SCIENCE PARKS AND ECONOMIC DEVELOPMENT

Lindholm Dahlstrand, Åsa
Department of Industrial Dynamics, Chalmers University of Technology, Gothenburg, Sweden

Lawton Smith, Helen
Centre for Local Economic Development, Coventry Business School, Coventry University, UK.

Keywords: Economic development, high-tech industry, image, technology transfer, science parks, incubators

Contents

Summary

Science parks originated in the USA in the 1950s where they were established in order to increase the possibilities and profitability of commercializing university research, and to meet the needs of entrepreneurially minded academics. They spread in Europe in the 1960s and 1970s and have now become a worldwide phenomenon. The original technology transfer motivation exists to a greater or lesser extent depending on the context. No two countries have the same pattern of development of science parks. This chapter defines science parks and traces the history of their development and compares their operation in different countries. The cases of Sweden and the UK are used to compare the roles played by science parks in economic development in different countries.

1. Introduction

The establishment of science parks has become a worldwide development. Since the early 1970s, universities, property developers, local authorities, regional and central governments in advanced and developing countries have developed prestigious sites.

High-tech images are used to project technological vitality and commercial credibility by their developers, their tenants and by public authorities. Although image is the common denominator, science parks have three broad, but not mutually exclusive functions: 1) 'land use profitability', 2) 'commercialization of the science base', and 3) as a component of local, or regional or national governments' strategies, to foster the growth of indigenous firms and to attract inward investment. Even though the buildings might look similar, there are considerable variations between science parks with respect to the types of tenants, in networks within the site, and in links with local universities. It is also clear that no two countries have the same pattern of development of science parks. Moreover, since the definitions used in different studies are not always consistent there are difficulties in comparing the establishments.

The phenomenon of science parks has its roots in the USA. Dating back to the 1950s, science parks were originally set up in order to increase the possibilities and profitability of commercializing university research, and to meet the needs of entrepreneurially minded academics. The Stanford Research Park in California, established in 1951, is often regarded as the genesis of the science park movement. Before 1960, four other projects were founded in the USA, including the Research Triangle Park in North Carolina, which is the first "center type" project. In the following decades, there has been an emerging trend of entrepreneurial universities in the USA becoming more directly involved in supporting new business development activities. One mechanism used for this purpose is the establishment of business incubators. By 1992, the US National Business Incubation Association reported that more than fifty universities and colleges had participated in this effort. Using a broad definition of science parks, Kung (1995) found that in 1992 there were as many as 188 Centers, 57 Incubators and 103 Parks in the USA.

The establishment of science parks in USA drew considerable attention in Europe and other parts of the world. It did not take long before the first European science parks were established. For example, university professors from both Britain and Sweden travelled to the USA to find out more about these new developments. Returning to their own European universities, some of them found the support to set up similar European science parks. It was usual then, as it is now, for European science parks to be modelled on American parks.

In 1960, there were only six science park projects in the world (five in USA and one in the former Soviet Union). During the next decade, both Sweden and the UK established their first parks. By the 1970s, science parks had been established in Belgium, Japan, Korea, Taiwan and a number of other countries, amounting to some 50 projects in 13 countries. From the 1980s, the whole world witnessed an explosion in the establishment of science parks. By 1990, there were over 1000 parks around the world. It was found that the distribution of science parks among the top ten leading countries in 1992 was: the USA - 398 cases, Germany - 106, Japan - 104, China - 52, the UK - 50, France - 35, Australia - 33, Canada - 31, Sweden - 15, and Russia - 14. With two parks each in 1980, the UK and Sweden shared a world ranking as number five. Since then, the pattern of development in these two countries has diverged. This paper analyzes the phenomenon of science parks through case studies of these two countries.

One of the aims of this paper is to place the science park movement into its geographical and historical context. We begin by defining what is meant by a science park. In the second section, we present some earlier findings about the worldwide development of science parks and discuss what roles science parks are intended to fulfil. We then focus on the role of incubators. These are discussed in relation to the incubators link to its local university, to the science park on which it is located, to private firms and to industrial parks. The third section of the chapter examines the evidence on how the objectives of science parks are matched by experience. We discuss the highly important regional aspects of science park development. In the fourth section, we give an overview of the Swedish and British science park phenomena, followed by case studies from each country. The chapter ends with a summary and conclusions.

2. Universities, Science Parks and Regional Development

In this section, we begin by defining "science parks" and then discuss two of their three broad functions: commercialization of the science base, and regional development. In some parks that market themselves as science parks, the "land-use profitability" is the over-riding motive. Science parks established for land-use profitability often put less emphasis on the commercialization of the science base or on regional development, even if they are sometimes able to also fulfil these functions.

2.1. Definitions

At least five terms - business park, innovation center, research park, science park and technology park - appear quite frequently in existing classifications. In addition, some terms have a certain meaning in one country and another in a second country, for example, in Germany, the term Technology Center is used as an equivalent of a science park. Another term that is often used is the Business Incubator, which is closely linked with the term innovation center, it is also one of the six terms included in the classification of science parks and related developments of the European Community.

