

Building World-Class Universities in Developing Systems: The Success Case of the Indian Institutes of Technology

JUNG HYUN RYU

Graduate School of Asia-Pacific Studies, Waseda University, Tokyo, Japan.

Email: jjryu@toki.waseda.jp

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Abstract With a global shift towards knowledge-based economy universities are required to produce knowledge and cutting-edge technologies to support their respective country's economy. In response, many countries around the world seek to build their own world-class universities. Altbach (2010, p.1) argues that world-class universities 'demonstrate world class thinking and policy development in the sense that they employ state of the art solutions to pressing challenges of the twenty first century'. However, world-class universities are found only in a few wealthy Western countries. For instance, if one takes a quick glance at Global University Rankings (GUR), nearly every top university is situated in a high-income country. There are exceptions, such as the Indian Institutes of Technology (IIT), which are known to produce the world's most creative engineers. The GUR of IIT steadily rose over the past few years, drawing much attention from the industry for its unprecedented success.

This research aims to trace the successful path of IIT to identify its success factors which may serve as reference points for other developing systems that aim to build world-class universities of their own. The study takes the two most prominent IIT, namely IIT Delhi and IIT Bombay. It also hypothesises and investigates whether the considerable amount of international co-operation activities IIT engaged in at the establishments have played a significant role in its success. The findings of the study showed that IIT's limited financial resources were complemented by a highly concentrated pool of talented and motivated students, as well as professors who have abundant experiences in top-tier research and technical firms abroad. Another major factor was the government's dedication. The government focused on creating a favourable environment for the institution

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and also prioritised IIT in its allocation of financial resources. Meanwhile, the study was unsuccessful in illustrating the role of international co-operation as the two sets of the collected data were contradictory.

Keywords: World-class university, IIT, India, rankings, international Co-operation, aid

1. INTRODUCTION

The global university rankings (GUR), whether generated in Asia or Europe, portray a similar picture; it is geographically skewed and only a limited number of countries manage to appear. Table 1.1 categorises the top 100 universities of the Academic Ranking of World Universities (ARWU) of Shanghai Jiao Tong University¹ and QS World University rankings² by region and income level. It indicates a domination by the Western and high-income countries.³ The only upper middle-income country on the list was China, whose GUR are increasing rapidly. The intensified competition in higher education and the obsession for rankings led to extensive discussion on how to build world-class universities. In fact, many governments, regardless of their regions and income levels, have implemented world-class university policies and projects. Table 1.2 lists some of the examples of these world-class university initiatives. These policies mostly focus on introducing generous funding to higher education institutes to expand researches, increase publications and encourage the use of English.

In response to this battle for world-class universities, World Bank (Salmi, 2009) published *The Challenge of Establishing World-Class Universities*, which discussed how to build world-class universities. However, there was much criticism as the term lacked clear definition and it was often synonymously used with 'Elite-Western.' Meanwhile, the Indian Institutes of Technology (IIT) have successfully achieved the title of world-class university despite their setting in a developing country with limited financial resources. The World Bank report (Salmi, 2009, p.18) praised IIT

¹ARWU is conducted by researchers at the Center for World Class Universities at Shanghai Jiao Tong University. It released the first global university rankings in 2002 (ARWU homepage, n.d.).

²Quacquarelli Symonds (QS) is a global provider of specialist higher education and careers information and solution. It has provided global university rankings since 2004 (QS homepage, n.d.).

³This classification is based on the World Bank's income level. World Bank divides economies according to 2010 GNI per capita, calculated using the World Bank Atlas method. (<http://data.worldbank.org/about/country-and-lending-groups>, accessed 2011/12/12).

