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**Anchoring globalization in Hong Kong's research universities:
network agents, institutional arrangements, and brain circulation**

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Abstract: International competition drives research universities to find ways to anchor globalization for academic productivity and innovation through cross-border collaboration. This paper examines the case of pre- and post-colonial Hong Kong and how its universities transited from undergraduate institutions to highly ranked research universities within 30 years. While this is attributed to an enabling environment of institutional autonomy, open borders and cross-cultural capacity, a case study of one research university points to the role played in all of Hong Kong's universities by network agents, institutional arrangements, and brain circulation to recruit and retain international scholars and scientists. While this has strengthened capacity, it cannot be sustained without indigenous academic leadership to ensure that globalization is anchored in local culture. The paper makes the case that the Hong Kong model can be generalizable as a cosmopolitan model for developing countries, as it has in the Chinese mainland, even Hong Kong research universities continues to align with the general rise and development of high-quality universities in Beijing and Shanghai.

Key words: (1) research university (2) anchored globalization (3) network agents (4) enabling framework (5) managed innovation (6) productivity

Introduction

Research universities are expected to play a greater role in anchoring globalization into nation development. Developing economies view their futures as being significantly enhanced by a strategically nested flagship university in an internationally networked city (Altbach & Salmi 2011). Universities are becoming judged on the extent to which their research can drive the kind of innovation that will provide a competitive edge for their region (Dill & van Vught 2010). Effective management of knowledge networks is prerequisite to raising the status of a research university in the global rankings. Among the key resources are amphibious entrepreneurs whose help determine the layout of knowledge networks and whether globalization works for or against a city, nation, or region (Powell & Sandholtz 2012). This paper examines the case of the Hong Kong Special Administrative Region of the People's Republic of China, and the manner and model in which its research universities have come to anchor globalization through a specific configuration of network agents, institutional arrangements, and brain circulation.

Although long known for its entrepreneurial prowess as an international hub for competitive business practices and global trade, Hong Kong used these same characteristics in its evolving aim to become a center for the reception, translation and diffusion of knowledge. Under the Basic Law of the Hong Kong Administrative Region, Hong Kong's system is distinct from that of the Chinese mainland in its social, political and educational practices. Moreover, its universities have capitalized on this one-country and two-systems arrangement by remaining closely integrated with the global academy, while at the same time reaping benefit from its long held mission to support the modernization of the Chinese mainland. Its universities have always valued its special bond with the Chinese motherland, yet they remain intellectually and academically free to use books and ideas banned on the Chinese mainland. Hong Kong's open borders, official policy of bilingualism, and first-class information technology, media, and communication infrastructure help it sustain global linkages for the reception and dissemination of knowledge and information. The international profile of its academic profession, most of whom are ethnic Chinese recruited with advanced degrees from overseas, make it an ideal center for translation and interpretation of ideas between China and the rest of the world. In short, the constitution of its university sector permits unencumbered knowledge networks – a core feature of the role of its universities in anchoring globalization, and brain circulation facilitated by network agents that help research universities anchor globalization (Saxenian 2005).

This paper examines the role of Hong Kong's universities in anchoring globalization through a particular network format for the exchange of ideas in research, and highlights the role played by network brokers and amphibious entrepreneurs who, as critical agents, shape an enabling environment to help spark innovation in research. The resulting high velocity of brain circulation provides Hong Kong with the capacity to remain in the upper reaches of global cities. Despite measures by government to facilitate institutional collaborations among its universities, Hong Kong's research universities are as closely linked with their counterparts overseas and on the Chinese mainland as much as they are with one another. There are also other government initiatives that promote the kind of knowledge exchange intended to resolve the tension between global and local culture. While Hong Kong's research universities draw most of their talent from overseas, the long-term success and stability of the university system is viewed as requiring the preparation and promotion of highly talented localized academic leadership.

Thus, an understanding of its network format and agency is essential for capturing the story about the rise of its research universities to world class status amid the forces of global convergence and divergence. The process of configuring the network rather than the configuration itself can provide a useful case study for emergent global cities with rising expectations for how their research universities can anchor globalization in ways that contribute to, rather than detract from, their development. Yet, network layouts for the exchange of ideas in research and innovation continue to evolve with the shifting patterns of globalization. In the case of Hong Kong, that evolution is also increasingly affected by the alignment of policies and plans for research and development of the Chinese nation of which Hong Kong has become an integral part.

From tiger to dragon

The driving discourse in Hong Kong higher education prescribes that it is imperative to ensure globalization works for, rather than against, research productivity and innovation. With a scarcity of natural resources and manufacturing industries, Hong Kong is left to rely almost solely upon its human resources. Its school system produces a very high caliber of achievement in mathematics and science (OECD 2012). Its higher education system, which has responded to calls to from industrialists and civil society alike to encourage more creativity and innovation by intensifying a liberal studies curriculum, continues to place a heavy emphasis on performance measurement and quality indicators (Postiglione & Wang 2011). Hong Kong has the highest proportion of globally ranked research universities in one place, viewed in part due to its strategic management of knowledge networks (Postiglione 2011).

Yet, this was not the case 30 years ago when Hong Kong was a low to mid-level income economy, surrounded by regional poverty, with only two universities that focused on undergraduate teaching. Hong Kong's rise was accompanied (though not always led) by the expansion of higher education and establishment of research universities. Thirty years later, research universities are expected to drive the economy and exchange knowledge with the surrounding society. This is facilitated by conditions that included a high degree of internationalism, a highly valued but self-defined Chinese cultural heritage, bilingual and bicultural adaptability, capacity to attract talented scientists, technology that permits a close integration with the global academy, open borders and easy mobility, stern protection of academic freedom, a lively intellectual climate, and the adjacent mainland of China with its policy of economic reforms and opening to the outside world (Postiglione 2006, 2007, Altbach and Postiglione 2012). In themselves, these basic conditions constitute an enabling environment for research universities. However, they alone do not drive research output and innovation. This is also determined to a great extent by the government's macro-steering and the strategic management of specific institutional and organizational circumstances in each university.