In this chapter we use the term 'science park' as the overriding concept for a whole group of related names and terms. As illustrated in Figure 1, a Science Park may include both a University Incubator and a Research Park for the transfer of technology. To be a science park it is, however, not necessary that these two functions are set up as separate legal units. Researchers have defined a science park very broadly as an organizational entity that sells or leases spatially contiguous land and/or buildings to tenants whose principal activities are basic or applied research or development of new products or processes. In addition, the UK Science Park Association in Britain requires that a Science Park:

- is a property based initiative;
- has formal and operational links with a University or other Higher Education Institute (HEI) or other major center of research;
- is designed to encourage the formation and growth of knowledge-based business and other organizations normally resident on site; and
- has a management function which is actively engaged in the transfer of technology and business skills to the organisations on site.

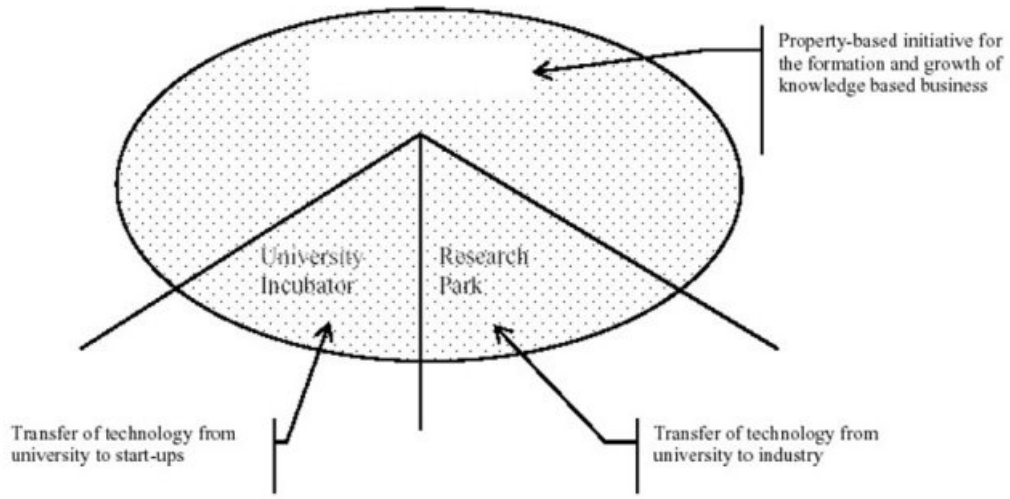

Figure 1. Science park as an overriding concept.

Using the Science Park as an overriding concept, including Incubators and Research Parks, we are excluding other concentrations of high-tech firms set up without formal links to universities. Following Kung, we classify Science Parks as:

- University Science Park - which has a locational proximity (campus-like) and important links to universities. Management and ancillary services are often important.
- Incubator - which can be synonymous with the "Innovation Center", "enterprise center" and "business and technology center". In general, an incubator is used for the start-up of firms engaging in R&D activities. A University Incubator puts special emphasis on the transfer of university research into the new start-up firms. Linkages with universities are important, so also is the help of on-site specialized management**.** An increasing trend is the formation of the sector specific incubators, particularly in the biotech sector.
- Research Park - where the transfer of technology and links with universities are very important. R&D is the preferred activity; prototype production is permitted, but mass production and commercial activities are not. One of the key features of the Research Park is the frequency of research collaboration and the transfer of technology between university and industry. There is no emphasis on the early development stages of new firms.

-
-
-

Bibliography

Acs, Z. J (1990) High-technology networks in Maryland: a case study. *Science and Public Policy* **15**, 315

Autio, E (1997) University links and technology-based SMEs in the Helsinki Region' In D.Keeble and C. Lawson (eds) 'Presentations and Discussions of TSER 'Networks, Collective Learning and RTD in Regionally-Clustered High-Technology SMEs' Munich Network Meeting Friday 28 February /Saturday 1 March 1997 ESRC Center for Business Research, University of Cambridge.

De Bernady, M (1998) RTD SMEs and Collective Learning: Historicity and Ability for a Local Economy to evolve: The Grenoble Case Study, in *TSER European Network on "Networks, Collective Learning and RTD in Regionally-Clustered High-technology Small and Medium Sized Enterprises" Regional Reports* July 1998 ESRC Center for Business Research, University of Cambridge.

Birch, D (1987) *Job Creation in America: How Our Smallest Companies Put the Most people to work.* New York: The Free Press.

Dourtriaux, J (1998) Canadian Science Parks, Universities and Regional Development. Chapter 15 in John de la Mothe and Gilles Paquet (eds) *Local and Regional Innovation Systems of Innovation* Kluwer Academic Publishers (1998) pp 303-326

Ferguson, D. (1995) Panacea or Let-down? Science Parks in the Literature, paper published by the Small Business Research Group, Department of Economics, Swedish University of Agricultural Sciences and TeknikBroStiftelsen i Stockholm.

