

# Knowledge Ecology and Knowledge Ecosystems at a South African University

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*A spin-off is a commercial entity founded within a university. Due to high levels of creativity and innovativeness, university spin-offs (e.g. Google and Yahoo) tend to be more successful in technology transfer (Gubeli & Doloreux, 2005:270), which is an important driver for economic development in developing countries like South Africa (HESA, 2007). Despite the availability of diverse skills within universities, these college-based companies are relatively difficult to form. Because of specialisation, innovators/ scientists, as they concentrate on their discipline, generally diminish on other necessary business skills. Given the often hi-tech nature of spin-offs, success often requires specialists from other disciplines such as law, marketing, accounting, investment, and management. Paradoxically, all the above-mentioned are trained at universities, but combining these for the purposes of forming an enterprise has proved to be a challenge. The knowledge ecosystems approach as applied by American institutions has been successful in bridging this divide. This paper seeks to evaluate the applicability of ecosystems in South Africa. The study will focus on universities of technology – the former ‘Technikons’.*

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## INTRODUCTION

Universities are developmental catalysts (Mellors, 2006:2). The foremost reason for establishing universities is to improve the welfare of society through increased jobs and employment, education, and socio-economic well-being. More appropriately, universities are major players and engines of change (Mellors, 2006:2). Above all, they are drivers in today’s knowledge economies (Ismail, 2008:145).

According to du Pre (2000:25), a university is an academic institution that specialises in creating and transmitting knowledge. Mellors (2006:2) agrees and notes, 20<sup>th</sup> Century universities were largely set up by benefaction from local industrialists, partly out of benevolence and partly because they recognised the contribution that universities could make to local economies. The latter, augments the argument presented by Duderstadt (2000:1), who researched that society is increasingly looking toward higher and advanced education for solutions in today’s modern knowledge economies. In South Africa, however, this has not been the case. It is against this background that the South African Government, through the Higher Education South Africa (HESA) and Department of Science and Technology (DST), resolved that technology transfer and the diffusion of such innovations be priority to the nations’ higher education sector (HESA, 2007:1).

## Technology transfer

Technology transfer (TT) is the process by which research and new knowledge are transformed into usable innovations, inventions, and products (HESA, 2007:1), and usually these result in economic value (Gubeli & Doloreux, 2006:269; Ma, Grubler, & Nakamori, 2009:296). The earliest TT initiatives were recorded in the US in the early 1970s (Association of University Technology Managers, 2005:16 qtd. in HESA, 2007:5). Since then, TT has been incorporated into college training and mostly manifests as spin-off and spin-out companies such as Google, Gmail, and Yahoo. The Grameen Bank in Bangladesh is one example of TT in the developing world, and to date, there has been a proliferation of spin-offs.

According to Robinson (2001:xxxiii), university education without technology transfer is not only inadequate, it is also meaningless. Shrivastava (S.a.:3) agrees with Robinson (2001) and explains that, traditional classroom teaching/ learning is too static for the 21<sup>st</sup> Century digital economies. Furthermore, Pinchot and Pinchot (1994) as quoted in Shrivastava (S.a.:2) argue that modern economies require organisations, including universities, to continually learn new knowledge and deploy it for value creation.

The above, if considered from the community's perspective, is not a question of whether universities should engage in technology transfer, but a question of how. It is generally expected that educated individuals should use their newly acquired education to reinvest in society. The renowned anthropologist, Dr. Marguerite Robinson, illustrates this point when she describes one of her trips to rural Indonesia in 1979. A curious interviewee asked Dr. Robinson why academics are oblivious to the fact that they have a duty to improve the living standards of life in communities they serve. The elderly gentleman made the following observation and commented:

*We are pleased that you are interested in us, that you visit our houses, and that you sit and talk with us. We try to tell you whatever you want to know. But we would like to ask a question. There is something that we cannot understand. We are sitting here in the mud because this is all we have. Can you not see that we are cold and wet, and that we are poor and have nothing? But you are educated and wealthy. Why do you want to sit here and learn about our customs? Why do you not also use your knowledge and resources to help us to have better lives and improve our customs (Robinson, 2001:xxxiii)?*

