The idea behind the call for universities in developing countries to embrace entrepreneurial mandate is derived from the notion that to compete, developing countries must enter new and emerging technology areas in their initial stages. The UN Millennium Project Task Forces on Science, Technology and Innovation (Juma and Lee 2005), emphasized that these new roles by universities in the developing world would allow the countries to take an active part in the prevailing and challenging trends of global knowledge economy. With this policy interest in mind, the chapter explores the extent to which universities in latecomer countries are contributing to the development of new emerging technologies. It examines this issue from the perspective of innovation and technological systems approaches focusing on the contributions of universities in Malaysia and Singapore to the development of fuel cell technology. Fuel cell technology is a new and emerging technology associated with the provision of cleaner and distributed sources of energy. According to the technological systems framework, the role of universities in the development of new emerging technologies is based on their contribution on a number of system level functions: knowledge development, knowledge diffusion, and entrepreneurial experimentation, direction of search, legitimation and resource mobilization.

Universities and New Technology Development

Carlota Perez and Luc Soete (1988) proposed that it is possible to leapfrog technological trajectories through the process of catching-up\(^1\)

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\(^1\) Catching-up is the term used to describe how developing countries (i.e. those that arrive late on the industrial scene) manage to narrow the productivity and income gap with the advanced countries (Fagerberg and Srholec 2005: 2)
if latecomer countries take advantage of the windows of opportunity\textsuperscript{2} temporarily created by the transition to new technologies. In other words, the process of *early entry*\textsuperscript{3} could be used to enhance the catching-up process (Perez and Soete 1988). They saw early entry strategy as based on acquiring the capacity for participating in the generation and improvement of technologies, as opposed to the simple use of them (Perez and Soete 1988: 458). This means entering the development of new technologies as early imitators. That is to say jumping quickly into the innovation bandwagon once the market and the technology is opened up by initial innovators. In other words, entering the technology’s development during the introduction or emerging phase of the technology life cycle. The idea of early entry was motivated by concerns that most developing countries continue to face enormous difficulties in the drive to industrialize, and that the infrastructural gap between the industrialized West and developing societies remains wide (Perez and Soete 1988: 458).

As a result, they believe that firms in developing countries should exploit the windows of opportunity such as free flow of technological knowledge, reduced competition due to lock-in of leaders in past technologies and lower investment in expensive and standardized capital goods, which are available during the early phase of the technology’s life cycle to increase the pace of the catching up process. They argue that universities could act as a set of actors to overcome barriers associated with scientific and technical knowledge during the so called introduction phase because of their free access to knowledge in the early stages of technological development (Perez and Soete 1988).

The biggest problem for early entry, in their opinion, is not because developing countries lack necessary actors, like universities, which are able to exploit and develop the science and technical part of the technology. Rather, the question as to whether endogenous generation can be sustained as the system evolve through constant technological development and continuous flow of investment. While Perez and Soete’s proposition on the role of universities in early entry and its supporting arguments were in most part theoretical, their assessment has,

\textsuperscript{2} This refers to specific periods where the conditions are favourable to the latecomer countries to participate in the development of a new technology.

\textsuperscript{3} Catching up strategy is simply referred to as ‘early entry’ in this chapter. The author believed that ‘early entry’ can be considered as one of three broad alternative of catching-up strategies.