Strategies and Factors Effecting Internationalization of University Research and Education

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ABSTRACT

Universities increasingly adopt strategies of internationalization in order to achieve competitive advantage in both national and international markets. However, every institution adopts different strategies according to various rationales, incentives, and political and economic circumstances. Internationalization of University depends on institutionalizing a strategic planning process that is representative in that it recognizes and utilizes the power of the culture within which it occurs. Internationalization of university research may involve various components that have to work in unison to achieve a common goal, including: a document outlining institutional commitment towards internationalization, academic exchange programs and joint degrees, communication of international opportunities and activities, provision of internal seed funding that could potentially attract external funding (from national and international agencies), mechanism to support faculty and student travels and provide facilities to enhance collaborations, and initiate and expand international student experience programs (including scholarships, medium to discuss international topics, extracurricular activities, etc.). Though, central administration plays an essential role in laying out a path to facilitate internationalization, the credibility comes from faculty participation in the process, particularly with respect to curriculum development, student supervisions and research collaborations. In general, international education engenders highly qualified personnel that are desirable in a global economy: international-mindedness and open-mindedness, second language competence, flexibility of thinking, tolerance and respect for others. Internationalization of university research is a difficult and iterative learning process that could implement strategies and specific programs to attract, retain and sustain collaborations that are of mutual benefit to parent and participating institutions. In this article, authors explore the concept of internationalization and various factors effecting the globalization of research and education. In addition, current article will identify benefits and constraints of internationalization of university research, and initiatives that could potentially establish a sustainable international research and educational program. It is important to measure the extent of international collaboration in order to identify strengths and weaknesses of the existing processes. Therefore, various mechanisms/processes will be discussed that could measure and evaluate the success of international efforts in order to make appropriate adjustments to further improve the program outcome.

Key Words: Internationalization, University Research, Higher Education, Research Collaborations, Partnerships

INTRODUCTION

In order to achieve competitive advantage in both national and international markets, universities increasingly adopt strategies for internationalization. Movement toward the internationalization of R&D activities has expanded considerably during the past decade. It is understood that in the future, knowledge and ideas/innovation are going to be important commodities of trade and universities will have to play a major role to sustain and advance research and education enterprise. Internationalization of university refers to the process of integrating an international, intercultural and global dimension into the purpose, functions and delivery of education and research of the concerned university (Chan and Dimmock 2008). According to Ellingboe (1998), internationalization is defined as an ongoing, future-oriented, multidimensional, interdisciplinary, leadership-driven vision that involves many stakeholders working to change the internal dynamics of an institution to respond and adapt appropriately to an increasingly diverse, globally focused, ever-changing external environment. International collaboration in scientific research involving extremely large - megascience - projects has also grown substantially, reflecting scientific and budgetary realities. Excellent science is not the domain of any single country and many scientific problems involve major instrumentation and facility costs that appear much more affordable when cost-sharing arrangements are in place (National Science Foundation 2008).

Ideally, a university would like to establish as much collaboration with as many universities from diverse regional, economic and geographic background as practical. However, it is not feasible to pursue and establish research linkages with many institutions at once. Therefore, some criteria or priorities have to be identified in accordance with the University strategic plans and goals. This would allow an institution and respective units/colleges to have access to mechanisms and facilities that could further complement their efforts. It is essential for an institution to pursue collaborations with international institutions, industries and foundations that could complement their research expertise and initiatives. Therefore, initially, a detailed exploratory work should be performed to identify outreach activities, research areas and countries of priorities that could complement efforts of parent institution in their efforts for internationalization.

The current article intends to explore various strategies and factors that should be taken into consideration while embarking on the process of internationalization of university research.

INTERNATIONALIZATION OF UNIVERSITY RESEARCH

The last decades of the twentieth century have seen the growth of common norms associated with increasing economic and political interdependence and the increasing flow of persons through migration and tourism. Simultaneously, international economic competition has intensified as formerly regulated monopolies were deregulated, state enterprises were privatized and rationalization proceeds through mergers, acquisitions, restructuring and downsizing. Free trade agreements in North and South America, the continuing development of the European Union, and the resulting economic integration, are manifestations and responses to strong international forces (Bartell 2003).

The internationalization of higher education mainly embraces mobile faculty and students, educational aids and international cooperation, and curriculum internationalization. In other words, internationalization of higher education includes faculty and student exchange, joint teaching and research programs as well as curriculum internationalization (Yunlai and Zhehua 2008).