From the time when TT was incorporated into the British higher education curricula, it has contributed significantly to public life, so much so that cities in the UK frequently bid to host university campuses (Mellors, 2006:2). Universities often initiate spin offs involving the communities. Some of the benefits of university entrepreneurship are increased jobs, reduced crime, and increased university revenue. These commercial entities, over and above the benefits to the community, appear to also address university financing challenges (refer to Athey, 1998; Duderstadt, 2000; du Pre, 2000; Nekati & Shambare, 2008). In contrast, South African universities still appear to be grappling with the concept of a university. In the interview with Professor Du Pre, he indicated that this problem is especially commonly with the former 'Technikons,'- the newest form of universities in the country. It appears Universities of Technology (UoTs) are battling to link technology transfer and entrepreneurship to the core functions of a university – teaching, research, and community engagement (du Pre, 2008).

#### **SPIN-OFF/ SPIN-OUT: TECHNOLOGY TRANSFER VEHICLES**

A spin-off is generally a small hi-tech company whose intellectual capital originates from a university or public research institution (Gubeli & Doloreux, 2006:270). Rogers and Steffenson (1999) as quoted in Gubeli and Doloreux (2006) emphasise that a spin-off is created when at least one employee leaves an existing company and takes with them intellectual capital to initiate a new company. This implies that both human and intellectual capital are transferred from the parent organisation to the newly formed entity. By definition, university spin-offs, therefore, should involve students, professors, and university administration on the one hand and community involvement or partnerships on the other.

Recent developments in the South African education sector, namely reduced government support and introduction of UoTs, have seen universities resort to third stream income projects and various other academic entrepreneurial vehicles (HESA, 2007:7-22). Although consensus among universities seem to suggest that academic entrepreneurship is critical to universities' survival (HESA, 2007:8), little has been done to effectively develop spin-offs at these institutions. The HESA 2007 survey reveals that only 6 of the 17 universities indicated that they have SME support services. Furthermore, partnership with the commercial business and community was significant – recorded at 24% and 10% representation, respectively – it could still be improved. Only 7 universities have on-campus incubators for spin-offs

(HESA, 2007:12-22). In considering the former and the latter views, it can be concluded that South African institutions of higher learning could still do more to develop spin-offs and technology transfer.

Despite research on the higher education financing encourages alternative funding mechanisms (c.f. Duderstadt, 2000), other more holistic approaches should be investigated. Such approaches are likely to integrate community as well as specific university needs – teaching, research, and community engagement, which ultimately results in a win-win situation. With such mechanisms in place, negative perceptions from the public/ industry over abuse of government funds as indicated by Nekati and Shambare (2008:258) are minimised, as the resultant spin-offs are not only university-situated companies, but community enterprises that serve the needs of communities and universities alike.

### **THE POWER OF NETWORKING**

Networking is an important aspect of business. As such, entrepreneurs initiate forums and groups that bring together business people within particular and related industries. The purpose of networks is to develop communication and to facilitate the sharing of ideas; for instance, the popular South African network forum, BNI International, states its mission to be:

*Our mission is to teach business professionals that the word of mouth process is about cultivating professional relationships for the mutual benefit of all. If you are looking for a competitive edge for your business through regular, qualified referrals, BNI is 'The' organisation for you! (BNI International, 2008: Online).*

In the recent past, many organisations, including universities, have devised expert networking forums – knowledge ecosystems (Por, 2000: Online; Shrivastava, S.a:2) to harness the power of networks and the benefits of diversity. The concept borrows from natural ecosystems. Therefore, to understand knowledge ecosystems, one should appreciate the multi-faceted nature of biological ecosystems as well as their complexity (Pickett & Cadenasso, 2002:1).

### **ECOLOGY AND ECOSYSTEMS: MULTIDIMENSIONAL CONCEPTS**

Ecosystems are complex (FAO, Online), and there is no standard definition of ecosystem in the literature. Sir Arthur Tansley defines ecosystem as a “biotic community or assemblage and its associated physical environment in a specific place” (Pickett & Cadenasso, 2002:6). In contrast, FAO (Online) defines an ecosystem as “complex interactions of populations between themselves and with their environment or the joint functioning and interaction of these two components (populations and environment).”