Table 1.1: Distribution of Top100 Universities by Region and Income Level

	Countries	%	
		ARWU	QS
Region	North America	56	34
	Europe	32	40
	East Asia and Pacific	12	34
Income Level	High Income	100	97
	Upper Middle Income	0	3

(Source: Created by author based on the data of ARWU 2013 and QS2013)

Table 1.2: World-Class University Initiatives and Policies

	Initiatives and Policies
China	Project 211, Project 985
Denmark	Centres of Excellence
France	Investment Programme for the Future
Germany	Excellence Initiative
Japan	21st Century Centers of Excellence, Global Centers of Excellence
Malaysia	World Premier Intl Research Centre Initiative, Super Global
UAE	Vision 2020
	Abu Dhabi Economic Vision 2030

(Source: Salmi (2009), Cheng et al.(2014) and elaborated by author)

as a success case, because it has the ‘ability to attract best students and turn them into creative engineers or engineer entrepreneurs.’ In fact, in 2005, *The Times* Higher Education Supplement ranked IIT system as the third best engineering school after MIT and University of California, Berkeley. Until recently, IIT have been ranked in top 100 of various subjects of GUR. Furthermore, the U.S. Congress passed a House resolution, which honoured the work of IIT alumni in the U.S., as they were the powerhouses of the Silicon Valley for many years (IIT Bombay, 2005). With this, the graduates of IIT are one of the most desired personnel around the U.S. firms today. This success of IIT attracts attention around the globe as it proves that a world-class university can be established in a developing country, if the right mix of key factors is present. Thus, the case of IIT may offer insights and policy implications for other countries eager to build world-class universities of their own.

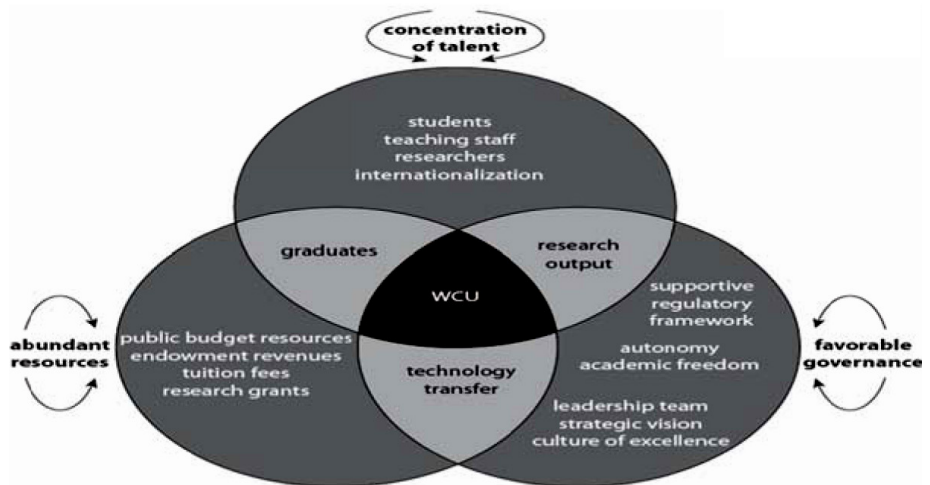
This study traces the institutional development of the two most prominent IIT campuses, Delhi and Bombay to identify success factors for becoming world-class universities. The study also investigates the role international co-operation activities played. The study employs mixed methodology of document analyses and in-depth interviews.

2. LITERATURE REVIEW

2.1 Characteristics of World-Class Universities

Although there is no given definition of the term ‘world-class university,’ there have been many attempts to identify its characteristics. Some of the enumerated characteristics include: top quality faculty and research reputation, talented undergraduate body, international presence and alliances, good management with high aspiration, clear strategy for academic lead and synergistic alliances with other leading institutions (Niland 2000; Khoon et al., 2005). This article will utilise the concept of world-class university created by Salmi (2009, p.7), which includes: a) a high concentration of talent (faculty members and students), b) abundant resources, c) favourable governance that enables institutions to make decisions and manage resources without encumbrance by bureaucracy and (d) the alignment of these factors.