In today's world of globalization of research and graduate studies, mobility of personnel is essential to sustain international networks. Though modern communication systems facilitate exchange of information, it is the personal interaction and experience gained through working at international institutions having complementary expertise results in innovative research and educational system. Institutions having diverse cultural, economic and geographic backgrounds bring unique perspective to existing research problems and education. For an international network to succeed, it is essential to have co-workers / team members who support and complement each other, provide positive competitive environment where they pursue a common goal as a team and serve a cause or solve problems that could otherwise take years in making or happening (EU/US Research and Education Workshop 2008).

People are considered as carriers of knowledge and exchange of researchers at early stage in their career (graduate and post-doctoral level) between institutions and industries results in sustained networks. For an individual to pursue international collaborations it is essential to have a motivation(s) whether it is personal or professional, a role model to look towards to seek advice and gain strength in difficult times (as international initiatives demands intensive efforts), an opportunity to collaborate and most of all an individual must have passion to pursue his/her goals and dreams, otherwise collaborations may not be sustainable over extended periods (EU/US Research and Education Workshop 2008).

Internationalization in higher education is multifaceted; its meanings and interpretations shift according to the various rationales, incentives, and political and economic circumstances within which it takes place (Callan 2000). Forces both within and outside the university usually influence the direction and extent of internationalization (Cuthbert 2002). Internationalization of university depends on institutionalizing a strategic planning process that is representative in that it recognizes and utilizes the power of the culture within which it occurs (Chan and Dimmock 2008).

Ellingboe (1998) specifically stated five components which are integral to complete understanding of the process applied in internationalizing the university. These components are as follows:

1) College leadership; 2) Faculty members' international involvement in activities with colleagues, research sites, and institutions worldwide; 3) The availability, affordability, accessibility, and transferability of study abroad programs for students; 4) The presence and integration of international students, scholars and visiting faculty into campus life; and 5) International co-curricular units (residence halls, conference planning centers, student unions, career centers, cultural immersion and language houses, student activities and student organizations).

In Canada, the following indicators have been used since 1997 by the Association of Universities and Colleges of Canada and the Bank of Nova Scotia (AUCC 1996–1997, 1997–1998, 1998–1999) in jointly granting Awards for Excellence in Internationalization:

1) International student participation; 2) Curriculum change; 3) International partnerships; 4) Mobilizing financial, human and technological resources for internationalization; 5) University-private sector partnerships; 6) Faculty contributions to internationalization; 7) Contribution of research to internationalization; and 8) Contribution of university development projects to internationalization.

A report by American Council on Education (Green 2005) has established six key activities describing the internationalization of Research at a University. They are: articulated commitment, academic offerings, organizational infrastructure, external funding, institutional investment in faculty, and international students and student programs.

Articulated Commitment: An institution must articulate their commitment for internationalization through mission statements, strategic plans, international education offices, and campus-wide international education committees. Any institution actively pursuing international research should establish guidelines to enable students to study abroad without delaying their graduation and their international participation. The institution must have internationalization as one of the top-five priorities in their strategic plan. In addition, most of

the research intensive internationalized institutions will consider international work while evaluating faculty promotions and tenure decisions (Green 2005). The university could also establish special awards to recognize exceptional researchers for their participation and sustainable internationalization of university (University of Calgary 2008). Organizational as well as unnecessary economic barriers to faculty members spending periods of time working abroad shall be reduced (LiU 2005).

Academic Offerings: One of the prevalent strategies for a research intensive university is to offer study abroad program for credit. In addition, research intensive universities would require students to take a general education course with an international focus (Green 2005). In an increasingly globalized economy, science and technology careers extend beyond national boundaries. Universities and research institutes worldwide are addressing these developments by setting up exchange programs, double and/or joint degrees, and foreign campuses (Embassy of France 2008; LiU 2005).

Organizational Infrastructure: The communication of international opportunities to the university faculty and student body is critical in internationalization efforts; which could be achieved through efficient and comprehensive university web site, group e-mail system, and newsletters. Universities with international focus will have human resources and facilities dedicated to international education and would have a campus-wide internationalization task force. In addition, these universities will have an international administration office to follow-up on activities and disburse relevant information to university community (Green 2005).

External Funding: Availability of funding is critical to internationalization of university research. However, it has been reported that for most of the universities, the primary source of funding is from private sources/foundations. Only highly internationalized universities are successful in attracting external funding from all available/possible sources (Green 2005). Therefore, it is essential to have a source of internal (university based) seed funding or an investment that could complement faculty efforts in attracting additional funds from private foundations and international granting agencies.

Institutional Investment in Faculty: Institutions aggressively pursuing internationalization must have mechanisms to financially support their faculty and student travel abroad programs for meetings and conferences, and study or establish research collaborations and teach abroad. In addition, universities should offer on-campus facilities and organize workshops to help faculty use technology to internationalize their courses (Green 2005). In addition, universities should provide incentives to junior faculty who are not tenured and would like to pursue international collaborations early in their careers.

