Chapter V
Integrated Business and Production Process
Data Warehousing

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ABSTRACT

Nowadays tracking data from activity checkpoints of unit transactions within an organization’s business processes becomes an important data resource for business analysts and decision-makers to provide essential strategic and tactical business information. In the context of business process-oriented solutions, business-activity monitoring (BAM) architecture has been predicted as a major issue in the near future of the business-intelligence area. On the other hand, there is a huge potential for optimization of processes in today’s industrial manufacturing. Important targets of improvement are production efficiency and product quality. Optimization is a complex task. A plethora of data that stems from numerical control and monitoring systems must be accessed, correlations in the information must be recognized, and rules that lead to improvement must be identified. In this chapter we envision the vertical integration of technical processes and control data with business processes and enterprise resource data. As concrete steps, we derive an activity warehouse model based on BAM requirements. We analyze different perspectives based on the requirements, such as business process management, key performance indication, process and state based-workflow management, and macro- and micro-level data. As a concrete outcome we define a meta-model for business processes with respect to monitoring. The implementation shows that data stored in an activity warehouse is able to efficiently monitor business processes in real-time and provides a better real-time visibility of business processes.
INTRODUCTION

In the continuously changing business environment nowadays manufacturing organizations can benefit from one unified business environment that brings production process data and business data together in real-time. We believe in a balanced view on all activities in the modern enterprise. A focus on the mere administration side of businesses is to narrow. The production process must be incorporated into information management from the outset, because excellence in production is a fundament of today’s businesses (Hayes & Wheelright, 1984). In fact, manufacturers generate incredible amounts of raw data in production processes, however, they are often not used efficiently yet. The rationales of turning production process data into information in industrial manufacturing are to improve production processes, competitiveness, and product qualities; enabling management to understand where inefficiencies exist and to optimize production processes, and to prepare smart business decisions for high-level management, such as to provide an accurate picture of occurrences on the production process. As a result, the need for highly integrated control and information systems as data resources for Business Intelligence (BI) applications is essential to addressing the emerging challenges.

Data Warehousing currently is almost identical to BI tools for supporting decision-making. A data warehouse (DW) stores historical data, which are integrated from different data sources, and it is organized into multidimensional data (Kimball, Ross & Merz, 2002; Inmon, 2002). Data in a DW is dynamically processed by an On-Line Analytical Processing (OLAP) tool (Codd, Codd & Salley, 1993) for high-level management to make decisions. Although DWs have been developed over a decade, they are still inadequate for answering the needs of BI applications. DW does not provide data based on events and lacks process-context. DW stores end measures, i.e., aggregated reference data, rather than process checkpoints (Creese, 2005). However, those processes, events, or activities always occur in business processes as well as production processes.

Workflow management (WfM) systems (Hollingworth, 1995) have been developed in the last decade to help automating business processes of organizations. Today’s workflow technology products known as business process management suites (Miers, Harmon & Hall, 2006) enable the tracking of data in business processes. Furthermore, Business Activity Monitoring (BAM) - a current business intelligence trend (Dresner, 2002; Mangisengi, Pichler, Auer, Draheim & Rumetschofer, 2007) – enables monitoring business process activities of an organization.

Based on our experience in successfully implementing an activity warehouse for monitoring business activities for integrating enterprise applications (Mangisengi et al., 2007), we argue that the workflow technology supported by Service-Oriented Architecture (SOA) and BAM technology are potential technologies for industrial manufacturing to optimize and improve production processes and business processes as well as product quality measures.

In this paper we envision the vertical integration of technical processes and control data with business processes and enterprise resource data. This paper presents a meta-model of an activity warehouse for integrating business and production process data in industrial manufacturing. We approach BAM requirements for deriving the meta-model of the activity warehouse.

This work is structured as follows. The next section gives related work. Then, research background and motivation are presented. Afterwards, we present production process data based on BAM requirements. Furthermore, we present a meta-model of integrated business and production process data. Finally, a conclusion and future research are given in the last section.
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