REVISED FINAL REPORT

Developing strategies for university, industry, and government partnership

The education sector analytical and capacity development partnership (ACDP-025)

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PT TRANS INTER ASIA (TIA) INDONESIA in association with The Institute of Public Administration of Canada (IPAC) Canada

The education sector analytical and capacity development partnership (ACDP)

The Government of Republic of Indonesia (represented by the Ministry of Education and Culture, the Ministry of Religious Affairs, and the Ministry of National Development Planning / Bappenas), the Australian Agency for International Development (AusAID), the European Union (EU), and the Asian Development Bank (ADB) have established the Analytical and Capacity Development Partnership (ACDP) as a facility to promote policy dialogue and institutional as well as organizational reform of the education sector to underpin policy implementation and help reduce disparities in provincial and district education performance. The facility is an integral part of the Education Sector Support Program (ESSP) which consists of EU sector budget support witj agreed arrangements for results-led grant disbursement, and earmarked policy and program-led AusAID sector development grant support consisting of a school infrastructure program, a nationwide district and school management development program and a program to accelerate the GOI's accreditation of private Islamic schools. This report has been prepared with grant support provided by AusAID and the EU through ACDP.

CONSULTING FIRMS

The consulting forms responsible for preparation of this Final Report are: PT Trans Inter Asia (TIA), Indonesia and the Institute of Public Administration of canada (IPAC). These firms are part of a consortium which includes 5 (five) associate partners – 2 (two) from Canada (Queens University snd Dalhousie University), and 3 (three) from Indonesia (Bogor Agricultural University, Faculty of Law – Padjadjaran University) and the Institute for Development of Economics and Finance.

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List of abbreviation

ATMI	Politeknik ATMI Surakarta
ACDP	Analytical and Capacity Development Partnership
ADB	Asian Development Bank
AIPI	Indonesia Academy of Science / Akademi Ilmu Pengetahuan Indonesia
BAPPENAS	National Planning Agency / Badan Perencanaan Pembangunan Nasional
BHMN	State Owned Legal Entity / Badan Hukum Milik Negara
BINUS	Bina Nusantara University
BPS	Badan Pusat Statistik / Statistics Indonesia
BPPT	Agency for Assessment and Application of Technology / Badan Pengkajian dan Penerapan Teknologi
BLU	Public Service Agency / Badan Layanan Umum
DGHE	Directorate General of Higher Education
DI	PT Dirgantara Indonesia, state owned aircraft industry
EU	European Union
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
IDR	InDonesian Rupiah
INSTIPER	Institut Pertanian STIPER Yogyakarta
IPB	Bogor Agricultural University / Institut Pertanian Bogor
IPR	Intellectual Property Rights
ITB	Bandung Institute of Technology
ITS	Sepuluh Nopember Institute of Technology / Institut Teknologi Sepuluh Nopember
KAI	PT Kereta Api Indonesia, state owned railway company
KAIST	Korean Advanced Institute of Science and Technology
KAIST ME	KAITS - Mechanical Engineering Department
LIPI	Indonesian Science Institute / Lembaga Ilmu Pengetahuan Indonesia
MALUT	North Maluku
MIT	Massachusetts Institute of Technology
MoA	Ministry of Agriculture
MoD	Ministry of Defense
MoEC	Ministry of Education and Culture
MoH	Ministry of Health
MoI	Ministry of Industry
MoPW	Ministry of Public Works
MoRT	Ministry of Research and Technology
MoT	Ministry of Trade
MP3EI	Master Plan for Acceleration and Expansion of Indonesia Economic Development
NIS	National Innovation System
NRA	National Research Agenda
NTB	West Nusa Tenggara / Nusa Tenggara Barat
NTT	East Nusa Tenggara / Nusa Tenggara Timur
OECD	Organization for Economic Cooperation and Development
OUIC	Office of University Industry Cooperation, KAIST
PAPPIPTEK	Pusat Penelitian Perkembangan IPTEK – LIPI
PNBP	Non tax state revenue / Penerimaan Negara Bukan Pajak
PP	Government Regulation / Peraturan Pemerintah
PTN-BH	Autonomous public university with legal status / Perguruan Tinggi Negeri - Badan Hukum
PUSKIM	Pusat Penelitian dan Pengembangan Pemukiman
PUSPITEK	Center for Research in Science and Technology / Pusat Penelitian Ilmu Pengetahuan dan Teknologi
QS	Quacquarelli Symonds Limited
R&D	Research and Development
RAPID	University - Industry Research / Riset Andalan Perguruan tinggi dan InDustri
SME	Small and Medium Enterprises
S&T	Science and Technology

