Business Process Management Systems: The Internal Control Perspective

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During the last decade, organizations have become more aware of the importance of their business processes in terms of effectiveness, efficiency and compliance. As a consequence, business process management (BPM) has gained much attention.

However, while current literature on BPM focuses mainly on the operational and functional aspects,[1, 2] there is little discussion about its effect on organizational internal controls. Understanding managerial and technological principles is of great importance for auditors, since they must be taken into consideration when internal control systems are designed or evaluated.

The purpose of this article is to introduce BPM to the internal control expert community and to examine the internal control perspective of BPM. The article will focus on major control concepts such as authorization, segregation of duties, application controls and auditability, and will analyze how each concept is handled by BPM systems *vis-a-vis* traditional event-based systems.

WHAT IS BUSINESS PROCESS MANAGEMENT?

BPM has evolved from business process reengineering (BPR) and has been largely impacted by the lessons learned from the low rate of success of BPR.[3] BPR's externally led, radical, one-step-event approach to process improvement has evolved into an inherent, ongoing and gradual practice with BPM. BPM's main principles are the following:[4, 5]

- **Processes provide a competitive advantage**—Good design of business processes is critical to the success of the organization. For example, bid preparation, a process that is usually conducted under time pressure, requires cross-organizational coordination involving finance, marketing and production departments. If this process is badly designed, it may slow down processing and lead to late submission of the bid or to an inadequately organized bid, reducing the chances of winning the tender.
- **Processes require management**—Organizations are usually divided into functional units (e.g., finance, marketing). Many business processes, however, are "cross-organizational," involving several functions within the organization. For example, a raw material purchasing process flows through the warehouse, logistics, purchasing and finance functions. Although each unit may function impeccably independently, processes may be impaired due to a lack of coordination among the units. To prevent this problem, BPM emphasizes the need to manage the process end to end. This includes appointing a process owner; setting performance standards (e.g., time, quality, cost); and establishing the control, monitoring and measurement of processes at work.
- **Processes should be agile**—In the modern business world, change is constantly occurring. Therefore, to ensure its competitiveness, the organization must continuously improve and adapt its business processes. Ironically, automated processes based on information systems are usually more difficult and expensive to change. Modifications to traditional program code require time and human resources, resulting in delays and high costs. Hence, to maintain business agility, automating business processes requires a technology that supports rapid modifications.

BUSINESS PROCESS MANAGEMENT SYSTEMS

The BPM principles have inspired the development of process-oriented technologies. Business process management systems (BPMS) integrate various information technologies to support comprehensive management of business processes from design through measurement and optimization.[6] It may be noted that since workflow is the main technology used in BPM, the terms "BPM" and "BPMS" are frequently used synonymously with each other.

Like enterprise resource planning (ERP) systems, BPMS are enterprise systems involved in supporting routine organizational actions.

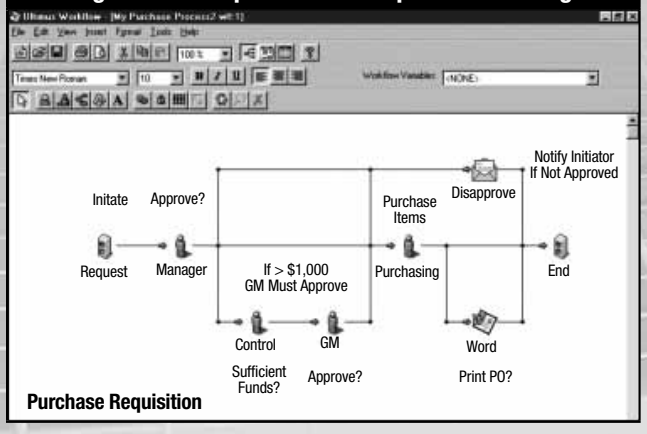
However, several differences may be noted, principally the fact that, while ERP systems are data-centric, BPMS are process-centric.[7]

BPMS usually include the following modules:

- Visual tools enabling process modeling and simulation to evaluate prospect performance
- Workflow automation platform upon which the process is executed according to its design
- Enterprise application integration (EAI) module
- Online process monitoring displays

A visual model of a sample process can be seen in **figure 1**.

Figure 1—Sample Process Map for Purchasing



The operational benefits of these systems relate to several organizational levels:

- Improving coordination and cooperation among the different functions involved
- Increasing the automation of the process
- Cutting elapsed execution time
- Reducing maintenance costs
- Improving customer satisfaction

Given the features and benefits of a BPM system, it is not surprising that it has become one of the more exciting areas in IT. A growing number of organizations worldwide are successfully implementing BPMS-based processes.[8] In addition, a range of suppliers (e.g., Savvion, Ultimus, Filenet) offer BPMS solutions. Leading manufacturers of ERP systems, including SAP and Oracle, have also begun to integrate BPM into their systems.

BPM AND INTERNAL CONTROLS

The use of BPMS enables an organization not only to implement more effective business processes, but also to significantly improve its internal control. Authorization, segregation of duties, application control and auditability have been accepted as the standard of IT internal control.[9, 10] A comparison between BPMS and traditional event-based systems (such as ERP) with respect to these control concepts is summarized in **figure 2**.

