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Kristi Jane Yuthas

Portland State University, yuthask@pdx.edu

Catherine Banbury

Darrell Brown

Portland State University

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ERPS AND STRATEGY: FIRST, DO NO HARM

Kristi Yuthas
Associate Professor
School of Business Administration
Portland State University
PO Box 751
Portland, OR 97207
kristiy@sba.pdx.edu
(503) 292-9544

Catherine Banbury
Associate Professor
Graduate Business Programs
School of Economics and Business
Saint Mary's College of California
Moraga, CA 94575
cbanbury@stmarys-ca.edu
(925) 631-4827

Darrell Brown
Associate Professor
School of Business Administration
Portland State University
PO Box 751
Portland, OR 97207
darrellb@sba.pdx.edu
(503) 725-3096

ERPS AND STRATEGY: FIRST, DO NO HARM

Abstract

ERP and other systems projects are now commonly preceded or accompanied by reengineering efforts. Traditional reengineering projects use a ‘clean sheet’ approach, in which companies attempt to design ideal processes without being bound to existing processes and constraints. When reengineering is associated with information technology (IT) implementation, the more common approach is known as ‘tool-driven’ or ‘system-enhanced’ reengineering. Under this approach, the new processes are designed with explicit attention to the opportunities and constraints presented by the capabilities of the new information system. Although IT-related reengineering approaches have matured through time, they have not kept pace with current perspectives on corporate strategy and competitive advantage. The perspective on strategy to which they implicitly subscribe is an industrial organization or industry structure model that is not sufficient to guide reengineering efforts when strategic advantage is at stake. Drawing on current, resource-based theories of strategy, this paper describes factors the organizations should consider when they wish to take a more strategic approach to process reengineering—one explicitly oriented to the creation and maintenance of sustainable competitive advantage.

ERPS AND STRATEGY: FIRST, DO NO HARM

It is interesting to note that, in an era where it is expected that IS will align itself with the goals of the enterprise, the exact opposite is happening with ERPs—the enterprise must align its processes with those of its chosen ERP! (Glass, 1998)

Introduction

The accounting activities throughout organizations today are often integrated into many of the business functions. The *value* of accounting relates directly to its ability to integrate into the overall value proposition of the business. Calls from academia, practice, and regulatory bodies emphasize the need for accounting to not merely add accounts but to add value (Randall 1999, Elliot 1994, Hunton 2002). Practitioners predict that the primary work in the near future will involve high value-added activities such as financial planning, financial analysis, and strategic and systems consulting (Albrecht and Sacks 2000, Hunton 2002). Yet one of the newest and most popular tools in the accountant's toolbox may damage rather than benefit the organization in which it is used.

Enterprise resource planning (ERP) systems have dominated new accounting system implementations in recent years, both in terms of time and capital invested (Poston and Grabski 2001, O'Leary 2000). Although a driving force for implementing ERPs is their cross-functional operations, accounting and accounting-related functions are still the highest priority drivers for implementation in most businesses. A recent study found that four of the first five modules implemented by most companies are accounting modules, with financial accounting being the first module implemented in over 90 percent of the companies (Mabert et al.2000). Given the demand that accountants add value, not just to the accounting function but to the entire enterprise, this puts a tremendous responsibility on the accountants who are involved with planning and implementing these systems. Accounting system professionals are responsible for considering not only the efficiency and effectiveness of the accounting system but more importantly, how the accounting system affects the business.

A primary benefit of implementing an ERP is the ability to pass information across the functional boundaries within an organization and across the boundaries between organizations. The efficiency with which ERPs can integrate information flows and business processes may well be the driving force for implementing these costly and time-consuming systems (Sutton 2000). In order to accomplish this, however, ERPs require relatively inflexible process implementations (Glass 1998, Sadagopan 2001, Smythe 2001, Stedman 2000). ERP system vendors gain their advantage from the fact that their systems are comprised of highly-structured, tightly-integrated components based on standardized processes. A 1999 Harvard Management Update states it succinctly, “ERPs sold by a single vendor are usually identical.” (Plotkin 1999).

Organizations must conform to the ERP processes to gain the greatest benefit from an ERP (Bingi et al. 1999, Osterland 2000). ERP software developers identify and implement “best practices” as they discover different and better ways to perform business activities (O’Leary 2000). These “best practices” are not evaluated and identified by the businesses in which the software is implemented. To take maximum advantage of the opportunities for internal and external coordination embedded in an ERP system, companies implementing ERPs must commonly redesign some or all of their underlying internal processes and their inter-organizational relationships to match those of the ERP system being implemented (O’Leary 2000, Poston and Grabski 2001). Therefore, large scale process-based systems, such as ERPs, are commonly accompanied by business process reengineering.

When companies reengineer processes in conjunction with a large-scale IT project, they tend to forgo the ‘clean sheet’ approach of designing optimal businesses models unconstrained by existing structures and systems (O’Leary 2000). Instead, they use a ‘technology-enabled’ approach, in which design aids or ‘best-practice’ templates provided by the software vendor are used to guide process (re)design (Bingi et al. 1999, Glover et al. 1999, Poston and Grabski 2001). The latter approach helps to ensure that the resulting designs can be supported by the ERP when the system is developed, and speeds the deployment of these systems (O’Leary 2000; Rosemann 2000). Indeed, research shows that overall information technology (IT) contribution to improved productivity often goes hand-in-hand with changes

in organizational structure, redesigned processes and investments in human capital (Hitt and Brynjolfsson 1996, Hitt and Brynjolfsson 1997, Brynjolfsson and Hitt 1998).

