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Abstract *Business process management has received much attention in the industrial engineering and management literature, and its benefits are well known. Much less has been written in the public sector management literature, and what has been written has been very general. Hence, there is confusion among public managers about how business process management concepts should be implemented. How should public organizations reorganize to accommodate business process management? How are existing or new enterprise systems aligned with business process management methodologies? This paper addresses these issues, and concludes that public organizations will have to change their organizational structures radically as well as their enterprise systems in order to implement business process management concepts successfully. The paper also discusses the benefits of public sector process management, and focuses in some detail on two of the reasons that public organizations have incentive to implement business process management methodologies.*

Why business process management?

Business process management is as old as the discipline of industrial engineering. Localized implementations of process management (e.g. manufacturing processes, shipping processes, etc.) have been prevalent for years[1]. The process management approach involves:

- Documenting the process to obtain an understanding of how work flows through the process[2].
- The assignment of process ownership in order to establish managerial accountability.
- Managing the process to optimize some measures of process performance.
- Improving the process to enhance product quality or measures of process performance.

Process management was firmly established on the shop floor, but it was more difficult to establish as an enterprise management strategy, primarily because it was extremely difficult to control large systems of integrated processes. Hierarchical models that emphasized strict managerial control were the models of choice for industrial-age managers. Computers were new and integrated systems were non-existent. Insufficient managerial information was present to support a distributed process management model. Managerial control was the primary reason for selecting the industrial-age hierarchical model.

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In the late 1980s, US manufacturers discovered that the new information technologies allowed managerial control of enterprise-wide process management (Davenport and Short, 1990). Business process management provided competitive advantage through cycle-time reduction, and the new information technologies provided managerial control. The constant quest for competitive advantage, enabled by new information technologies, unleashed the private sector management transformation that is still underway today. Davenport and Short (1990) state that "thinking about information technology should be in terms of how it supports new or redesigned business processes, and business processes and process improvements should be considered in terms of the capabilities that information technology can provide". Davenport and Short (1990) go so far as to call this new approach to process management: "the new industrial engineering".

What are processes?

One source of continual confusion is the imprecise use of terminology. Process is a word that means different things to different people. Even for practitioners who are extremely familiar with the concepts of process management, there is still confusion across disciplines. When software engineers document processes, they are often interested in the relationships among static activities. When industrial engineers discuss process, they most often focus on the dynamic linking of activities; e.g. process flows. For this reason, it is important to precisely define "process" for each implementation context. If not, it is impossible to communicate. For example, Davenport and Short (1990) define a business process as "a set of logically related tasks to achieve a defined business outcome". It is difficult to argue with this definition, but it is not sufficiently precise for our purposes. For example, "logically related" has no temporal workflow connotations.

When we speak of processes, we imply event-driven process chains. According to Scheer (1993), a "process is an occurrence of some duration that is started by an event and completed by an event"[3].

We present the concept with an example from a hypothetical manufacturing organization. The high-level business functions of this organization are presented in Figure 1.

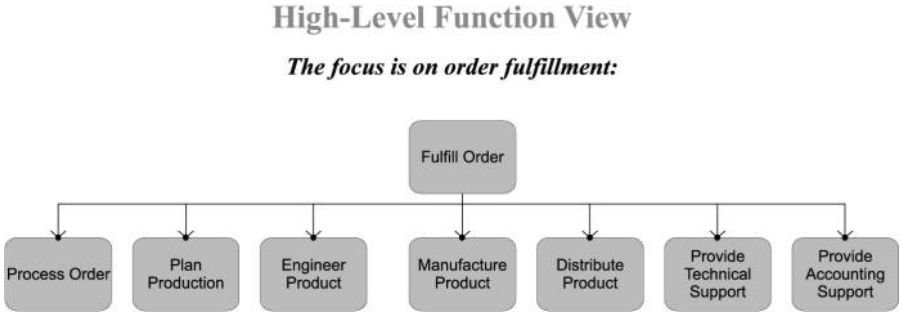

Figure 1.
High-level functions for a hypothetical organization

The primary function is to "fulfill order", which is decomposable to second-level functions that are executed to complete order fulfillment. Of course, the second-level functions could be decomposed to lower levels as desired.