Figure 2—Control Concepts for Event-based Systems vs. BPMS

Control Concept	Traditional Event-based Systems	BPMS
Authorization	• Part of access control system • Assigned by activity type • Require *ad hoc* controls within applications	• Part of process rules and role definition • Assigned by various case factors • Complete authorization definition
Segregation of duties	• Time-consuming and costly management approval • Limited mechanism of assigning tasks for approval	• Speed up approval time and cost by work flow technology • Various models of task assignment for approval, to eliminate bottlenecks
Application control	• Menu-driven work • Potential of errors, such as selecting a wrong task, failure to perform a task or an object identification error	• Task-list-guided work • Include elimination of potential errors of tasks and object selection
Auditability	• Transaction-based system • Does not provide monitoring of process status • Require an *ad hoc* audit trail to link between transactions within a process	• Process-based system • Include built-in, continuous, visual process monitoring • Include a built-in process log

Authorization

BPMS strengthen the authorization mechanism and prevent potential threats. Authorization restricts employees and allows them to perform only predetermined activities according to their roles.

In event-based systems, authorization control is based on activity types. Each user or group is granted access only to certain activity types. The problem with this system is that, in reality, authority may be defined not only by the type of action, but also in terms of other parameters, such as the monetary amount of the activity, the subject of the activity and preconditions. To solve these problems, system developers add *ad hoc* complementary authorization controls and restrictions within the application code. However, this is a complex and expensive solution, required merely because the regular authorization mechanism is inadequate.

In BPMS, authorizations are not separate from the process, but are derived directly from the roles of the employees and their authority as defined in the process.[11] Authorization is not granted per activity type, but at the single incident level. In other words, the system grants a one-time authorization for the execution of a specific activity. The authorization is granted on the basis of the organization's business process rules. In principle, authorization for an identical activity type may be granted in each incident to a different employee. For example, in the customer service process, if a customer contacts the organization with a request for billing information, he/she is then, according to the business rules, transferred to a financial function. If the client is interested in a new product, he/she is transferred to marketing. Or, in the case of a problem with the product, the customer is transferred to technical support. The authorization is granted at the level of a specific action, solely to the function to which the task was routed. Although all those involved are dealing with a single type of activity—response to a customer's inquiry—in BPMS, they are not authorized to take action unless the task has been routed to them.

Moreover, each authorization for the execution of an action within the process is granted to the relevant individual for a temporary period only, and is revoked immediately upon the action's completion.

To sum up, authorizations in BPMS are granted solely to the correct user to perform the correct task for the right time frame.

Segregation of Duties

Thanks to BPM technology, a higher degree of segregation of duties can be applied without impairing the efficiency of processes. Clearly, proper segregation of duties, especially between the execution and authorization of business actions, is an important component of internal control.

Unfortunately, this type of internal control consumes expensive work time of the authorized executives and, therefore, is considered very costly. Furthermore, the number of steps required to complete the process is increased, inevitably lengthening the process. This problem is exacerbated by the fact that in many cases authorization by managers creates a bottleneck and delays the completion of the process.

Therefore, it is hardly surprising that some have viewed managerial involvement in a process as overhead and argued that although internal controls should be subject to cost-benefit considerations, the designers are not always aware of the real cost they impose.[12] Therefore, to avoid process cost and delay, BPR refrains from using managerial authorization and prefers to rely on detection controls on an after-the-fact basis, via such things as analytical reports, comparisons and reconciliations. From the control perspective, however, after-the-fact detection controls are clearly less effective than preventive controls within the process.

BPMS offer a superior solution. They substantially reduce the cost of authorization within the process. The activities are transferred for authorization instantly via an electronic form system. The manager receives an e-mail notifying him/her of the new task, and the inspection and authorization are performed directly in an electronic form. According to the manager's decision—approval or rejection—the electronic form is transferred to the next step in the process. As a result, the authorization process may be completed in just a few minutes. The efficiency and low cost of electronic authorization allows for the use of executive authorizations within the process and even extends their use to enhance segregation of duties and control.

> "A higher degree of segregation of duties can be applied."

In addition, the electronic task routing of BPM enables several innovative, flexible mechanisms to authorize actions, e.g., delegating authority to comanagers, a pool of authorizing managers or a sequential authorization pool. These mechanisms are highly beneficial to reduce bottlenecks when managers are overburdened or unavailable.

To conclude, BPMS allow organizations to maintain sufficient segregation of duties and authorization controls while reducing cost and delays.

