
***The entrepreneurial university model, a modern
day ideal: issues, prospects and alternatives, for
the developing country***

A. Gabriella Fraser, M.A.
Economist, Principal, The Vivian Group
August, 2012
Email: agfraser@viviangroupbahamas.com

1. Introduction

The role of higher education as a driver for social and economic development is inevitably more pronounced in the developing country context. In the many that lack wealth in natural and other resources, and opportunities that may potentially be derived in size, it is an important vehicle for capacity building; a major policy instrument for national development. So much so that it is widely projected as a primary, if not the principal vehicle capable of facilitating sustained filling of the gaps that separate developing economies from the developed world.

Some argue however that the pace of development in this vehicle and the accelerated trends towards a globalised agenda of innovation has had the ironic effect of widening disparities in our global community; while some project emerging trends as opportunities that could bring about the ultimate outcome of speeding up the 'catch up'.

This paper will discuss globalisation in higher education, with a view to distinguishing the developing country experience. It will review the conceptual framework of the emergent entrepreneurial university model and will examine the university-industry-government triad of the Triple Helix Model, whether and how variations in the applicability of the principles and the roles might elicit effective outcomes for the developing country context. It will discuss the concepts of innovation and entrepreneurialism and how creative and/or expanded interpretation of these themes has [or can] lend to enhanced relevance in the developing country model. It is on the basis of this model that determination of whether the entrepreneurial movement in higher education is [may be] a viable alternative for developing country institutions will be established.

The paper will draw on the experiences of various developing country cases to bear out concepts and illuminate challenges and prospects. This paper is divided into mainly four parts:

- Globalisation, the University and the Developing World
- Impact of Trends in Globalisation
- "Third Mission" or "Second Revolution"
- The Entrepreneurial University, including the Triple Helix Model

2. Globalisation, The University and The Developing World

"The prevailing economically-oriented paradigm and the ideological underpinnings of globalisation are in direct tension with the social purpose of higher education and its contribution towards the public good, social renewal and basic development", Subotzky (p402 1999)

In this section, a defining context of globalisation for the developing country university is framed.

Since the closing decades of the twentieth century, when globalisation emerged as arguably the most defining phenomenon of that time, developing nations have struggled with a two-faced reality: The task of internalising global forces into effective national policies while staving off amplified national insignificance in the world's landscape. Globalisation has indeed had an uneven or as many have contended, an unequal impact across countries of the world.

Altbach aggregates the world into what he characterises as “centres and peripheries, in an unequal environment” (2004 p6). The advanced industrialised economies of the worldwide landscape he considers as the centres of global advancement; the countries where global development and change originates; those economies that are the essential drivers of the world's trends. The less developed and developing of the world he describes as peripheries; analogous to the ‘outsider looking in’ metaphor. Those that have little to no influence on the nature and scope of phenomena like globalisation, but must find a way to at least subsist if not thrive despite associated pressures. Altbach (2006a) contends that existing inequalities therefore become more pronounced, as centres get stronger and become more dominant, while the peripheries become increasingly marginalised.

Countries of the Caribbean and other sovereign island states among the peripheries, are the world's “micro-states”. They share added characteristics of smallness of scale, insularity and dependence (Brock, 2008). Errol Miller, Professor, at the University of the West Indies who describes the Caribbean as an addendum in the Western Hemisphere, provides an Anglophone Caribbean perspective similar to the Altbach notion of centres and peripheries; albeit more strongly emphasising a one-sided-ness of the inter-country dynamic. The Caribbean he says “is a distinct but small and vulnerable sub-region that is caught in the intersection of the exercise of power within the Hemisphere. We would be grossly mistaken if we believe that we can rely on either North America or Latin America to be concerned about our wellbeing, unless it coincides with some interest of theirs... the Caribbean is inconsequential in the political economy of the rest of the world.” (Miller, 2007 p14)

Universities have long been considered global institutions. What has changed however, is the sharply shifted perspective away from the ideal of higher learning for the sake of learning, or even as a public good, to a more commercially viable internationally tradable service. The mere language of today's higher education literature is indicative of this transformation. From the so-called ‘hallowed halls’ of academic tradition to its own market centres of commerce. Today's literature speaks of a ‘higher education business sector’ and higher education institutions as ‘knowledge traders’. Scholars and faculty members have been penned as ‘knowledge workers’ and ‘entrepreneurial scientists’. In today's era of ‘academic capitalism’ or ‘academic entrepreneurship’, higher education outcomes are distinguished for their ‘intellectual value added’ and the ‘commodification of education’ has become a defined economic activity.

Interestingly however, this notion of higher education as an economic activity is not a new one. Pscharopoulos (1972) argues that it is an economic activity, because it has a raw material [students] that is processed [through learning] and which produces a final product [graduates] that is delivered to the market. Globalisation however has been broadly accepted as a transforming phenomenon that has redefined higher education, even engendering a revolutionary effect on the sector.

3. The Impact of Trends in Globalisation on Higher Education in Developing Countries

“Globalisation has added a new dimension to existing disparities in higher education” Altbach (2004 p8).

In this section I will examine the veracity of this statement using six defining trends derived from writings by Altbach (2004 and 2006a) and Segrera (2008):

- i. The impact of advances in information communication technologies (ICT)
- ii. The imperatives of mass demand and increased societal needs for highly educated people
- iii. Growing privatisation
- iv. The advent of multinational higher education institutions
- v. Use of a common language for scientific communication and teaching
- vi. An increasingly international and mobile academic professional

i. The Impact of Advances in ICT

The **internet** alone has perhaps been the most revolutionary development in ICT in our time. The World Bank (2002) characterises change in the ICT sector as revolutionising the capacity to store, transmit, access and use information. Increased computing power, diminishing prices for hardware and software, innovations in hardware and software products, improvements in wireless and satellite technologies, and reduced costs in telecommunications are all cited by the Bank as together having all but removed space and time barriers to information access and exchange .

Altbach argues that the internet has imbued a “democratising effect on scientific communication and access to information” (2004 p18); true only however to the extent that there is equal access to internet technologies. Many, in the developing world have only limited access to the internet. Moreover, simply being able to access the internet is not enough. The internet, which integrates public services with private enterprise, represents a somewhat unique public-private good conundrum. There are countless websites and email services that are available at no costs, yet it is the subscription based content and other pay services that determine access.