International Students and Student Programs: The universities focused on internationalization should have internal funds to support on-campus international student research and extracurricular activities. In addition, these universities should provide scholarships to international students, a meeting place or medium to discuss international topics, and fund international recruitment officers to travel abroad (Green 2005).

The Association of Universities and Colleges of Canada (AUCC) in 2000 published a study on internationalization at Canadian Universities and summarized that it might be easier to centralize internationalization activities; that a champion is needed and an organizational structure to support that person. The study also indicated that credibility comes from faculty participation in the process (if not the international office itself), particularly with respect to curriculum development and supervising students. However, faculty members must get credit for this work, have their teaching load reduced and have a committed and motivated dean/leader. It was generally agreed that internationalization is a priority for smaller institutions but that the key problem is one of resources and how to get faculty interested (AUCC 2000).

BENEFITS OF INTERNATIONALIZATION

Key benefits of internationalization include (UW 1999): 1) diversifying and enhancing the learning environment for the benefit of domestic students, the University, and the nation; 2) diversifying and enhancing the student population by attracting excellent international undergraduate and graduate students; 3) ensuring that research and scholarship are informed by international, as well as national, provincial and local, considerations and issues; 4) producing graduates who are internationally knowledgeable and cross-culturally sensitive; 5) addressing through scholarship the increasingly interdependent nature of the world, thereby contributing to improved understanding among nations; 6) generating resources to enhance other international activities; 7) helping to maintain the economic, scientific and technological competitiveness of Canada, and promoting the export of Canadian educational products and services abroad; and, 8) raising the international profile of the University.

Generally, international education engenders the "international characteristics" fostered in students that are desirable in a global economy: international-mindedness and open-mindedness, second language competence, flexibility of thinking, tolerance and respect for others (Hayden *et al.* 2003; Chan and Dimmock 2008).

CONSTRAINTS/RESTRICTIONS TO INTERNATIONALIZATION OF UNIVERSITY RESEARCH

Bartell (2003) stated that universities are loosely-coupled systems (Weick 1976), or more colorfully, “organized anarchies” (Cohen and March 1986). The collegial process and executive authority are both required in managing the university. Bureaucracy, well-suited to a stable or slowly changing environment, is a component in the internal environment as is political (unit) behavior, in the attempt to justify and obtain resources from the central administration. The complexity, high degree of differentiation, multiplicity of units and standards, autonomy of professors, control and management philosophies and mechanisms, which increasingly do not operate effectively even in business organizations, are likely to be complicating and inhibiting factors vis-à-vis pressures for institutional change, particularly, for internationalization of the university as an identified strategic high priority. Under these circumstances, the culture of the university assumes greater prominence in mediating and regulating the university environment. An understanding of the university via its culture can facilitate the analysis of managing structure and processes (Dill 1982; Masland 1985) in order to implement strategies for internationalization in an integrated approach at a level broader than the single, specialized unit or sub-unit.

Student mobility is mostly restricted by financial and curriculum related constraints. Participating institutions should provide incentives to students and researchers interested in international careers by offering them common supervision and joint degree programs. It is crucial to have on-going faculty collaborations that will lead to student exchanges and joint programs. It is vital to educate undergraduate and graduate students about benefits of having an international experience and instill globalization concepts early in their educational program (EU/US Research and Education Workshop 2008).

It is important to provide incentives to junior faculty who are not tenured and would like to pursue international collaborations early in their careers. In addition, a faculty could have appointments at two universities (e.g. 50-50%) to allow them flexibility to conduct teaching and research (EU/US Research and Education Workshop 2008).

Family commitments were considered as one of the top factors to effect international collaborations and mobility of researchers. In most of the scenarios, a comfortable and balanced family life results in successful international careers. Therefore, it is essential for an institution to provide additional resources to promote family values and flexibility to researchers that could allow them to integrate personal commitments in their international professional career without compromising their research and educational goals and objectives.

INITIATIVES TO INCREASE INTERNATIONALIZATION OF UNIVERSITY RESEARCH

Internationalization of research and graduate studies is not a new concept for most of the research intensive universities. Usually, a few dispersed groups or individual researchers pursue international collaborations as their passion; however, it is essential for an institution to recognize these existing international linkages and initiate program that could provide institutional support (including seed funding) to potential researchers interested in pursuing international careers.