In simple terms, the government steers the system but provides universities with a high level of autonomy. Each institution's research portfolio has the responsibility to attract and manage funds, persuade funding bodies, plan strategic research themes and areas of excellence, monitor and evaluate research and publications, disseminate and publicize (and sometimes commercialize) research breakthroughs, as well as provide research teams and their doctoral students with a supportive and dynamic environment to increase academic research output and innovative science.

This paper begins with a contextual overview of the past three decades in order to provide an understanding of the character and evolution of the environment that enables research universities to develop their own strategies for managing academic knowledge networks and research output. Data is also provided on the trends in research collaboration of Hong Kong academics in comparative perspective. Finally, an institutional case study is presented to better illustrate styles of managing research networks and academic output in Hong Kong. In this way, the paper presents a story of how a developing economy with few natural resources or manufacturing industries, and with only one or two undergraduate universities made the

transition to a system of mass higher education with three to four globally ranked research universities.

The evolution of an enabling environment

In 1980, Hong Kong was ensconced within a region of Asia surrounded by a great deal of poverty. In Asia, only Japan managed to upscale its economy to compete internationally. In its wake, four smaller economies (Hong Kong, Singapore, South Korea, Taiwan) began to forge ahead based on export trade and semi-skill based manufacturing. Yet, from the early 1980s (until the 1997 Asian Economic Crisis), the four Asian tigers posted impressive growth rates (Chen 1979, 1983, 1994, 1997). With only a pair of universities, Hong Kong prospered through trade, re-export, small manufacturing enterprises, and financial services backed up by an independent legal system (Youngson 1982). Its economy remained relatively unencumbered by government bureaucracy, and its civil service earned a reputation for the highest level of integrity in the region (Burns 2004). It also managed to rid itself of corruption, while remaining unscathed by the rising tide of global terrorism (Lee 1981). Its greatest challenge was to overcome the Asian economic crisis that began in 1997 and lingered through the SARS epidemic of 2003 (So and Chan 2002, Loh 2004).

Thirty years ago Hong Kong only had two small universities. It managed until 1963 with only one university, the English medium University of Hong Kong (established in 1911) with students were from Chinese families in Hong Kong and Malaysia (Chan and Cunich 2002, Cunich 2012). By the late 1930s, Hong Kong experienced a series of disruptions that included the Japanese occupation and China's Civil War that led to the establishment of the PRC in 1949. The trade embargo during the Korean War (1950-51) led to establishment of the textile industry during which migration from the Chinese mainland ballooned the Hong Kong population. As basic education became popularized, a second university (The Chinese University of Hong Kong) was established in 1963, from a collection of missionary and other Chinese colleges, to absorb the growing number of graduates from the Chinese medium secondary schools (Sweeting 2004).

When the Chinese mainland initiated its policy of economic reform and opening to the world in December of 1978, Hong Kong's two undergraduate universities together admitted only two percent of the relevant age group into degree programs. Throughout the 1980s Hong Kong shared similarities with Singapore, another ex-British colony with an elite system of higher education that limited access to degree places. The low access rates were possible because their English medium school sectors broadened students' opportunity to enter university overseas. For the same reason Taiwan and Korea, without a large English-medium sector, had to absorb more of the demand domestically for university education. The Hong Kong colonial government preferred elite higher education without a substantial amount of research funding, and it was not until the late 1990s that international development agencies espoused the potential of more higher education to build a knowledge economy.

Since universities need a critical mass of undergraduates to establish viable graduate schools, the rise of research universities in Hong Kong gained traction after the Tiananmen incident (1989), when government decided to double university enrolments in the wake of an exodus of talent. Before 1990, most degree courses were offered in two universities. A third university, the Hong

Kong University of Science and technology, was established in 1991. One polytechnic began offering degree courses in 1983 and another polytechnic and one tertiary college began to offer degree courses in 1986. The polytechnics and one of the tertiary institutions earned university titles in 1994. Another was elevated to university status by 1999.

The three top-tier research universities — the University of Hong Kong, the Chinese University of Hong Kong, and the Hong Kong University of Science and Technology – each provide a range of programs that lead to undergraduate and graduate qualifications. Both the Hong Kong Polytechnic University and the City University of Hong Kong (the former polytechnics) offer a number of graduate degrees and have research programs in selected areas but have a strong emphasis on the application of knowledge and vocational training, and they maintain strong links with industry and employers. The Hong Kong Baptist University (formerly Baptist College) and Lingnan University (formerly Lingnan College) together provide undergraduate courses in the arts, sciences, social sciences, business, and communication studies, but also offer graduate degrees, with research programs in selected subjects. The Hong Kong Institute of Education offers degrees at all levels and has moved toward a more comprehensive profile of academic programs in anticipation of gaining university status (University Grants Committee 1996, 1999, 2000, 2002, 2004, 2004a, 2009). The other degree granting institutions are Shue Yan University, the first private University, the Open University of Hong Kong (government established but financially independent) that offers distance education, and the Hong Kong Academy of Performing Arts under the government Home Affairs Bureau of Government.

The funding of eight degree granting institutions is largely determined by the recommendations of the University Grants Council (UGC), an influential group of local and international leaders in academia, business and society. It is composed of a near equal proportion of local and international appointments, and provides a global network of advisory services that steer the overall format for the management of the knowledge networks of research universities.

As Hong Kong began to rapidly expand its universities in the 1990s, it also began to diverge from the other Asian tigers. Learning from Japan's success, the governments of the other three tigers (Singapore, South Korea and Taiwan) ratcheted up their high-tech industries, but Hong Kong's non-interventionist government refused to do so. Hong Kong's colonial end-date of 1997, and the tendency of investors to think in the short rather than long term, led to an abbreviated vision for high tech industries. Instead, the Hong Kong government chose to focus on infrastructure, which also came to include the establishment of a University of Science and Technology (officially opened in 1991). This became a test of the viability of an S&T university because the proportion of the government budget for R&D was amongst the lowest in the world for an economy with average personal income levels that rivaled the UK. Allocation for R&D was 0.7% of GDP, placing Hong Kong in the 50th position in global rankings for this indicator (Ng and Poon 2004, World Bank 2012).