Hitt and Brynjolfsson (1997) find, however, that the improved productivity does not mean improved profitability. They find that “profitability results suggest that, on average, firms are making IT investments necessary to maintain competitive parity but are not able to gain competitive advantage” (p. 139). Where competitive advantage is based on unique processes and competitive parity is based on adopting “best practices” or some other standardized processes, firms that implement ‘off-the-shelf’ ERP packages may actually forego advantage for parity¹(Schroeder et al. 2002). Most ERP vendors provide reference models to assist them in configuring the software and to guide their choices for process reengineering (Rosemann 2001). Rosemann (2000, 2001) identifies several ways in which vendors’ use of these reference models whereby they end up fitting the client’s processes to the software rather than the software to the client’s processes, limit the value of reengineering².

Reengineering processes to meet the requirements of ERP packages can lead to tremendous time and cost savings, but they can also have a profoundly negative affect on the competitive strategy and core capabilities of the organization (Schrageheim 2000). For example, Dell Computer avoided the negative

¹ As pointed out by a reviewer, what we call “competitive parity” is actually just the potential for achieving competitive parity. In order to achieve competitive parity, the ERP user would need to be as efficient and effective with the enterprise system as other users within the industry.

Another comment received was that many organizations “would be thrilled to achieve competitive parity”. This is certainly true, and is a valid reason for some organizations to implement an ERP. Our paper addresses issues of loss of competitive advantage due to standardization of processes and due to loss of creativity and unconventional thought when using ERPs. The optimal result is to have a well-coordinated information system without sacrificing these competitively advantageous traits in an organization.

² Rosemann (2000, 2001) notes that the reference models are limited in the following ways:

1. the models do not show what configuration alternatives exist,
2. the models ignore enterprise-individual interactions, business objectives, and manual tasks,
3. the models do not clearly show the consequences of a change in one process on other processes, and
4. the models are not linked to the actual execution of the process or the database design.

⁴ For example, a dominant vendor of ERPs provides a sales tool that is segregated by industry. The implication is that each member of the industry can be well-served by adopting a (similar) set of components from the set provided by the vendor (SAP 2000).

effects when it chose to forego an enterprise-wide implementation of an ERP. Dell found that integrating all operations made the ordering, manufacturing, and other systems too cumbersome to rapidly respond to changes in a dynamic business environment (Martin 1998, Stein 1998). In addition, once an ERP is in place, there are significant costs involved with changing the associated business processes—often a source of competitive advantage to organizations (Glass 1998, Williamson 1997). These potentially huge trade-offs are rarely addressed in the scramble toward rapid implementation (Glass 1998).

The purpose of this paper is to identify ways that ERP-related process engineering projects can capitalize on recent understanding in strategy to protect and promote competitive advantage. The paper begins with a brief review of the literature relating business processes, information technology, and competitive strategy. It then uses key tenets of resource-based perspectives on competitive strategy to explore how process designers can use this information in reengineering projects to avoid doing harm to the company's existing sources of competitive advantage, and to encourage ongoing development of future sources of advantage.

Strategy and Competitive Advantage

Industry structure perspective

Porter's 'five-forces' model (1980) is a seminal work in the industry structure perspective of strategy. Porter suggests that the competitive strength and profitability of firms in an industry is a function of the strength of five forces: rivalry among competitors, potential new entrants, firms offering substitute products, and bargaining power of both suppliers and customers. By introducing an enterprise-wide system, a company can temporarily improve its competitive strength vis-à-vis its competition and raise the costs of competitive entry, thereby raising the barriers to entry. Once implemented by one firm in an industry, (if ES systems do improve firm performance), we would expect competing firms to be fast followers. Since ES systems, though valuable are not rare and are relatively easy to imitate they are not likely to be a source of competitive advantage, but they do provide a means by which firms may remain competitive and raise the cost of entry. Potential competitors are forced to make similar investments in

technology to obtain the cost and transaction efficiencies of firms with enterprise systems. Enterprise systems can also increase a firm's bargaining power over customers and suppliers by increasing the costs they must incur to switch to a different trading partner. To the extent that use of the system translates into cost decreases or service improvements, the system can reduce the threat of substitutes. These factors combine to strengthen the competitiveness of firms in the industry.

Another well-accepted concept in the industry-structure literature is Porter's idea of generic strategies. Porter argues that within an industry, firms compete through generic strategies emphasizing cost leadership, differentiation, or focus (1980). Research exploring the relationship between IT and competitive advantage have relied heavily on Porter's arguments to speculate on how IT can promote advantage (Booth and Philip, 1998). However, neither the five forces model or arguments based on Porter's generic strategies address firm heterogeneity, and subsequently the types of resources that are most likely to generate a competitive advantage.

Vendors of enterprise systems subscribe to an IT-based approach to competitiveness that is implicitly based on the industry structure perspective of advantage. Their web sites are filled with examples seeking to demonstrate that IT systems offer new ways to compete through cost reduction and differentiation. They also recognize that competitive conditions and strategies vary across industries. Thus, in addition to 'generic' enterprise systems that can be tailored to fit a variety of firms, vendors have created numerous industry-specific models that incorporate the 'best practices' for the particular industry. In the industry packages, these practices are inter-linked, creating pressure for the firm to adopt the entire system and keep customization to a minimum.

