



## Virtual factory and relationship marketing—a case study of a Taiwan semiconductor manufacturing company

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### Abstract

As global competition grows, building and maintaining of long-term customer relations are major concerns of companies, such that relationship marketing becomes a new marketing paradigm. Customer service in addition to manufacturing capability is an important way to keep the customer commitment. The Internet is a powerful information technology used to provide value-added service to customers and to communicate with each other. As such, the Internet-based virtual factory has been proposed to facilitate connections among partners. Taiwan Semiconductor Manufacturing Company (TSMC), one of the world's largest dedicated integrated circuit foundries, constructed its virtual fabrication to strengthen bonds with customers. Customers are able to access directly to TSMC's and its strategic alliance partners' information system and thereby receive immediate status reports of their orders or some other feedback. In this paper, the framework of TSMC's virtual fabrication is introduced, and the competitive advantages resulted from virtual fabrication are investigated. Implications of TSMC's experience are then discussed. © 2002 Published by Elsevier Science Ltd.

*Keywords:* Virtual factory; Internet; Electronic commerce; Relationship marketing

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### 1. Introduction

In today's business-to-business markets, many companies face intense pressure caused by fast changes in technology, short product life cycle, and fierce global competition. It is increasingly important for companies to help customer's business be able to change production plans as

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market demands dictate. In this situation, much attention has been paid to timely and customized services, which provide customers easy access to and control of the elements throughout the manufacturing process. In the past decade, new thinking about the buyer–seller relationships is so evident that experts have suggested that relationship marketing (RM) is a new marketing paradigm (Webster, 1992; Grönroos, 1994). It focuses on approaches to build, develop and maintain all successful relational exchanges (Berry, 1983; Morgan & Hunt, 1994; Grönroos, 1994). By building and maintaining customer relationships, the selling partner can achieve higher financial performance (Kalwani & Narayandas, 1995; Holm, Eriksson, & Johanson, 1999), customer trust, commitment (Morgan & Hunt, 1994) and satisfaction (Cannon & Perreault, 1999). According to resource-based view, Morgan and Hunt (1999) also argued that long-term relationships are one of the sources of sustainable competitive advantage.

To lure new customers and to hold onto existing ones, businesses are investing heavily in information technologies. The Internet plays an ever-increasing role in understanding customer needs, serving customers better, responding faster to customer inquiries, communicating more efficiently with customers and developing new opportunities (Murphy, 1996). It is ultimately appropriate for heightening the dependence of buyer and seller, and managing customer relationship (Angelides, 1997; Armstrong & Hagel, 1996; Evans & Wurster, 1997).

The Internet has many potential uses, such as being a source of information, communication tool and distribution channel, depending on the objectives and capabilities of the user (Ranchhod & Gurãu, 1999). The traditional face-to-face interchange of business marketing gives way to this emerging new transaction tool that helps to standardize and centralize the conversations (Deighton, 1997). According to a survey from Advanced Manufacturing Research, 71% of manufacturers already use the Internet to communicate with customers, and 11% plan to do so in the near future (Allnoch, 1997). Despite the perceived importance of the Internet, there are still only limited empirical studies about Internet-enabled relationships (Davis, Buchanan-Oliver, & Brodie, 1999).

During the past decades, foundries have become one of the fastest growing businesses in the world and the importance and competition in this industry will keep growing in the near future. Foundries have invested in process technology and manufacturing capabilities; however, customer service is the new strategy for foundry companies to differentiate from competitors. The service-oriented new concept of “virtual fabrication (VF)”, which is proposed by the industry, has become one of the critical aspects for achieving competitiveness (Korczyński, 1997). In order to achieve higher levels of customer service, the world’s largest integrated circuit (IC) manufacturer, Taiwan Semiconductor Manufacturing Company (TSMC), is constructing its VF. The implementation of VF helps in improving the customer relationships and operational efficiency, and, as a result, brings competitive advantages.

The intention of this paper is, therefore, to contribute to the understanding of the Internet as an enabler that strengthens the relationships between buyers and sellers. More specifically, the purposes of this study are to: (1) introduce the framework of TSMC’s VF; (2) explore the influence of important Internet capabilities on customer relationships; and (3) investigate the relationship between the services provided through Internet and operational efficiency improvement.

In the following sections, first we review the past research about the important capabilities of Internet communication and the literature on RM. Next, we describe the case study methodology

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