From the above, it can be argued ecosystems are life-sustaining entities within specified physical spaces or locations; more appropriately, competition, evolution, landscape and succession (Pickett & Cadenasso, 2002:7), are key features of any ecosystem. Over and above supporting life, such systems stimulate synergies and symbiotic relations of diverse elements in otherwise complex environments to ensure the flow of energy (*Ibid*, 2002:3). The following are characteristic of ecosystems (Pickett & Cadenasso, 2002:6; FAO, Online):

- a. Consists of populations and environments as the main components of the system
- b. The interaction between these entities (populations and environments) is systematic, i.e., there exists cross-linkages amongst entities – the processes of input, throughput, and output are present and observable.
- c. A hierarchical structure emerges due to interaction of elements within the system
- d. The physical space and size is usually not restrictive and thus cannot be defined in absolute terms. An ecosystem, therefore, can assume any size – and cannot be too big or too small.
- e. It is a dynamic system, which is constantly changing and may exist in a state of disequilibria (input may not necessarily equal output).

In considering the above features and characteristics and despite the apparent state of equilibrium (or disequilibria), ecosystems appear to be self-contained structures. Ecosystems are generally considered to have common characteristics competition, evolution, landscape, and succession (Pickett & Cadenasso, 2002:5). These are given in more detail below.

- i. **Competition** – rivalry within a population (e.g. a pack of lions fighting for hunting territories) and against other population groups (e.g. lions and hyenas fighting for the some territory).
- ii. **Evolution** – gradual transformation and improvement to gain a competitive edge. Such a process is also known as natural selection or survival of the fittest.
- iii. **Landscape** – the physical environment (land, space, and natural resources) that accommodates the various population groups.
- iv. **Succession** – the sequential order of coming after another as a result of competition and evolution.

Because interaction of population and of populations and environment is confined within a specified physical space, energy and matter are not leaked to other systems. Furthermore, other natural phenomena such as the carbon and hydrological cycles help maintain energy within the ecosystem.

The concept of natural ecosystems illustrated above is multidimensional and flexible; it can be exported to other systems (Pickett & Cadenasso, 2002:7). According to Pickett and Cadenasso (2002), the framework can be applied to other disciplines such as courts of law, administration, decision making, individual behaviour (Pickett & Cadenasso, 2002:6; FAO, Online), and more recently, universities (Shrivastava, S.a.).

### **ECOSYSTEMS AT UNIVERSITIES**

In considering the applicability of ecosystems models at universities, four considerations are taken into account. Foremost, within a college, there is inherent competition amongst students and between universities themselves (nationally and internationally) – e.g. Ivy League, university athletics, and conferences – the SABSA or MBA.co.za.

Secondly, reclassification of ‘*Technikons*’ to Universities of Technology in South Africa is indicative of evolution within the system. Thirdly, university campuses are restricted to a certain locality and space. Individual faculties may be considered to be the delimiting factors or landscape. In contrast, virtual and correspondence universities like UNISA or MANCOSA delimit their landscape through restricted access to websites and other electronic resources. Lastly, succession is typical in the different office bearers (e.g. Vice Chancellor, SRC Representative, Deans etc) from time to time as well older outdated curricula being replaced by newer curricula.

In the context of a university, a knowledge ecosystem can be defined as relationships, tools, and methods for creating, integrating, sharing, using, and leveraging knowledge (Por, 2000: Online). Thus a university can be considered to be a knowledge society that relies on efficient flow of knowledge for the prosperity and well-being of its people (Shrivastava, S.a.:3). Such a society considers knowledge to be the primary production resource instead of capital and labour. Por (2000) summarises the above in what he calls ‘The Wheel of Knowledge Ecosystems,’ similar to the one below. This concept is growing fast and many companies such as Xerox and American Management Systems have initiated knowledge ecologies of their own (Shrivastava, S.a.:5).



**Fig. 1.** Por's Wheel of Knowledge Ecosystem. **Source:** Adapted from Por (2000: Online)

## CONCLUSIONS AND IMPLICATIONS

The implication for universities is that they should set up vehicles or processes that foster development of ecosystems. Within the ecosystem, all the needed expertise could be systematically regulated through a structured incubation process depending on the nature of business and industry. For example, students from different disciplines (e.g. law, business, finance, and engineering), lecturers, and the community in establishing commercial entities would be paired to complete the 'Wheel of Knowledge,' as indicated above. However, it must be emphasised that for this to happen, the silo mentality within academic departments/ faculties should be managed. A point of departure should be the realisation of the unavoidable reality of synergistic partnerships.

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