Figure 2.1: Characteristics of a World Class University: Alignment of Key Factors



(Source: Salmi, 2009)

The key factors of world-class universities can be divided into external and internal (Salmi, 2009, p.35). External factors concern national framework and public funding, while internal factors concern institutional dimensions. However, both factors become drastically difficult to generate in developing countries due to severe financial austerity, frequent political interference and instability (Johnstone, 2010 p.177).

2.2 International Co-operation

In the case of IIT, there have been a significant amount of international co-operation activities since establishment. This study, therefore, includes international co-operation activities that IIT engaged in as a major dimension in their institutional development. According to Knight (2005), international co-operation can have very different meanings depending on the country and the actor or stakeholder. In some cases it is used as a generic term to describe the myriad relationships an institution or sector has with partners overseas.

In this paper, the term ‘international co-operation’ will take a generic definition, inclusive of the term ‘international development co-operation’ as well. There are two different forms of international co-operation activities; horizontal and vertical. The horizontal activities include mutual co-operative activities, such as forming academic alliances or collaborative research activities. The vertical activities are development co-operation activities, which include receiving financial or technical assistance (Knight, 2005, p. 27).

2.3 Background of IIT and Indian Higher Education Framework

The first five IIT campuses—Delhi, Bombay, Kharagpur, Madras and Kanpur—were established between the 1950s and the 1960s. They are considered to be the elitist institutions in India. Based on their success, the number of IIT campuses grew to 19, which are operated and managed autonomously. IIT is designated as the Institute of National Importance by the Indian government, which offers many privileges, such as the highest degree of autonomy possible in India and relatively generous funding (AICTE, n.d.). Also, much of the international aid India received was channelled into IIT. For instance, IIT Bombay and IIT Delhi received aid from the Soviet Union through the United Nations Educational, Scientific and Cultural Organization (UNESCO) and Britain, respectively.

Despite its relatively scarce government budget, like many other governments India is very enthusiastic about the idea of a world-class university. India is far from satisfied with the success of the IIT system and in 2009 announced its world-class university initiatives called ‘Innovation

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University.’ However, challenges, such as a poor financial situation, remain. There also are internal social and political pressures against elitism, which can be blamed on the caste system. Quality control is another chronic problem. In fact, there is a huge gap in the quality of education between top colleges such as IIT, Indian Institute of Management and Indian Institute of Science in Bangalore and the rest of the country. Thus, these institutes were named the ‘islands of excellence in an ocean of mediocrity’ (Jayaram, 2010, p. 167), allowing them to attract the best students in the country without difficulty.

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Research Objectives and Significance

Altbach (2010, p.1) argues that the leading universities play a central role in political and social development of a country as ‘world-class universities demonstrate world class thinking and policy development in the sense that they employ state of the art solutions to pressing challenges of the twenty first century.’ However, no developing nation has successfully established a world-class university so far, with the exception of IIT in India. This research, therefore, focuses on the case of IIT to explore its institutional development and identify success factors in hopes of providing reference points to those policymakers of similar nations.

3.2 Research Framework

Salmi’s (2009) function of world-class universities requires Concentration of Talent, Abundant Resources, and Favourable Governance as shown in Figure 3.1.

Meanwhile, the function for IIT is hypothesized as shown in Figure 3.2, where x , y , z are unknown factors that may have been part of IIT’s success, but not other world-class universities: Firstly, the concentration of talent remained in the function as many previous literatures highlighted that India

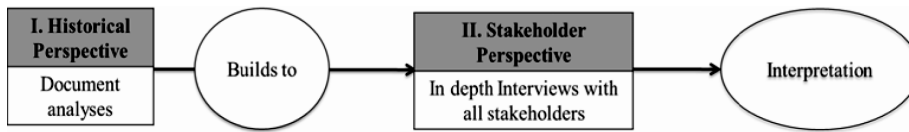
Figure 3.1: Traditional World-class Universities

$$\text{world-class university} = f(\text{Concentration of Talent, Abundant Resources, Favourable Governance})$$

Figure 3.2: IIT’s Key Factors

$$\text{world-class university} = f(\text{Concentration of Talent, Favourable Governance, International Co-operation, } x, y, z)$$