Some would argue that Figure 1 represents a process. Figure 1 seems to meet the requirements of the Davenport and Short definition; i.e. it presents a set of logically related tasks to achieve a defined business outcome, a fulfilled order. By our terminology, Figure 1 is a static functional decomposition; i.e. a set of hierarchically decomposed activities. Figure 2 combines the functions of Figure 1 with the necessary events for converting the functions in Figure 1 into a business process.

Figure 2 is more complex, but it is easy to read and understand. First, notice that the process chain in Figure 2 contains all of the second-level functions in Figure 1. These functions are linked using events, which "trigger" the functions. To describe events, we use a blow-up of the far left of Figure 2. This picture is provided in Figure 3.

Figure 3 presents two events and one function. The important concept in this figure is the understanding that events "trigger" functions. The order arrives, it is processed, and then a notification is submitted. The combination of events and functions describes a specific time sequencing of the functions, and the sequencing is explicitly documented. This time sequencing defines a dynamic relationship (as in Figure 2) as opposed to a static relationship (as in Figure 1).

Now we can review Figure 2 with a better understanding of the concepts. First, as mentioned above, the process chain in Figure 2 is dynamic; i.e. there is an explicit time sequencing of the events. Second, some functions are executed simultaneously, and Boolean logic defines the relationships. Third, the process in Figure 2 is cross-functional. In fact, the business process spans every function in our hypothetical organization. This understanding of cross-functional business processes (documented as event-driven process chains) is necessary to understand the public sector business process management problem. This is a critical point. The most difficult problems in business process management involve managing across functional boundaries. Hence, an appreciation for dynamic cross-functional business processes is absolutely essential[4].

Public sector process management

In the public sector, the primary benefit of business process management is the "increased effectiveness and efficiency achieved from restructuring the organization along cross-functional processes". In the application of the Defense Planning and Management Framework (Sullivan *et al.*, 1999) to The Army Plan, other benefits were noted:

- By managing processes, the Department of Defense (DoD) can better integrate warfighting perspectives and priorities with resource management (this is equivalent to the increased private sector focus on managerial accounting through activity-based management).

