

# Continuous monitoring of business process controls: A pilot implementation of a continuous auditing system at Siemens<sup>☆</sup>

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## Abstract

In this paper we report on the approach we have developed and the lessons we have learned in an implementation of the monitoring and control layer for *continuous monitoring of business process controls* (CMBPC) in the US internal IT audit department of Siemens Corporation. The architecture developed by us implements a completely independent CMBPC system running on top of Siemens' own enterprise information system which has read-only interaction with the application tier of the enterprise system. Among our key conclusions is that "formalizability" of audit procedures and audit judgment is grossly underestimated. Additionally, while cost savings and expedience force the implementation to closely follow the existing and approved internal audit program, a certain level of reengineering of audit processes is inevitable due to the necessity to separate formalizable and non-formalizable parts of the program. Our study identifies the management of audit alarms and the prevention of the alarm floods as critical tasks in the CMBPC implementation process. We develop an approach to solving these problems utilizing the hierarchical structure of alarms and the role-based approach to assigning alarm destinations. We also discuss the content of the audit trail of CMBPC.

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## 1. Introduction

The experience with the evolution of new technologies and business processes suggest that CA will initially be used to do no more than automate existing audit procedures, and thereby take full advantage of the capabilities that it has in the new ERP based environment... [The] second stage of its evolution [will be reached] when audit processes are reengineered to exploit the underlying technological capabilities to the fullest...

However, to reach that stage will require more than technology implementation. For one thing, it will necessitate auditors actually examining their processes to see if they are susceptible to process mapping and reengineering... At the same time, continuous analytic monitoring will intrude into the internal control arena, especially since it is built on the firm's own ERP systems...

While the theoretical work in CA has made progress, the field has been hindered by the lack of a proper set of experimental and empirical research.

From Vasarhelyi et al. (2004), pp. 19–20.

Providing assurance in the modern business environment requires a thorough understanding of the ongoing changes in the way businesses organize their activities. A critical insight of the last two decades consists in deconstructing a business into its underlying business processes. A *business process* (BP) is “a set of logically related tasks performed to achieve a defined business outcome,” see Davenport and Short (1990).

While businesses always faced the task of measuring and monitoring their activities, paper-based information technology (in the form of accounting journals and ledgers) had to rely on pre-filtered and aggregated measures which were typically recorded after a significant time lag. Modern *information technology* (IT) utilizes converging computer and networking tools to capture BP information at its source and in the unfiltered and disaggregated form, which makes it possible to measure and monitor business processes at the unprecedented level of detail on the real-time basis.

*Continuous auditing* (CA) is defined as “a methodology for issuing audit reports simultaneously with, or a short period of time after, the occurrence of the relevant events” (CICA/AICPA, 1999). CA methodology can utilize the IT capability to capture transactional and process data at the source and in the disaggregated and unfiltered form to achieve more efficient, effective and timely audits. An important subset of continuous auditing is the continuous monitoring of business process controls (CMBPC), a task made particularly significant by the passage of Section 404 of the Sarbanes/Oxley Act that requires both managers and auditors to verify controls over the firm's financial reporting processes. The managers' responsibilities are clearly going to be largely based on the work undertaken by the firm's internal audit department.

Kogan et al. (1999) discussed the problem of finding a trade-off in the CA implementation between control-oriented and data-oriented CA procedures. There are numerous enterprise environments where process controls are either not automated or their settings are not readily accessible. In such environments, which rely on loosely-coupled legacy data processing systems, automated audit procedures of CA have to be mostly data-oriented (i.e., automated tests of details and analytical procedures), while control testing will involve significant “manual” work.

The tremendous scale and scope of implementations of *enterprise resource planning* (ERP) systems since the early nineties has resulted in many companies approaching the state in which

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