Accessing the world's major resources such as online journals, electronic databases and data retrieval systems, and inter-library loan facilities, for many higher education institutions in the developing nations are cost prohibitive. Atuahene (2011), who writes of the experience of universities in countries of Africa, explains that even free online resources are not readily accessible to most faculty and students. "Penetration rates of internet connectivity in Africa and the rest of the developing world, trails developed neighbours", (p335). According to Atuahene, universities throughout the continent, still rely on defunct index card catalogue systems. Yet, he maintains, the African student is held to the same standard as one from an advanced country.

According to estimates by the International Telecommunications Union (ITU), a United Nations agency for global telecommunications, in 2011, Africa's penetration of internet users was 12.8 per 100 inhabitants, compared to a world average of 34.7. Asia-Pacific at 27.2 also fell short of the world average, in contrast to the Americas (including the United States, Canada, Latin America and the Caribbean) 56.3 and Europe at 74.4. An estimated 5.7 per cent of African households and 24.9 per cent for the Asia-Pacific had internet access, compared to 49.7 per cent and 72.2 per cent in the Americas and Europe.

Adair (1995) refers to the developing country higher education experience as being stunted by poor communication. In this vein, distance education, a key vehicle that allows less-advantaged nations to access courses and degree programmes unavailable to them in their home countries, represents another aspect of higher education that may be profoundly affected by poor or ineffectual ICT. ICT deficiencies are amplified, when against a backdrop of resource-poor libraries and laboratories and similar deficient technical support and personnel.

In a later work, Altbach (2006a) surmises that "trends such as the rise of the internet and globalisation of knowledge have the potential for creating severe problems for academic institutions and systems in smaller or poorer nations." (p24)

ii. The Imperatives of Mass Demand

Mass demand or the "**massification**" of higher education emerged, as economic growth around the world becomes more skill-intensive, and knowledge as a commodity becomes more pronounced. Industrial activities are increasingly more "knowledge-rich", requiring higher levels of education, greater technical competence and computer literacy, resulting in a raised skill-threshold (Yusuf, 2008). This outcome has driven a widening and intensifying in the demand for higher education, introducing new stakeholders and changed expectations for the sector.

Worldwide enrolment in tertiary education has risen tremendously over most recent decades; from 13 million in 1960 to 28.6 million in 1990, 137 million in 2005 and 152.5 million in 2007 (UNESCO 2007 and 2009). Over seven years beginning in 2000, student enrolment growth was sharpest, at 51.7 million. The share of global enrolment for Latin America and the Caribbean

doubled from 6 per cent in 1990 to 12 per cent in 2007, which compared with more than five-fold increase in the region's gross enrolment ratio (GER), from 6 per cent in 1970 to 34 per cent in 2007. For East Asia and the Pacific, the GER rose from 7 per cent to 26 per cent in the corresponding years and from 0.8 per cent to 5.6 per cent in Sub-Saharan Africa.

Developing countries have found it difficult however to meet the needs of these growing demands. "The Anglophone Caribbean lags behind the rest of the world with respect to its indigenous capacity to provide its population with higher education" (Miller, 2007 p63). "In 2007, over 2.8 million students were enrolled in higher educational institutions outside of their country of origin" (UNESCO 2009). This number constitutes a 53 per cent increase from the 1999 total which rose on average, at a rate of 5.5 per cent annually.

There are both economic and social consequences to this student mobility, especially relevant to developing nations. Economically, most international students pay for their own studies, or are funded by predominantly locally based benefactors, which Altbach (2004) attests, produces significant income for the host country, but is a drain on the students' respective home countries. He argues that for some countries, the combined expenditure for citizens studying abroad has equalled or exceeded foreign aid that those countries had received in the same period.

"Taxpayers in developing countries have paid to educate many of those who leave" (Outward Bound, 2002, p25). This is especially true for nationals whose study is funded by state sponsored awards and loans. This issue is heightened when students after becoming graduates, remain in their host countries. According to the special report on emigration, the United States (US) for instance educates an estimated one-third of the world's international students. About half of those graduating with PhDs are still in that country five years later. For those with terminal degrees in physical sciences and mathematics, that proportion increases to 60 per cent (Outward Bound, 2002). The result of such emigration weakens the future tax bases of the home countries, while boosting that of the host countries, and also introduces the issue of 'brain drain' which has both social and economic costs.

iii. Growing Privatisation

Privatisation may be understood in differing ways: surge in the number of private institutions; universities' growing reliance on funding from private resources; or universities' increasing operational trend toward more firm-like behaviour (Bernasconi, 2005). The increased number of private universities and corresponding rising proportion of enrolment has been the strongest indicator of its surge. Altbach (1999, p1) described it as "one of the most dynamic and fastest growing segments of post-secondary education at the turn of the twenty-first century". Privatisation has absorbed increased demand and provided diversity, but is predominantly profit driven.

For the developing economy, Arocena and Sutz (2001) rate the value of privatisation by whether the private institutions add capacity in endogenous research; knowledge creation based on local-needs objectives. The problem however for developing nations, as with those in Latin America, is that local capacity for privatisation is largely non-existent. Such capacity typically comes predominantly from foreign interests. In this context they characterise privatisation as “foreignisation” (Arocena and Sutz, 2001). This lack of local capacity is true for perhaps most lesser-developed nations.

“The ‘foreignisation’ trend of the Latin American process of privatisation weakens the potential internal demand for knowledge and the potential opportunities for learning to cope with complex problems”, (Arocena and Sutz, 2001, p1226). The contention is that the new internationally based entity has little interest in tackling the more complex problems of the country, nor the local knowledge that may be required to do so.

Arguably, with growing privatisation, the inherent ‘voice’ of the people, is traded for the ‘voice’ of industry. Bernasconi (2007) refers to this as the public versus private university ideologue. Universities have traditionally been perceived as institutions that help shape societies’ morals and values; centres for scholarship and debate on issues of great social and political significance. Bernasconi (2007) argues that private institutions instead retain ties to business interests and ideologies. You end up with education companies as opposed to education institutions (Altbach, 2006a), whose interests and ideologies are ultimately reflected in their course and programme offerings.

“Due to costs of associated capital and infrastructure, private institutions for the most part do not offer more socio-economically relevant disciplines like basic sciences, engineering and medicine” (Arocena and Sutz, 2001). The necessary support infrastructure for these kinds of programmes — equipment, laboratories and libraries — render them simply too costly to deliver; they are just not profitable. Segrera (2008) explained that “in the last two decades in Latin America and the Caribbean, many emerging higher education institutions, including some of the traditional ones have lost their ways as institutions and tend to resemble business organisations. Such is the case of corporate universities that seem more like enterprises” (p24). The implied result he says is a loss of the university’s social function.

