Chapter 4.19

Engineering Design at a Toyota Company:
Knowledge Management and the Innovative Process

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ABSTRACT

The author worked in the research and design department at a large Toyota company in the late 1990s and experienced an innovative process where engineers worked in tightly knit groups where monitoring, the informal hierarchy and dependence resulted from an emphasis on collective work. In the approach to innovation during the design process, the Toyota engineers were found to engage in an inductive process that placed an emphasis on the concrete and an orientation toward the field as a result of an approach that relied on experience based knowledge. The use of tacit and explicit knowledge is discussed within the context of the design process and the author finds that explicit knowledge dominates the improvement of productivity and organizational learning. The latest research in the sociology of culture and cultural psychology is used to highlight the cognitive approach to problem solving during the innovative process.

INTRODUCTION

With the rise of Toyota's renowned position as a producer of high quality automobiles, the past two decades has seen a dramatic increase in the study of the company's use of knowledge and organizational learning (Cusumano and Nobeoka 1998; Keeney and Florida 1993; Monden 1993; Womack, Jones and Roos 1991). The literature primarily focuses on the principles of the Toyota Production System and it's unique blend of human resource and management techniques. Scholars claim that Toyota's success stems from employing principles of continuous improvement and problem solving in what is known as "lean production". Although the studies initially focused on manufacturing techniques, such as just-in-time manufacturing and continuous improvement (kaizen) to reduce waste and increase quality, scholars claim that management's use of knowledge in the research and design stage in the Toyota organization is an important aspect of implementing the best practices of lean production. (Liker 2004) suggests that one of the keys to Toyota's success lies in its ability to create an organizational culture focused on problem solving, continuous improvement and organizational learning implemented at all levels of product development.

Another stream of literature focuses on the cognitive processes behind the use of knowledge in organizations. The use of tacit verses explicit knowledge initially discussed by Michael Polanyi has become the basis for studies in knowledge management in Japanese organizations. Tacit knowledge is defined as knowledge known only to an individual by experience. Explicit knowledge, on the other hand, is knowledge that is available in written form and can therefore easily transferred to others. (Nonaka and Takeuchi 1995) claim that Japanese firms do not employ the Western, hierarchical top-down management structure where selected knowledge flows from below to top management who use the information to devise corporate strategy, nor do they employ a bottom up strategy where employees are independent, and the hierarchy and the division of labor are eliminated. Japanese firms instead employ a middle-up down process of knowledge creation where middle managers are at the center of knowledge management and are best able to exploit the use of both tacit and explicit knowledge to improve organizational learning and productivity.

Many of these studies developed in part as a consequence of Japanese manufacturing industries posing a threat to American companies and the turn to investigating intellectual resources and organizational learning during the 1990s (Styhre and Sundgren 2005). Although studies of management and the Toyota Production System have contributed to the understanding of knowledge management in Japan, they are pointed toward learning specific management techniques and rarely focus on the micro-social processes behind the dynamics of innovation. In this paper I will discuss the use of knowledge and innovation through an ethnographic analysis of my experience working at a Toyota company in Japan. I will draw on the Toyota scholarship while discussing the cognitive turn in sociology and the latest findings in cultural psychology.

Current research in the sociology of culture and cultural psychology suggest that culture influences the way actors interpret and use knowledge. Sociologists believe that actors' thoughts, motives and intentions are constituted by the cultures and social institutions of their society and that cultures and institutions are reproduced by the structurally shaped and constrained actions of those actors (Sewell 2005). Structures consist of available rules and schemas (procedures or principles of action), capable of being put into practice in a range of different circumstances. (Swidler 1986) suggests that strategies of action are cultural products which are derived from practices of a group or society that create ways of organizing experience and evaluating reality. Culture shapes a "tool kit" of habits and skills in which individuals construct a strategy of action.

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