Figure 3.3: Flowchart of Research Methodology



(Source: Mixed methods research design adopted from Creswell and Clark 2011)

is well endowed with talented and meritocratic students. Secondly, favourable governance remained in the function as the literature review indicates the Indian government attempted to maximise the autonomy of IIT. Thirdly, it is hypothesized that abundant resources are absent, because IIT is a public institution that relies only on public funding. Lastly, international co-operation is factored into the function. IIT as the two campuses highlighted in this study were heavily funded and staffed by the international community during the first decade of existence. Thus, it is hypothesized this may have not only aided the institution financially, but also in forming their academic culture. In addition, the study attempts to identify other key factors that may have played a part in the development process of IIT.

3.4 Research Methodology

This research employs mixed method research design ‘Convergent Parallel for Mixed Methods Research’ adopted from Creswell and Clark (2011, p. 77). This design requires both qualitative and quantitative data collection followed by analysis to compare, relate and interpret the data.

Firstly, this research employed a document analysis to examine institutional development from historical perspective. It examined the ‘Annual Reports of Ministry of Human Resources for Technical Education’ from 1952 to 2010, as well as the Director’s Reports issued by IIT Bombay and IIT Delhi. The documents were read closely and passages relating to all world-class university components were excerpted and then coded. From the reports, a total of 282 excerpts were made and 287 items were coded.

Secondly, to find out how the stakeholders perceive institutional success, in-depth interviews were conducted with faculty, administrative staffs and governmental officials through purposive sampling. A total of 12 institutional stakeholders, and four government officials were interviewed in September 2011. Finally, the findings from the two methodologies were analysed and compared.

Table 3.1: In-depth Interview Participants

	ORG.	CATEGORY	NAME	POSITION	DEPARTMENT
1	IIT D	Leaders	L1	Dean	Alumni Affairs and International Relations
2	IIT B	Leaders	L2	Executive Officer	International Relations
3	IIT D	Admin	A1	International Relations Officer	Registrar/ International Relations
4	IIT B	Admin	A2	Junior Officer	International Relations
5	IIT D	Faculty	F1	Professor	Social Sciences
6	IIT B	Faculty	F2	Professor	Physics
7	IIT D	Faculty	F3	Professor	Management
8	IIT B	Faculty	F4	Professor	Mechanical Engineering
9	MHRD	Govt.	G1	Researcher	
10	MHRD	Govt.	G2	Chairman	University Grants Commission
11	MHRD	Govt.	G3	Deputy Secretary	University Grants Commission
12	MHRD	Govt.	G4	Advisor	All India Council for Technology Education (AICTE)
13	IIT D	Student (Int'l)	S1	Graduate Student	
14	IIT D	Student	S2	Graduate Student	
15	IIT D	Student	S3	Graduate Student	

4. FINDINGS

4.1 Concentration of Talents

4.1.1 Students

All interviewees chose the talented and highly motivated students as a major driving force for IIT's success. The endowment of brilliant students at IIT was highlighted in many literatures as well. For example, the Ministry of Human Resources Development ([MHRD], n.d.) reports state that the attraction and selection of the brightest students is one of the strengths of the IIT system.

IIT has always had the luxury of attracting the best students, because the government has designated it as the institute of national importance from

the beginning. Students have perceived IIT as the best institute offering the quickest way up the social ladder in a country where social hierarchy remains entrenched. One of the ways that IIT assure the quality of the student is through a very competitive admission exam, the Joint Entrance Examination (JEE). An administrator interviewed elaborated that “12 million graduate from high school and 400,000 sit in for the JEE, 12,000 students are admitted across all IIT. That means only the very top 2% of the applicants are accepted to the institution (L2).”