THES	Times Higher Education Supplement
TPSDP	Technological and Professional Skills Development Project
TusPark	Tsinghua University Science Park
UB	Brawijaya University
UBAYA	University of Surabaya
UGM	Gadjah Mada University
UI	University of Indonesia
UICC	University Industry Cooperation Committee, Tsinghua University
UIG	University – Industry – Government
UIPG	University - Industry Partnership Grant
UNAIR	Airlangga University
UNAND	Andalas University
UNHAS	Hasanuddin University
UNSRAT	Sam Ratulangi University
WEF	World Economic Forum

Executive summary

The government of Indonesia has launched an ambitious *Master Plan for Acceleration and Expansion of Indonesia Economic Development* or MP3EI, with a view to promoting geographically dispersed growth, through establishing seven economic corridors across the nation. The objective of this study is to review the current status of universities in Indonesia in terms of their capacity to work in partnership with industry and government, so that they can contribute to the realization of such a vision and the making of recommendations about future strategies and actions. The study was commissioned by the Ministry of National Planning (BAPPENAS) and the Ministry of Education and Culture under the Analytical and Capacity Development Partnership (ACDP) program, funded by the European Union and the Australian-AID, and administered by the Asian Development Bank (ADB).

The study set out to address three sets of questions related to

a) the nature of Indonesia's innovation systems: at what stage of development they are and what kind of interactions are evident among the three institutional spheres : universities, industry and government;
b) the role of universities: what role they should play, and what changes and development strategies universities need in order that they are able to play such roles; and
c) future actions and programs: what specific actions and programs are needed, how they should be designed, and what resources are needed to develop UIG partnerships.

The initial findings of this study was presented at the 10th Triple Helix Conference, held in Bandung 8-10 August 2012, and the paper has been published in the Elsevier's Procedia Social and Behavioral Sciences. The full manuscript of the article is presented in Annex I of this document, and available at http://dx.doi.org/10.1016/j.sbspro.2012.09.468.

Our study found that universities, industries, and government remained as three separate spheres, still quite distant from each other. We identified only a small number of examples where the three spheres cooperated productively, and where essential knowledge was developed and shared by universities with others. We found only one case in which the actors from the three sectors worked together to generate new strategies and ideas through developing a new organizational structure to realize such joint strategies. However, it was clear that the initiative was an isolated example rather than a regular feature of a regional innovation system.

We found that none of the three spheres appeared to be sufficiently equipped to lead the development of Indonesia's innovation systems, whilst the international study visits to Korea and China show the central role of the government in driving the initiative. Given a different political attribute and different systems, the government seemed unable to become as proactive and directive as China or Singapore in pushing the realization of any innovation. Another deterrent is that unlike Korea and Japan, Indonesia lacks leading industries which may contribute to the creation of innovations. To conclude, the only feasible entry point that universities can offer is pushing UIG partnership which is essential for accelerated and geographically dispersed economic development as outlined in MP3EI. For that reason, developing universities across the country to become strategic institutions has a special significance for Indonesia.

While the size of the higher education system is broadly appropriate and expanding in an adequate speed to meet the needs of the economy, it crucially needs further differentiation of institutional mission, serving the need of economic development and making out geographical distribution more even. Therefore, every economic corridor needs to have:

a) at least one institution with relevant expertise in critical fields of importance for regional development, called 'relevant research institutions' – not necessarily equipped with research capacity to cover everything;

b) nimble practically-oriented teaching institutions which can collectively offer short cycle as well as professional education to get students to become ready for the job market; and
c) generic teaching institutions which offer good quality undergraduate education in a wider range of subjects to prepare students to meet unpredictable regional needs particularly the need of services.

At the national level, it would also be critically important to have 'relevant research institutions' which have a much wider range of expertise, which are able to undertake both fundamental research and application oriented research for the most knowledge-intensive industries.

Our study found out that there have already been some well-established polytechnics as well as an increasing number of private universities which offer good-quality, nimbleness, practically-oriented education at diploma and undergraduate levels. In other words an education offering good practices to meet employers' practical skills are already available. The next key step is to make sure that such good practices are spread more widely across institutions and across regions. This is important as employers are often unsatisfied with the quality of graduates, particularly in their soft skills such as their English competence and IT skills.

There is a critical lack of excellence amongst teaching-oriented institutions. Most universities are teaching-oriented in terms of their capacity. And yet there is a distinct lack of commitment to undergraduate teaching, as most institutions aspire to become generic research institutions. We are also concerned about the loss of momentum in the '*quality movement*' that has been there since the 2000s. Significant quality improvements were made during the late 1990s and the 2000s, with good practices emerging particularly at departmental and study program levels. However, the changes were often not institutionalized particularly in public institutions so that there was a belief that the spirit of 'quality movement' had been fading in the last several years. There is a need not only to push further the quality improvement in undergraduate education in general, but also to create practices to meet more intangible skills in which the economy begins to experience. It is essential that the quality movement is restarted, particularly to push quality culture at the institutional levels across all categories of institutions.