Though, it is relatively easy to establish targets and state vision/mission statements in strategic plans for an institution; it is a difficult and iterative learning process to implement strategies and specific programs that could truly attract, retain and sustain collaborations that are of mutual benefit to parent and participating institutions. It is usually a lengthy process and the feedback period is often in number of years. Therefore, strategic support from university central administration as well as constituent colleges plays a major role in developing a successful international program. In addition, support from central administration complements faculty and student plans to further extend their horizon and prepare a long-term plan for establishing international collaborations. Some of the specific activities or plans for internationalization of university research are (UW 1999):

1. Attract international conferences and events to university that could showcase research and scholarly strength to international community;
2. Support and encourage faculty and student participation in international conference and events;
3. Advertise strengths of university in major journals and research/scholarly publications;
4. Establish seed funding to support and promote new international initiatives;
5. Identify financial support required for new priority international initiatives, and incorporate those needs into the next fund raising initiative;
6. Establish a reporting system to identify and track international research and development study projects and funding;
7. Establish a target in overhead funds generated from new international projects to help support international initiatives;
8. Change policies or guidelines related to faculty annual performance reviews, as well as promotion and tenure, to encourage faculty participation and excellence in research, teaching, training and administration with an international focus, with particular regard to the significant lead-times often required before measurable outputs occur from such activity;
9. Establish guidelines to distribute overhead funds from international projects and tuition income from international students among the University/Faculties and

groups or individuals who take a lead role in generating them, as an incentive to generate new revenue;

10. Complete an overall marketing strategy to promote internationalization, including education and training, for international clientele for delivery both in Canada and abroad, initiatives with possible donors, alumni, research sponsors, etc.;
11. For recruitment and promotion, finalize design of and produce an integrated set of promotional material which will service educational fairs, educational publications, funding agencies etc. The purpose is to have sets of promotional material custom-prepared for various international markets and funding agencies. Also develop a new process and application form designed for international students;
12. Establish seed funding to enhance internationalization of curriculum design, to support development of proposals for international consortia research projects, to facilitate mobility of younger faculty both abroad and to the university to enhance educational upgrading and to develop collaborative research opportunities, and to allow regular visits to major donor organizations. Consortia-oriented research projects also will enhance the capacity for interdisciplinary research at the university; and
13. Develop objectives, activities, expenditures, outputs, outcomes and impacts related to internationalization initiatives, to determine which activities should be continued, enhanced, reduced or ended.

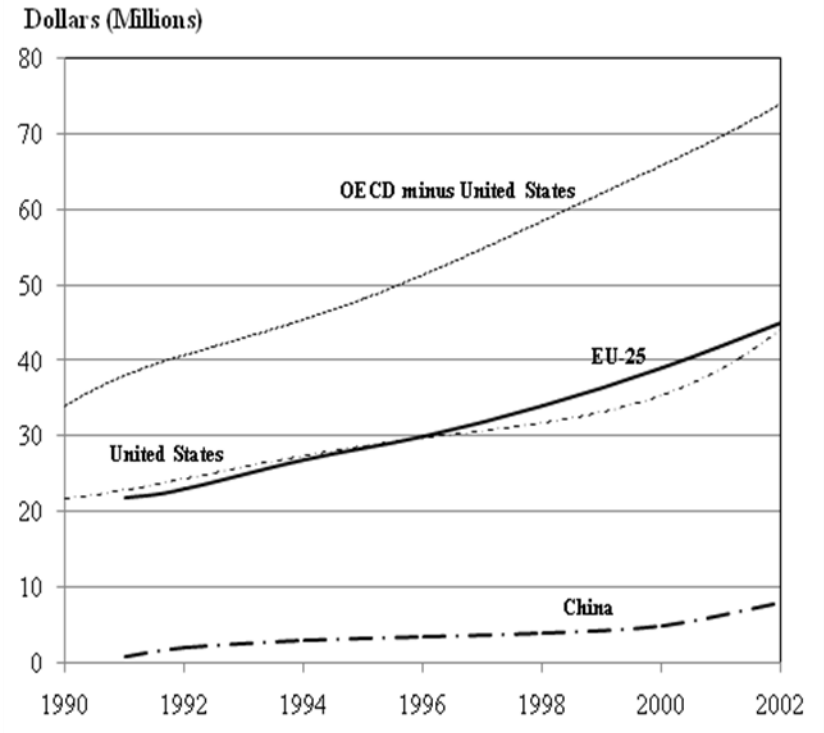
MEASURE OF INTERNATIONAL COLLABORATIONS

Though feedback period for most of the international initiatives is in number of years, mechanisms should be in place to measure and evaluate the success of international efforts in order to make appropriate changes to further improve the program outcome. Some of the mechanisms or methods to measure success is to: a) determine the number of co-authorship articles published in international journals (short term results); b) number of projects initiated and amount of funding brought into the research enterprise (short term results); c) determine the number of students from partner institutions who decided to pursue their careers and studies at host institution and vice-versa (researcher and student exchanges); d) track the number of sustained collaborations that foreign recruits are having with their native institution or alma mater; e) incorporate experience gained through collaborations into their teaching methods and course outlines; and f) initiate exchange of student and researchers with host partner institutions (SRI 2002).