Hong Kong took advantage of the sunset years of a colonial administration to nest an American style research university within the British colonial system of higher education. This added a dynamic element to the duality of an English medium (HKU) and Chinese medium (CUHK) university. The new University of Science and Technology (HKUST) distinguished itself from the status quo by putting research on an equal footing with teaching, and elevating an

entrepreneurial approach to university development. In the American format, the new university appointed rather than elected Deans, and required students to enroll in social science and humanities courses outside of their science and technology specialization (Postiglione 2011).

Although Hong Kong's budget for research and development remains low, the 1988 decision to establish a Research Grants Council (RGC), during the planning stage of HKUST, was pivotal for the transition to a system of research universities (Universities Grants Committee 2000:11). As part of the UGC, the RGC provided a template for large scale research funding and further refined the global network of advisory services that steers the format for the management of the knowledge networks. The RGC made competitive research grants available to all academic staff. As the primary source of research funds, RGC nudged Hong Kong's traditionally teaching-focused universities toward a heavier research orientation.

The more entrepreneurial HKUST was quick off the starting blocks and its share of research funding gradually rose to levels comparable with the other two leading research universities. It remains ahead of them in the proportion of competitive RGC grants received. For example, in 2009 its application success rate was 47 percent, ahead of the 36 percent for the other two top research universities. The amount awarded per faculty member is almost twice as much as at any other university. Thus, the RGC and HKUST were important catalysts for Hong Kong's research productivity. Yet, the government's resistance to invest heavily in high tech industrialization limited the potential role of Hong Kong's research universities to be a catalyst for that sector. The powerful property and real estate sectors as well as the second tier civil servants who were perched to lead Hong Kong after its handover in 1997 did little to support Hong Kong's development as a center of high technology, thereby driving that opportunity northward where Shanghai became the proactive benefactor.

In summary, Hong Kong took a calculated risk at a critical turning point in its history. The odds were stacked against Hong Kong by a lack of natural resources and a small manufacturing sector, a miniscule budget for R&D, and an uncertain future. With Mainland China's economic reform less than a decade old, Hong Kong took steps to expand higher education and decided before the end of the 1980s to establish a Research Grants Council and an American style university of science and technology. This was indeed a shrewd gamble. However, the choice was taken with little debate because other options were limited.

Thus, Hong Kong's research network and knowledge exchange system of today had its trajectory set by 1990. The burst of university funding could be said to have been fed by a fear of brain drain following the Tiananmen incident. However, the stakeholders in government, business, and higher education decided to move forward for multiple reasons. Higher levels of talent emigration led to a need for confidence building as the sovereignty of Hong Kong's capitalist system prepared to cross the river of post-colonialism under the umbrella of a socialist China under reform. The confidence building exercise not only included construction of one of the world's major airports, but also an expanded university sector and sustained protection of academic freedom. Other reasons played an equally important role, including what the strengthening of knowledge networks could afford – aspirations for global excellence in higher education at a time after the Cold War ended and a recognition, reinforced by prescriptions for expanding higher education by international development agencies such as the World Bank, that

the fate of economic survival would increasingly depends upon the capacity of universities to support a knowledge economy.

The decade of the 1990s would see the elevation of several colleges and polytechnics to university status. However, certain issues remained unsettled. For example, a debate about changing the length of university education from a three-year to a four-year structure which began in 1988, was stifled until 2013 by a variety of factors, as was the issue of merging universities to improve resource efficiency. A review of the higher education system (UGC {Sutherland Report} 2003) suggested that new economic realities called for concentrating resources in fewer institutions. While the matter met with much debate, it was resisted by the academic profession in the two universities that were to be merged. Nevertheless, the basic format was set for the organization and administration of universities, though they remained under continual review, with increased top-slicing of university budgets for reallocation that would support initiatives and incentives to strengthen research capacity, including ways to better manage research networks and academic output.

Government steering and institutional autonomy

Through the University Grants Committee (UGC) and Research Grants Council (RGC), the government steers the direction of higher education sector through prioritized funding and performance guidelines. Yet, each university is an autonomous body with its own Ordinance and Governing Council. Universities control curricula and standards, staff and student recruitment, research, and internal allocation of resources. UGC, as a non-statutory body, often mediates between universities and government because it not only has the responsibility to ensure academic freedom and institutional autonomy, but also of ensuring that tax payers' moneys are spent well. UGC offers advice to and receives advice from government and universities and is expected to take on a role in promoting quality, especially regarding international standards, through peer reviews and initiatives to monitor and enhance the academic standards. It has a stated aim to make Hong Kong a regional hub.

The UGC carries out a Research Assessment Exercises (RAE), which follows, if not two steps behind, the framework used in the United Kingdom. Based on the RAE result, it adjusts the distribution of the research portion of block grants to each university. In this way, it aims to hold universities accountable and drive improvements in research output. The bean counting quality of the RAE has withstood criticism in Hong Kong more than elsewhere, for reasons mentioned later in this paper. The membership of the UGC is comprised of academics and university heads, many of which can be considered amphibious entrepreneurs since they include eminent academics from outside of Hong Kong who are also part of the local community of leaders in business and commerce that sit on University Councils and help set the course of higher education.

The Research Grants Council (RGC), established in 1988, operates under the umbrella of the UGC, and advises on research matters. Like UGC, the RGC is a non-statutory advisory group that is responsible to government for advice about research undertaken by academic staff of UGC institutions. As an international knowledge network of global leaders in academia and business, the UGC and RGC are expected to encourage initiatives that better use knowledge

networks to increase academic productivity and drive innovation. Some of this is accomplished through special grants that support cross-institutional collaboration, such as the Collaborative Research Fund (CRF). In 2012/13, the RGC increased the CRF by 50 percent to \$80 million, from \$53 million, in 2011/12, in an effort to fund more high quality collaborative research projects. The RGC sets out an aim to fund out-of-the-box cross-disciplinary projects. Project teams are expected to engage in interdisciplinary, collaborative research that is only possible by working by crossing departmental and institutional borders. In assessing proposals, the RGC is supposed to put an emphasis on capacity building and the potential of a research topic to develop into an area of excellence that distinguishes Hong Kong from other research hubs.

Hong Kong's UGC uses a development strategy in which resources are distributed competitively but does not set out to concentrate resources in one institution at the expense of others. Its view is that Hong Kong's research universities should complement one another and thereby strengthen the entire system's research capacity.

