is the case of Owens Corning (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996). Here a ten-person steering team was responsible for guiding the process of BPR and for developing a powerful business tool that would empower the workers. The steering team formed nearly 200 full-time implementation teams from the global operations, representing all disciplines, to carry out the BPR and to customise the SAP system. Each team was responsible for a core business process and consisted of various functional and process-oriented sub-teams, such as planning and communication, process innovation, architecture, and technology application.

As seeking external help from consulting firms is inevitable for many organizations embarking on SAP R/3 implementation, the way it is managed and integrated with other roles contributes highly to the success or otherwise of SAP implementation. Product knowledge, project management and BPR are the main areas where companies require help (Caldwell, 1998). Organizations such Kodak (Stevens, 1997), Amoco (Jesitus, 1997; *Industry Week*, 1997), Owens Corning (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996) and Farmland (*Industry Week*, 1998a; Jesitus, 1998) have taken a clear approach to emphasise their ownership of their project and to ensure an effective transfer of knowledge and expertise.

At Owens Corning (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996), the consultants were used for two specific tasks:

(1) facilitating early process design; and
(2) training on technical aspects, especially the SAP components and the client/server.

To maximise the technical expertise of the consultants and build new capabilities internally, Owens Corning adopted the concept of knowledge transfer by which transference of all necessary skills to Owens Corning's employees at the end of the project was ensured.

From the outset, Kodak's (Stevens, 1997) intention was to understand the system they were developing and to be self-capable of

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supporting it in the future. Therefore, the involvement of third-party support was limited in duration and thus the people who lead Kodak became the ones who understand it best.

Change management

An effective change management ensures a smooth insertion and a minimum resistance of the newly implemented systems, processes and structures into working practice. A survey of SAP implementation experience shows that 63 per cent of the responding companies used change management tools in various stages of implementation. Of these cases, 54 per cent undertook the change management efforts before implementation began, while 78 per cent believe that change management should take place prior to the implementation (Cooke and Peterson, 1998).

There should be a strategy for change management that covers various aspects, like communication, people involvement and empowerment, and training and education, and creates a change readiness in organizational culture (Bancroft *et al.*, 1998). All that effort requires sound management processes and practices which can positively influence the success of SAP R/3 implementation, such as top management support and commitment, championship and sponsorship, and effective management of risks.

Table III illustrates how a number of best practice organizations go about implementing some change management areas as part of their SAP implementation efforts.

BPR

BPR and SAP R/3 are interdependent in the sense that BPR must be supported by integrated and process-oriented IT systems such as SAP R/3, and SAP R/3 implementation forces BPR. In other words, BPR is an indispensable and core component of SAP R/3 implementation, and SAP R/3 itself can be considered as the missing IT link to BPR.

The results of a German survey of 220 European companies implementing SAP, which was carried out by Gemini Consulting in association with Wolfgang Goethe University, showed that simultaneous implementation of BPR and SAP R/3 has proved to be the most effective and powerful method for business improvement, and that the decision to implement SAP has led companies to consider BPR (*Chemical Marketing Reporter*, 1996). Steve Stanton, a management guru, advocates adopting BPR through SAP R/3 implementation as the recommended approach for business reinvention (Restivo, 1998).

There are several approaches to integrating BPR with SAP R/3 implementation. The most effective and most frequently used approach is reengineering to the SAP business model. However, reengineering prior to SAP selection has been found by some companies to be less effective (Cooke and Peterson, 1998). In fact, the decision as to when BPR should take place in SAP R/3 implementation is highly dependent on the business situation, the motivations for choosing SAP, and the magnitude of improvement desired by the organization (Bancroft *et al.*, 1998).

BPR is defined by Hammer and Champy (1993) as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed" (p. 32).

Since a process-based design for business provides a potential for gaining competitive advantage, it is the only way through which a business can be improved to substantially reduce costs. Therefore, BPR focuses on business processes as the essence of business rather than on its functions, products or the services it delivers to customers. Davenport and Short (1990) define a business process as "a set of logically related tasks performed to achieve a defined business outcome" (p. 12). SAP R/3 itself offers a great opportunity to move from a fragmented, function-based structure that is inefficient, costly, slow and complex, to a process-based structure that is integrated cross-functionally, standardised, customer-focused and competency-centred.