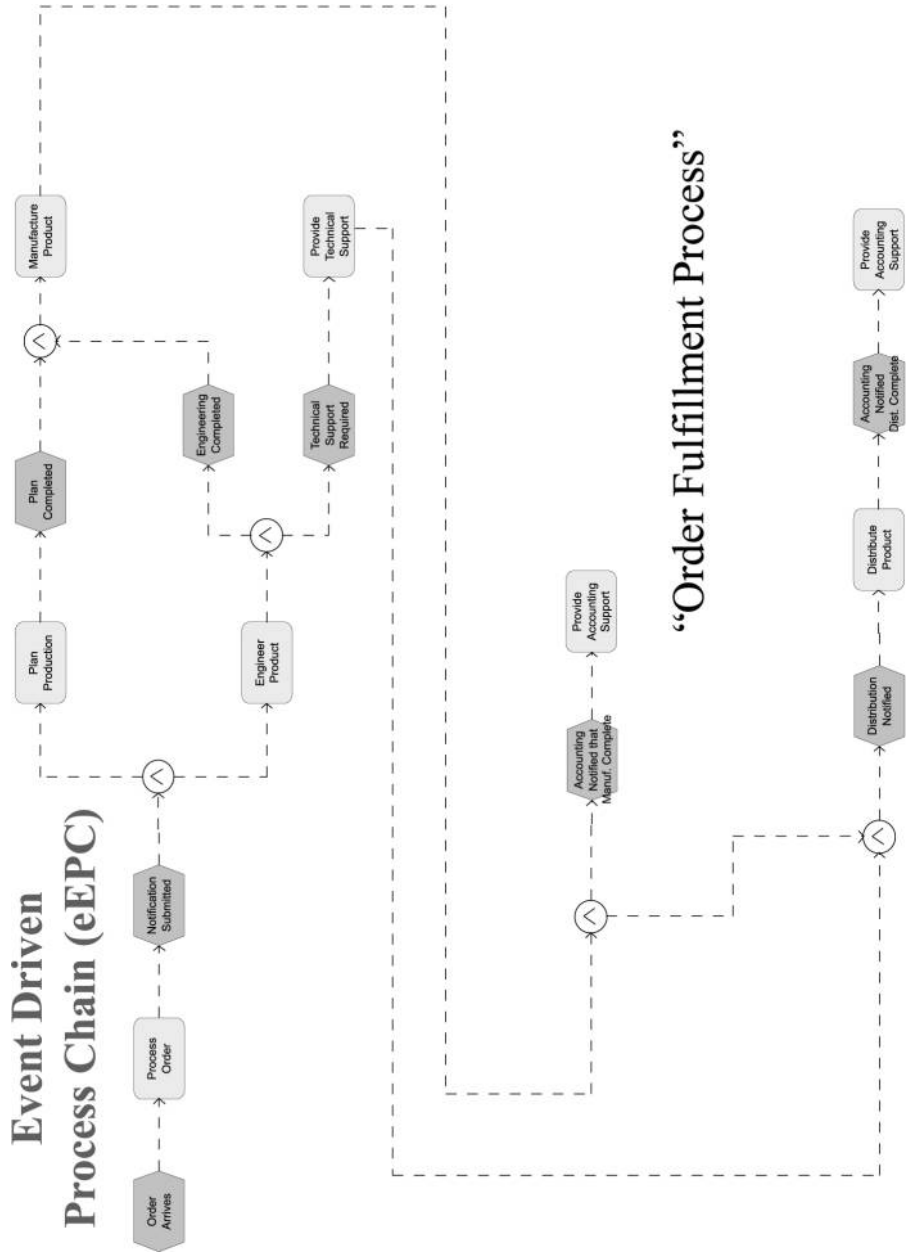

Figure 2.
Event-driven process chain diagram for the hypothetical organization

- Many new DoD management initiatives (e.g. the Government Performance and Results Act and Information Technology Management Reform Act) require process management, and it is impossible to implement process management concepts under the old industrial-age management models.
- Process management opens the door for creative and innovative approaches to enhancing organizational performance.
- Process management allows the effective implementation of modern systems and standard software; i.e. most new implementations are process-oriented.

We agree with all of the above, but we note some subtle differences that others have not fully elucidated.

A process orientation for implementing the law

This section relates to one of the above bullets. A number of recent US legislative actions have forced process management to be implemented in public sector organizations. One could argue that the impacts of such mandates were not completely understood at the time of the mandates, but never-the-less, public sector organizations have a process management mandate. Some of these mandates are reviewed below, but we first offer the following general observation.

Managing by business process is an all or nothing proposition. You cannot maintain a command and control hierarchical management structure and expect process management to be effective. Likewise, you cannot maintain "stovepiped" information systems and expect process management to operate efficiently and effectively. One problem that has hindered the DoD implementation of the Government Performance and Results Act (GPRA) and the Information Technology Management Reform Act (ITMRA) is that both call for process management concepts, without changing the fundamental organizational model. That is, they mandate process management concepts on a hierarchical command and control management structure. The private sector experience is that this approach enhances the probability of failure. However, the mandates exist and they must be understood. Hence, the process-oriented mandates of several of the more important laws and executive orders are presented below.

The Government Performance and Results Act. The Government Performance and Results Act is the primary legislative framework through

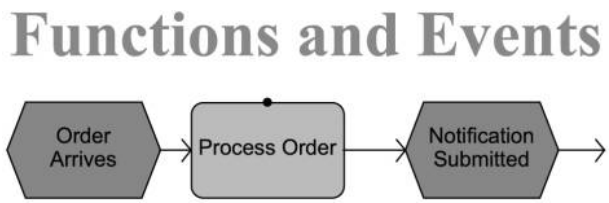

Figure 3.
The relationship between functions and events in a process

which agencies are required to set strategic goals, measure performance, and report on the degree to which goals were met. It requires each federal agency to develop strategic plans that cover a period of at least five years. The plan should include the agency's mission statement, identify the agency's long-term strategic goals, and describe how the agency intends to achieve those goals through its activities and through its human, capital, information, and other resources. Under the GPRA, agency strategic plans are the starting point for agencies to set annual goals for programs and to measure the performance of the programs in achieving those goals.