“by developing an interlocking system where the whole higher education sector is viewed as one force... values a role-driven yet deeply collaborative system of higher education .. committed to extensive collaboration with other institutions..” (UGC 2009).

In summary, the government, through the UGC/RGC aims to drive collaboration among academics across Hong Kong's universities. The international composition of the UGC/RGC committees symbolizes a commitment to building knowledge networks throughout the global academy. The members act as network brokers and conduits between Hong Kong and the rest of the developed world, including top ranked universities. Moreover, as new members are appointed, they act as fillers of network holes. Some of the local appointees of the UGC are from the business and industrial community. Though local by residence, they are internationally connected and act as amphibious entrepreneurs across a number of sectors, including higher education (Saskin 2004). As Hong Kong local stakeholders, the appointees are also key advocates for excellence. This has led to a heavier reliance on quantification as part of quality assurance mechanisms, and though controversial to an extent, is tolerated to some degree by comparing it to the alternative that plagued efforts elsewhere in China.

Still, some credit this, at least in part, for why four of Hong Kong's eight universities are ranked in the top ten in Asia (THE 2008). Still, within a system of autonomous universities, the UGC's role is limited. There has even been discussion in academic circles as to whether the UGC has outlived its role, especially as universities have to generate a larger and larger amount of their own funding. The bulk of the work of building and managing domestic and international knowledge networks is handled by each university, to which we will turn in a later section.

Patterns of research collaboration

The template of institutional arrangements, network agents, and brain circulation for anchoring globalization in Hong Kong's universities facilitates a high amount of research collaboration, both domestic and international, by Hong Kong academics. The level of collaboration has significantly risen in the past two decades according to surveys of the academic profession by the Carnegie Foundation for the Advancement of Teaching and the Changing Academic Profession

project (Table 1) (Postiglione 1997, Postiglione and Wang 2011). The postcolonial era of research collaboration has retained the traditional collaboration networks with academics in Anglo-countries, but has widened it to include more collaboration not only with Mainland Chinese academics but also with counterparts in many parts of the world, such as Russia and South Asia, Africa and Latin America. Moreover, as Southeast Asian countries have expanded their universities, and Australia has internationalized theirs, more regional collaboration has become possible.

Three quarters of Hong Kong academics were working on independent research projects in 1993 but only half had at least one such project in 2007. While only 79 percent of academics were collaborating on a research project in 1993, that figure had risen to 84 percent in 2007. The most prominent change among Hong Kong academics concerned their international collaboration on research projects, which jumped from 35 percent in 1993 to 60 percent in 2007. This change is more pronounced among the most productive 20 percent of academics, 84 percent of whom indicated they collaborate, while 95 percent indicated they collaborate internationally on research projects (Table 2). Moreover, Hong Kong academics are more collaborative than their Asian counterparts, though they are less competitive in this respect when compared to their counterparts elsewhere in the world (Table 3).

A higher degree of international collaboration is not surprising for Hong Kong. Hong Kong academics are most international in citizenship of all 19 systems (except Australia) that participated in the international survey, and 75% of Hong Kong academics earned an overseas doctorate usually at a university in North American or UK. This may also help to explain why Hong Kong academics have a relatively low level of identification with their universities when compared to their counterparts in other university systems.

While the rise of Asian economies has led to more regional collaboration and cross-border partnerships in research, data from the web of science make it clear that Asian research patterns are still closely wed to universities in Western countries (Table 6) (Chapman, Cummings, Postiglione 2010). For example, Asian academics from Hong Kong, Indonesia, Malaysia, Singapore, Philippines and Vietnam collaborate often with counterparts in USA, Australia, and England. Within Asia, Japan has spent many years trying to build research networks in Southeast Asia. The large size of China and India make them emerging partners for knowledge networks with other Asian partners. Finally, knowledge networks in the natural sciences, medicine and engineering still predominate (Table 7). This is the case throughout Asia. However, Hong Kong academics in the humanities and social sciences have a greater outreach, due again to internationalism and academic freedom, to collaborate with counterparts in other parts of the world.

In summary, the data from the international surveys of the academic profession and the web of science both indicate that the globally collaborative nature of the academic profession in Hong Kong. Recruitment of academic staff is competitive internationally and institutional management provides ample opportunity for short and long term visits by distinguished academics involved in collaborative projects. Institutional management facilitates academic productivity by providing advantages for building international knowledge networks and for publishing research findings overseas. At the same time, performance measures bite with a vengeance as they drive academic

productivity. Hong Kong academics agree more than those from most other systems that performance measures are used to make personnel decisions and also about the allocation of resources in their universities (Table 5). While there is a downside to the overuse of quantitative measures, especially in stifling creativity, the Hong Kong system can absorb this due to the composition of the academic profession, many from United Kingdom where these measures were developed, and returnees from Mainland China who view it in comparative perspective. It also placates the members of University Councils who remember the days of colonial universities and who are now in government and industry where performance measures are common. While the measures have been found to increase stress on academics, it also raises their level of job satisfaction, presumably knowing that institutional decisions are relatively fair and less politicized (Postiglione and Wang 2011).

Establishing knowledge networks

Hong Kong's universities seemed to catch on quickly to the new demands of managing knowledge networks, partly due to their close integration with the global academy, but also due to appointing university presidents who were prominent in leading universities overseas. For example, the president of the University of Hong Kong is a world-renowned geneticist. The Chinese University of Hong Kong has had presidents who were awarded the Nobel Prize for fiber optics, and named "Asian Hero" by *Time* magazine for work on SARS. The president of the Hong Kong University of Science and Technology distinguished himself in the US National Science Foundation, in charge of the Mathematical and Physical Sciences Directorate.

By the turn of the century it began to become apparent that global competition, especially for low resource economies, would hinge on knowledge networks. As the cost of higher education began to rise, the community in Hong Kong began to question expenditures. University councils composed of leaders in business and commerce, began to engage more in the discussions about the running of universities. University presidents began to take a greater role in attracting donations, leaving the running of the academic side of the university to its provosts. With the professionalization of management, and the sophistication of information of technology, universities in Hong Kong were expected to function more efficiently, though not always aligned with the values of the academic profession. The increased demand by the academy for research funds in an economy that allocated little of GDP to R&D made it more important for universities to appeal to local entrepreneurs, foundations and alumni. As the walls of the elite university era were drawn down and the door opened wider to the larger community, the demand also grew for networks that permitted more exchange of knowledge between university and society.