4.1.2 Faculty

Along with the pool of talented students, all interviewees chose the faculty as a major success factor. Among the faculty members, the alumni who returned from overseas to teach at IIT have been identified as a key in IIT’s success, as they brought world-class standards to the research labs and classrooms. An interviewee offered an example:

The teaching style at IIT is traditionally very much lecture based, but young professors coming back from foreign countries after finishing their studies are enthusiastic to change the style of teaching in the class by doing more demonstrations and using visuals, which attracts students’ attention more (F4).

However, many interviewees have also chose recruitment off aculty as the biggest challenge. Currently, the faculty-to-student ratio at IIT is between 1:6 and 1:8 (Jayaram, 2011, p.172). This ratio is on par with other world-class universities around the world. However, retaining this ratio has become increasingly difficult due to the shortage of professors. The lack of faculty has been a chronicle problem not only for IIT, but also for Indian higher education in general. This serious shortage of professors can be blamed on (1) the non-availability of suitably qualified people or (2) the ban on recruitment of faculty due to financial distress faced by the governments (Agarwal, 2010, p.386).

In addition to the salary issue, the shortage of professors is exacerbated by the rapid expansion of the IIT system. Eight new IIT campuses were added within a two-year period of time without securing enough faculty members. A faculty interviewee testified that the newer IIT campus esestablished post-2000, such as Roorkee, could not fill their faculty positions. In fact, professors teach only 20% of the courses; lecturers or visiting facultyteach the remaining 80%, which seriously damages the quality of the education.

4.1.3 International Students and Faculty

International students and faculty are also an essential part of world-class universities (Salmi, 2009, p. 20). However, this was not observed at IIT, as the

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statistics indicated that there is a very small number of international students on IIT campuses. Although many interviewees pointed out that having international students is necessary as it is important for IIT students to learn diverse cultures and to accept other values, it is unlikely that the institutions will recruit international students. As an interviewee explained:

...as we are completely public in the sense that we owe all our funding to the government... We are first answerable to the people of this country. Our mandate is to serve the local students before we can serve the foreign students (L2).

Another faculty interviewee (F2) stated there is enough talent pool in India that there is no need to turn to foreign countries for students. Of the stakeholders interviewed, most seemed to share the same perspective. However, a young faculty member (F4) has pointed out that even if IIT was open for admission for international students, it is very unlikely that they will attract high quality students due to the poor infrastructure and backward teaching style at IIT. Meanwhile, the number of international professors at IIT is also very minuscule. Until recent amendment in the regulations, IIT were not able to hire non-Indian nationals as faculty (Jayaram, 2011, p.175). However, even with the relaxed regulations recruiting foreign faculty remains to be a huge challenge due to the small compensation package.

4.2 Favourable Governance

4.2.1 Autonomy

All interviewees agreed that the government allows a relatively higher degree of autonomy to IIT, which was essential to its institutional development. In fact, IIT were granted maximum autonomy upon their establishment and they had a very small influence from the political or governmental interference (Jayaram, 2011). IIT are under the provision of IIT Council rather than *All India Council for Technical Education (ACITE)*, an agency that is responsible for all academic and management decisions of technical institutes in India, which often causes administrative bog.

However, as bureaucrats have certain share of the seats in IIT Council, IIT are not completely free from these influences. A faculty interviewee (F1) gave an example where IIT Delhi was without a director for nine months in 2005 due to the governmental officials in the council refusing to renew the contract of the director without the successor's appointment in time. Another example is the admission guidelines set by the government. It requires IIT to offer nearly 50% of the admission seats to lower caste students as a part of

affirmative action, but IIT stakeholders believed that this may be detrimental to assuring the student quality. However, the interviewees generally understood that it is impossible to exclude the government in managements of IIT as they are nationally funded.

4.3 Resources

4.3.1 Financial Resources

The financial resource situation at IIT can be summarized in one sentence: Indian government pampers IIT with the maximum funding it can afford, but it is far short of what a world-class university requires. Until recently the public funding was the only financial source for IIT. The annual budget is reportedly 20million USD, which is estimated to be 4,000~5,000 USD per student. Making the funding situation even more complicated, IIT are not permitted to build an endowment over 2 million dollars (Indiresan, 2007, p. 98).