Simply, private providers will focus on the most profitable segments of the market; the segments where demand is highest. Management and other business studies and information technology comprise some of those segments. The end result may be significantly adverse due to a repatriation of profits to the home country of the institution, and/or a ‘crowding out’ of the local provider from those high-demand segments of the sector. ‘Crowding out’ also places added strain on universities that do offer the less profitable though socio-economically significant programmes to their home countries. Most rely on the earnings derived from the various profitable programmes to partly subsidise the costs of providing those academic

disciplines that though costly, are very necessary to the development and general advancement of those sovereign states.

iv. Advent of Multinational Higher Education Institutions

Under the strains of multinationalisation, 'crowding out' becomes an issue not only of commercial viability, but also a 'crowding out' of ideas and practices, values and norms. When programmes or institutions are exported from one country to another, the models and curricula of the exporting country typically dominate. "History shows that the export of educational institutions and the linking of institutions from different countries, generally represent a union of unequals. In almost all cases, the institution from the outside dominated the local institution, or the new institution was based on foreign ideas and non-indigenous values." (Altbach 2004, p16). Such a premise does not bode well for the country looking toward higher education to help build capacity; to develop academic solutions and technical support to indigenous problems.

"Multinationalisation", may be explained broadly as the offering of academic programmes or the presence of institutions of one country, in another. Academic literature refers mainly to two models, "twinning" and "franchising". Twinning describes joint degree offerings among institutions in two or more countries. Franchising, describes the setting up of offshore spinoffs of established institutions, equivalent to the 'branching' of more traditional retail business enterprises. The foreign institution lends its name and curriculum to a local enterprise, and also authorises that enterprise to issue degrees locally, in the name of the foreign institution.

This franchising sometimes characterised as "McDonaldisation", underscores not only the branching aspect but also draw attention to the perceived tradeoff in quality for speed in delivery of a pre-packaged homogenised product/service. This becomes especially problematic where supervision and/or quality control support from the foreign institution is absent, or is too limited to be effective. These kinds of conditions, particularly in circumstances where institutions may be motivated more strongly by a profit objective rather than an educational mission, tend towards what today's marketplace describes as diploma or degree mills. Institutions that award degrees on the basis of requirements and competencies that are below the appropriate standards for the degree level.

The local student pays tuition and fees to the multinational at market-based prices—and thus likely comparatively costly for the developing country student—believing that they'll achieve a standard similar in value to holders of the same degree in the home country of the institution. In return however, while a credential is received, because the graduate has not been required to achieve the skill-set standardised by the institution's home country, the qualification is inferior. Altbach (2006a) explains that "smaller poorer countries have little autonomy or competitive potential in the globalised world. Globalisation in higher education exacerbates dramatic inequalities among the world's universities".

v. Use of a Common Language for Scientific Communication and Teaching

Today **English**, is the dominant language of scholarship. Altbach (2004) explains that it is the most widely studied foreign language in the world and is also the most widely used second language. English he says is the “main medium of instruction in many of the most prominent academic systems” (2004 pp10). English language products, books and journals, dominate the international academic marketplace. The primary challenge however of a common language, especially for developing countries where English is not the first or primary language, is that for those countries, it represents yet another barrier to accessing academic information, databases and networks. It becomes a barrier to intellectual discourse and articulation of scientific and technical studies (Atuahene 2011).

The researcher of indigenous work is especially disadvantaged, particularly for countries with multiple languages and patois, each oftentimes unique to specific segments of a community. The standards of acceptance of scholarly work for publication in reputable journals and other resources are very high. Serious language difficulties could be the difference in whether indigenous works achieve a broader global platform. This type of exposure is essential for the academic to have his/her work critically assessed by international colleagues on a platform where it may benefit from/be a benefit to other scholarship. A common language therefore can be a barrier both in terms of access and exposure.

vi. Increasingly international and mobile academic professional

Migration is claimed to take place at all levels of the academic system. Literature broadly supports the contention that significant numbers of skilled academics from developing countries work in academic systems in advanced economies. In 2000, universities in the US hosted nearly 80,000 visiting scholars (Altbach, 2004). Lowell and Findlay (2001) report that in the case of Ethiopia for instance, more Ethiopian holders of doctorate degrees work outside of Ethiopia than at home.

Altbach (2004) refers to “push” and “pull” factors that compel academics from developing countries to migrate to developed neighbours. The pull factors he explains are external to the local higher education system: better salaries and working conditions; access to necessary tools for research and scholarship; and access to most current knowledge and international community of scholars. Push factors which are home-based, he describes as most often: limited academic freedom, presence of partiality in academic appointments and lack of job security or stability (p14).

These examples highlight the significant academic resource advantages of universities in the industrialised world compared to the deep deficiencies of academia in the world’s developing constituencies. Adair (1995) and other writers point to basic living standards issues, political and social instabilities as core non-academic factors that contribute to countries’ inability to attract and retain talented faculty. Whereas one might consider that higher education institutions perhaps ought to enjoy some degree of control over noted “push” factors, political

instabilities for example may hold ultimate sway. These kinds of factors in resource-deficient academic environments, combined with limited to no access and/or exposure to academic professional networks and forums, makes it difficult for developing country institutions to keep even their own most talented at home.

Such losses are especially damaging because it is typically the most talented individuals, those that are among the country's best in their fields of study, that are most eligible for appointments overseas. This kind of 'brain drain' hurts a country's ability to build capacity in specialised academic fields, hurting especially poorer economies. Writers agree that migration of the internationally mobile academic professional has weakened already strained academic institutions in many developing countries. This becomes the developing world story, not only for the academic but more generally for the university educated graduate. "Skilled migration is a key component of globalisation." (Lowell and Findlay, 2001, p10)

The Lowell and Findlay report found that roughly 30 per cent of all highly educated Ghanians and Sierra Leoneans live outside of their countries. Outward Bound's (2002) cumulative findings suggest that 12 per cent of Mexico's population with higher education, including 30 per cent of all Mexican doctoral degree holders, live in the United States, along with 75 per cent of tertiary educated Jamaicans. These statistics are especially telling when compared to gross enrolment ratios which for some developing countries are well below the world average.

4. "Third Mission" or "Second Revolution"

"There has been a long term academic development from teaching college to research university (the first academic revolution) and then from research university to entrepreneurial university (the second academic revolution)." (Etzkowitz, 2003, p317)

This section discusses the evolution of the university, its purpose and role, and the defining influence/impact of the pace and scope of country development on this evolution.