The law calls for an agency strategic plan with specific goals and objectives. Furthermore, the agency is required to provide:

> . . . a description of how the goals and objectives are to be achieved, including a description of the operational processes, skills and technology, and the human, capital, information, and other resources required to meet those goals and objectives.

The focus of this section of the law is on formally linking planning objectives to organizational processes. Furthermore, the agency shall:

> . . . establish performance indicators to be used in measuring or assessing the relevant outputs, service levels, and outcomes of each program activity.

That is, performance measures will be defined that are linked to organizational functions (i.e. activities).

The Information Technology Management Reform Act. The Information Technology Management Reform Act of 1996 (i.e. ITMRA or the Clinger-Cohen Act), which took effect August 8, 1996, abolished the Brooks Act (it repealed Section 111 of the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 759)). The Brooks Act made the General Services Administration (GSA) the central authority for procurement of automatic data processing (ADP) resources. The Federal Information Resources Management Regulation (FIRMR) was issued to implement the Brooks Act and established a process that required federal agencies to obtain a Delegation of Procurement Authority (DPA) from GSA to acquire ADP, initially, and telecommunications (TC) resources. Passage of the ITMRA is causing a major paradigm shift in the process for acquiring and managing IT. The task of understanding the objectives of ITMRA and establishing a program or process to manage IT in a federal agency is a major undertaking.

The word "process" is used throughout the act, but here is one reference that is particularly relevant:

> In fulfilling the responsibilities under section 3506(h) of title 44, United States Code, the head of an executive agency shall – where comparable processes and organizations in the public or private sectors exist, quantitatively benchmark agency process performance against such processes in terms of cost, speed, productivity, and quality of outputs and outcomes.

The intent is clear in this passage. It is a direct mandate to manage by process, while benchmarking against other public and private sector organizations.

Executive Order 13011 of July 16, 1996. One section of the executive order relates specifically to the duties of the Chief Information Officer (CIO) Council:

> The CIO Council shall share experiences, ideas, and promising practices, including work process redesign and the development of performance measures, to improve the management of information resources.

This extends process management to include the private sector concept of business process improvement[5].

A process mandate without a process management structure

The law is clear in its intent. It is pushing public sector organizations in the direction of private sector process management. However, process management does not work very well when overlaid on a hierarchical command and control management structure. This has been documented in the research literature[6]. Hence, the shift to process management requires a restructuring (i.e. a reengineering) of management[7].

The next compelling reason for implementing process management is less understood, but equally important. The business process provides the internal organizational structure for integrating process-oriented information systems. Integrated systems deliver competitive advantage when they are aligned with the organization's value adding processes.

Properly aligned and integrated systems

We use an example from the US Navy to make this case, but there are many public and private sector examples.

Figure 4 (taken from a Logistics Management Institute briefing) indicates a problem in providing base-level system support, while providing senior managers with the information necessary to manage Navy installations.

This figure provides a model for extracting information from a sequence of stand-alone systems, and presenting that information to a senior or regional executive. Ignoring the technical issues, the idea is to provide the executive with a "roll-up" (using an intranet architecture) of information from various information systems. From the executive's point-of-view, an information query should be to a single integrated system, as opposed to a number of stand-alone systems. This is a relative standard presentation, and the executive has better access to information; i.e. he queries a single system as opposed to searching for information from multiple systems.

Figure 4 represents a model that has been implemented by the private sector. However, it is well known that this architecture is suboptimal because it ignores the business processes that define the executive's management responsibilities. In modern enterprise integration implementations, it is the business process that provides the mechanism for integrating the systems (Scheer, 1994). That is, the business processes generate organizational outputs and executives are responsible for managing this process of output creation.