Interviewees offered some examples where the quality of education and research are jeopardised due to inadequate financial resources. Firstly, given the characteristics of the technical education, the research often requires expensive equipment for which IIT has always had problems funding for. Therefore, the faculty members are frequently forced to share outdated equipment or purchase equipment from overseas markets, which uses most of the miniscule research funding. Secondly, due to the limited resources, IIT cannot afford to have enough graduate students who play critical roles in the research labs. The lack of graduate students results in reduced quantity and quality of research outputs. However, with the co-ordinated efforts between the institutions and MHRD, the number of graduate programmes has been growing steadily. Thirdly, the shortage of faculty continues to worsen because MHRD sets IIT's compensation regulations. This compensation package cannot be matched with the salaries paid at overseas universities or within the industry itself. In fact, interviewed faculty members were unsatisfied with the amount of their salary and funding. Nevertheless, they were appreciative of the fact that they were funded by the central government, which is at least tenable compared to institutes with private financing.

Fortunately, the financial situation improves every year as India's economic expands steadily. An interviewee explained that his research funding has increased over the past few years as IIT started to diversify its funding sources. Furthermore, consultancy opportunities expanded for faculty members, generating more revenue for the institutions.

4.3.2 Alumni Support

Alumni support was one of the top three success factors chosen by the interviewees along with faculty with experiences abroad and central

government funding. IIT produced one of the wealthiest alumni pools, which contributed to the institution's funding situation in the form of donations. No official data on alumni donations is available, but in the case of IIT Bombay, the alumni association claims that about 2.7 million USD was donated in the 2009 academic year (IITB Alumni Association Report, 2009). This amount, however, is miniscule compared to other world-class universities in the West. For example, MIT reportedly received 27 million USD from their alumni in the same year, which is exactly 10 times greater than IIT (The Tech, 2009).

4.4 International Co-operation

4.4.1 Phase I (1950s~1960s): International Aid

Between the 1960s and the 1970s, IIT received financial assistance from foreign countries. While some of the financial assistance had been agreed upon at the establishment of the institution, some came from new partners and programmes introduced afterwards. For example, the following was excerpted from the document analysis of annual reports of 1960:

In 1961, UNESCO will provide 33 experts, 5 fellowships and \$570,800 worth of equipment. In the following year 1962, 25 experts, 7 fellowships and \$174,000 worth of equipment will be provided. The aid is earmarked mainly for principal technological and research institutions of India, the major portion being allocated to the Indian Institute of Technology, Bombay (Annual Reports of MHRD, 1960).

According to the analyses of the pooled data from the annual reports between the 1960s and the 1970s, the Soviet Union, US and Germany were the most profound aid providers. The most common form of international co-operation was receiving technical assistance, such as professors, lab technicians and university management specialists. In addition, IIT personnel were invited to the partner countries for training. Other activities included receiving research funding, computers, equipment and books. With these development aid oriented co-operation activities, IIT was able to develop more variety of specialised degrees. The graduate programmes were also established during this period.

However, interviewees had mixed opinions on the role of international co-operation in its success. An interviewee, who graduated from IIT in the early 1970s and served as a faculty member upon attaining a doctoral degree in the US, believed that the aid it received from the Soviet Union did not match IIT Bombay's actual needs. He explained:

I have a feeling that Soviet Union's own condition at that time wasn't very great so they couldn't help us that much although they were responsible for training the professors... In fact, they provided us with books that were written in Russian. No one can read Russian here. They were just useless (F2).

In contrast, an interviewee from IIT Bombay said, although it was a very short while the international co-operation has contributed positively to the institutional development:

50 years passed since the help we received. Although, it was a very short while, we owe the hand holding part to Soviet Union... Initially, it helped IIT to jump start, because India had no technology back then (L2).

These mixed responses of interviewees' perceptions on international aid make it difficult to draw a clear conclusion on the role of international co-operation in IIT's institutional development.

