

# **A CASE STUDY OF RESEARCH INSTITUTE AS A TECHNOLOGY BUSINESS INCUBATOR: ITRI**

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## **ABSTRACT**

We explore the roles and services provided by the Industrial Technology Research Institute (ITRI) for development of Taiwan's high-tech industry, and report the technology transfer activities of this organization. Specifically, we focus on the high-tech spin-off process through which new firms were formed. Our study suggests that spin-off could be an effective means for catching-up economies to diffuse technology capabilities from public sectors to private sectors. This spin-off mechanism is an approach for local firms to acquire complex new technologies.

Keywords: technology business incubator; high-tech spin-off; technology transfer; technological innovation; research institute

## **INTRODUCTION**

Research institutes are increasingly charged with the mission of boosting regional economic growth through the creation and application of technological knowledge. Technology licensing, research contracts, consultancy and other technology transfer mechanisms are often used to link the knowledge base of research institutes and the needs of industrial firms to develop technological know-how. Spin-off is one of those mechanisms to transfer technology from the research institutes to industries. This paper studies Industrial Technology Research Institute (ITRI) and its spin-off companies as an example to show how spin-off can be a major wedge of transforming an industrializing economy into a newly industrialized one. Ambitious new ventures often failed due to the lack of required domestic industry networks and supporting infrastructure that threatens the survival of those new ventures, especially in the early stages of business development. Technology business incubation (TBI) provides a mechanism to shield the new ventures from hostile environment and to nourish their capabilities and distinctive competences before they can independently compete against other multinationals. The concept of TBI is often associated with university-based, private or hybrid technology research center in the case of U.S. (National Business Incubation Association, USA, 1993). The ITRI and its spin-offs provide an interesting example of developing new business models and commercializing foreign technologies through a unique TBI process. This paper focuses on how and why the TBI process of ITRI, before spin-off and the linking mechanisms between spin-offs and ITRI after spin-off, can create value.

## **SPIN-OFFS AND THE SPIN-OFF PROCESS**

One mechanism of technology transfer is the founding of a spin-off company that embodies a technology developed at a parent organization. The term "spin-off" usually means a new company that arises from a

parent organization. Typically, an employee (or employees) leaves the parent organization, taking along a technology that serves as the entry ticket for the new company in a high-tech industry. Spin-offs are the main mechanisms of technology transfer in some areas like Silicon Valley (Rogers and Larsen, 1984). Spin-offs are also known as “start-ups” and “spin-outs” (Carayannis et al., 1998; Steffensen et al., 1999). Roberts and Malone (1996) and Carayannis et al. (1998) identify four principal roles that are usually involved in the spin-off process:

- 1) The technology originator, who brings the technological innovation through the innovation-development process (Rogers, 1995) to the point at which the transfer of technology can begin.
- 2) The entrepreneur(s), who attempts to create a new business venture that is centered on the technological innovation. The role of the entrepreneur is to commercialize the technology into a product or service that is sold in the market place.
- 3) The parent organization, in which the R&D activities to create the technological innovation take place (and thus in which the technology originator is usually located), and which may provide such functions to the spin-off as an assistance in patenting the innovation, technology licensing, etc. The main function of the parent organization is to make available the intellectual property rights to the technological innovation, perhaps for a technology licensing fee or in exchange for an equity share in the new venture.
- 4) The venture investor, who provides the financial resources to establish the spin-off, may provide the needed business management expertise.

In USA (the birthplace of academic entrepreneurship) the spin-off phenomenon, achieved its first success many years ago. Popularised by the development of the legendary ‘Silicon Valley’ and ‘Route 128’ around prestigious universities such as Stanford and MIT, academic spin-offs have been part of the American academic landscape for decades (Brett et al., 1991; Roberts, 1991; Ndonzuau et al., 2002). Comparing with those of United States, the academic spin-offs in Taiwan are still at an early stage of its development, but the spin-off phenomenon has achieved its success to a certain extent since 1980s through the government-led R&D center, namely, the Industrial Technology Research Institute.