BPR results in change, and successful BPR implementation requires solid organizational change in terms of organizational structure, culture and management processes (Davenport, 1993). Change management is a tool used to manage organizational change through various dimensions, such as culture, structure, performance measures and management style. Bancroft *et al.* (1998) believe that organizations which approach the implementation of SAP R/3 with an organizational change mind-set are more likely to be successful than those which focus solely on technical details.

Table III Representative best practices in SAP-related change management

Dimension	Description	Organization
Involving people early on	Critical to include representative from each business-line at level of personnel in SAP implementation efforts as early as possible	Amoco (Jesitus, 1998; *Industry Week*, 1997)
Strong and stable top management commitment	Commitments made by team leaders to operate under extensively reduced budgets seen as very helpful especially when some projects run into organizational or logistical difficulties	Lucent (Francesconi, 1998)
	Top management committed to ensure that company exceeds customers' expectations, achieves growth targets, and maintains industry leadership	Owens (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996)
Style of leadership and project management	Major decisions on SAP made by strategy group consisting of representatives from top management, HR, manufacturing, marketing, consumer imaging unit, and shared services. Group members' commitment very obvious, well positioned, and felt	Kodak (Stevens, 1997)
Use of on-line computer-based training (CBT)	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, 1998; *Industry Week*, 1997)
Establishing a knowledge transfer centre	Recognition of need for global configuration management, and adherence to global standards. Therefore, it establishes knowledge transfer centre to certify trainees as well as trainers	Kodak (Stevens, 1997)
Creating a shared service model	Development of shared-services model where similar or redundant functions performed within individual business units are combined to increase efficiencies	Lucent (Francesconi, 1998)
Structural change	Definitions of roles, responsibilities, and reporting procedures	Kodak (Stevens, 1997)
Effective communication	Establishment of extensive internal communications channels, including focus groups, newsletters, e-mail, and web-based archives, help get employees informed about new developments, and answer questions about SAP implementation	GTE (Caldwell, 1998), Owens (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996)
	Use of collection tools such as surveys, communications sessions, and conferences to keep the doors of communication open for everyone	Lucent (Francesconi, 1998)
Dealing with management resistance	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 minimise their resistance	Amoco (Jesitus, 1997; *Industry Week*, 1997)

In SAP implementation, BPR should follow a systematic and structured methodology that provides the necessary working plans, techniques and software tools to help redesign business processes, map them, and ensure their alignment with SAP processes. BPR efforts must also be strategically linked to other ongoing process improvement initiatives, if there are any, or sustained by creating incremental improvement initiatives (Zairi and Sinclair, 1995). This integration secures a longer life for the newly redesigned business processes and ensures that they are continually improved.

A performance measurement system is also needed to monitor process performance against a set of pre-defined indicators that ensure that the SAP implementation effort is well on target for achieving the desired business-centred outcomes. Kodak (Stevens, 1997), for instance, uses a well-disciplined "phases-and-gates" approach that moves projects through a series of steps of assessment and planning, design and prototyping, and delivery and absorption. This approach enforces a review of the efforts at certain checkpoints with very specified deliverable expectations in order to make sure the efforts fulfil commitment levels within the expected time and budget.

Organizations like Owens Corning (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996), the State of Kentucky (Henry, 1998), Eastman Kodak (Stevens, 1997), Amoco (Jesitus, 1997; *Industry Week*, 1997), RTL Television (Bancroft *et al.*, 1998), Farmland (Jesitus, 1998), Du Pont (Stevens, 1998b), and NEC Technologies (Bancroft *et al.*,

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1998) have all integrated BPR into their implementation of SAP.

Owens Corning began its BPR efforts by establishing a global supply-chain view that would fit all its business unit improvements (Bancroft *et al.*, 1998; Romei, 1996; Anita, 1996). This approach enabled many design teams to work in parallel, as well as resolving integration issues across process boundaries. Each process team used a standard BPR methodology, received global benchmark data, and was supported by experts in R/3 environment and the particular business processes under implementation.