Resource based perspective

Although there is evidence that industry structure is related to profitability, industry structure provides only a partial picture of competitive advantage (Rumelt, 1990, Brush, 199xx??). The resource-based view helps complete the picture. From a resource-based perspective, if all competitors within an industry introduce similar technologies and routines, which seems to be the goal of ERP providers⁴, the

industry can be strengthened but individual firm advantage is not improved. Advantage to individual firms, however, accrues when they have capabilities that are valuable and idiosyncratic, imperfectly imitable, and non-substitutable (Barney, 1991). So while a firm's *failure to deploy* effective technologies can lead to a competitive disadvantage, *deploying* them can allow a firm to 'catch up' to its competitors but cannot provide it with a competitive advantage.

The linkage between a firm's business processes and its ability to achieve and sustain competitive advantage is now widely accepted in the strategy literature. Hamel and Prahalad (1994) are perhaps the most well known theorists promoting the argument that business processes often are an important source of competitive advantage. These theorists work within the resource-based view of strategy. Barney (1991) lays out the basic arguments of this perspective as follows. Competitive advantage is a function of a firm's physical, human, and organizational resources. To provide competitive advantage, these resources must be valuable, rare, imperfectly imitable, and non-substitutable. By definition, any resource that can easily be bought or sold in the market place cannot therefore provide competitive advantage.

Prahalad and Hamel (1990) have argued that the resources that are most important to the firm are usually not material assets, but are those embedded in business processes. They have popularized the term 'core competencies' to refer to those processes that provide the foundation for a firm's ability to compete effectively and capture abnormal returns. The resource-based view sees the most valuable use of information systems as complementing unique processes rather than as inherently providing competitive advantage (Booth and Philip 1998).

Strategic Implications of Business Process Reengineering

Re-engineering, ERPs and strategy

The classical view of reengineering, according to Davenport (1995), describes reengineering as "the radical redesign of broad, cross-functional business processes with the objective of order-of-magnitude performance gains, often with the aid of information technology." In reality, most reengineering projects fall somewhere between this ideal and the modest incremental changes associated

with continuous improvement and other initiatives. Davenport (1995) reviews the literature on business process reengineering (BPR) and identifies its three key components: its attention to broad, cross-functional processes, its emphasis on “clean sheet” design, and its use of IT to enable new ways of working. Despite the high failure rate suggested in the business press, empirical research suggests that most companies do succeed at creating better work designs through reengineering efforts. Those that succeed attribute their success to such factors as managerial support, effective teams, and adequate investment of resources (Davenport, 1995).

In the early days of reengineering, IT was used as a tool to support BPR efforts. Today, it is often the reverse. The enterprise systems being implemented in many large functionally organized companies are process-based. Thus, implementation of the ES is generally accompanied by reengineering efforts that affect all units and activities employed in the system (Laughlin 1999). Indeed, advice for successful ERP implementations often emphasize that changing, obliterating, or re-organizing processes is a critical factor (Plotkin 1999, O’Leary 2000). This paper looks at BPR efforts coincident with implementation of ERP process-based systems.

When a firm implements enterprise-wide systems, it must shift to a process-based conceptualization of organization, which requires the firm to reengineer its business processes. In implementing these systems, there is an inherent trade-off between accommodating the firm’s current processes and modifying them to allow for rapid implementation of the system (Davenport, 1997). These systems can be very large, and companies spend millions of dollars on their full deployment. In their haste to get the new systems up and running within time and budget constraints, firms often accept the ‘best practice’ process templates provided by the vendor rather than work through the lengthy, costly, and risky process of customizing the system to support the firm’s ideal processes. Thus, in implementing these systems, companies engage in a balancing act between effectiveness and efficiency. When firms choose to implement these ‘vanilla’ systems, in which customization is minimized, the benefits tend to come from improvements in efficiency as opposed to effectiveness.

In summary, ERP implementations are costly and time-consuming efforts that increase information integration and flow throughout an organization, and potentially to its suppliers and customers. These implementations may, at times, provide early adopters with a temporary competitive advantage. For example, ERPs may contribute to the ability of a firm within the industry to be a cost-leader. The advantage however, is likely to be short-lived, as others within the industry can readily adopt the same software, theoretically achieving the same results. Once these systems are adopted by other firms in the industry, they become part of the norms of doing business in the industry, and the associated benefits are accrued at the industry level by increasing the barriers to entry and, sometimes, increasing the industry's power over suppliers and customers. From a resource based view of strategy implementation of ERPs do not provide a competitive advantage. In most instances the integration and efficiency benefits are dependent upon the organization reengineering its business processes to conform to the processes supported by the software. Reengineering to adopt business processes supported by the software, by definition, reduces and eliminates idiosyncratic process differences—the very things that create competitive advantage. Resource-based theories of strategy emphasize the importance of a firm's idiosyncratic processes in generating and maintaining competitive advantage. Therefore, reengineering a company's core processes to accommodate ERP implementation could destroy the source of the company's competitive advantage and damage its ability to compete. Barney's (1991) characteristic of inimitability is replaced with standardized, identical processes across the industry.

ERPs provide, for many companies, needed integration and efficiency. The goal of a superior implementation would be to achieve these benefits without sacrificing competitive advantage. Using a resource-based perspective of competitive advantage, we examine ways that companies can protect and promote competitive resources through their reengineering efforts. We next discuss the strategic implications of business process reengineering, and then identify a variety of resource-based strategy perspectives and discuss how each perspective can inform the reengineering effort to mitigate the loss of competitive advantage.