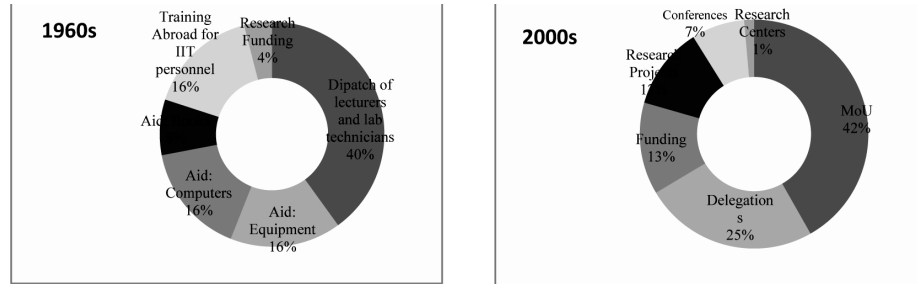
4.4.2 Phase II (1970s~1990s): Structure Adjustment and Financial Austerity

The document analyses revealed that international co-operation activities reduced drastically during the 1970s to 1990s (Phase II). The only active programmes were the funding of scholarships provided by its international partners (MHRD, 1998). This reduction of aid can be blamed on the structural adjustment in 1980s initiated by the World Bank. Also, the declaration of *Education For All* in the 1990s resulted in shift of aid from higher education to primary education.

Making the financial situation worse for IIT, the Indian government faced budget constraints, as the growth rate of Indian economy dropped significantly to 2.9% in the 1970s compared to 4.0% in the 1960s. The growth rate eventually recovered in the 1980s, heading back up to 5.9% (World Bank, 2007), but the situation remained dull. Meanwhile, huge budget became necessary for IIT, as institutes' scientific equipment required a renewal during this period. Most of the equipment, which had been financed or donated to IIT through the international co-operation in the course of establishment in the 1950s and the 1960s, became increasingly obsolescent over the years (IIT Review Committee, 1986). However, the government continued to struggle to secure funding, delaying the renewal process except for the small and low price equipment.

4.4.3 Phase III (2000s) Diversification of international co-operation

Until the 2000s, the international co-operation activities were rather vertical. IIT received various form of assistance from the international community.



(Source: Created by author based on empirical data of document analysis)

Figure 4.1: Comparison of international co-operation activities in 1960s and 2000s

However, the activities changed drastically to horizontal forms of international co-operation, such as research collaboration, establishment of research centres and organising conferences. This indicates the international co-operation has different implications for the institutions in present.

In addition, partners of its international co-operation have diversified. The US, the UK and Germany are the top three partners, but activities with Asia Pacific are also increasing especially with Australia and Korea. Multilateral agencies, such as UNESCO, EU and regional research institutes are also co-operating with IIT in the field of research projects and organising conferences. Furthermore, the partners in the first two phases were mostly government agencies, but it has diversified to individual institutions and multinational corporations.

4.4.4 Increased International Research Co-operation

The research output of higher education in India is largely dominated by business enterprises rather than higher education institutes. However, research collaboration between the business enterprises and IIT is increasing. An interviewee (F1) explained that global enterprises, such as Microsoft, have been setting up labs at IIT, because it is more cost-efficient than any other location in the world. According to the data provided by another interviewee (A1), currently at least four labs are set up by global enterprises at IIT Delhi: Cisco, Intel, Phillips and Microsoft. IIT Delhi also receives sponsorship for research from companies such as Sun Microsystems, Volvo, Ford and IBM. Domestic firms are also actively involved in sponsoring the research activities at IIT. For an example, The Bharti Telecom, the fifth largest telecom firm in the world provides the partial funding for the Telecom Technology and Management Program at IIT Delhi. The interviewee claimed that the sponsored activities are estimated to provide funding of 36.4 million USD and the total amount has been growing by 25~30% ever year.