Another example is the State of Kentucky (Henry, 1998), which chose American Management Systems Inc. to migrate its Management Administrative and Reporting System (MARS), an enterprise-wide financial, budget and procurement system, to the SAP environment as part of the State's extensive reengineering efforts to use a technical tool to change business processes, streamline government administrative procedures, and cut costs.

SAP R/3 installation

Though installing SAP R/3 modules is not as difficult as getting the organizational soft elements in line with all the change imperatives, its critical role in yielding optimum outcomes from implementation cannot be over-emphasised. The technical installation of SAP R/3 is usually the most costly part of implementation, since it entails the dedication of a considerable amount of money and other resources (Gibbs, 1998).

An effective installation of SAP requires an integrated approach that links together all technical phases, ensures that they are all driven by strategic principles and thus aligned with business strategic vision, and provides a feedback mechanism at all stages in order to audit efforts, discover any deficiencies and suggest the necessary adjustments for realignment.

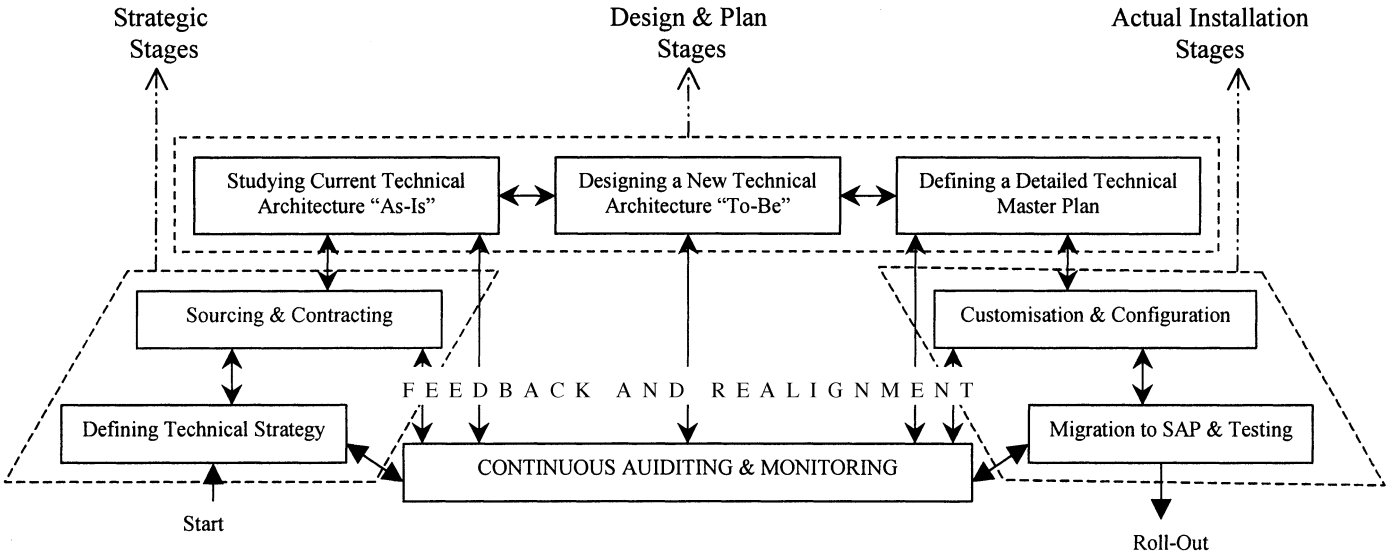
Figure 3 illustrates the major steps that are often taken in any SAP R/3 installation process (Bancroft *et al.*, 1998; Keller and Teufel, 1998). However, the emphasis in each step varies from one organization to another, depending on the current IT infrastructure status and the desired shift in forms of IT support for business processes. An effective installation of SAP begins with a high-level technical strategy that describes the new business information requirements, the shortcomings in current IT infrastructure, and a definition of future strategies and their anticipated benefits with regards to various IT infrastructure components (hardware, software, data, shared services, and human resources). It also sets guidelines and plans for other stages, particularly the sourcing decision and contracting stage. The stage of sourcing SAP and contracting with suppliers and third-party consultants is very important, since it determines the biggest chunk of the entire project budget. Also, this stage is a prerequisite for other stages and managing it adequately ensures that the project will be rolled-out as planned and within the frames of time and budget.