Linking re-engineering and ERPs to strategy

Although the benefits of increased integration and efficiency can be dramatic, the strategic implications of system-related reengineering efforts have not been carefully addressed. Davenport (1997), in his best-selling book on enterprise systems, briefly discusses the need for a link between enterprise systems, such as ERPs, and strategy. Companies, he argues, do not spend enough time considering how the enterprise systems will affect the firm's competitive position. Davenport suggests that firms think about the strategy/system relationship before making systems decisions by asking questions such as 'What are my current sources of competitive advantage?' and 'Will the enterprise system bring about new strategic capabilities that may be useful in the future?'. A corollary question would be "how will implementing an enterprise system effect my unique processes."

Nolan (1995) also recognizes the importance of the strategic focus in reengineering efforts. He argues that reengineering takes place within the strategic context of industry structure, competitive strategy, and cooperative strategy. He provides examples of how reengineering has affected each of these contextual aspects. For example, flexible manufacturing has reduced capital requirements, logistics management has improved cost efficiencies, and online ordering has improved shipping performance. Nolan suggests that for effective redesign, business process and IT redesign should be simultaneous and also recursive, so that the processes can continually be made more effective, and the company can avoid lagging behind its competitors. In doing so, he argues that firms can move beyond the "make-and-sell" strategies of the past to a "sense-and-respond" strategy more attuned to today's environment and opportunities.

Venkatraman (1994) takes a broader view of business strategy, as he explores five levels of business transformation. The first three have the traditional efficiency focus embraced by Hammer and Champy (1993) and most of their successors. In these three levels, respectively, firms use IT to achieve local efficiencies, integrate internal business processes, and redesign internal business processes. To these he adds two additional levels designed to enhance the strategic capabilities of the firm. The first of these is termed business network redesign. At this level, IT is used to enhance interdependent

relationships between a firm and its constituents through shared transaction processing, process linkages, and knowledge. Venkatraman's highest level is business scope redefinition, at which IT becomes a source for new strategic opportunities. For example, software developed to enhance a firm's effectiveness can become a product marketed to other firms. Venkatraman argues that IT's potential benefits can be exploited when IT is viewed as a source of opportunity for redefining an organization's strategies.

Keen (1997) has gone much further than the other authors in analyzing the direct link between processes and competitive advantage. He suggests that when firms consider process changes, they must first consider the strategic importance of the processes they address. He provides a detailed method for doing this. He argues that many firms have engaged in large reengineering efforts that have failed because they have spent too much effort reengineering the wrong processes. The dramatic increases in process performance enjoyed by these firms have not translated into improved financial performance for the firm. Keen (1997) provides a detailed method for considering the strategic importance of processes. He introduces the concept of 'salience' as a means of determining the strategic importance of business processes, arguing that reengineering efforts should be focused on those processes that have the strongest influence on the organization's distinctive identity and organization's ability to accomplish its primary objectives.

In the following sections we incorporate insights from current literature in strategy to improve and inform reengineering for ERPs. We identify several key strategic aspects of business processes which IT personnel involved in projects involving reengineering can use for thinking through how processes can best be designed. These insights can be used to identify how proposed changes to business processes might affect the firm's long-term competitiveness.

Strategic Aspects Of Business Processes

Firms implementing enterprise-wide systems have the potential to make large and enduring changes to the processes that underlie competitive advantage. From the resource-based strategy literature,

we have identified six types of business processes (operational, contextual, identity, managerial, relational, and sustainability processes) which may be sources of competitive advantage to organizations. Each of these types of processes have potential for both providing competitive advantage and, importantly, for disruption or destruction through reengineering for implementing ERPs (????????Sentence does not make sense????????). Table 1 lists the types of processes and provides a brief summary of the ERP and resource based views of each type (????????Do we have sources/references for this typology????????).

Operational Processes

Operational processes are a collection of tasks that take inputs and transform them into useful outputs. The ultimate outcomes of a chain of processes that runs through an organization are the products or services that flow to the customer. Inputs to a process include labor, material, energy and capital; outputs are goods and services. The performance of these processes is measured by comparing the quantity of outputs to inputs to determine the productivity or efficiency of the processes. Process speed and product quality are also commonly used performance measures (see Simons 2000 for a review of performance measures for business strategy). Operational processes are generally viewed as rather mechanistic, with predictable outputs from defined inputs. Consultants and practitioners often advocate changing these processes to improve productivity (Gunn 1999).

Many tools have been developed for describing operational processes. The most basic of these tools is the process flow diagram. The diagram uses symbols to represent tasks, stores, and flows of materials and information. When processes are represented in these terms, they appear as a simple sequence of tasks and flows that can be assembled and reassembled as needed to improve performance. This representation often guides managerial thinking about operational processes. Often overlooked in analyzing processes is the *knowledge* embedded in the processes. Like skills possessed by an experienced craftsman, processes develop and evolve over time through experimentation, repetition, and revision. The

resulting processes have a history and incorporate lessons contributed by organizational actors over time (Nelson and Winter 1982, Johnson 2001).