Case studies can be used to illustrate how network agents, institutional arrangements, and brain circulation drive a research university that operates in a highly resilient enabling environment of a globally ensconced civil society. A particularly illustrative case of how Hong Kong research universities have anchored globalization concerns the relatively recent establishment and development of the Hong Kong University of Science and Technology (HKUST). Within the context of the enabling environment cited earlier in this paper, that is provided to Hong Kong's universities. HKUST's network format and agency worked in favor of its rise amid the forces of global convergence and divergence. The process of configuring its network was shaped by rising expectations about Hong Kong approaching postcolonial status and China's economic reform

and opening to the outside world. The network layout for the exchange of ideas in research and innovation continued to evolve without assaulting the traditions of Hong Kong higher education. That evolution is also increasingly affected by the alignment of policies and plans for research and development of the nation of which Hong Kong is part.

The case of HKUST's institutional management of research capacity

Managing the take-off phase

Although established in 1991, it became an internationally ranked research university within a decade. HKUST's rapid rise illustrates how a new research university builds and activates academic capital for research collaboration in global knowledge networks, even in the context of a system that had accumulated a certain amount of inertia. A critical factor in its take-off was the planning of the first-tier faculty recruitment. This was done by its first president, a renowned physicist with significant access to knowledge networks of leading scientists. Born in Shanghai, schooled in Hong Kong and Taiwan, he became the first Chinese president of a leading university in the United States. As a member of the planning team during a period of time when recruitment was encumbered by troubling events on the mainland in 1989, and as then as president beginning in 1991, he managed to project the saliency of HKUST's uniqueness, and strategically settle it into the already existing system of higher education. Aside from being an accomplished scientist who helped reinforce the idea of liberal arts education for preparing scientists and engineers in Hong Kong's higher education system, he was also very much in the mold of an amphibious entrepreneur, by being able to situate himself in multiple worlds on both sides of the Pacific. No doubt this helped him to build trust and persuade many of the most accomplished American scientists of Taiwan origin and leave academia in the USA and take up a post in what would soon be a special zone of the PRC.

Elevating knowledge networks

As HKUST and its management of knowledge networks continued to evolve after its first ten years when the second president, Paul Chu, also a world renowned scientist, took office when Hong Kong was still suffering the effects of both the Asian economic crisis and soon embattled by the SARS crisis. Yet, he managed to establish an Institute of Advanced Study (IAS) modeled after that at Princeton University, where noted scientists from around the world visit, think, and conduct workshops. The IAS, with an international advisory board composed of 12 Nobel Laureates, promoted collaborative projects across disciplines and institutions, and forged relationships with academic, business, community, and government leaders, all with the aim to transform Hong Kong and the Greater China region into a global source of creative and intellectual power. For example, visitors included Aaron Ciechanover, Nobel Laureate in Chemistry, and Eric Maskin, Nobel Laureate in Economics. It also recruited "star scholars" as permanent Institute Faculty Members and honors each with a named professorship, which provides salary enhancement and additional research funding. Another 60 named fellowships are available for young and promising scholars who join IAS as postdoctoral fellows to work closely with the permanent Institute Faculty.

Managing funds for research in a new donor culture

Research funding available to HKUST steadily increased except during the Asian Economic Crisis. Donations for research by such groups as the Hong Kong Telecom and the Hong Kong Jockey Club biotechnology were helpful to the research profile of HKUST especially for biotechnology. HKUST's research fund as of June 2008 included Hong Kong private funds (28.2%), non-Hong Kong sources (1.9%), Research Grants Council funds (35.7%), University Grants Committee funds (24.1%), and other Hong Kong Government funds, mostly from the Innovation and Technology Commission (10.1%). The total includes R&D projects administered by R&D corporations (HKUST 2009). The high impact areas of research have been identified as Nano-Science and Nano-Technology, Biological Sciences and Biotechnology, Electronics, Wireless and Information Technology, Environment and Sustainable Development, and Management Education and Research. Aside from their scientific significance, they are viewed as adding value to the social and economic development of the region, including Hong Kong and the surrounding Pearl River Delta.

Starting off as the only university in Hong Kong without an alumni sector, HKUST looked for ways to take advantage of the timely rise of Chinese philanthropy. The government facilitated the donation culture by providing matching grants. Donations in the early phase of development came from a variety of local business and family foundations. During its 10th anniversary, HKUST noted that it received contributions from 18 Foundations and 19 Corporations, as well as seven individual and family donors.

Collaborations, partnerships, and internationalization

HKUST's collaborations, partnerships, and internationalization have also played a significant role in anchoring globalization. Under the Hong Kong Area of Excellence scheme in research, HKUST has collaborative project with other universities in Hong Kong in the following areas: Chinese Medicine: Research and Further Development (with CUHK), Institute of Molecular Technology for Drug Discovery (with HKU), Centre for Marine Environmental Research and Innovation Technology (with CUHK), Developmental Genomics and Skeletal Research (with HKU), and Control of Pandemic and Inter-Pandemic Influenza (with HKU).

HKUST also has a Research and Development Corporation (RDC) for partnerships and knowledge transfers with industry. Moreover, RDC partnerships and other HKUST academic partnerships extend beyond Hong Kong to commercialize high-tech research products. For example, HKUST, Peking University, and the Shenzhen Municipal government established a tripartite cooperative institution that engages in production, study and research. HKUST scientists are expected to be globally networked and are accountable for knowledge products that drive their fields of research expertise.

Accessing social and cultural capital

Each university draws up on special conditions to establish knowledge networks. For example, HKUST has accessed social and cultural capital to recruit many overseas Chinese scientists who were embedded in mainstream research university knowledge hubs. The first president of

HKUST drew upon his extensive social networks of scientists that spanned the Pacific. The approaching date of Hong Kong's return to China was a source of cultural capital for those overseas Chinese scientists who would not have come to Hong Kong were it not for the end of the colonial era and the Chinese mainland's reform policies. In short, HKUST capitalized upon advantageous conditions such as institutional autonomy and the provision of capital resources. Yet, its success was also ensured by a strategically proactive recruitment and a form of governance of its academic faculty that was initially unique in Hong Kong higher education. This set of conditions, as well as the timing of its establishment and take-off, also contributed to situating itself relatively quickly within global networks of knowledge production and output. The first president of HKUST characterized those he recruited as having shared purpose and relentless drive to support his university's rise into the ranks of the so-called "world-class" research universities (Woo 2006).

