

# Business information modeling for process integration in the mold making industry

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## Abstract

Driven by industrial needs and enabled by the latest information technology, enterprise integration has rapidly shifted from information integration to process integration for performance excellence in the entire business process. This paper reports on the modeling of a business information model which enables mold making companies to achieve business process integration. The needs of process integration in mold making companies are first highlighted. Typical mold making business processes are analyzed and four critical business processes to be integrated are identified. Further, a process-oriented business information model is proposed, which associates business information entities to meet the needs of all business processes. Based on the model, the integration of four critical business processes is investigated, which enables seamless information flows to streamline the business processes, maximize information sharing across the business processes and achieve the automation and concurrency of the business processes. Finally, the implementation and benefits to industry of the system derived from the developed information model is presented.

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## 1. Introduction

In the past decades, various computer-aided software systems, such as computer-aided design (CAD), computer-aided process planning (CAPP) and computer-aided manufacturing (CAM), have been widely adopted by companies to improve business performance in terms of productivity, flexibility, quality and utilization of resources [1]. However, a survey [2] of 18 companies reveals that not all of the technologies perform as well as expected and some even lead to a total failure. Some companies complain that their business performances are not improved though the adopted technologies function well.

According to our study, some of the main reasons causing these situations are highlighted as follows:

- Incompatible proprietary information models underneath different systems restrain the ability of information sharing and exchange [3].
- The lack of integration breaks down information flows and fragmentizes business processes. As a result, the performance improvement of individual activities does not contribute to the overall performance of an enterprise.
- The limited flexibility of adopted systems restricts the changes of business practices to gain new business opportunities.
- Individual systems are selected and implemented based on the initiatives of individual departments rather than the common goal of the enterprise.
- Each department highlights its importance and competes for investment to adopt new systems or upgrade

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existing systems. This leads to the difficulty in the utilization of investment to achieve the most optimal technology deployment [4].

- Too much emphasis is focused on the technologies and human beings are improperly ignored [2].

Nowadays, enterprise integration gains much attention and is widely recognized as an effective means to improve the business performance [5]. Two methods exist to achieve enterprise integration: information integration and process integration. Information integration is to build up a fundamental information infrastructure, with new information technologies incorporated, to make information exchangeable between computer applications [6]. Information integration achieves information exchangeability by transforming information from proprietary formats to neutral formats and representing various information entities according to common standards. Though information integration enables information sharing between different applications, its shortcomings are obvious. Some of the main ones are listed as follows:

- The success of information integration too much relies on the openness of applications and the maturity of various standards.
- It often requires end users to do additional work to export information in neutral formats for exchange.
- Sometimes, the coexistence of multiple duplications of the same piece of information is inevitable as different applications still have their own databases. The difficulty in information synchronization stands out.
- The common goal of an enterprise could not be clearly highlighted as information integration usually takes place between different pairs of applications rather than among all applications at once.
- Internal competition for technology upgrading among different departments may still exist since information integration only focuses on some applications [7].

Recently, enterprise integration has been rapidly evolving from information integration to process integration as process integration promises to position individual performance initiatives under a process umbrella to maximize the overall performance and boost operating results [4]. It looks into all the activities of an enterprise and enables the enterprise to work as a whole towards a common goal. Therefore, enterprises have the opportunity to improve cooperation, coordination and communication, to link functions with information, resources, applications and people, and to streamline material, information and control flows throughout the business cycle [8]. The optimal resource utilization can be achieved to gain the maximum profit. As such, process integration has gained the focus of enterprises intending to enhance productivity and agility [9].

In the modern business paradigm, companies can be clustered into two groups: (1) master companies, which outsource their work to other companies; and (2) partner

companies, which are driven by customer orders from master companies. Mold making companies, which are typically small- and medium-sized enterprises (SMEs), usually act as partners of molding companies, which are usually large companies [10,11]. They design and produce molds for molding companies to manufacture molding products. As the market lifecycle of products becomes shorter, the time for mold making companies to design and produce molds also shrinks remarkably. To improve competitiveness, many mold making companies are seeking solutions to improve their working efficiency. As such, this paper intends to develop a business information model for process integration in the mold making industry to streamline the business activities and maximize the overall performance.

## 2. Analysis of industrial requirements

The shortened product market lifecycle requires mold making companies to supply molds in shorter time. This can be evidenced by our industry partners in that they are often requested to deliver molds to customers within 3 months of customers' orders instead of the luxurious expectation of 6 months in the past. To retain customers, mold making companies are forced to improve their productivity to rapidly respond to molding companies, their customers. At present, mold making companies have adopted some computer-aided systems to assist business activities. However, most of these systems work autonomously. Each system utilizes a dedicated data model and manages data in different databases. Relevant data cannot be associated to form useful information for decision making. Due to the lack of the ability to support the client/server architecture, many adopted systems are installed in local computers. In such a computing environment, information exchange is usually achieved by physically copying some files from one computer to another. The coexistence of the multiple duplications of some data is inevitable. Information inconsistency and integrity are potential issues and security management becomes difficult. Communication between different people and departments is inefficient and error-prone. Thus, enterprise integration is drawing the attention of mold making companies.

In particular, mold making companies usually operate in a make-to-order manner because molds have to be specifically produced based on the requirements of customers. Since molds are not the merchandize that is frequently traded in the market, few third parties produce exchangeable key parts of molds for the replacement of damaged parts. Molding companies usually have to order the replacements of damaged parts from the original maker of the mold. When a mold reaches the end of its life, the molding company usually orders a new mold from the mold maker of the depreciated mold. In these cases, it is critical that mold making companies are able to quickly find all related information for the reproduction of some key parts or a whole mold. With the original information on hand, the reproduction cycle can be dramatically

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