Arguably, the most serious issue is possibly the lack of relevant-research institutions. It is not that there are no candidates as some established universities have both sufficient qualified human resources and the eagerness to be research-active. The issue is that the natural direction for their institutional development is simply to become more focused on fundamental science through the emphasis on internationally-publishable research. A commensurate push for academics to work with industry, to remain 'relevant' and to develop application-oriented thinking was not there. That this is an environment where even industrially-active academicians voice difficulties in identifying industrial partners is a worrisome status which must be straightened out.

Our review of the R&D capacity further highlights the need for significant action. Compared to the percentage of the number of population in Indonesia, the percentage of the number of Indonesia's scientists and engineers is one of the lowest in the world. In addition, Indonesia's investment in R&D is extremely low as it spends merely 0.08% of its GDP for R&D activities, compared to the 0.7% in Malaysia, 0.85% in India, and 1.6% in China. Universities represent important players within the R&D sector; while research funding for them has been increasing in the past five years, the overall level of research funding remains small, and there are just little increase in the funding of strategic research to act as incentives for universities and to undertake research relevant for national needs.

Furthermore, there are several issues which need to be highlighted. One of the most fundamental issues is the lack of understanding and mutual trust among the three sectors. Too many universities develop their strategies without recourse to industrial stakeholders, and many academicians are still looking down on industries, considering them 'greedy' and 'lacking idealism'. On the other hand, Industrialists consider universities to be ivory towers, bureaucratic, and too focused on consensus building to meet their needs. There is a critical need for creating more 'hybrids' making industrialists

joining academician, and academicians taking leave to work in industries. There should also be more opportunities for 'structured encounters' where industrialists and academicians meet regularly, to build better understanding about each other's function and operation. Governing boards and advisory committees in both universities and businesses, professional societies, joint projects, alumni interactions and consultancies all offer invaluable opportunities for individuals from the two sectors to gain exposure to the other sector. The study visit to Korea and China shows that universities can, and certainly have to, create more structured opportunities.

Second, there is a serious flaw in the institutional framework for public universities to be engaged in partnership with industry. Their lack of financial autonomy means a difficulty in running projects efficiently. Having no legal status they have no credibility in negotiating contracts involving intellectual property rights. Thus, institutional development without autonomy means that most institutions would develop without having institutional mechanisms or structures for strategic actions.

Third, regional disparity is a debilitating factor which could undermine the vision of MP3EI. The distribution of university capacity is so uneven that unless concerted efforts are made wisely, universities will not be able to play meaningful roles in many Eastern regions.

We also identified two broader issues; though the identification of appropriate follow up strategies and action programs is beyond the scope of this study. First, there is an issue of serious weaknesses in incentive structures to promote industrial R&D and to encourage industry to move downstream to embrace higher value added products such as product from mining or agriculture. We believe that the MP3EI type development is not feasible without a comprehensive look at incentives in industry, and developing strong affirmative policies to promote faster industrial upgrading. Second, we think that it is essential to enhance research capacity an Indonesia, particularly in the field of biological science in order to squarely address its future with the conservation as well as exploitation of biodiversity. Both issues merit further work: exploring the circumstances deeply and developing strategies and programs for action.

A more specific recommendation for universities is to become strategic institutions with a culture of innovation and relevance. First, they must become much more strategic in ensuring that their distribution of expertise is appropriate to meet the needs of the surrounding region and/or the nation. Second, universities must develop UIG support facilities, such as corporate relations or industrial liaison offices, effective support for external contracts, specialized expertise for creating space for collaboration and commercialization such as science parks and incubation centres, which are staffed with dedicated professionals who understand the academic world, but need to have their own expertise to bring to the table well beyond what most part-time academician can offer. Thirdly, universities must offer appropriate incentives to encourage individual academicians to engage themselves in industrial partnerships and undertake commercialization.

It is clear that the framework for institutional autonomy must be reoriented to allow universities to develop fully autonomous institutions. To the extent that not everything can be sorted out within short-term, the government must develop workaround mechanisms to facilitate universities to work better with industries, including ensuring that funds can be effectively channelled. It is likely that it will require many public institutions to establish new organization units to interface cooperation between universities and industries.