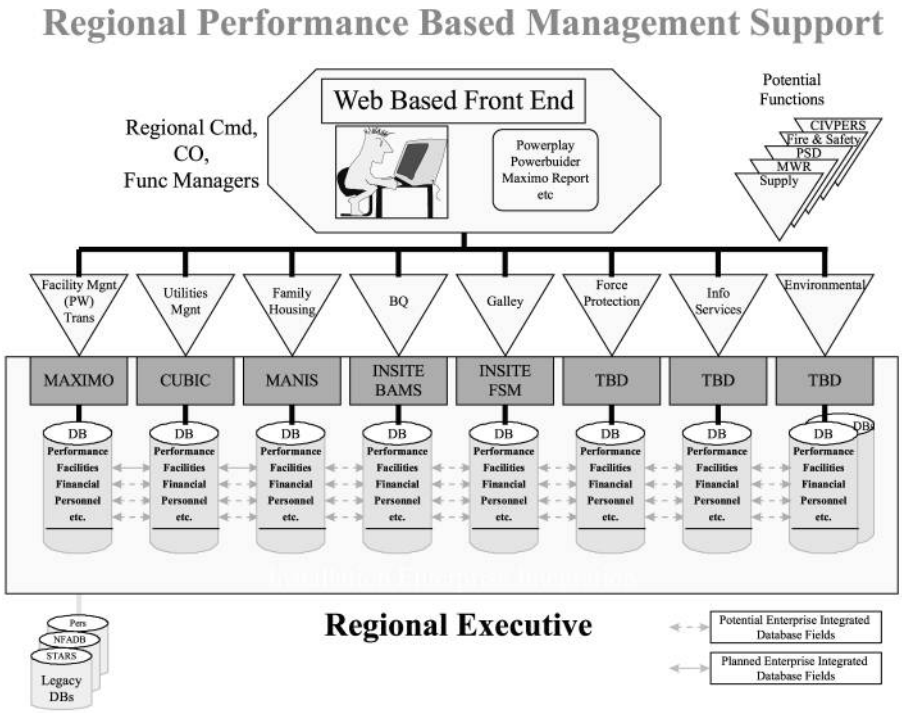

Figure 4.
Systems to support installation management

The information systems should align with (i.e. integrate in accordance with) the business processes. The concept is indicated in Figure 5.

This is a key point. The business processes of the organization deliver value to the customer. The executive's primary objective relates to the delivery of value to the customer. The integrated systems are secondary and subservient; they enable a more efficient and effective delivery of value to the customer. The organization's systems should be integrated around the business process. It is possible to integrate systems without this alignment, but there is no guarantee that these non-aligned systems support the customer.

Empirical evidence

The academic literature on information system alignment is relatively sparse. However, there are some references in the trade literature, and there is one significant study by the Boston Consulting Group (BCG) (2000). The BCG study is comprehensive and based on a survey of 100 executives who were leading (or had led) enterprise implementation projects. Booker (2000) provides a good summary of the data from the BCG study that is relevant to this paper. Booker noted that the managers who spent the necessary upfront time to analyze how their systems aligned with their business processes were much more likely to view their projects as being successful. Booker quotes the BCG research team as saying, "Users who followed these procedures achieved positive outcomes