### **INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE(ITRI)**

The Industrial Technology Research Institute, founded in 1973 by the Ministry of Economic Affairs (MOEA), is primarily responsible for providing product development guidance to developing industrial technologies, and helps private enterprises to enhance their competitiveness. The major functions ITRI are: 1) To engage in applied research and technical services to accelerate the industrial development of Taiwan; 2) To develop key, compatible, forward-looking technologies to meet industrial needs and strengthen industrial competitiveness; 3) To disseminate the research results to the industrial sector in a timely and appropriate manner, in accordance with the principles of fairness and openness; 4) To foster the technology development of small and medium-sized businesses, and cultivating industrial technology human resources for the benefit of the nation. ITRI has since grown to become the biggest technical incubator for industry as well as an important arm of the government's industrial policies on this island. ITRI's research projects span a broad spectrum of industries, ranging from traditional to emerging, and from labor-intensive to high-tech. Research of ITRI can be divided into 6 major established fields of technology: 1) Communications and optoelectronics; 2) Biotechnology and medical technology; 3) Precision machinery and MEMS technology; 4) Sustainable development technology; 5) Materials and chemical engineering technology; and 6) Nanotechnology. In addition, ITRI's Open Laboratory Program was initiated in July 1996. This ITRI on-site program has two segments, i.e., joint research and incubation. The joint research segment encourages people come in to share ITRI's facilities and expertise, in pursuit of

new technology with commercial promise. The incubation segment offers entrepreneurs the convenience of one-stop service, including technical, legal, and business consultations. For both the segments, ITRI's close industrial ties are an important asset. By the end of 2002, there were 155 projects completed, 87 in joint research and 68 in incubation. Ninety-eight companies were formed with a total capitalization of NT\$38.7 billion (about U.S. \$1.1 billion). They span a very broad industrial spectrum.

### **KEY SUCCESS OF ITRI'S INCUBATING NEW VENTURES**

Through the study of ITRI and its spin-off cases, we can make a general analysis of its success and find some characteristics of ITRI's founding its spin-offs and the relationship between them.

#### **Characteristics Of ITRI's Founding Its Spin-Offs**

In general, ITRI as a parent organization (through its research centers) played a key, positive role in establishing its spin-offs. The employees of a research center usually play the main role as originator in assisting the spin-off process. ITRI is a government-based and non-profit technology business incubator, aiming to cultivate new potential companies in Taiwan via technology transfer to speed up industry development and promote the national economical growth. In this way, government's policy to support the vital and prospective industry has an important impact in the interaction of ITRI's operation with private sector. The private sector relies on basic research from government-funded laboratories to provide the supporting data for their own applied research that will lead to the development of marketable products. Most large corporations cannot leverage basic research because of the constant pressure from stockholders, but small startups can often do as efficiently as government laboratories in filling the vital role of transferring the results of basic research to applied research for industry. On the other hand, the institute invests in start-up technology-based companies with market potential. However, it is different from ordinary technology business incubator in that it places the promotion of technology-driven business in Taiwan, not profit, as the ultimate goal. ITRI actively encourages technology transfer, especially spin-offs.

#### **The Relationship Between ITRI And Its Spin-Off Companies**

The success of a new spin-off company depends essentially on its relationship with the parent organization. The more a spin-off company can receive support from its parent organization, the more chances it can gain to be succeeded. However, lengthy negotiations were required for spin-offs to acquire the intellectual property rights for its core technology, being commercialized by the spin-off, from the parent organization in the start-up process. A high volume of legal disputes may occur frequently in the contexts involving parent companies and their spin-offs, for instance, in Silicon Valley where the parent organization is usually the technology companies. On the contrary, the ITRI's spin-offs experienced few frictions with their parent, in each case a government-based research center. If frictions occurred, they were overcome, or the spin-off companies like UMC, TSMC, and VIS could not have begun and grown to world-class companies without the assistance of its parent research center at ITRI. In other words, the spin-offs' relationship to their parent organization, ITRI, has been quite positive. The research center often provides laboratory facilities and access to research equipment to the spin-off and several ITRI faculty and research staff worked on contract for the spin-off companies during the early period. On the other hand, the spin-offs of study have generally advanced the research (especially on IC) and development activities of ITRI. The spin-offs usually provide funding to the parent organization (such as for technology licensing fees), and a role-model to promote further technology transfer from a research center. Such transfer via spin-offs contributes to the ITRI's role in the economic development.

[The complete paper is available upon request]