Claes (2005) describes the birth of the university as a very "complex historical process in which its structure, identity and mission have been appropriated and re-appropriated to the different needs, structures and aspirations of different times and settings" (p39). For countries of Africa for instance, and the many commonwealth nations that share the heritage of colonisation, higher education and the university became something of a post-independence symbol; as much a symbol of sovereignty as a tool for early nation building. A principal purpose according to Atuahene (2011) was the training of civil and public servants to fill roles of public administrators during the decolonisation period.

Goransson et al (2009a) trace the evolution of the university to medieval universities where religious teaching is claimed to have dominated that era, with the objective of "finding God in Science". The next iteration was what the literature broadly characterises as the 'Humboldtian

University' or the Von Humboldt model, which many attest was perhaps the most influential in shaping the modern university. The Humboldt model was mainly science based, but Humboldt is attributed for having also incorporated the liberal arts tradition and having "placed research at the heart of the university ... the core of the modern university is its research-based teaching" (Claes, 2005, p39)

"Research became an inextricable part of the teaching process, as teaching extended from the dissemination of available knowledge, to include methodologies that retrieve lost knowledge ... enabling students to participate in the creation of new knowledge as part of their training" (Etkowitz, 2004, p65). So we see research evolve from an integral tool/ facilitator of the teaching ideal, to an independent driver that has in many ways repurposed higher education.

The research mission became the academy's first revolution: transformation of the university from a teaching institution into one that combined teaching with research (Etkowitz, 2003). This transformation is today still very much ongoing. "Most of the world's universities are mainly teaching institutions. In developing countries, virtually all are in this category" (Altbach, 2004, p8). Research capacity hinges on the quality and availability of certain core resources, material and human; funding, facilities including libraries and laboratories, ICT and qualified personnel, including academics, assistants, technicians and even graduate students. University policies and institutional leadership are also fundamental factors necessary to facilitate a rich and purposeful research environment.

Major deficiencies in these core capacity needs, combined with the pressures associated with accelerated demand for higher education services hinders advancement of under-resourced and/or small developing states beyond the university's initial mission.

Miller (2007) described the nature and scope of research productivity in the Anglophone Caribbean as limited mainly to student projects, theses and dissertations. Faculty research and publications he observed tend to mostly only reflect established university criteria for individual job promotion. Instead of being creators of knowledge, the Anglophone Caribbean he says "has long depended on knowledge generated in metropolitan centres of the Anglophone world that is adopted and adapted to Caribbean communities" (p64).

Segrera (2008) also underscores this persistent importation of innovation, "despite advances, we still have not been able in Latin America and the Caribbean to achieve the crystallising of a new university "model" in which the production of knowledge predominates, not its mere transmission" (p26). Adair (1995) speaks about the difficulty in translating disciplines to indigenous cultures; a theme broadly espoused in the literature. It is typical to find in the developing country university experience, a predominance of traditional degree-programme offerings, instead of new field offerings and/or innovations in curricula with broader country and/or regional relevance and application.

The ensuing second academic revolution was driven by a third mission. Goransson et al (2009a) characterise it as an “amorphous concept”. They explain, “the concept of the third mission encapsulates many of the rising demands on the university; in one sense it is a residual, encompassing all university activities not covered by the first two missions – teaching and research” (p84). The writers illustrate this point in a later work (Goransson et al 2009b) comprising a 12-country study that reviews the variation in each country’s interpretation of this third mission.

The task of the third mission they determined was in finding the right balance between the first and second missions. They found that this third mission was driven predominantly by either of two increasing demands: knowledge/technology transfer or more broadly, support for society. They concluded that for universities in advanced economies, the third mission was derived from demand for knowledge/technology transfer to private industry. In the case of developing states and interestingly transition economies as well, third mission emphasis was the university’s ability to serve community needs and more generally societal-based issues.

For the country cases that the study characterises as low-economic-level countries, dominant traits include, limited public financial resources, under-developed or very modestly developed industries and low-level innovation. Third mission objectives entailed in the case of Vietnam for instance, support to farming sectors on national and local community levels and basic yet specific scientific research according to select local needs. In the case of Tanzania: low-technology (as opposed to ‘high-tech’) efforts adapted to the needs of small- and medium-enterprises and non-technical activities aimed at fostering cooperation between firms.

The study’s medium-economic-level countries, characterised by comparatively higher availability of public financial resources, and broader demand for higher skilled labour, albeit still in the context of moderately developed, less complex industries. This group included countries like Cuba, China, Brazil, Uruguay, Russia, South Africa and Latvia. In this group, mission elements driven by knowledge/technology transfer to private enterprises, were very specific and more the exception than the standard.

For both low- and medium-economic-level groups, the writers concluded the defining factor common to them all was missing “structural absorptive capacity” of firms. Simply, industrial partners, from whom demand for such knowledge transfers would come, just did not exist or did so but in very limited context. In economies where the potential was greatest, transition economies for instance, old structural frameworks including legal frameworks prevented new economy elements from emerging.

We see this theme of a lack of “structural absorptive capacity” throughout the developing world. The issue is especially magnified as capacity is an issue in both demand markets as

described here and in supply, discussed earlier, where very limited capabilities beyond the public sector exist, for the provision of adequate higher education services. Arocena and Sutz (2005) point out that “in Europe and the USA, the rise of the research university was fostered by the second industrial revolution of the 19th century” (p577). In the US “contracts and grants” and “technology transfer” offices emerged as part of the usual administrative structure of the university, to facilitate industrial demands.

The Massachusetts Institute of Technology (MIT) is cited as an example of one of the earliest US universities to turn to industry as a driver of its research agenda. Demands arising from the Second World War are attributed with influencing the establishment of MIT’s then Office of Scientific Research and Development (OSRD). These and similar developments led to the emergence of the industrial park and incubator models. By 1980, there were said to be 19 universities in the US with research industrial parks. There were a reported 76 by 1989, together housing some 1,700 companies at these sites (Etkowitz, 1990).

In the developing world however, the reality of dependency on foreign capabilities for innovation remained, and persists today. Arocena and Sutz (2005) explain that the demand-pull from the economy was always weak. As a region however, Latin America they point out did eventually experience some change. “The academic revolution of the 19th century, that made research a main function of universities in the industrialised world, was transmitted a century later to Latin America in a slow, gradual and certainly ‘non-revolutionary’ manner” (p577).

Goransson et al (2009b) conclude that the university “take a more visible role in stimulating and guiding the utilisation of knowledge for social, cultural and economic development” (p84). Mainardes et al (2011) similarly describe this third mission as responding to the needs of the community, to bring about a learning culture, socioeconomic development and society-wide improvement in living standards. The modern day university thus contrasts sharply with its earlier ‘ivory tower’ iteration. In Claes’ (2005) traditional definition of the university, “society” he says “is ministerial to the university, not vice versa. The university is largely autonomous from society” (p42).