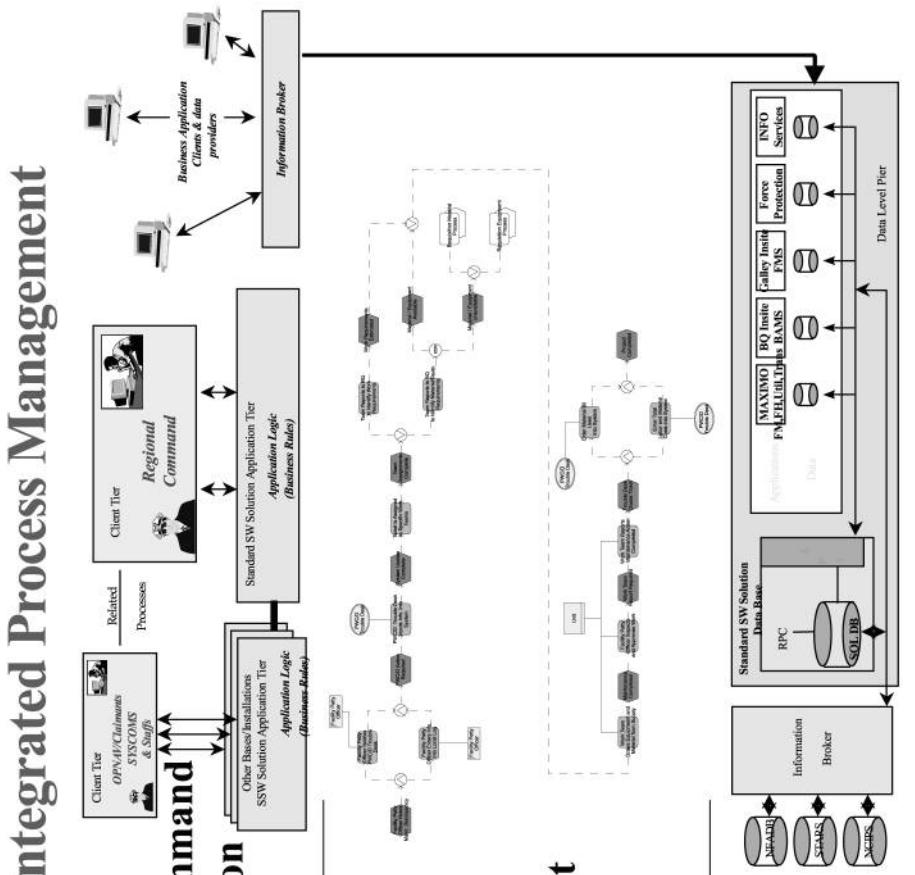

Figure 5.
Properly aligned process management model

56 per cent of the time versus only 8 per cent for those who failed to conduct such an analysis". In the commercial sector, the empirical evidence is overwhelming. Organizations that take the time to align their business processes with their information systems are more like to achieve success. On the surface, it only makes common sense. The software executes one set of business processes, and the organization has particular business process requirements. If the business process requirements do not align with the business processes that are supported by the software, then there is a gap. If the gap is not closed, then projects do not achieve their intended results. The only way to close the gap is by business process modeling and analysis, followed by careful software configuration or customization. The concepts of requirements modeling, gap analysis, and gap closure are discussed in detail in Blick *et al.* (2000). The Blick *et al.* (2000) paper shows how the concept of gap analysis was used to achieve business process alignment in a large enterprise system implementation project. Kirchmer (1999) also addresses these issues at a higher level.

The culture of processes

Organizations that attempt business process management without realigning their information systems will not realize the full benefits that process management can deliver. These organizations cannot quickly respond to the customer, and management does not have appropriate decision-support information, but these are only the obvious observations.

If organizations maintain their stovepiped systems while attempting business process management, the information owners within the stovepipes inhibit effective process management. Given this scenario, there is tremendous pressure to revert to hierarchical management practices. However, the reverse is also true. If systems are aligned with processes, then it is much easier to maintain a process-oriented culture. That is, the stovepipe owners have less power, and it is difficult for them to inhibit the process management efforts.

International comparisons

The major arguments of this paper have been written from a US perspective. Hence, an international comparison is required. Osborne and Gaebler (1992) presented the general concepts for "reinventing government", and a general increase in interest in the topic ensued in the USA. The concepts were popularized by Vice President Gore's National Performance Review, which later became the National Partnership for Reinventing Government.

Similar programs evolved in other countries, but primarily in developed western governments. The Local Government Act in the UK has characteristics that are similar to the US Government Performance and Results Act. The Local Government Act requires that Best Value Performance Plans be constructed to provide "a clear practical expression of an authority's performance in delivering local services and its proposals to improve". The Department of the Environment, Transport, and the Regions (DETR, 1999) provides an overview

of implementation guidelines, and the requirements are similar to those in the GPRA. For example, a best value performance plan includes:

- a summary of objectives;
- a summary of current performance;
- a comparison of performance with previous years;
- a strategy and approach for generating improvements in efficiency; and
- planning documents that include financial statements and performance targets for future years.