Application Control

The proactive automation of the workflow in BPMS strengthens the computerized application controls, ensuring the accuracy of the process flow. One of the most significant differences between event-based systems and BPMS is the proactive nature of BPMS. Event-based systems, such as ERP, consist of a collection of computerized business transactions, usually organized in menus. However, in these systems, the process itself is usually not automated—the user must identify the required action to be executed, according to the organizational procedures, and then select it from the system's action menu. Failure to recognize the required action may result in an error in the process.[13]

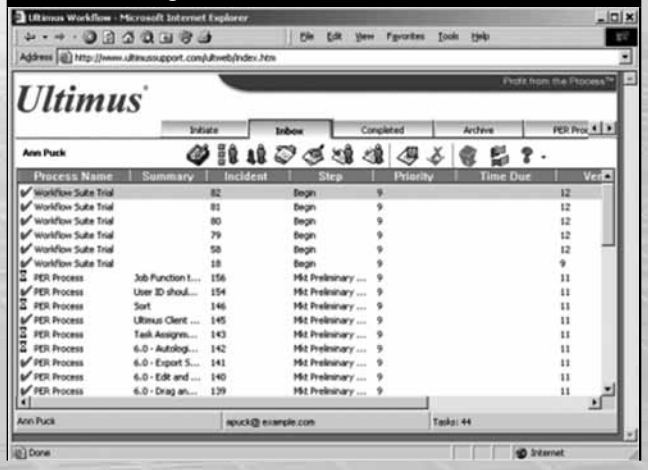
This can be illustrated through, for example, the shipping of goods. After the goods are delivered, the accountant receives a copy of the packing slip signed by the customer. The reception of this document should signal the accountant to select the action of issuing an invoice and to charge the customer's account. If the accountant fails to select the correct action to perform, whether accidental or deliberate, it may disrupt the entire process. Several types of errors are liable to occur:

- Execution of redundant actions (e.g., the accountant issues a sales invoice to the customer although a signed packing slip has not been received)
- Failure to execute a required action (e.g., the accountant forgets to issue the invoice or performs a different action by mistake)
- Failure to select the correct object (e.g., the wrong packing slip is selected from the computerized list, charging a different customer or charging the correct client, but for a different packing slip that has not yet been supplied)

The proactive process management of BPM eliminates such a problem. The user is not required to identify the action for execution, nor is he/she required to select the correct action from long menu lists. As soon as the system identifies that, according to the defined business rules, the preconditions of a specific user task are fulfilled, this task is sent to the user's personal task list. It will remain in his/her task list until it is executed. An example of a task list can be seen in **figure 3**.

The proactive automation of the process in BPMS, in accordance with the organization's procedures and business rules, constitutes preventive and application control, thwarting potential errors and omissions:

Figure 3—Task List for Execution

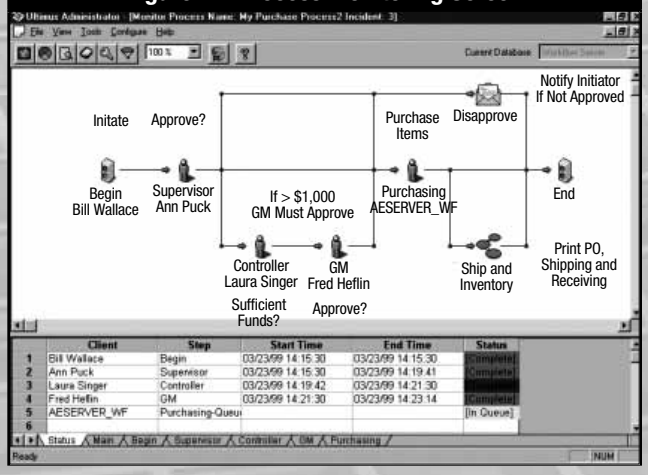


- The procedures cannot be circumvented and users cannot execute a different action from those appearing in their task list.
- Until the task has been executed, it remains in the task list and it cannot be deleted. Moreover, reminder messages are sent to the user until the task is performed.
- Each task in the task list encapsulates the required objects to complete the task, thus preventing identification errors.

Auditability

BPMS provide process monitoring and tracking systems and a full process log that serve as a built-in audit trail (see **figure 4**).

Figure 4—Process Monitoring Screen



Since traditional systems are transaction-based and handle each transaction and business document separately, it is difficult to audit processes end to end. Therefore, in such systems, proper audit trails should be designed and implemented to ensure that a chronological record of all events that have occurred in the system is maintained.[14]

BPMS, by contrast, are process-based and, therefore, audit trails are a built-in feature. All incidents and steps of a process are documented and linked to each other in the order they occurred. The "story" in each case can easily be tracked.

From the auditor's perspective, BPMS support continuous auditability of business processes, while they are active and afterward.

CONCLUSION

As a new technology and managerial approach, BPM may have a significant impact on the internal controls of organizations. Segregation of duties, especially between task performance and authorization, is no longer considered overhead; instead, it is an effective and efficient preventive control. Also, BPM introduces a new type of one-time access control and proactive workflow automation. In addition, monitoring and audit trail become built-in features that are seamlessly implemented.

Since BPM technology is relatively new, it is difficult to identify and analyze its full impact on internal controls. Nevertheless, from accumulated observation and forecasts of IT analysts for the coming years, this technology is expected to play a growing role in improving organizational operations and have a major influence on strengthening organizations' internal control systems.

ENDNOTES

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