Etkowitz’ (2003) second revolution, the integration of economic and social development with teaching and research, observes “intellectual capital becoming as important as financial capital as the basis for future economic growth”. This notion of intellectual capital introduces a larger market-based conceptualisation of the university; the entrepreneurial university, first conceptualised by Burton Clarke.

5. The Entrepreneurial University

This section establishes the context for the entrepreneurial university. The Triple Helix Model is introduced and select country experiences are used to illustrate variability in established principles for developing states.

Against the backdrop of a changing global macroeconomic setting that boasts of knowledge societies and knowledge-based strategies for development and growth, the entrepreneurial university transforms the knowledge produced within the university into capital. Capital to drive and support the needs and interests of the new and evolving higher education stakeholder base as globalising trends become permanent features of higher education today. Claes (2005) calls it the “innovative model”, where students are regarded as consumers, with specific wants: marketable skills and competencies certified by academic credentials. Service providers, in a diversified higher education system, compete, in order to satisfy these consumer wants.

In this approach, government and industry are also customers with specific wants, affirming the first of Etzkowitz’ (2004) five “norms” of the entrepreneurial university, which is capitalisation; capitalisation of knowledge. These wants of the government and industry involve research, which gives way to contract-based research funding to satisfy specific knowledge needs. “Universities stand to gain recognition and prestige, increased influence in the community, and continuing support from government or funding agencies, with opportunities for further expansion and growth” (Claes, 2005).

Etzkowitz (2004) cites interdependence and independence as the second and third norms for the entrepreneurial university. “To be an entrepreneur, a university has to have a considerable degree of independence from the state and industry, but also a high degree of interaction with these institutional spheres” (Etzkowitz, 2003, p319). Hybridisation is defined as the fourth norm. Claes (2005) affirms this point of the entrepreneurial university having created “repercussions for the way the university is organised and operated”. Including a reorganisation and reshaping in the type of research that is conducted, funding structures and more broadly, implications for change in academic life; tasks of the academic “becomes largely ‘organisational’ in nature, like running a small business” (Etzkowitz, 1990, p 111).

The fifth and final norm of the entrepreneurial university proffered by Etzkowitz (2004) is reflexivity. The entrepreneurial university is arguably constructed along two dimensions, strategy and relationship building. What is the university’s strategic outlook for its own development and what are the institutional relationships it perceives as necessary to achieve its strategic objectives? Etzkowitz reasons, that the entrepreneurial university has continuous life, over which its relationships, industry and government, evolve in what he calls a renovating cycle.

The Triple Helix Model

So far we have established that there are various structural dependencies associated with country advancement. In this discussion of the Triple Helix Model, we examine a few key issues: whether there may be preconditions for the model to be effective; whether the developing country higher education institution, still navigating the early phases of development might feasibly achieve this latest revolution in the commercialisation of knowledge.

In their 1996 writing “Emergence of a Triple Helix of University-Industry-Government Relations”, Leydesdorff and Etzkowitz described an urgency for countries to build and enhance their knowledge infrastructure. Fostering knowledge based economic and social development, they contended was the new global ideal for industrialisation. This they said required establishment of linkages between the state and industry, academia and industry and national coordination between industrial, science and technology policies. Etzkowitz (2003) postulated that the university-industry-government triad relationship is the key to improving conditions for innovation in a knowledge-based society. Industry he says, is the locus of production; government, the source of contractual relations that guarantee stable interactions and exchange; and the university, the source of new knowledge and technology, the generative principle of knowledge-based economies.

Konde (2004) underscores however that these relations may not be well defined in poor countries that do not generate their own technology; “the process of technology transfer, adaption and diffusion requires a high level of innovation from the recipient” (p441).

Notwithstanding, Etzkowitz’ transformation of roles and relationships among these institutional spheres, is borne out in the dynamics of the model. In one dimension each sphere performs its traditional role while concurrently performing its new/transformed role(s) in another dimension. The model replicates a continuous movement of spirals. “University, industry and government are conceptualised as intertwined spirals with different relations to each other”, notably however “spirals are rarely equal; one usually serves as a motive force, the ‘innovation organiser’, around which the others revolve” (Etzkowitz, 2003, p303). The writer speaks of origins of a “laissez-faire regime”— industry as the driving spiral— versus a “statist” origin which places government in the lead role. For the advanced economy, private industry may be the primary driver, while in lesser developed states, governments remain the most significant player.

Against this backdrop, two characteristics of the model are especially significant:

1. The core spiral/motive force may change over. For economies in transition for instance, one may see a declining government influence amid rising private sector significance
2. The model constitutes a fluid framework, “if one element is missing and another has appeared, then by all means insert that element in the framework” (p312). In the case

of the developing economy, where industry may be modest or weak, the non-national sector may fill the void of the 'missing' industrial component. For many developing countries, the foreign investor and/or the international donor plays a major role in the economy.

Konde (2004) describes internet development in Zambia as a triple helix of government-university-partners. In his example, "partners" replace the "missing" local industry. In 1994 ZAMNET, an independent company is established out of The University of Zambia's own IT network (UNZANET). Through ZAMNET, Zambia became the "fifth African country to attain full internet access" (p443). The government's principal role was in "creating a favourable environment for technology adaptation", including the provision of incentives. Partners like the World Bank provided funding; and technical assistance came from various expatriate sources. Financial support, especially as far as "helping universities function as incubator firms by providing seed funding" (p449), was considered particularly critical given their underlying potential for stimulating economic productivity.

Similar in principle to the 'missing' element, may be a principle of 'best relevance'. Subotzky (1999) talks about the country imperative to find its most appropriate balance between globally oriented development, which promotes export led high-tech competitive engagement and redistributive development—meeting the basic needs of the majority of the population. A third mission question. He emphasizes a higher education-community partnership, as an alternative to the entrepreneurial model. Given increasing 'market-like' behaviour and governance of higher education institutions, and a more entrenched entrepreneurial university model, such an alternative collaboration he maintains would uphold ideals of equity, community development and the notion of higher education as a public good. Ideals which remain imperatives in the developing country experience. This becomes a variation of the model, in which industry is substituted for the community/civil society; knowledge innovations are localised to the specific needs of the surrounding communities.