While the wording of the Local Government Act is different, the general intent of Best Value Performance Plans is the same as the planning requirements of the Government Performance and Results Act.

Similar initiatives in other countries include *Results for Canadians* (Treasury Board of Canada, Secretariat, 2000) and New Zealand's *Improving Accountability* project (State Services Commission, 1999). Additional examples can be identified at many levels of government (e.g. federal, state, regional, and local) in many parts of the world. While the requirements and content vary, the concept is the same: establish better accountability and service delivery by using modern planning and performance measure methodologies and techniques.

These programs share one common feature. Their links to business process management and information system alignment are not well defined. In fact, in many cases the content is intentionally left vague. For example, for best value performance plans, "the Government does not propose to issue explicit guidance concerning the exact format". The idea is to allow "local authorities maximum flexibility as how to present and publish key performance information". Given this flexibility across initiatives and countries, the results of this paper can be universally applied. The government initiatives only require plans and performance measures. Specific guidance on how to link these planning objectives to business processes and eventually align organizational information systems is not included. While cultural differences may suggest different approaches to implementation, there is no technical difference. It is good management practice to align plans, business processes, and organizational information systems.

Conclusions

Business process management has received much attention in the private sector management literature, and its benefits are well known. Much less has been written in the public sector management literature, and what has been written has been very general. This paper precisely defines business processes as extended event-driven process chains. The paper discusses the benefits of public sector process management, and focuses in some detail on two of the reasons that public organizations have incentive to move to process management.

The first reason relates to the public law. The law mandates process management approaches on public organizations. However, the mandate to date has been implemented in the traditional command and control organizational structures that are holdovers from the industrial age. These mandated process management concepts are not likely to be effective when implemented in these organizational structures.

The second reason relates to the interaction between organizational processes and the new information technologies. Integrated information systems are desirable, but they are effective when they enable the organization's value adding business processes. The business process forms the basis for integration, with the organization's information systems integrated in such a way that they are aligned with the business process. Process-aligned information systems help to create a culture that enables business process management.

However, we are not so optimistic about public organizations being able to meet their legal mandate. Even though there are significant incentives, there are major cultural impediments, and it will be many years before we can assess the implementation effectiveness of the GPRA, ITMRA, and similar initiatives from other countries.

Notes

1. Industrial engineers commonly used the term "process engineer" as opposed to "process owner" or "process manager" (Grass, 1956).
2. Very elaborate and paper-based "mapping" methodologies were designed for this documentation process (Mullee and Porter, 1956).
3. If the reader has a good understanding of event-driven process chains, then the remainder of this section may be skipped without loss of continuity. If the reader is unfamiliar with the concept, this material is critical for understanding our views on business process documentation and should be read.
4. The empirical evidence to support this assertion is overwhelming. In fact, event-driven process chains are the basis for the SAP R/3 business process architecture and for all business process-oriented information system implementations (Kirchmer, 1999).
5. The terminology differences are subtle. Some argue that business process improvement (BPI) is different from business process reengineering (BPR). This paper uses Harrington's (1991) definition of BPI. "BPI is a systematic methodology developed to help an organization make significant advances in the way its business processes operate. It attacks the heart of the current white-collar problem in the United States by focusing on eliminating waste and bureaucracy. It provides a system that will aid you in simplifying and streamlining your operations, while ensuring that both your internal and external customers receive surprisingly good outputs. The main objective is to ensure that the organization has business processes that; eliminate errors, minimize delays, maximize the use of assets, promote understanding, are easy to use, are customer friendly, are adaptable to customers' changing needs, provide the organization with a competitive advantage, and reduce excess head count."
6. See, for example, Majchrzak and Wang (1996).
7. This is one of Champy's (1995) major points.

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