



## Chapter X

# Information and Knowledge Management for Innovation of Complex Technologies

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### Abstract

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*This chapter investigates the role of information and knowledge management in innovation of complex technologies. A conceptual framework for three patterns of technological innovation (normal, transitional, and transformational) is presented, and the process of information and knowledge management in accessing and using knowledge is analyzed. Particularly, emphasis is put on the cultural impact on the information and knowledge management processes. Five case studies of evolving technologies carried out in the United States, Japan, Germany, India, and China are used to elaborate the conceptual framework and key points presented in this chapter. Lessons for managers and public policymakers concerned with facilitating the innovation of technologies are discussed.*

## Introduction

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Complex technologies are the most valuable technologies in the global market. In the 21<sup>st</sup> century, the capability of repeated innovation of complex technologies is crucial in order for a country to become or to remain advanced. Networks are essential to the innovation of complex technologies, as networks involve linkages and relationships that make it possible to access, create, synthesize, and diffuse the diverse tacit and codified knowledge.

The capacity of effective management of information and knowledge needed for innovation is a basic requirement for firms that want to be competitive in both domestic and international markets. Information and knowledge management is defined as the collection of processes of the creation, dissemination, and utilization of information and knowledge. Accordingly, information and knowledge management for innovations refers to creating, diffusing, learning, and using information and knowledge to promote technological innovation.

This chapter investigates the role of information and knowledge management in innovation of complex technologies. A discussion of three patterns of technological innovation is presented, and the role of information and knowledge management in accessing and using knowledge is analyzed. Particularly, emphasis is put on the cultural impact on the information and knowledge management processes. This chapter also suggests lessons for managers and public policymakers concerned with facilitating the innovation of technologies.

The research method employed in the chapter is case study. Given the problems in measurement and the availability of empirical data regarding technological innovation and cultural dimensions, a quantitative analysis is hard to achieve. On the other hand, however, the case study method, despite its disadvantage in generalization, provides more insights that help to understand the dynamics of causes and effects. Five case studies of evolving technologies carried out in the United States, Japan, Germany, India, and China are used to elaborate the conceptual framework presented in this chapter. The previous five countries represent five different cultures.

## Innovation Patterns of Complex Technologies

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### Complex Technology

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The significance of the capacity to carry out technological innovation in long-term economic growth long has been recognized. As Freeman and Soete (1997) point out, in the classic works of Smith, Ricardo, Marx, and Malthus, invention and innova-

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