Etzkowitz (2003) establishes 10 underlying propositions for the triple helix model (p296-299). Key among them:

- There is no single driver of innovation. Innovation he writes is a broader phenomenon than anything that takes place in a single sphere.
- Increased integration between the three has had the effect of generating new structures within the individual spheres and integrating mechanisms among them, leading therefore to new organisational innovations, new social arrangements and means for interaction e.g. incubators, science parks, new modes of interdisciplinary knowledge production

For the purposes of this paper, emphasis will be placed on the seventh listed proposition: "Developing countries and regions have the possibility of making rapid progress by basing their development strategies on the construction of niche knowledge sources, supported by the political economy" (p298). Etzkowitz further asserts that "leapfrogging", to skip some stages of

development, is possible as are “catch up” strategies of attracting foreign direct investment and inward technology transfer.

“Niche Knowledge Resources”

There are certainly country cases like the Zambia example that validate the notion of the potential in the developing country context for “niche knowledge sources”. Cuban emphasis on scientific research in bio-technology is another example.

In the case of Cuba outlined by Ones and Jover (2009) we see a higher education system oriented towards a third mission which steers its scientific research towards a direct and demonstrable role in social and economic development. The country’s 1962 University Reform established three core guiding values for the “new” Cuban university: social relevance, commitment to society and scientific institutionalisation. 80 per cent of R&D is government financed and 65 of the 211 public R&D institutes are higher education institutions. Innovation-oriented university research became an established Cuban priority.

The University of Havana’s Laboratory Synthetic Antigens, of its Chemistry Faculty, which was ultimately responsible for producing a breakthrough vaccine. Authors explain that in the 1980s an estimated half-a-million children reportedly died each year, from pneumonia caused by haemophilus influenza Type B (Hib), mainly because the vaccine was simply cost prohibitive for developing countries including Cuba. “Turning the academic possibility of obtaining a small amount of synthetic antigen into a technology able to produce the antigen for millions of doses” became the top priority of the Cuban bio-tech industry. Following years of work and the involvement of at least 10 institutions and 300 persons, the vaccine was achieved. It became “the first major product of the Cuban bio-tech industry with origins in university laboratories” (Ones and Jover, p99); and in 2005 received awards of international recognition.

Government’s support was a major success factor. The vaccine goal became a national priority supported by enabling government policies. A “robust bio-tech based medical-pharmaceutical industry” is claimed to have emerged as a result of the implemented policy initiatives and reforms. Including strengthening of the network of high level centres devoted to research and bio-tech. The university’s scientific community provided human resources necessary for the research to advance. International cooperation was keenly essential. These developments underscored the underlying potential, when the objectives of the triad relationship are clear and well supported by each constituent group. The writers emphasise however that this success was driven by commitment to social responsibility by the knowledge community, and not forces of the market; that success was based on inter-institutional cooperation and not competition. The Chilean example explained by Bernasconi (2005) is more entrepreneurially focussed.

According to Bernasconi, the Pontificia Universidad Catolica (PUC) in Chile was driven to reforms by necessity, following severe cuts in government financial support. In 1972, direct public funding accounted for 88 per cent of total PUC revenue, but just 40 per cent by 1982. Bernasconi explains that from 1982 – 2000 public funding was cut by a further 39 per cent vis-à-vis a doubling in budget from 1990 – 2000.

The university's strategy for survival therefore hinged on diversification in funding sources. Other strategic objectives included creation of policy incentives for schools/academic units to raise their own funds, reform towards more cost efficient administration, and to expand enrolment while also increasing tuition; although tuition increases were a significantly limited prospect.

Echoing Etzkowitz' notion of finding niche sources, Bernasconi explains that "the overarching notion guiding entrepreneurial activities in the Pontificia Universidad Catolica was to develop businesses as close as possible to the core activities of the university" (2005, p255); capitalising on things that you do well. PUC established viable "university enterprises". Most significantly, a private medical clinic, an engineering corporation and a television station.

In 1988, PUC partnered with professors from its medical school to build a private clinic. The clinic offered services that targeted an affluent client/patient base. By 2000 clinic sales were valued at \$65 million. During the 1980s The School of Engineering's Department of Scientific and Technological Research expanded into business services including quality control and certification, professional development and consulting, and in 1994 was transformed into a new corporation and added technological development and incubator services. Sales in 2000 were \$4.1 million. The TV station, Channel 13, in four decades since its 1959 experimental launch, became the second largest commercial TV network in Chile.

Bernasconi (2005) underscored that part of the success of these university enterprises was because while university representatives sat on the various governing boards of these enterprises, the university did not "meddle in the affairs of enterprises ... business units are managed as business units. Their executives are professional managers..." (p255). Importantly Chile's economy at the time was on a robust upswing. By 2000, just 17 per cent of the university's revenue came from public funding, 29 per cent from tuition and 48 per cent from sales of services. Notably however PUC's tuition policy reform generated significant hikes in fees, to compensate for relative inflexibility in the state controlled tuition rates, creating an essential barrier to entry for most students, effectively transforming PUC into an institution for the elite.

Marques' (2006) account of the industry-university-government trilateral relationships in Portugal with the University of Coimbra at the centre, is another example of the generation of significant enterprise from the trilateral model. The university comprised 8 faculties and 18 not-for-profit "interface institutions" that were the primary innovation drivers, including university

research institutes, research institutes for industry and services, consulting entities and incubators.

“Leapfrogging to Development”

Subotzky (1999, p406) cites a very telling argument by Chomsky (1997) from the writing, *Neoliberalisation and Global Order: Doctrine and Reality*. “Chomsky argues that Britain and the USA turned to liberal international policies only once their dominance in world markets was assured.” The reality for many developing states of the world is that in their current state, they may be generations behind the development of some in the industrialised world. Yet their “catch up” to the rest of the world is essentially expected to be faster and deeper, albeit under conditions of significant resource deficiencies with limited scope for improvement; or using Altbach’s characterisation, to achieve “centre” type goals/standards from the “periphery” of the world’s stage.

Wong (2007) describes a national effort to restructure the economy of Singapore, a newly industrialised economy (NIE) from being “investment driven” to an “innovation driven” economy. Wong explains “how the mission and governance of local universities in late-comer economies may need to be reformed toward an entrepreneurial university model to enable such economies to achieve a faster catch-up in the global innovation race” (p941). Singapore universities he explains are focussed on building capacity to stimulate economic growth, based on five underlying principles: industrially relevant research; technology commercialisation; high-tech spin-offs; attracting foreign talent; and inculcating entrepreneurial mindsets among graduates.