Regardless of the expansion in sponsored activities and global collaborative researches, few scholars argue that IIT is far from being a research university. The fact that IIT is not a research university has much to do with its small enrolment and poor quality of graduate programmes, which is closely related with the research output. MHRD and IIT's institutional leaders are, however, aware of this problem and there have been many co-ordinated efforts to improve the graduate programmes while expanding the size.

5. DISCUSSION

5.1 Success and Challenges

A large number of stakeholders identified talented students and professors as the major driving force behind IIT's success. The existence of distinguished alumni largely located overseas was also selected as IIT's success factor. The alumni are committed to supporting IIT financially, but also in the form of human resources as they often return to their alma mater as faculty members or advisors. IIT also has government's full support, which is dedicated in fostering IIT into world-class universities. The government provides maximum financial support, although it is inadequate. Meanwhile, poor compensation system for faculty, lack of internationalisation and multidisciplinary programmes, were identified as challenges. However, IIT have many opportunities arising as India's economy continues to expand, which is expected to resolve many of the cross-cutting issues.

5.2 Traits of a World-Class University vs IIT

This study hypothesised that IIT's characteristics maybe similar, but not identical to those of world-class universities in developed countries. The findings revealed that IIT clearly shared characteristics of traditional world-class universities. The most conspicuous ones were the concentrated talent of students and faculty.

In contrast, abundant resources were absent at IIT. First, IIT rely entirely on the public funding, which provides far less than what a world-class university would require. Second, the endowment is significantly small, because government regulation does not allow IIT to build endowment over 20 million. Lastly, IIT also have very limited revenue resources. Meanwhile, research grants and alumni donations continue to grow steadily. Research grants saw a huge increase as recently as international enterprises choose IIT for commissioned researches.

Another finding that greatly contrasts with other world-class universities characteristics is the lack of internationalisation among the student body and

faculty. Despite the merits of having international students on campus, IIT currently do not have plans to attract international students for two reasons: 1) as a public institution, they put priority in serving Indian students and 2) there is a sufficient talent pool within India that IIT require. While a lack of international students is somewhat intentional, the situation is entirely different for professors. The current pay scheme at IIT simply cannot afford foreign professors or researchers. IIT overcame this challenge by recruiting alumni, who attained their highest degrees or professional experiences overseas, as professors. Other characteristics of a world-class university, such as research outputs and leadership team with clear strategic vision were exhibited by IIT, but were frail.

5.3 Role of International Co-operation

The study was unsuccessful in clarifying the role of international co-operation during the initial stage of the institution in the context of building world-class universities. The document analyses indicate that various forms of assistance were received from the international community, which allowed IIT to jump-start the process in becoming a world-class university. However, the in-depth interviews indicated otherwise. The majority of the interviewees responded that international co-operation did not contribute significantly to the success of IIT. This disparity could be re-examined through other methodologies.

In recent years the international co-operation, more particularly in researches, has become a substantial part of IIT. The findings clearly indicated that the forms of international co-operation have evolved from vertical to horizontal. IIT currently engage in various forms of research co-operation with various international institutions and enterprises.

CONCLUSION

The case of IIT illustrated that world-class universities can be established in developing system. The messages for the developing system seeking to build their own world-class universities are clear. The limited financial resources can be complemented if a highly concentrated pool of talented and motivated students is present. Additionally, the government's clear strategies and vision are thought to have played an important role in creating environment to build world-class universities as well. However, the formulas to building world-class universities vary depending on the national context. The national context of India is unique. For instance, a wealthy endowment of human resources is not a characteristic often found in many developing countries. Thus, the findings of this study pose limitations on theorisation or application.

According to IIT's founding committee at the Ministry of Education in the 1950s, IIT's mission was to create and circulate knowledge. IIT have successfully managed to fulfil their mission in circulating knowledge and to train the next generation, which allow them to build a powerful academic brand. However, IIT still faces challenges in creating new knowledge that par with other world-class universities. IIT's next task must focus on expanding their research to create world-class knowledge that matches their reputation.

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