Ferguson, D. (1999) *What's in a Location? Science Parks and the Support of New Technology-based Firms*, Doctoral thesis, Dept. of Economics, Swedish University of Agricultural Sciences.

Garnsey, E. & Lawton Smith, H. (1998) Proximity and Complexity in the Emergence of High Technology Industry: The Oxbridge Comparison. *Geoforum* **29 (4)**, 433 – 450

Hilpert, U and Ruffieux, B (1991) Innovation, Politics and Regional Development: London: Routledge. Technology Parks and Regional Participation in High Tech in France and West Germany. Chapter 3, pp 61-88 in U. Hilpert (ed) *Regional Innovation and Decentralisation: high tech industry and government policy*, London: Routledge

Hauschildt, J. and Steinkühler, R. H. (1994) The Role of Science and Technology Parks in NTBF Development, in Oakey, R. (ed.) *New Technology-Based Firms in the 1990s*, Paul Chapman Publishing Ltd., London.

Keeble, D. and Oakey, R. (1997) Spatial Variations in Innovation in High-technology Small and Medium-sized Enterprises: A Review, in A Cosh and A Hughes (eds) *Innovation: National Policies, Legal Perspectives and the Role of Smaller Firms*, Edward Elgar, London.

Kiese, M (1995) University of Warwick Science Park, Survey of Tenants in the Barclays Venture Center. A Report for University of Warwick Science park Ltd, Warwick

KPMG (1994) University of Warwick Science Park Review, Final Report - September 1994. London:KPMG Peat Marwick.

Kung, Shiann-Far (1995) *The Role Of Science Parks in the Development of High Technology Industries, with Special Reference to Taiwan*. Doctoral dissertation, St. Catharine's College, Cambridge University, UK.

Lindholm Dahlstrand, Å. (1999) British and Swedish Science Parks and Incubators for Small Technology-Based Firms, in During, W., Oakey, R. and Mukhtar, S-M. (eds) *New Technology-Based Firms in the 1990s, Volume VI*, Elsevier Science.

Luger, M., and Goldstein, H. (1991) *Technology in the Garden: Research Parks and Regional Economic Development*. The University of North Carolina Press, Chapell Hill & London.

Luger, M.I., and Goldstein, H.A (1991) Universities, the Urban Milieu, and Technology Development. Paper presented at 1991 ACSP-AESOP Conference, Oxford

Massey, D, Quintas P, Wield, D (1992) *High-Tech Fantasies: Science Parks in Society, Science and Space* London: Routledge

Mian, S. A. (1994) US university-sponsored technology incubators: an overview of management, policies and performance. *Technovation* 14 (8), 515 - 528.

Pratt, A (1997) The Emerging Shape and Form of innovation Networks and Institutions, in J. Simmie (ed) *Innovation, Networks and Learning Regions* Jessica Kingsley (1996) pp 211-237

Smilor, R. W., and Gill, M. D. Jr. (1986) *The New Business Incubator: Linking Talent, Technology, Capital, and Know-How*, Lexington Books, D.C. Heath and Company/Lexington, Massachusetts/Toronto.

Tamásy, C. (1999) Evaluation of Innovation Centers in Germany, paper presented at the Babson-Kauffman Entrepreneurship Conference, St. Carolina, May 11 – 15.

United Kingdom Science Park Association, (UKSPA, 1994) Science Park Directory, 6th Edition, edited by S. Cooke (ISBN 1 871786 06 1), the UK Science park Association.

UKSPA (1998) *UKSPA Annual Report 1998* Birmingham:UKSPA.

Vale of White Horse (1993) *Vale of White Horse Local Plan 1993* Abingdon: Vale of White Horse.

Westhead, P. and Storey, D. J. (1994) An Assessment of Firms Located On and Off Science Parks in the United Kingdom, Main Report, HMSO publication, London.

Biographical Sketches

Dr. Åsa Lindholm Dahlstrand is an Associate Professor at the Department of Industrial Dynamics, Chalmers University of Technology, Gothenburg Sweden. Her research interests include studying small technology-based firms and the role of entrepreneurs in the development of companies and economies. She is especially interested in pursuing the research of acquisitions and spin-offs as various entrepreneurial forms of promoting innovativeness and growth. This includes analyzing technology-based spin-offs from different incubator systems, including both universities and private firms, and the role these firms may have (e.g., for transferring technology) in subsequent acquisitions.

Dr Helen Lawton Smith is a Reader in Local Economic Development, Coventry Business School, Coventry University**,** is the founder and Director of Research of the Oxfordshire Economic Observatory, is a senior Research Associate in the School of Geography, Oxford University, and is a Research Associate at the Centre for Business Research at Cambridge University. Her research interests include regional and local innovation support systems, academic entrepreneurship and scientific labor markets in Europe.