In particular, the National University of Singapore (NUS) has implemented numerous policy reforms, leading generally towards creating conditions that are “inventor friendly” and developing a culture of entrepreneurship both inside and outside the classroom; including the introduction of new programmes and revision of existing ones based on academic objectives in entrepreneurship, and adaptation of entrepreneurial principles in how the university is organised and administered.

6. Concluding comments

Have accelerated trends towards a globalised agenda for innovation widened disparities in our global community? If we were to consider the world as broadly divided into two constituent groups: knowledge creators and knowledge consumers; those who are predominantly exporters of knowledge versus those that are net-importers. Disparities are widened when net-importers are unable to access new knowledge and innovations at a rate comparable to its production; when the pace of innovation outstrips the pace at which countries can improve their ICT, financial and other resource constraints, limiting their capacity to consume the world’s new knowledge. That it may be adapted and applied to their own developmental needs and uses. Combined with other outlined pressures associated with trends in globalisation an

otherwise slowed or comparative slower pace of development could result, thus amplifying any existing disparities.

The triple helix model however demonstrates that a strategic approach to establishing collaborative partnerships with a view to capitalising on institutional strengths could, help not only to fill resource gaps in areas of need but to also excel in areas of greatest potential. We see how choosing relationships with viable partners and adapting ourselves can help us to build and acquire the capacity needed to optimise those relationships towards achieving specific ends. The lesson is in the fluidity and flexibility of the model that permits us to substitute a helix for one more relevant to prevailing needs. It may for instance be an international partner, or a private though non-profit partner; depending on our needs and objectives. While a developing country university may not become an exporter of knowledge today, its creation of knowledge at the local level will put it on a path of future capacity building as it meets more immediate developmental needs.

What about the notion of “catching up” or “leapfrogging” stages of development? If one had to assign preconditions for the industry-university-government triad relationship to be so successful that it resulted in growth that outpaced global averages, two conditions stand out most: having the capacity and resources to create knowledge; and correspondingly, having the structural absorptive capacity of industry, which would be the key driver for knowledge transfer. Both these conditions are largely absent in developing economies. There are however numerous niche knowledge resources in the developing world. Capitalisation of these, along with national policy that integrates higher education planning into the national development planning process, can certainly serve as a potentially significant source of economic strengthening. As would steering trends of an increasingly international higher education sector and growing multinationalisation to suit pressing national needs. This could mean establishing direct institutional relationships and academic collaborations with exporters of knowledge in ways that will help grow these niche resources. A country like The Bahamas, a nation of islands, national College’s recent collaboration with the State University of New York to build a baccalaureate programme in maritime studies, is an example.

For the economy however that is in transition or as in the case of Singapore, is a newly industrialised economy, the notion of catch up is more plausible. For these economies the above noted conditions related to capacity are partly already satisfied. These economies are largely building from higher education systems that boast the presence of institutions that have indeed achieved academia’s first revolution and are navigating the second. They may for the time being lag developed economies but there is demonstrated potential for innovation-based growth.

AUTHOR'S PROFILE

An Economist by profession, Ms. Fraser is a proven researcher and analyst. The founding Principal of the Vivian Group, her career achievements cross key sectors of the Bahamian economy, including, Higher Education, Tourism, Financial Services and the Electronic Communications Sector, in core responsibility areas of administration, policy and regulation. At The College of The Bahamas she was the Associate Vice President with responsibility for External Affairs and a part time faculty member in the School of Business; at the Ministry of Tourism and Aviation she was the Director for Onshore Communications; while at The Central Bank of The Bahamas, she held various positions including Economist and Assistant Manager of the Bank's Research Department; at the Utilities Regulation and Competition Authority she was the Corporate and Consumer Relations Manager.

Trained by the International Monetary Fund (IMF), The World Bank, The Bank of England, The Commonwealth Secretariat, The Centre for Latin American Monetary Studies (CEMLA) and the University of Florida's Public Utility Research Center, she holds a Master of Arts degree in Economic Development and Policy Analysis from the University of Nottingham (UK), a Bachelor of Science degree in Economics and Finance from Barry University (USA), and an Associate of Arts degree in Pure and Applied Mathematics from The College of The Bahamas. Ms. Fraser has a postgraduate Diploma in Financial Economics from the University of London and a certificate from the London School of Economics and Political Science for studies in Unemployment, Inequality and the Welfare State and Economic Perspectives on Society. She is currently completing a Doctorate in Business Administration degree (DBA) with the University of Bath (UK).

REFERENCES

- ADAIR, J. G. 1995. The Research Environment in Developing Countries: Contributions to the National Development of the Discipline. *International Journal of Psychology*, 30, 643.
- ALTBACH, P. G. 2004. Globalisation and the university: Myths and realities in an unequal world. *Tertiary Education and Management*, 10, 3-25.
- ALTBACH, P. G. 2006. Higher Education and the WTO: Globalisation Run Amok. *International Higher Education: Reflections on Policy and Practice*. August 2006 ed. Chestnut Hill, Massachusetts: Center for International Higher Education, Boston College.
- ALTBACH, P. G. 2006. Knowledge and Education as International Commodities: The Collapse of the Common Good. *International Higher Education: Reflections on Policy and Practice*. August 2006 ed. Chestnut Hill, Massachusetts: Center for International Higher Education, Boston College.
- AROCENA, R. & SUTZ, J. 2001. Changing knowledge production and Latin American universities. *Research Policy*, 30, 1221-1234.
- AROCENA, R. & SUTZ, J. 2005. Latin American Universities: From an Original Revolution to an Uncertain Transition. *Higher Education*, 50, 573-592.
- ATUAHENE, F. 2011. Re-thinking the Missing Mission of Higher Education: An Anatomy of the Research Challenge of African Universities. *Journal of Asian and African studies*, 46, 321-341.
- BERNASCONI, A. 2005. University Entrepreneurship in a Developing Country: The Case of the P. Universidad Católica de Chile, 1985-2000. *Higher Education*, 50, 247-274.
- BERNASCONI, A. 2008. Is there a Latin American Model of The University? *Corporate Education Review*, 52, 27 - 52.
- BROCK, C. 2009. Perspectives on Higher Education in the Anglophone Caribbean. In: SEGRERA, F. L., BROCK, C. & SOBRIHNO, J. D. (eds.) *Higher Education in Latin America and the Caribbean 2008*. Caracas: UNESCO International Institute for Higher Education in Latin America and the Caribbean.
- CLAES, T. 2005. Defining 'The University': From 'Ivory Tower' to 'Convenience-Store'. In: MCMAHON, F. & CLAES, T. (eds.) *Probing the Boundaries of Higher Education*. Oxford, United Kingdom: Inter-Disciplinary Press.
- ETZKOWITZ, H. 1990. The Second Academic Revolution: The Role of the Research University in Economic Development. In: COZZENS, S. E., HEALEY, P., RIP, A. & ZIMAN, J. (eds.) *The Research System in Transition*. Dordrecht, Netherlands: Kluwer Academic.
- ETZKOWITZ, H. 1998. The norms of entrepreneurial science: cognitive effects of the new university-industry linkages. *Research Policy*, 27, 823-833.
- ETZKOWITZ, H. 2003. Innovation in Innovation: The Triple Helix of University-Industry-Government Relations. *Social Science Information*, 42, 293-337.