It is essential for an institution pursuing internationalization of research and education to identify countries of priorities based on their strategic plans. This could be achieved by

understanding current trends and development in science and engineering fields in global scenario. The assessment of academic research and development (R&D) funding could be one of the tools to understand research intensiveness of any country. It has been reported that the United States and EU-25 has doubled their R&D funding since 1990 to $41-44 billion in 2003. The Organization for Economic Co-operation and Development (OECD) nations other than the United States spent $74 billion, an increase of 120% since 1990. However, China has experienced a growth in R&D expenditure from $1.1 billion in 1992 to $7.3 billion in 2002 (Figure 1) (National Science Foundation 2006). In addition, the share of academic research funding compared to total research funding of a country provides valuable information to initiate scientific collaborations (Figure 2) (National Science Foundation 2006).

Figure 1: Academic research and development expenditures: 1999-2003

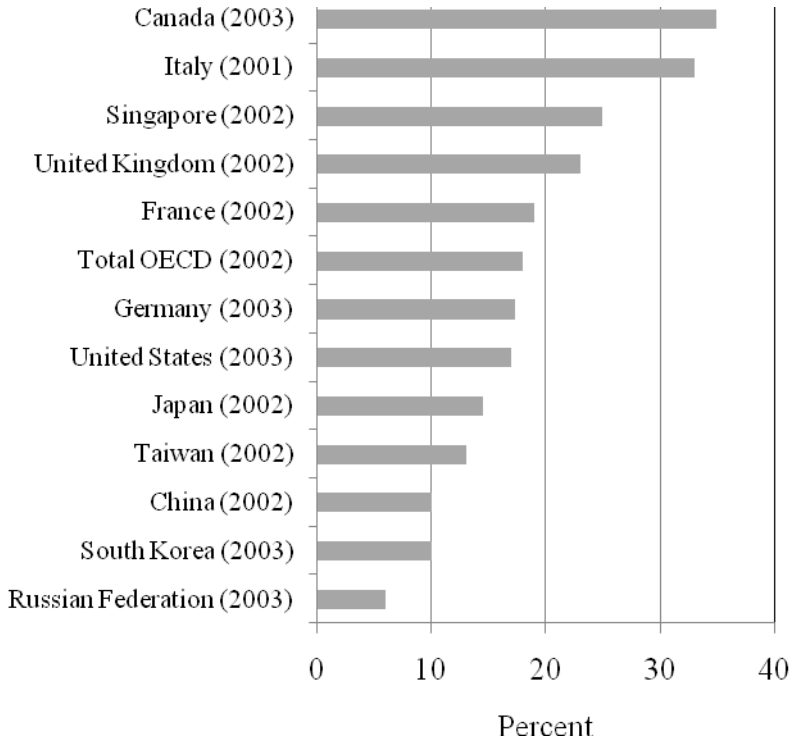


EU = European Union; OECD = Organization for Economic Co-operation and Development

NOTES: All data calculated by OECD with purchasing power parties. EU-25 is EU-15 plus 10 new member states.

SOURCE: OECD, Main Science and Technology Indicators (various years)

