

## Chapter 22

# An Empirical Analysis of Innovation Success Factors Due to ICT Use in Japanese Firms

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### ABSTRACT

*ICT (Information and Communication Technology) has now become one of the most important sources of innovation, and it contributes to share information on innovation within the firm as well as between firms. The former is referred to as ICT use inside the firm, while the latter as ICT use outside the firm. The objective of the chapter is to analyze how innovation is enhanced by two categories of ICT use based on a survey conducted with respect to 2,260 unlisted Japanese industrial companies in January 2010. This survey asked how ICT is used among respondents and the number of patent applications, which is used as a proxy of innovation. After defining the index of internal innovation capability, how ICT use promotes internal capability and innovation are analyzed using probit estimation. Moreover, the study focuses on open innovation, and these analyses are applied for firms practicing open innovation.*

### INTRODUCTION

Due to the long stagnation and the satiation of markets, business environments surrounding Japanese SMEs (small- and medium-sized enterprises) have become increasingly severe. SMEs have been struggling to survive in these circumstances

by creating innovations such as developing new products and services, finding new markets, and improving the efficiency of business processes. Creating innovation is not easy task, and firms have to enhance their capability for innovation. The sources of innovation have been analyzed from various aspects. Since innovation is mainly

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related to technology, the technological level of firms, such as in R&D capability, human resources including engineers, and so on, are important. Innovation is not solely a technological matter, but is created by a firm as a whole, and the nature of the firm's organizational management, such as the leadership capabilities of top management, the structure of the organization, the business culture oriented to managerial reform and renovation, is also important.

These sources of innovation have been shifting from one aspect to another in accordance with the development of the economy, technology, and social norms. In the contemporary stage of the economy, information technology (IT) or information and communication technology (ICT) is greatly related to innovation; the Internet, computers and mobile phones have advanced dramatically, and have become widespread not only in firms but also in society as a whole. ICT has been regarded as a tool that improves the productivity of firms and enhances innovation activities. ICT contributes to firms in the following ways:

1. Improving the efficiency of management and communication inside the firm;
2. Enabling networking and collaboration among business entities and organizations by reducing the time required for communication and overcoming geographical constraints; and
3. Creating new markets for business, such as e-commerce.

As a result, ICTs have become one of the essential bases for promoting innovation activities (Dogson et al., 2006; Lee & Xia, 2006; Idota et al., 2012a). Moreover, ICT has created new phenomena related to innovation; ICT also activates communication among employees or between employees and the top management within the firm, and accordingly strengthens the knowledge creation process. It is reported that even the use

of SNS, Twitter, or blogs by employees promotes innovation (Idota et al., 2011). In addition to ICT use inside the firm, ICT use also supports collaboration with entities outside the firm, which is referred to as "open innovation." In particular, cooperation with other firms, universities, and local research institutions has been an important focus (Chesbrough, 2003, 2006a, 2006b). In the open innovation process, a strategy for sharing information and resources with other firms, from suppliers to customers, is required. The use of ICT is, therefore, indispensable for the promotion of open innovation, since ICT can connect firms and expedite the sharing of information related to innovation (Tsuji & Miyahara, 2010, 2011; Idota et al., 2010, 2012a).

The simple introduction of ICT, however, does not necessarily promote innovation. Firms which succeed in innovation have already established the basis for success prior to introducing ICT, which is referred to as an internal innovation capability consisting of managerial behavior and organizational capability, which form the origin of sustainable competitiveness. The internal innovation capability firms possess is enhanced by the introduction and intensified use of ICT, and the promotion of innovation activity. Thus firms can employ ICT to further promote innovation. From this view, Japanese SMEs are thought to be not necessarily skillful in ICT use when compared with large firms (Tsuji, 2005; Japan Small Business Research Institute, 2008).

Although ICT is acknowledged as a factor in promoting innovation, few empirical studies have been conducted, but these include Lee & Xia 2006, Idota et al. 2010, 2012a, and Spiezia 2011, for example. This study therefore aims to clarify the relationship between ICT use and innovation by examining innovative Japanese firms. In the analysis, we examine ICT use not only inside but also outside the firm. In so doing, we conducted a mail survey with respect to 2,260 unlisted firms, which are mainly SMEs, in industries such as

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