Through its processes or routines, which embody knowledge developed over time and through practice, the organization itself can be seen to possess knowledge (Johnson 2001). Tyre and von Hippel (1997, p. 72) state that “collaborative processes are important because no one person embodies the breadth and depth of knowledge necessary to comprehend complex organizational problems” and because explicit knowledge cannot fully address such problems.

Knowledge, to some observers, comprises the principle source of a firm’s economic rent (Grant, 1996). Knowledge itself includes language, forms of symbolic communication, statistical competence, shared meaning, and recognition of individual knowledge domains (Spender, 1996). Latour (1996) suggests that knowledge itself, is better characterized as a process than as an object, is contained within actor networks and is continually evolving.

Management literature often differentiates between two types of knowledge: explicit and tacit. Explicit knowledge is knowledge that can be articulated and therefore transferred from one individual or organization to another. Tacit knowledge or know-how, however, is difficult to communicate and is revealed through its use. A person is knowledgeable if he can act intelligently, even if he is unable to describe the actions involved (Giddens 1984). Because tacit knowledge is difficult to appropriate and cannot be purchased, it has the potential to be a source of competitive advantage.

Conceiving of processes as the embodiment of hard-earned tacit knowledge versus a set of sequential tasks has important consequences for process designers. First, process designers who recognize that processes contain knowledge may be more attuned to the risk to knowledge associated with reengineering. When processes are modified or ‘obliterated’ to use Hammer and Champy’s (1993) term, the potential for loss of tacit understanding embodied in that process is great.

Designers therefore have the responsibility to attempt to discern the knowledge inherent in processes and to make explicit those knowledge components critical to a sequence of events. This

requires selectively focusing attention and action toward this end⁵. The goal of this attention is to make the knowledge embedded in a process explicit through efforts to understand, reconceptualize and objectify it. This is, of course, difficult. Knowledge is subject to different interpretations and is difficult to disaggregate from its context. It is clear, however, that knowledge is less likely to be discerned if it is not being looked for. Designers must seek to understand how processes evolved, what unsuccessful alternatives have been attempted, and how constituents view the effectiveness of the process.

It is also important for designers to recognize the interrelatedness between the process and the actors carrying it out. The networks of actors have developed ways of conducting and integrating their tasks that rely on common or shared knowledge. When a process is redesigned, the actors end up in different organizational positions with new work relationships. As many a failed implementation will attest, individual's knowledge and skills do not always transfer readily to a new set of routines.

This is not to say that knowledge is maximized by maintaining the status quo. To the contrary, Tyre and Von Hippel (1997) argue that learning occurs through interaction, and when individuals interact in multiple social and physical settings, they apply what they know and can (and do) create new knowledge. As it is difficult to discern knowledge, it is also difficult to predict its trajectory in light of organizational changes. Nonetheless, viewing processes as knowledge-laden and attempting to extract and preserve the knowledge can reduce the potential damage done by reengineering operational processes.

Contextual Processes

In a firm, business processes are tightly interwoven with structures such as policies, lines of authority, and control over resources. These structures influence the emergence and evolution of processes, both constraining and enabling them. Each organizational setting presents a different combination of processes, resources, and organizational structures which together help determine which

⁵ An example of focusing attention and action might be, prior to the redesign of processes and systems, the organization undertaking development of an organizational memory information system (Wijnhoven 1999) to capture and institutionalize the knowledge inherent in the current processes and systems.

tasks are performed and how they are performed. These organizational characteristics develop over time as a result of managerial decisions and investments in combination with changing features of the firm's industry and other environments. Teece et al. (1997) suggest that routines relating to coordination are firm specific. They argue that innovations such as the introduction of new production or information technology, even when the change is quite small, can be devastating to some firms. Thus, the replication of organizational best practices may be impossible when appropriate structural support is not available. At a minimum, adjusting the organizational context to accommodate new processes takes time and effort.

Understanding the embeddedness of processes within a rich and complex organization context is important in reengineering efforts. Enterprise system vendors promote 'best practices' that are by definition independent of context under the implicit assumption that they will benefit any organization into which they are introduced irrespective of the organization's environment (Harris 2000). A common example of problems arising from this perspective is in the use of common codes such as part numbers, to allow global integration of inventory management processes. This design feature requires centralized decision-making, reducing the flexibility and autonomy of organizational unit decision makers. Centralization may be desirable in some situations, flexibility and autonomy in others. The answer is embedded in context.

ERP vendors have long recognized the interrelatedness of business processes, and one of their most important features is their ability to provide an integrated network of processes. For example, since the successful introduction of just-in-time inventory systems requires coherence with manufacturing and purchasing/receiving routines, ERP vendors traditionally offer IT solutions that help integrate these functions. However, the software does not address how these solutions will fit with, for example, traditional lines of authority and reporting relationships, or even with IT governance structures. The idiosyncratic nature of organizational structures makes the context of the processes in different organizations virtually impossible to predict.

Business process designers, therefore, must be aware of the importance of organizational structures, and must develop an understanding of how the structures relate to the processes to be

reengineered. Both exploring and managing these relationships can be critical to the success of the system, but are not part of the skill set of the typical process designer. One important way designers can address this problem is through the makeup of the reengineering team. The team should include organizational strategists who understand the organization's sources of competitive advantage and the interdependencies among these sources. The team should also include experts, preferably from within the organization, on change management. These members would have the charge of exploring how contextual features of the organization must be changed to accommodate introduction of new processes associated with the enterprise system, and how these changes can best be accomplished.