Science and Engineering Indicators 2006



OECD = Organization for Economic Co-operation and Development

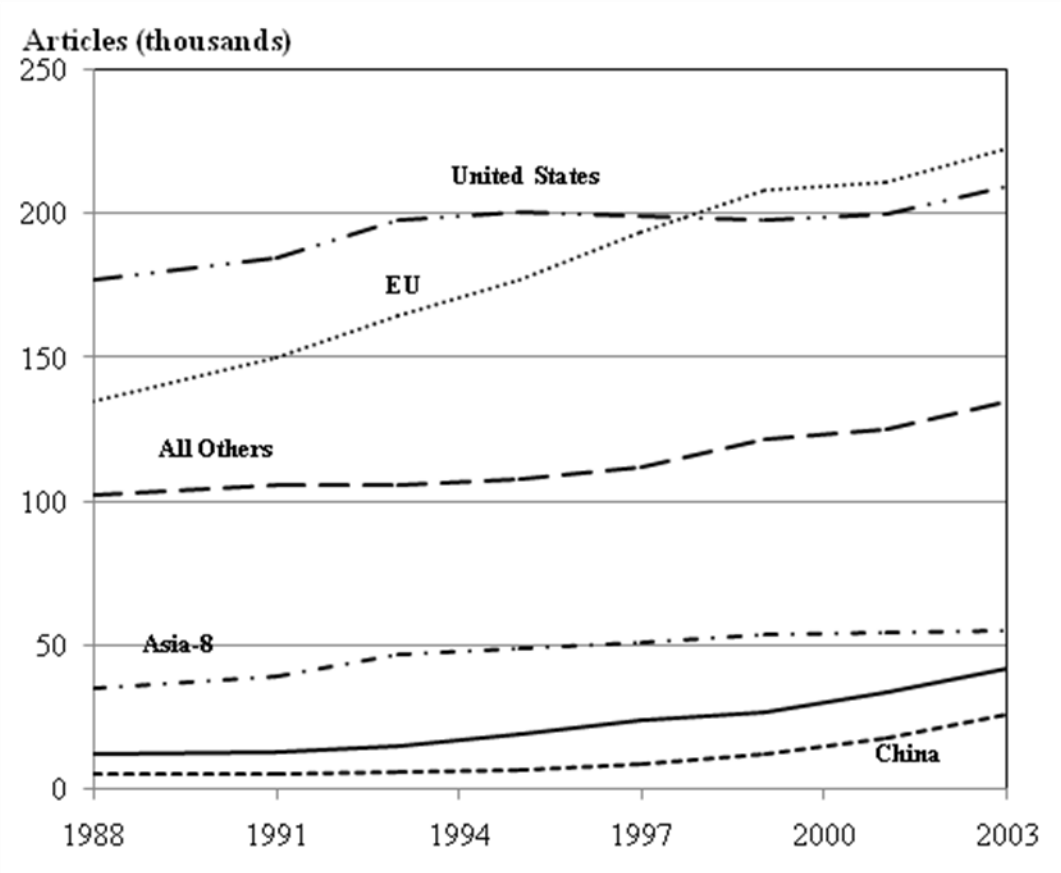
SOURCE: OECD, Main Science and Technology Indicators

(various years).
Science and Engineering Indicators 2006

Figure 2: Academic R&D as share of total R&D, by country economy: Most recent year

Publication of research articles in peer-reviewed world leading journals could be the other indicator of scientific and engineering excellence. It has been reported that the total number of articles published in the world rose from 466,000 in 1998 to 699,000 in 2003. Over this period the combined share of articles for US, EU-15 and Japan declined from 75% to 70% of the total. Meanwhile output from China and Asian-8 countries (India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand) expanded rapidly by 30% and 235%, respectively (Figure 3) (National Science Foundation 2006).

The scientific portfolios of articles from emerging Asian countries showed prominence in the physical sciences and engineering areas. In contrast, the literature from both the United States and the EU-15 showed a fairly heavy emphasis on the life sciences (45%–54%) and a relatively lighter share in engineering (10%–13%) and the physical sciences (22%–39%) (Figure 4) (National Science Foundation 2006).



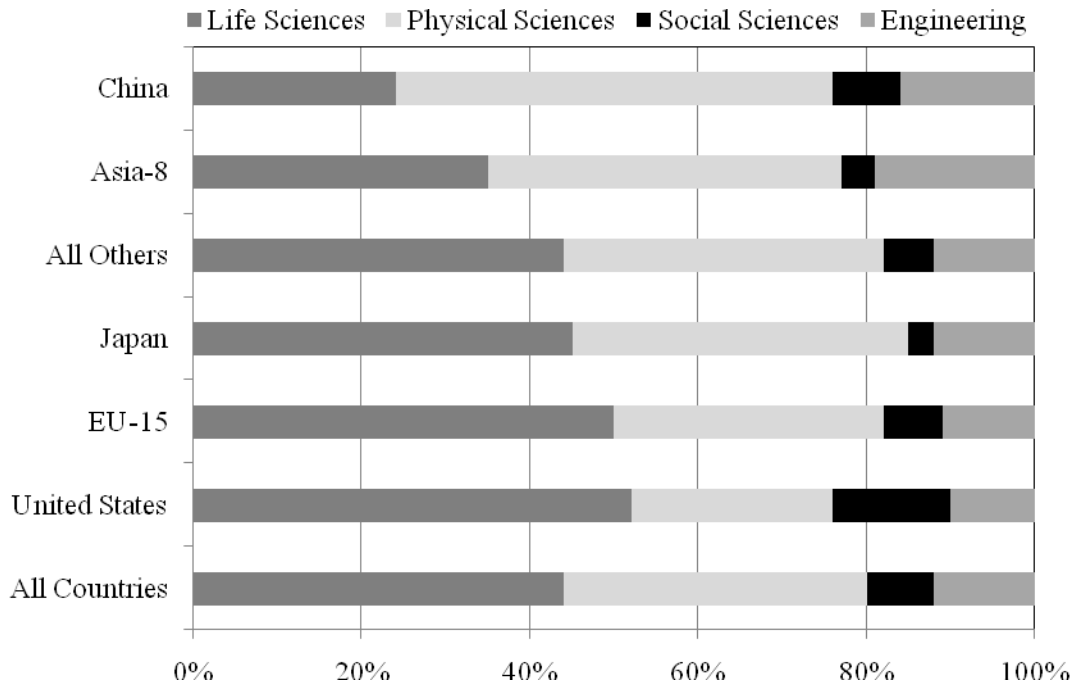
EU = European Union

NOTE: Asia-8 includes South Korea, India, Indonesia, Malaysia, Philippines, Singapore, Taiwan and Thailand.