Planning, risk-taking and governance

Management of knowledge networks by a new research university requires risk taking and shrewd decision making in order to take advantage of the context within which the institution is established, including an economy on the rise, industrial restructuring, a shifting emphasis in higher education toward more applied research and commercialization, an already existing local system of higher education, and the intensification of the global discourse on knowledge economics. In the case of HKUST, it was also essential for the planning committee to be adroit enough to establish a new international university without assaulting the already existing *governing traditions* in the university system.

At the very least, the HKUST case emphasizes the centrality of local advocates in government and society, such as S.Y. Chung, who led the planning for the new university, as well as amphibious entrepreneurs in the academic world who easily crossed the geographical spheres of knowledge networks in the Chinese mainland, Taiwan, Hong Kong and the US. The macro enabling environment for the HKUST project permitted a new pattern of brain circulation that not only gave a strong emphasis to the research enterprise, but also to the commercialization of research. HKUST's Business Faculty played a key role in ratcheting up the entrepreneurial capacity of the institution.

Recruiting and sustaining talent

Although many factors can be seen to support the design and trajectory of the research output enterprise, the key decisions made by the university leadership there was none more crucial for the establishment of an internationally recognized research university than initial faculty recruitment. This set in motion a platform with a top layer of academic talent that could be used to draw upon, establish, nurture, and initiate new knowledge networks. Although managing top academic and scientific talent from around the world is a process that cannot be controlled or predicted, access on a personal level to a defined networks of noted scientists, and the ability to persuade academic leaders of the wisdom of trading a secure position at one top university for the opportunity to begin a second life as part of a new enterprise are indispensable traits for a university president or vice-presidents with the research portfolio. Recruitment for HKUST involved geographically expansive interviewing of prospective faculty. Moreover, the HKUST

case demonstrates that competitive salaries, though helpful, may only be of limited benefit to recruitment efforts. Salary was not the main factor in persuading already established top talent to dislocate their selves. Many were already highly paid in American universities and a move to Hong Kong meant a major trim in their living space, often affecting their family routines and children's education.

After a new research university has gotten off to a strong start in its first phase of development, the next challenge becomes how to retain an academic profession that remains committed over a long period, not only to maintaining a high caliber of research but also to building a purposeful engagement with the society and country within which the university is situated. In the second phase of development of a new research university that began by recruiting overseas talent, the issue the issue of how to ensure that knowledge networks take root in the local society, in this case, Hong Kong, becomes crucial to sustained success. This means the reproduction of a high enough threshold of academic leadership that is culturally, civically, and emotionally rooted in the host city.

The HKUST case shows a gradual trajectory to a more localized academic leadership that is able to keep the university globally networked, actively involved, and leading in selected fields of knowledge. Thus, for any newly established research university that rapidly achieves success and status within the larger international network of research universities, it is important to plan ways to sustain the gains of the initial developmental stage. While HKUST experienced good timing and some luck, its focus remained the same: emphasize research and hire the best scientists. Nevertheless, while one can recruit the top scientists from the outside at the initial phase, continuity cannot be sustained unless a certain indigenization takes hold in the next phase.

A large sector of the next generation of young scholars had to make Hong Kong a centerpiece of their academic lives. In short, sustaining a rise has to move forward with the preparation of a generation of local scientists who will serve and become leaders for the surrounding region, in this case, for South China as it develops in the decades to come. In fact, building knowledge networks for Hong Kong researchers in the Chinese mainland may have different challenges and requirement than building the same networks elsewhere.

HKUST facilitated the creation of a model of a global research university with a scholarly community adjoining a globally emergent and reformist China (Mohrman, Ma & Baker 2008). In this sense, HKUST identified a niche within the Hong Kong system, by establishing a new international university and projecting its vision far beyond that system and into the Chinese mainland, especially signified by the new Southern University of Science and Technology under planning in the Adjacent Shenzhen Special Economic Zone. It identified a niche, not only in the field of science and technology but also in delivering a research focused university culture and encapsulated it into an institutional vision that stressed uniqueness. The central factor underlying its success was the substantial recruitment from two generations of overseas networked Chinese scholars, many who had the emotional attachment to their cultural heritage and intense commitment to China's development. By providing them and other local and international faculty with a unique historical opportunity and a scholarly work environment that was adequately resourced, HKUST sustained its creation of a robust scholarly community

Conclusion: anchoring globalization

Regardless of the level of development, research universities remain nested within regional civilizations. It is all the better if they are situated within global cities and endowed with amphibious agents that not only act as globally linked conduits who help format a template to facilitate research collaboration and drive innovation through open borders and brain circulation. The management of institutional research networks is enhanced by stakeholders who have the means to mediate the clash of civilizations. This is especially important for stakeholders that can help universities maintain the balance between as instruments of international competition, as well as instruments of peace.

In this respect, an important development shaping the future of research and knowledge networks is an initiative ushered in by the Central Government of China. Since Hong Kong's funding for research and development is only 0.7% of GDP, the rise of its research universities has much to do with international collaboration. Scientists who came from overseas or were networked through previous study overseas to large projects were enabled by the institutional conditions to take advantage of such knowledge networks to improve collaboration.