Identity Processes

Most analyses of processes fail to address the relative contribution of individual business processes to competitive advantage. Core competencies are distinctive capabilities of the firm, dependent on experience-based knowledge that is acquired, developed, and improved over time (e.g. Prahalad and Hamel, 1990), that allow the firm to compete effectively (Teece et al. 1997, Barney 1995). All processes, however, do not meet the requirement for creating sustainable competitive advantage. To create and sustain competitive advantage the processes must be rare, difficult to imitate or duplicate, and contribute positively to performance (Barney 1991). When reengineering processes for implementing ERPs, the choice of which processes to reengineer may determine the success or failure of the implementation. Additionally, the choice of which to reengineer may determine whether or not core competencies are preserved.

There is much evidence of reengineering efforts that fail to use competitive advantage as a driving framework in system design (Keen 1997). Keen documents several examples of firms that have successfully reengineered business processes (from a local efficiency perspective) but have ultimately failed to translate this success into organizational effectiveness. Keen refers to this problem as the process paradox, and argues that this is due to mis-located investment to reengineer processes that do not contribute to strategic capabilities.

Keen (1997) provides a taxonomy of processes based on the process' 'salience' or importance in securing the firm's competitive identity. He suggests that organizations should identify all major processes and categorize them according to their salience prior to beginning work on reengineering. Processes most closely associated with the firm's competitive identity are called 'identity' processes—for example, overnight delivery activities for Federal Express. Processes not as visible to customers, but still vital for maintaining competitive identity are 'priority' processes, such as airline maintenance. 'Background' processes are functions, such as payroll, that provide support for daily operations. 'Mandated' processes are those required by law, such as filing tax forms.

Once a process's salience is determined, it can be further identified as either an asset—adding value to the organization, or a liability—diminishing value (Keen 1997). This view of each process helps the firm assess the investment that should be made to either preserve or reengineer the process. After identifying its processes, a firm has three basic choices with regard to redesigning them—abandon them or adjust them in a minor way, enhance them, or subject them to basic or foundational change. Keen (1997) suggests that firms protect their identity processes and continually improve their priority processes. Background and mandated processes that have become liabilities to the firm should be outsourced—or converted to best practices.

Although he advocates a clean-sheet approach to BPR, Keen provides valuable insights for tool-driven reengineering projects such as for ERP implementation. To begin, designers ascertain the salience of each process. This is not a small add-on to the reengineering project, but a new and complex dimension. As companies identify their processes, they must also determine how these processes contribute to competitive advantage. Thus, strategists and top-level executives should be involved in the identification and categorization of the company's core processes.

When the firm determines its identity processes, these processes should receive special attention in reengineering efforts. As these processes form the core capabilities of the firm they are by nature firm specific and attempts to reengineer them to fit system capabilities can be particularly problematic. Replacing identity processes to accommodate a new system jeopardizes the firm's sources of advantage.

If a firm begins its process mapping activities prior to the selection of a vendor, it can attempt to choose a system that will support its identity processes. If a vendor has already been selected, special effort can be made and resources devoted toward configuring the system to accommodate key identity processes.

Unlike identity and priority processes, background and mandated processes may be good targets for replacement with best-practice templates. As these processes are less critical to the company's success they may be easily replaced by generic processes. These processes probably received less attention than others over time, and may be less modern and efficient than more important processes. Where this is true, use of best practices can lead to large productivity gains.

A final suggestion for process designers is to give careful consideration to processes they seek to add. Designers should not be tempted to incorporate functionality just because it is available in the system or because of institutional pressures. Keen (1997) argues that designers create problems when their thinking is bounded by industry traditions. When additions are made, it should only be because they can contribute in a meaningful way to advantage or they can reduce the drain caused by background and mandatory processes. Simply adding on extra background processes most likely represents an unprofitable investment of resources.

Managerial Processes

Competitive resources can be physical, human, or organizational (Barney 1991). Organizational resources include both operational and managerial processes, where the higher-level managerial processes are often the foundation of competitive advantage (Teece et al. 1997). Managerial processes include routines for integrating and coordinating internal activities (operational processes) and external relationships (Teece et al. 1997, Dyer and Singh 1998). Examples from authors such as Garvin (1998) and Clark and Fujimoto (1991) provide evidence suggesting that production routines were not as important in generating advantage as were managerial processes.

Most information technology change drives changes in the managerial processes and skills necessary to adapt to differing interactions with employees, infrastructure, and value chain partners.

Bresnahan et al. (2001) identified organizational redesign, as a response to technology change, as more important than the change itself in disrupting managerial processes. Despite the obvious strategic importance of managerial processes the process reengineering literature focuses heavily on operational processes. In his book, Keen (1997) notes that there is an overemphasis on workflows with little attention being paid to coordinating processes. Process handbooks such as MIT's eBusiness Process Handbook (2000) include mostly operational processes. Process diagramming tools and process modeling software are well equipped to accommodate the resources, tasks, and flows associated with workflow processes but typically ignore or shortchange managerial processes.

ERP vendors do recognize the importance of certain managerial functions such as interpreting key success indicators and maintaining relationships with organizational constituents, and provide tools for these functions. These systems accommodate only a small subset of managerial processes, however, and the rest can be easily overlooked in reengineering efforts. Process tools supplied by the vendors of ERPs are far better developed in operational areas. Nonetheless, managerial processes are critical in supporting these workflow processes and in providing other important strategic functions. For managerial processes not addressed by blueprints, leaving their redesign to chance can be equally problematic. When underlying work flows change, managerial processes must also change. Managerial processes that are critical components of competitive advantage are unique and can rarely be successfully replaced by generic templates. Designers must attempt to identify, categorize, and then protect or improve important managerial processes.