SOURCES: Thompson ISI, Science Citation Index and Social Sciences Citation Index,

http://www.isinet.com/products/citation/; ipIQ Inc.; and National Science Foundation, Division of Science Resources Statistics, special tabulations. See appendix table 5-41.

Figure 3: Scientific and technical articles, by country/region 1998-2003



EU = European Union

NOTES: Asia-8 includes South Korea, India, Indonesia, Malaysia, Philippines, Singapore, Taiwan, and Thailand. Countries/regions ordered by percentage of life sciences.

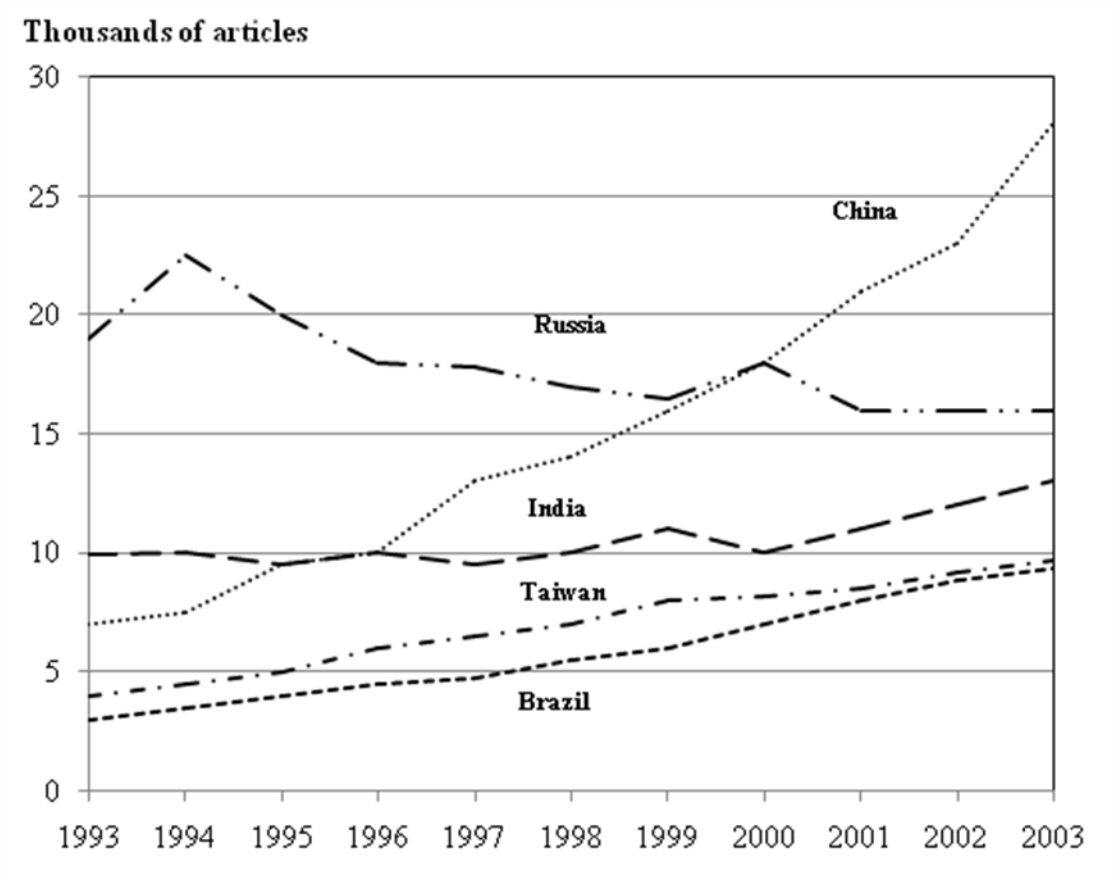
SOURCES: Thompson ISI, Science Citation Index and Social Sciences Citation Index, http://www.isinet.com/products/citation/; ipIQ Inc.; and National Science Foundation, Division of Science Resources Statistics, special tabulations. See appendix table 5-45.