The third stage looks in some detail at the current IT infrastructure for the purpose of producing a full, "as-is" picture of current systems architecture and information flow between various business operations within the scope of implementation. This stage provides detailed insight into how best the current infrastructure can be migrated to the SAP R/3 environment, and in which form it can be migrated.

Based on the high-level strategy and the description of the current infrastructure, a new technical architecture is developed, that describes the "to-be" design and maps business processes into R/3 according to the business model. This architecture is built in accordance with the business processes configuration that results from the BPR process. The new architecture identifies data and systems interfaces, develops the R/3 hierarchy, and sets rules for configuring and customising SAP modules, as well as for the transition of current IT systems to the new environment.

Once the full picture of how the SAP R/3 modules will be positioned and integrated with the reengineered processes is created, a detailed technical master plan is developed to guide the process of putting the new architecture in place. This plan is actioned through the two final core stages. At the customisation and configuration stage, all activities relating to building the networks, installing desktops, creating tables, scripts and scenarios, populating the system with real data, and training on the system, are carried out (Bancroft *et al.*, 1998). This is followed by the migration and testing stage, where the old systems are switched off and the SAP systems

Figure 3 Major steps in SAP R/3 installation



go live once they have been completely tested. After the project is rolled-out, continuous maintenance is necessary to improve the system and enhance its functionality.

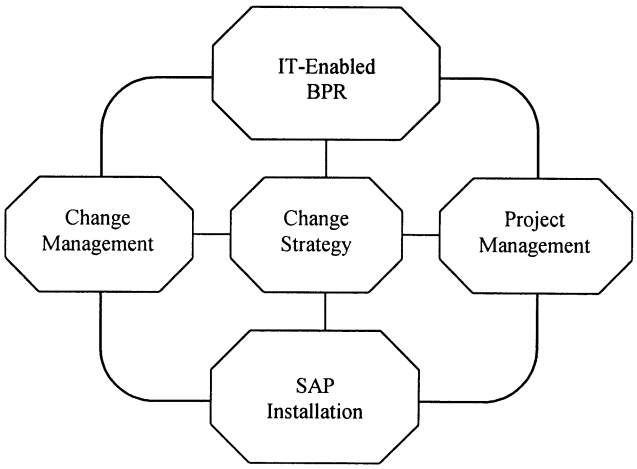
Conclusion

Just like the BPR movement, the SAP R/3 concepts and practices seem to have evolved over time from an IT-centred perspective to the soft side of change management, and have finally settled into a more holistic view which recognises the importance of processes and systems and their integration in business strategy, structure and culture.

This paper has proposed a model for effective implementation of SAP R/3, based on a holistic view. The core elements of the model, their expected roles and contributions, and the overall integrated aspects which together can result in optimum impact on performance outcomes, have all been scrutinised.

The paper has also argued that the full benefits resulting from the implementation of SAP R/3 will not be obtained unless a fully integrated and balanced perspective is taken towards linking together all essential change elements in such a way as to create a fit between the newly-reengineered business processes and their underlying IT systems. It also argued that any organization intending to implement SAP R/3 on a corporate level needs to establish its competencies in five core areas (Figure 4). These are:

Figure 4 Essential competencies for effective SAP R/3 implementation



- change strategy development and deployment;
- enterprise-wide project management;
- change management techniques and tools;
- BPR integration with IT; and
- strategical, architectural, and technical aspects of SAP installation.

The model proposed in this paper offers a great opportunity for further study and is appropriate for more empirical testing and validation across several dimensions, such as:

- scrutinising the dynamic interaction between various implementation components;
- identifying the implementation variables which determine a particular approach for a particular project context;

- developing techniques to help make appropriate implementation decisions;
- studying contextual factors that have control on the implementation process;
- identifying implementation challenges and ways of dealing with them;
- developing a set of critical success factors (CSF) for SAP implementation;
- examining the relationship between standardisation and adaptability to innovation, and ways of increasing its alignment.

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