Process designers must not focus their reengineering efforts on only those processes for which acceptable tools exist. They must recognize that by following traditional reengineering methods important strategic processes are often left out. To address this problem, they must seek out tools to accommodate the identification and modeling of competitively important managerial processes.

Relational Processes

The relational view of competitive advantage recognizes that important business processes span organizational boundaries, and that these relationships between firms provide an increasingly important source of competitive advantage (Dyer and Singh 1998, Rindova and Fombrun 1999). Dyer and Singh (1998) argue that competitive advantage can be gained when business partners possess idiosyncratic inter-firm linkages and present four potential sources for relational advantages: asset investments such as physical proximity of plants, knowledge sharing routines such as collaboration on patents, complementary resource endowments such as foreign production and local distribution, and effective governance such as the use of self-enforcing agreements. Rindova and Fombrun (1999) identify a set of reciprocal processes between a firm and its constituents which enable competitive advantage, relying upon the development and operation of these relationship processes interactively and iteratively.

Relational processes range from improving reputation through credible communication to increasing effectiveness through alliances with complementary organizations to decreasing transaction costs by entering into self-enforcing agreement with trusted trading partners. These sources of competitive advantage rely heavily on unique relationships with specific alliance partners that often cross firm boundaries. As the movement toward outsourcing, alliances, and “virtual organizations” accelerates, the number and importance of cross-boundary processes increases. As with internal processes, these include both operational and managerial processes and can contribute in varying degrees to the organization’s competitive advantage.

The importance of cross-firm relationships is well recognized in the IT realm. Increased attention to internet-enabled implementations, support for XBL standards, and customer relationship management and supply chain modules by ERP vendors shows they recognize the importance of inter- and intra-organizational connectivity. Along with these changes, enterprise systems that have historically focused on optimizing local resources are beginning to turn attention toward optimizing resources across the supply chain. Companies forming these relationships are recognizing the advantages to be gained by

crossing firm boundaries just as they have by crossing functional area boundaries within the firm (Kanter 1994).

BPR efforts, however, tend to focus on local optimization, and emphasize internal efficiencies and effectiveness. Process modeling approaches and software to support them are designed to incorporate only activities taking place within the focal firm. Activities performed by external members of a firm's organizational field are represented only as inputs and outputs to the firm's processes. Process designers must therefore emphasize looking for cross-boundary processes, particularly those that can be important sources of competitive advantage for the firm. Designers should seek out and map these along with the other existing processes, and give them adequate consideration and analysis when determining which processes to preserve, which to enhance, and which to re-engineer.

Firms currently not making competitive use of cross-boundary processes may be overlooking potential risks and may be missing untapped sources of advantage. Current advances in enterprise systems accommodate and even prioritize cross-boundary applications such as supply chain and customer support functions. Designers can work with other team members to explore options for capitalizing on such processes.

As they explore cross-boundary processes, designers should remain cognizant of the fact that these processes only contribute to competitive advantage under certain conditions. As with intra-firm processes, these processes fit within their organizational and industry contexts. When one trading partner attempts to modify these arrangements, both partners will be affected. Routines for knowledge sharing and governance may be profoundly affected by small changes in each participating firm's processes. Hence understanding critical interdependencies is another issue that needs to be addressed by system designers.

Sustainability Processes

The final and perhaps most important category of processes are those that help ensure the sustainability of a firm's competitive advantage. The arguments and suggestions advanced above may be sufficient to ensure, at a minimum, the protection of a firm's competitive advantage and its sustainability

over time in a relatively stable business environment. However, most industries today are subject to ongoing and increasingly rapid change, and in some industries, the pace of change is frenetic. For dynamic industries, regardless of the nature of the firm or its products, two core competencies rise to critical importance: the ability to learn and the ability to adapt.

In recent years, research on competitive advantage has begun to emphasize dynamic capabilities and the important role knowledge plays in a firm's ability to continually recreate itself to remain competitive over time. Teece et al. (1997) present a 'dynamic capabilities' argument which suggests that in addition to managerial processes, critical sources of advantage lie in the firm's learning and reconfiguration/transformation processes. Learning processes allow a firm to improve upon the performance of current activities and to identify new opportunities for improvement. Reconfiguration/transformation processes allow the firm to take advantage of what it has learned by redeploying its investments and processes to support organizational renewal.

Knowledge-based theories of the firm also emphasize dynamic capabilities. Hall (1992, 1993) argues that knowledge and knowledge-based intangible assets are the key competitive resources of the firm. Grant (1996) views the firm as an institution for continually organizing and integrating the specialized knowledge of individuals. Spender (1996) views knowledge as a dynamic process housed within actor networks. Knowledge-based views suggest that to maintain their effectiveness in an era of rapid change, organizations must constantly add to and reconfigure their processes "to create resource configurations that have advantage" (Eisenhardt and Martin 2000, p 1117xxx).

Enterprise systems acknowledge the importance of knowledge management, and emphasize the benefits of integrated data warehouses over isolated data marts. Although these systems generally collect and store important information they are short on interpretive routines that help firms translate this information into organizational knowledge that can be used strategically. System vendors certainly recognize the importance of measurement as a precursor to learning, and have incorporated modules that accommodate, for example, critical success factors or balanced scorecards. ERPs, however, create a model that inherently frame and limit how sustainability processes will "learn" (Baskerville et al. 2000).