Figure 4: Portfolio of scientific and technical articles, by field and country/region: 2003

Gains in cross-country academic research collaboration are indicated by the substantial increase in international co-authorships during the past decade. Interactions with Asian countries particularly seem to be on the rise, and significant programs have been launched by Europe and the United States with countries of the former Eastern bloc, especially Russia (National Science Foundation 2008). Based on published literature, three countries – Brazil, China and India were identified as countries of strategic importance to many developed and developing countries. One indicator of scientific research capability and international

collaboration is the publication of international co-authored articles in the world's leading scientific and engineering journals (Slipersæter and Aksnes 2008). Among the non-OECD countries and economies, five – Brazil, China, India, Russia and Taiwan – produced two-third of their total scientific article output (Hill 2007).

The articles published by these five countries from 1993 to 2003 are presented in Figure 5 (Hill 2007). The figure shows that among the non-OECD countries, China is now the dominant, producing almost 40% of the articles. China quadrupled its scientific and engineering article output in a decade. Brazil and Taiwan also experienced a rapid increase in their publications with Brazil tripling their output and Taiwan more than doubling their publications. During this period Russia has experienced a decrease in their scientific publication, while India's output raised by 31% over a decade (Figure 5).



NOTES: For internationally coauthored articles, each country and economy receives fractional credits on the basis of proportion of its participating institutions. China includes Hong Kong.

Figure 5: Scientific and Engineering article output of Brazil, China, India, Russia and Taiwan: 1993-2003 (Hill 2007)

The number of scientific and engineering articles that reflect international collaboration by these countries and economies rose rapidly between 1993 and 2003 (Table 1). However, trends in their rate of international collaborations, as measured by the share of their articles with international authors, were divergent. In Russia and India, which had declining and modest growth in total articles output, respectively, the rate of international collaborations increased markedly during this period. In Brazil, China and Taiwan, which had rapid growth in scientific and engineering article output, the rate of international collaboration rose in Taiwan, showed little change in China and declined in Brazil (Hill 2007).

Table 1: International Scientific and Engineering article collaboration of Brazil, China, India, Russia and Taiwan: Selected years, 1993-2003 (Hill 2007)

Country/Economy	1990	1995	1997	1999	2001	2003
Brazil						
Total S&E articles	3,708	4,550	5,653	7,552	9,078	10,779
Internationally coauthored articles	1,459	1,906	2,301	2,898	3,369	3,794
Internationally coauthored as share of total (%)	39.3	41.9	40.7	38.4	37.1	35.2
China						
Total S&E articles	8,907	10,916	14,622	18,922	24,638	34,110
Internationally coauthored articles	2,395	2,966	3,784	5,026	6,703	9,132
Internationally coauthored as share of total (%)	26.9	27.2	25.9	26.6	27.2	26.8
India						
Total S&E articles	10,546	10,469	10,352	11,792	12,561	14,529
Internationally coauthored articles	1,414	1,591	1,660	2,166	2,685	3,187
Internationally coauthored as share of total (%)	13.4	15.2	16.0	18.4	21.4	21.9
Russia						
Total S&E articles	21,912	23,109	22,053	21,306	20,356	20,630
Internationally coauthored articles	4,035	5,515	6,506	7,281	7,774	8,363
Internationally coauthored as share of total (%)	18.4	23.9	29.5	34.2	38.2	40.5
Taiwan						
Total S&E articles	4,107	5,421	6,500	7,607	9,115	10,448
Internationally coauthored articles	754	1,038	1,154	1,419	1,897	2,178

Internationally coauthored as share of total (%)	18.4	19.1	17.8	18.7	20.8	20.8

Notes: Internationally coauthored articles have at least one collaborating institution from outside of indicated country/economy. China includes Hong Kong.

Therefore, based on scientific and engineering potential (journal articles) and increase in international collaborations, China and India are the obvious choices and Brazil has been considered as the third option as they have shown the potential for growth in scientific and engineering area.

CONCLUDING REMARKS

Universities are the best place to start collaborations or sharing of research and technical knowhow resulting in institutions that will become universities in "true sense" i.e. build and develop international expertise based on sharing of knowledge and personnel. Therefore, it is essential to understand current trends in internationalization of university research and strategies that needs to be adopted to establish a potentially successful international program. Universities are a loosely-coupled system, which requires a collegial process and executive authority to manage the process of internationalization of university. Internationalization of the university depends on institutionalizing a strategic planning process that is representative in that it recognizes and utilizes the power of the culture within which it occurs. The core of internationalization of higher education embraces faculty and student exchange, joint teaching and research programs as well as curriculum internationalization. However, it is essential to provide incentives to participants (faculty, staff and students) and initiate programs (such as provision of internal seed funding, enhance international student experience, etc.) that could facilitate the entire process. The scientific R&D expenditures and technical publications related to OECD and non-OECD countries helped in understanding current trends in a Global scenario. It is also important to establish guidelines to measure the extent of international collaborations in order to identify strengths and weaknesses of the existing processes.

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