

# **Learning-By-Doing and Knowledge Spillovers: National System of Innovation and The Development of the Japanese and Korean DRAM Industries**

Jeffrey Y. Kim

University of California, Irvine, CA ,U.S.A

The countries of the Pacific Rim, including the US, are world leaders in DRAM (Dynamic Random Access Memory) production, holding more than 90% of global share. DRAM is crucial because it is an essential input to the "information economy" based on computers and communications technologies. The DRAM market the US created and dominated in the early years had been captured by Japanese firms by the mid-1980's. However, by the mid-1990s, Korean firms have taken more than 30% of world share, with Japan holding less than 50% and the US holding only 15%. The competitive scene is still changing. Taiwanese firms are poised to compete in the DRAM market, and China will enter the DRAM market in the near future.

The catch-up observed in the DRAM industry does not follow the traditional model of innovation, channeling knowledge from R&D to production. Such catch-up strategies depend primarily on successful techniques for rapid learning, and have been demonstrated particularly clearly in the case of East Asian nations. A particular form of learning, learning-by-doing, is widely believed to play a key role in development of high-technology industries in those nations. However, the history of DRAM industry development in Japan and Korea suggests that the mechanisms by which learning takes place are not uniform across the countries involved in DRAM sectors. It is important to understand the differences in what I call learning-by-doing capacity (LBDC) at the firm, agency, and national levels.

This paper examines the example of LBDC development that has proven effective in the creation of the semiconductor industries in Japan and Korea. Both of these countries pursued catch-up strategies in the DRAM industry. The DRAM examples reinforce our understanding of differences in development patterns between Asian countries, especially Japan and the NIC's, and Western developed world. Spillover effect of DRAM development may also be understood in the light of changes in learning-by-doing capacities.

# **Incubator Program In Taiwan**

Benjamin J.C. Yuan

National Chiao Tung University

1001 Ta-Hsueh Road, Hsinchu

Taiwan, Republic of China

In Taiwan's industry, the small and medium enterprises play leading roles in economic developments, being flexible in management, able to attend the needs of the markets, and capable of manufacturing diverse products on a small scale. However, Taiwan has limited land for industrial use, the raised labor cost and environmental protection cost, which gets more attention, increases the management cost that gradually covert small and medium enterprises from their traditional labor-intensive industry to technology-intensive industry with more competitive advantage. It is really a challenge for them to get their industry upgraded, due to the difficulty in getting new technology in addition to their limited scale, capital, and human resources. The establishment of incubators will mark the beginning of a new era in Taiwan. Incubators can provide new entrepreneurs an excellent environment for business incubations, lower the risk while commercializing an innovative technology, at the same time, contributing to the integration of technology resources. In order to make Taiwan's second economic miracle possible, new ventures are encouraged to develop innovative technology with added value, an aim to changing Taiwan to be a technology island, at the same time, an Asia Pacific Operation Center. Up to April 1997, Eight university-based incubators, two non-profit research institution-based incubators and one private incubator have been established since 1996. This research will focus on one of the effective way to upgrade the technologies of small and medium enterprises as well as the orientation, content, and planning and progress of incubators in Taiwan.