- ETZKOWITZ, H. 2003. Research groups as 'quasi-firms': the invention of the entrepreneurial university. *Research Policy*, 32, 109-121.
- ETZKOWITZ, H. 2004. The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation*, 1, 64 - 77.
- ETZKOWITZ, H. & LEYDESDORFF, L. 1996. Emergence of a Triple Helix of University Industry Government Relations. A Triple Helix of University-Industry-Government Relations (The First Triple Helix Conference), January 3-6 1996 1996 Amsterdam. Amsterdam, 10.
- ETZKOWITZ, H. & LEYDESDORFF, L. 1999. The Future Location of Research and Technology Transfer. *The Journal of Technology Transfer*, 24, 111-123.
- ETZKOWITZ, H. & LEYDESDORFF, L. 2000. The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy*, 29, 109-123.
- FERLIE, E., MUSSELIN, C. & ANDRESANI, G. 2008. The steering of higher education systems: a public management perspective. *Higher education (Amsterdam)*, 56, 325-348.
- GIBBONS, M. 1998. Higher Education Relevance in the 21st Century. *UNESCO World Conference on Higher Education*. Paris, France: Post/Basic Education and Training Team, Human Development Network/Education, The World Bank.
- GORANSSON, B., RASIGAN, M. & SCHMOCH, U. 2009a. New activities of universities in transfer and extension: multiple requirements and manifold solutions. *Science and Public Policy*, 36, 157-164.
- GORANSSON, B., RASIGAN, M. & SCHMOCH, U. 2009b. New challenges for universities beyond education and research. *Science and Public Policy*, 36, 83-84.
- KONDE, V. 2004. Internet development in Zambia: a triple helix of government-university partners. *International Journal of Technology Management*, 27, 440 - 451.
- LAZZERONI, M. & PICCALUGA, A. 2003. Towards the Entrepreneurial University. *Local Economy*, 18, 38-48.
- LEYDESDORFF, L. 2001. Knowledge-Based Innovation Systems and the Model of a Triple Helix of University-Industry-Government Relations. *New Economic Windows: New Paradigms for the New Millennium*. Salerno, Italy.
- LEYDESDORFF, L. & MEYER, M. 2006. Triple Helix indicators of knowledge-based innovation systems. *Research Policy*, 35, 1441-1449.
- LOET, L. 2009. Knowledge-Based Innovation Systems and the Model of a Triple Helix of University-Industry-Government Relations.
- LOWELL, B. L. & FINDLAY, A. 2001. Migration of Highly Skilled Presons from Developing Countries: Impact and Policy Responses. *International Migration Papers*. Geneva: International Labour Office (ILO).

- MAINARDES, E. W., ALVES, H. & RAPOSO, M. 2011. THE PROCESS OF CHANGE IN UNIVERSITY MANAGEMENT: FROM THE "IVORY TOWER" TO ENTREPRENEURIALISM. *Transylvanian Review of Administrative Sciences*, 33, 124-149.
- MARQUES, J. P. C., CARACA, J. M. G. & DIZ, H. 2006. How can university-industry-government interactions change the innovation scenario in Portugal? The case of the University of Coimbra. *Technovation*, 26, 534-542.
- MILLER, E. 2007. Research and higher education policies for transforming societies: perspectives from the Anglophone Caribbean. In: MOLLIS, M. & VOEHL, M. N. (eds.) *Research and Higher Education Policies for Transforming Societies: Perspectives from Latin America and the Caribbean*. Port of Spain, Trinidad and Tobago: United Nations Educational Scientific and Cultural Organisation (UNESCO).
- ONES, I. P. & JOVER, J. N. 2009. Higher education and socio-economic development in Cuba: high rewards of a risky high tech strategy. *Science and Public Policy*, 36, 97 - 101.
- OUTWARD BOUND 2002. Do developing countries gain or lose when their brightest talents go abroad? *The Economist*. Special Report on Emigration ed.
- PSACHAROPOULOS, G., 1972. *The Economic Returns to Higher Education in Twenty Five Countries*. Higher Education, 1 (2), pp 141-158.
- SANTOS, S. & SEGRERA, F. L. 2009. Relevance of Higher Education Institutions in Cuba. In: SEGRERA, F. L., BROCK, C. & SOBRIHNO, J. D. (eds.) *Higher Education in Latin America and the Caribbean 2008*. Caracas: UNESCO International Institute for Higher Education in Latin America and the Caribbean.
- SAWYER, A. 2004. African Universities and the Challenge of Research Capacity Development. *Journal of Higher Education in Africa*, 2, 211 - 240.
- SAWYER, A. 2004. Challenges Facing African Universities: Selected Issues. *African Studies Review*, 47, 1-59.
- SEGRERA, F. L. 2009. Trends of higher education worldwide and in Latin America and the Caribbean. In: SEGRERA, F. L., BROCK, C. & SOBRIHNO, J. D. (eds.) *Higher Education in Latin America and the Caribbean 2008* Caracas: UNESCO International Institute for Higher Education in Latin America and the Caribbean.
- SUBOTZKY, G. 1999. Alternatives to the entrepreneurial university: New modes of knowledge production in community service programs. *Higher Education*, 38, 401 - 440.
- THE WORLD BANK, 2002. *Constructing Knowledge Societies: New Challenges for Tertiary Education*.
- UNESCO, 2007. Global Education Digest: Computing Education Statistics Across the World.
- UNESCO, 2009. Global Education Digest: Computing Education Statistics Across the World.
- WONG, P.-K., HO, Y.-P. & SINGH, A. 2007. Towards an "Entrepreneurial University" Model to Support Knowledge-Based Economic Development: The Case of The National University of Singapore. *World Development*, 35, 941 - 958.

YUSUF, S., SAINT, W. and NUBESHIMA, K., 2008. *Accelerating Catch up: Tertiary Education Growth in Sub-Saharan Africa*. Draft World Bank Report.