Meanwhile, the proportion of Hong Kong academics that collaborates with colleagues at universities on the Chinese mainland has risen rapidly. This was originally due to the calculation that research budgets in Hong Kong could take advantage of the low salaries on the Chinese Mainland. Later, the environment of research had improved and many more scholars were returning to mainland universities after overseas study, and others were attaching themselves there through special programs. By 2010, the Chinese mainland was increasing its budget for R&D by about 20 percent per year and the door was opening to Hong Kong scientists to apply for large funds. This is only the case in science and technology fields where they can partner with what are designated as state key laboratories. Partner laboratories in Hong Kong can received up to 1.2 million dollars of support for five-year projects. In the case of the adjoining region of Guangdong province, the seven strategic industries include:

- Energy saving and environmental protection (clean energy technology)
- Next generation IT (modernization of the country's telecommunications infrastructure)
- Bio-technology (pharma and vaccine manufacturers)
- High end equipment (airplanes, satellites, manufacturing technology)
- New energy (nuclear, wind, solar)
- New materials (rare earths)
- New energy cars (electric and hybrid cars, batteries)

Nevertheless, while increased collaboration with scientists on the Chinese mainland will provide another major source of research funding, scientific research there is still considered relatively weak, and as Bai Chunli, President of the Chinese academy of Sciences, stated on a 2012 visit to Hong Kong, "There are still many negative elements hindering the birth of scientific discovery."

In an Asian region which aims to become the global driver of the world economy by mid-century, there is an emerging discourse about the urgent need for a commitment to be reflective about how to bring the Western academic model into the service of the local and regional communities.

The president of the Hong Kong Institute of Education made reference to this as it concerns developing countries in Asia: “Will Asia be just producing more of the same of the Western-originated contemporary higher education model, or will it be able to unleash a more critical understanding and practice in higher education, a cultural and epistemological reflection on the role of universities as venues of higher learning” (Cheung 2013).

In short, world class research universities in Asian developing countries also have to be regionally focused with national positioning and global impact that does not just move in lock-step with the Western model. The focus has to be on the selection of fields and specialties so that there can be an efficient employment of resources to address regional growth challenges. Governance needs to support an organization and system that is innovative and unique, that promotes a sense of ownership among academic staff, that protects the academic research atmosphere, and that is international without assaulting local or national traditions.

Hong Kong’s two pronged development strategy was resilient enough to provide HKUST and other research universities in Hong Kong with the autonomy to sustain their uniqueness even during economic recession. The one time that a consolidation of universities which would have created a remix of local knowledge networks was considered, it was almost unanimously opposed by academic staff and alumni. Hong Kong’s universities have been able to distinguish themselves from one another in a system largely financed by government but provided by law with a high degree of autonomy.

The Hong Kong model, though not easily duplicated due to a specific set of historical conditions that existed during the establishment and development of its research universities, still provides a useful case of research university institutionalization. Much of the enabling environment referred to above can be duplicated. However, for some research university systems, changing the medium instruction to English could be fraught with difficulties. That has not stopped leading universities in Japan and Germany, for example, but it has handicapped the rise of universities in Malaysia and Korea. Hong Kong was also in a unique condition in being able to draw on both the Chinese diaspora and its adjacency to the Chinese mainland during an era of economic reform and opening to the outside world. Nevertheless, research universities in developing countries may be able to duplicate some aspects. It can recruit from the diaspora in countries on their continents and plan to calibrate more closely with the development of their global cities as they stand in relationship to their hinterlands. Finally, there is the role for network brokers who can help fill holes in knowledge networks. As local agents, they can act as network conduits, advocates and stakeholders from government and the business community. As global agents and committed stakeholders they become amphibious entrepreneurs. Their ability to work together becomes pivotal for building and maintaining a framework for managing an effective network layout that facilitates brain circulation and knowledge translation, adaptation, transmission and innovation.

Selective aspects of the Hong Kong model can be employed where suitable for the particular economic, political and social context in specific developing countries. The model has already had an influence in Mainland China. For example, the new South China University of Science and Technology has been more heavily influenced by HKUST than any other university outside of China. While the Chinese Mainland may still look more toward Harvard than Hong Kong, the

advantage of the latter model is that it succeeded in a cultural setting that resonates with that in the Chinese Mainland. At the same time the Hong Kong model continually fine tunes itself to the rise of top universities in Beijing and Shanghai, and elsewhere in Asia.

In short, the Hong Kong model anchors globalization by realizing that research universities in a global age play a central role as both infrastructure and as confidence builders. Its development model is best viewed as more as a process than a product model, especially in its ability to recognize opportunities and take calculated risks in planning and implementation at different phases of development. It has also been able to keep corruption at bay better than most systems in Asia, while resisting an overly rapid privatization of higher education. While enabling entrepreneurialism in its research universities, it has also nurtured a culture of philanthropy in partnership with government which provided matching grants on donations. While its budget for research and development is modest, it looks highly upon academic staff with extensive national and/or international knowledge networks that attract external research funds. The turnover rate and mobility of academic staff are viewed as contributing to the international linkages that help sustain knowledge networks. Yet, some would point to a stultifying assessment environment that helps maintain quality and productivity while increasing work stress and opportunities for fresh thinking.

Research universities in developing countries can better anchor globalization in national economies through a cosmopolitan format as exemplified in the Hong Kong model. That model rests on an enabling environment of institutional arrangements, amphibious agents as staunch stakeholders, and a deft engagement with brain circulation. Above all else, the Hong Kong model is a one that places an emphasis on the establishment, protection, and elaboration of knowledge networks. For developing countries, that means a model that takes strategic advantage of economic globalization by nesting its research universities in a cosmopolitan center where it can more easily access regional and international scholar hubs. It also means enlisting amphibious entrepreneurs who have a stake in the local community, a willingness to take a role in facilitating brain circulation, and the agility to bridge academia, industry and government, all the while standing forth to support an enabling environment of academic freedom and mobility.

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Tables

Table 1. Research Collaboration among Hong Kong (PRC) Academics

	1993 (%)	2007 (%)
Are you working independently on any of your research projects?	284 (74.2)	349 (50.7)
Do you have collaborations in any of your research projects?	301 (78.6)	578 (83.9)
Do you collaborate with international colleagues?	92 (35.1)	415 (60.2)
N	471 (100)	689 (100.0)

(Note: %, proportion of 'yes' respondents in each question)

1993 data: Boyer, E.L., P.G Altbach, and M. Whitelaw. 1994. *The Academic Profession: An International Perspective*. Princeton: Carnegie Foundation for the Advancement of Teaching, Figures from Table 1 from unpublished tabulations of the Hong Kong portion of the database for the International Survey of the Academic Profession.