They have not yet developed ways in which their depositories of information can be leveraged to generate ‘sense and respond’ strategies so necessary in hyper-competitive environments.

Similarly process designers recognize the importance of knowledge management. Reengineering projects often differentiate ‘information processes’ from operational and managerial processes. Wang, Lee, Pipino and Strong (1998) represent a knowledge-as-resource perspective similar to that adopted by process designers. These authors suggest that to take advantage of information, companies need formalized processes to manage its production, valuation, consumption, and elimination. Although these processes are certainly important, they traditionally do not extend much beyond traditional feedback loops that seek to learn about and improve upon those activities currently pursued by the organization. While pursuing efficiency in these activities may certainly be important, if their relevance to strategy is not explicit, they are unlikely to contribute to competitive advantage let alone sustain it.

Blumentritt and Johnston (1999) go beyond these authors to focus more heavily on the use of information to create useful knowledge. They argue that while information can be produced and transmitted, knowledge exists only within an intelligent system. They note that relatively little attention has been paid to processes associated with translating information into knowledge and identifying and managing organizational knowledge. For example, they argue that as information is created, it is automatically distributed to those who can use it to create new knowledge. Process designers can seek to identify existing reservoirs of knowledge and to develop processes to ensure that they are continually fed with a supply of relevant information.

As discussed above, transforming the organization to capitalize on what has been learned is also becoming a critical capability in dynamic environments. To accommodate ongoing transformation, process designers should explore the flexibility of both existing and proposed processes. Implementing a new system can be akin to ‘pouring concrete’ around work and transaction flows, but this need not be the case. Davenport and Beers (1995) suggest that organizations can and should be open to continuous reengineering, as has been emphasized in quality management programs. To do so, organizations must not only measure information about organizational performance, they must also have processes for

capturing and using information about the processes themselves. These authors argue that even the most process-oriented firms fail to effectively manage information about these processes. They suggest that managing a base of information about the performance and relevance of processes can provide a source for effective business transformation.

Concluding Remarks

It has become commonplace to argue that the most ‘successful’ implementations of enterprise-wide systems are the most ‘vanilla’. Implementers are told that, whenever possible, companies should modify their business processes to accommodate the functionality of the system they are implementing. We have argued here that pursuing reengineering in this fashion firms are in fact opting for competitive parity and are overlooking the critical relationship between a firm’s unique business processes and its ability to achieve and sustain competitive advantage.

In this paper, we have explored the strategic character of business processes, and have developed several suggestions for process designers seeking to promote strategic advantage. Pursuing these suggestions will be difficult, as in many instances, it can mean that processes cannot be accommodated by the information system, and some form of customization will be required. Pressures to modify processes to accommodate system choices will perhaps be even more intense for late adopters of enterprise systems. As industries converge on standard solutions, institutional pressure to comply with practices of industry leaders will add to pressure from customers and vendors seeking ease of integration. Even very large and stable companies can have difficulty maintaining unique corporate identity under these conditions. As enterprise systems continue to move down market, smaller firms with less industry power and smaller implementation budgets will also feel pressured to adopt standardized process templates. And companies using alternative service providers rather than purchasing and maintaining their own systems will have even less flexibility in their configuration choices. In the end, firms may be paying a higher price than they realize to achieve parity, if parity is attained at the expense of advantage.

Given the ongoing pressure to redesign processes to accommodate systems, it is increasingly important for process designers to take an active role in protecting and improving those processes most

closely related to competitive advantage. The suggestions provided here should serve as a starting point in this endeavor.

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Table 1

Strategic view of business process types from resource-based perspective of competitive advantage.

Type	Description of process—as viewed by ERP implementation	Description of process—from resource based perspective
Operational Processes	Processes are a series of mechanical tasks; inputs of information and material are mechanistically converted to productive output	Processes are series of tasks adapted over time; inputs include knowledge and learning as well as information and material
Contextual Processes	Processes are distinct activities, independent of the particular setting in which they are embedded; changing the setting in which the process occurs, without changing the process, has no inherent effect on the process	Processes are inextricably intertwined with structures such as business policies, lines of authority and controls; processes lose their character when these structures are removed or modified; processes cannot be understood separately from their environment
Identity Processes	All processes are equally important; generally the processes which are the most noticeable or the easiest to work with are the ones most likely to be implemented and/or reengineered	Processes have differing importance to a firm’s competitive identity; processes are ranked by their salience to the firm and are prioritized for reengineering...and preservation
Managerial Processes	Operational processes are most likely to be part of the ERP implementation, they are most likely to be similar across organizations, they are the easiest to address, they are most tractable for computerization	Processes are operational or managerial, managerial involve higher-level routines; reengineering tools exist for operational processes but rarely address managerial processes
Relational Processes	Processes exist in an organizational unit, they may relate to other processes, but generally through information hand-offs, not integration	Processes span organizational boundaries, within or across firms; relational processes are often ignored when attempting to optimize firm processes
Sustainability Processes	Processes accomplish work, they are the result of evolution, but are not the evolutionary mechanism	Processes for learning and adapting provide dynamic capabilities, the ability for the firm to recreate itself; sustainability processes hold essential skills for meeting and adapting to change in the business environment