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# Agent and data mining based decision support system and its adaptation to a new customer-centric electronic commerce

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## Abstract

Recently, as the Internet has become more widely used, Electronic Commerce (EC) has emerged and has developed a high-level business environment. The customer-centric EC model is important for the success of EC and this study presents a new customer-centric EC model in make-to-order (MTO) semiconductor manufacturing environment. In this study we proposed the EC model providing the process transparency of process sampling method that can provide online semiconductor customers with the performance information of available process sampling methods which can be used at all manufacturing process steps for their own products in MTO manufacturing environment, and then the capability to select a desirable one among them based on their purchase situations on EC web site. In the proposed EC model the customer can select a process sampling method that is most suitable to him/her according to the customer's purchase situation. In this model the use of intelligent decision support system called customized sampling decision support system (CSDSS) that can autonomously generate available customized sampling methods and provide the performance information of those methods to EC system is requisite. We implemented an Internet-based prototype of CSDSS which had an architecture based on intelligent agent technology and also the successful integration of data mining process for the generation of optimal sampling method into DSS framework by means of applying that technology. © 2003 Elsevier Ltd. All rights reserved.

*Keywords:* Electronic commerce; Process transparency; Decision support system

## 1. Introduction

Recently, as the Internet has become more widely used, electronic commerce (EC) has emerged and has developed a high-level business environment. The initial rush to EC by businesses resulted in the first step of establishing a commercial Web presence. However, companies have now begun to mature from using the Web as a promotional tool, to actually conducting business over it. Businesses providing Web-based services can track the personal preferences of their customers through monitoring their Web browsing and purchasing habits. This can even be fed back into the presentation of products to customers permitting the development and marketing of an 'individual product' tailored to a particular customer's preference. At the same time the direct link between business and

customer has allowed the delivery of close to 'real-time' services. However, this personal contact builds high customer expectations-if they are let down, they are quick to judge and only one click away from your competition.

When a customer purchases products in EC market, he/she may have many possible sources for the desired products and in making a choice decision of product, greater product information is expected to be critical to ensure effective customer decision making. Rather than always demanding the lowest price in EC, online customers have shown an interest in making quicker, better, informed decisions ([The Economist, 1997](#)).

Efficient EC market generally has the manifest concept of transparency in four primary dimensions ([Morgan Stanley Dean Witter, 2000](#)): price transparency that means the trading participants can get the market price or the price they have come to expect, and know nearly perfect information on price variation by geographic region or by size of supplier (or buyer), availability transparency that

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implies the customer who needs a certain product can get the information on who has it now, supplier transparency that is about that who else out there makes the product, and product transparency that indicates whether there is a substitute, alternative product.

Transparency is a knowledge-based concept that implies participants have intelligence about the market around them and buyers always want more market transparency in EC market. In this paper we introduce another concept of transparency, process transparency, in EC market in order to improve the efficiency of that. Process transparency implies that online customers can have access not only to product information, product pricing and product availability but also to order status, product career information (e.g. manufacturing and testing process history of product: test results, quality information, etc.), etc. (Fig. 1).

Process transparency is intended to provide customers greater visibility of a (seller) company’s internal activities such as the placement and processing of purchase orders. Through the EC web site providing process transparency, customers can monitor, feedback and furthermore regulate a (seller) company’s operations for their own products. It can give a higher degree of customer satisfaction concurrent with a high degree of customization in especially make-to-order (MTO) manufacturing by providing customers the capability to directly control the operations of manufacturing process for their own products.

In our study we address the new semiconductor EC model specifically providing the process transparency of

process sampling for MTO semiconductor manufacturing (SM). In this model when the online customers of semiconductor product order in the EC web site, they can access to the performance information (e.g. detection of any abnormality and good representation of total defect distribution) of available process sampling methods which can be used at all manufacturing process steps for their ordered products, and then select a desirable one based on their purchase situations. In our study we call the selected sampling method customized sampling method. The underlying idea of customized sampling method is that according to the customer’s purchase situation, the desirable (optimal) process sampling method to him/her is different.

When a customer purchases products in EC, the purchase is generally made based on multiple attributes considerations such as product quality, delivery time, quantity, price/cost at the same time. In some cases, the purchases of customer are time-critical, so that if the products are not received before a deadline, they are worthless. In those situations, delivery time is a crucial attribute to the customer. In other cases, the customer wants to purchase products of very high quality, so that the product quality is very important to the customer. Thus, the customer purchases are made based on the varying importance of each attribute to his/her purchase situations.

In the semiconductor industry, each customer has a different set of attribute requirements and technology needs

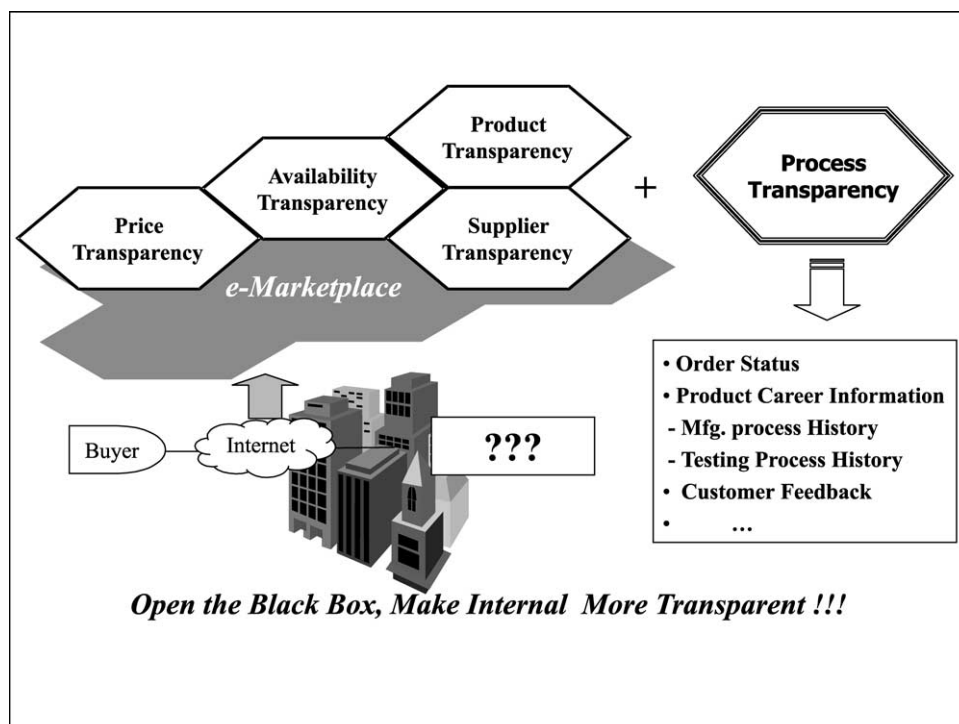


Fig. 1. Concept of process transparency in EC market.

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