2007 data: International Survey of the Changing Academic Profession

Table 2. Research collaboration among top 20% most productive Hong Kong (PRC) academics, 1993 and 2007

	1993 (%)	2007 (%)
Are you working independently on any of your research projects?	58 (81.7)	64 (46.7)
Do you have collaborations in any of your research projects?	61 (85.9)	131 (95.6)
Do you collaborate with international colleagues?	45 (59.2)	116 (84.7)
N	76 (100)	137 (100)

(Note: %, proportion of 'yes' respondents in each question)

1993 data: Boyer, E.L., P.G Altbach, and M. Whitelaw. 1994. *The Academic Profession: An International Perspective*. Princeton: Carnegie Foundation for the Advancement of Teaching, Figures from Table 2 from unpublished tabulations of the Hong Kong portion of the database for the International Survey of the Academic Profession.

2007 data: International Survey of the Changing Academic Profession

Table 3. Collaboration among academics from 19 higher education systems 2007-2008(%)

	Collaboration	Domestic collaboration	International collaboration
Canada	84	69	64
USA	78	61	33
Finland	88	69	70
Germany	68	64	50
Italy	82	77	59
Netherlands	88	64	63
Norway	82	60	66
Portugal	63	69	54
UK	82	67	61
Australia	89	67	59
Japan	62	52	24
Korea	75	65	30
China	84	55	60
Hong Kong	73	37	13
Malaysia	85	55	32
Argentina	88	69	47
Brazil	58	45	28
Mexico	66	47	35
South Africa	54	45	41

Source: International Survey of the Changing Academic Profession (ISCAP). 2007. Data source for tables 3 from unpublished tabulations of the Hong Kong portion of the ISCAP data base.

(Note: %, proportion of 'yes' respondents in each question)

Research collaboration: Do you have collaborators in any of your research projects?

- Domestic collaboration: Do you collaborate with persons at other institutions in your country?
- International collaboration: Do you collaborate with international colleagues?

Table 4. Research Collaboration for Academics in Asian Systems of Higher Education, 2007-2008

	Japan (%)	Korea (%)	Hong Kong PRC (%)	China (%)	Malaysia (%)
International collaboration	24	30	60	13	32
Co-authored with foreign colleagues	31	28	49	3	27
Published in a foreign country	42	53	86	28	49

Source: International Survey of the Changing Academic Profession (ISCAP). 2007. Data source for tables 4 from unpublished tabulations of the Hong Kong portion of the ISCAP data base (Note: %, proportion of 'yes' respondents in each question)

- International collaboration: Do you collaborate with international colleagues?
- Co-authored with foreign colleagues: Have you ever published co-authored paper with colleagues located in other (foreign)countries in the last three years?
- Published in a foreign country: Have you ever published paper in a foreign country in the last three years?

Table 5. Academic Perspectives in Asia about performance-based management

			China	Hong Kong	Japan	Korea	Malaysia
A strong performance orientation		Sample	60.1	65.4	52.3	62.8	56.6
		Top 10%	69.5	67.9	61.7	64.8	58.6
		Bottom 10%	56.5	63.9	40.0	59.9	59.7
Performance based allocation of resources to academic units		Sample	49.6	58.3	31.2	34.1	34.9
		Top 10%	52.9	56.6	39.6	40.7	50.0
		Bottom 10%	49.6	57.0	23.4	33.1	33.1
Considering the research quality when making personnel decisions		Sample	56.3	69.3	59.7	33.0	39.8
		Top 10%	58.0	72.8	62.4	36.6	50.0
		Bottom 10%	52.9	71.3	53.5	22.4	40.6

(Unit: % of 'strongly agree' and 'agree' in five Likert scale)

Source: International Survey of the Changing Academic Profession (ISCAP). 2007. Data source for tables 7 from unpublished tabulations of the Hong Kong portion of the ISCAP data base

- At my institution, there is a strong performance orientation
- To what extent does your institution emphasize the following practices? Performance based allocation of resources to academic units
- To what extent does your institution emphasize the following practices? Considering the research quality when making personnel decisions

Table 6. Collaboration of Co-authored Journal Publications in Six Asian Countries

	Hong Kong	Indonesia	Malaysia	Singapore	Philippine	Vietnam
Number of article (Total)	10,542	1,129	7,749	9,426	940	1,409
Number of authors (Total)	31,721	4,363	20,715	29,791	3,939	5,768
Number of authors (domestic)	Hong Kong (15,439)	Indonesia (1,563)	Malaysia (12,665)	Singapore (14,890)	Philippine (1,310)	Vietnam (1,959)
Number of co-authors from abroad	China (7,578)	Japan (555)	England (650)	USA (3,709)	USA (580)	USA (449)
	USA (2,724)	USA (323)	India (639)	China (2,426)	Japan (262)	Japan (379)
	Australia (815)	Australia (276)	Australia (632)	Australia (1,155)	Australia (144)	South Korea (332)
	England (615)	Malaysia (259)	USA (576)	England (854)	England (128)	France (259)
	Canada (504)	Netherlands (175)	Japan (525)	Germany (586)	South Korea (119)	Italy (241)
	Taiwan (473)	Germany (130)	Iran (524)	Japan (552)	Germany (107)	Germany (216)
	Singapore (376)	England (117)	Saudi Arabia (315)	France (537)	China (97)	England (165)

Source: Web of Knowledge, 2011

Unit: Number of co-authors

Table 7. Research publication by discipline

Hong Kong	Indonesia	Malaysia	Singapore	Philippine	Vietnam
Engineering (1,935)	Engineering (128)	Engineering (1,205)	Engineering (1,808)	Agriculture (149)	Mathematics (189)
Physics (1,097)	Chemistry (112)	Chemistry (837)	Chemistry (1,589)	Plant Sciences (70)	Physics (175)
Chemistry (1,070)	Environmental Sciences & Ecology (106)	Crystallography (772)	Physics (1,535)	Environmental Sciences & Ecology (67)	Chemistry (172)
Computer Science (929)	Physics (75)	Materials Science (735)	Materials Science (1,270)	Life Sciences & Biomedicine (45)	Engineering (124)
Materials Science (924)	Materials Science (60)	Physics (493)	Computer Science (692)	Chemistry (40) Engineering (40)	Materials Science (101)
10,542	1,129	7,749	9,426	940	1,409

Unit: Number of article

Source: Web of knowledge, 2011