The recommendation for the government is to win back the confidence of private businesses, by firstly establishing national forums with leaders from government, industry and universities to meet and work with each other. Second, it is essential that the government develop a consistent set of policies and public investments to support the vision of economic growth with innovation, not only in ensuring university autonomy but also in affirmatively supporting the development of industries with higher value added, such as downstream industries of agricultural and mining products. Thirdly, the government must comprehensively revamp and increase its investment in R&D.

Improving R&D investment is a critical requirement, but we do not recommend a simple expansion of existing types of research funding. We see that research funding from DGHE and MoRT have significantly increased shown by their improved abilities in funding good research projects. What is badly needed is an improvement in the mechanisms of channeling funds, by pushing block grants, faster disbursement, and allowance for multiple year projects to increase effective use of first and foremost funds.

We also see a critical need for increased government funding for what may be best termed as 'strategic research' to promote particular themes of research that have national relevance in the future. The MoRT already provides some similar funding, but this is the kind of funding in which other sectoral agencies could be more active in providing more grants or contracts to push universities to undertake research and development projects of national relevance.

We see the most urgent need in a set of competitive funding programs to promote a new culture of industrial engagement and relevance among universities. The use of competition is important as it may provide incentives for institutions to innovate. The specific requirement that proposals be developed in consultation with stakeholder industry and government officials for all programs will also help push collaborative planning for institutional development. More specifically we recommend three types of programs.

The first type includes fellowships to be awarded to individual academics (both prospective and future) and industrialists to gain work exposure in each other's spheres so that they develop 'hybrids' perspectives.

The second type offers institutional grants to strengthen professional support functions for UIG partnerships, such as corporate relations/industrial liaison work and commercialization support.

The third type of program includes the development of universities' through capacity building and making research expertise in new fields relevant to industry. We recommend 'tiered' competition so that the regional disparity issue is addressed directly with a targeted support for universities in Eastern region. Some of these programs can start immediately for which we recommend a certain sequencing of grant programs to ensure effective preparation and implementation.

From the medium to long term, we expect DGHE as well as other government funding bodies to be able to enlist individual industrialists to advise them on their strategies, policies, as well as funding program design and implementation. In the short term, it is unlikely that identification of such personnel is easy. We therefore recommend new programs to be initiated by DGHE, but with a concerted effort to ensure that industrial views are solicited in (a) program design through individual consultation with industrial experts; (b) selection, monitoring and evaluation by experimental engagement of industrial experts; and (c) individual grant proposals, through requirements that universities cannot submit proposals without consulting stakeholder industry.

Chapter 1. Framework of the study

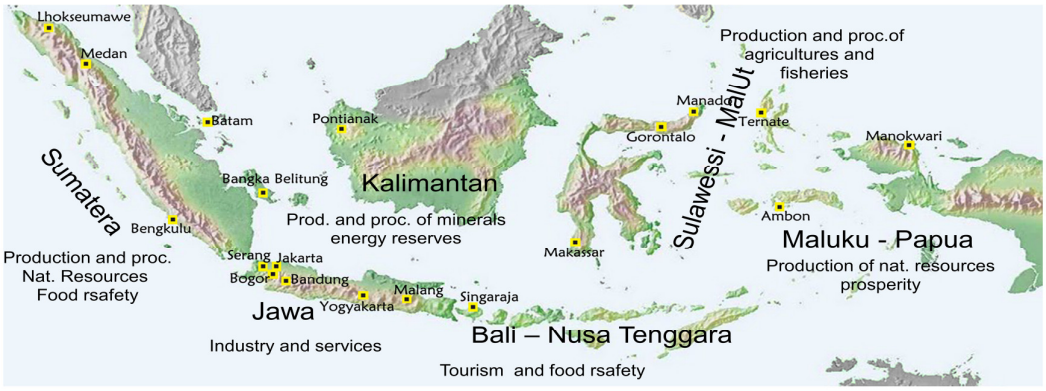
1.1 Introduction

Despite the global slow-down in many parts of the world, Indonesia's economic growth has so far remained resilient to the weakening global economy. It has successfully maintained growth above 6 percent (projected 6.4% in 2012), a budget deficit below 2.5 percent of GDP, and a public debt to GDP ratio of 25 percent. As an emerging economy, Indonesia is now considered to be the low middle income country entering the third stage of economic development, called the "efficiency driven economy" by the World Economic Forum (WEF 2012).

Indonesia currently needs to address more complex elements to improve its competitiveness, amid its entrance to the efficiency driven economy. In this context higher education is critical for economic growth and national competitiveness. Well-educated human resources, excellence in scientific research and better linkages to industry and government are regarded as key policy priorities in practically all OECD countries, with more governments developing explicit innovation strategies and with various support programs to encourage universities to take on greater economic roles. Emphasis on university-industry-government partnerships is a global trend not only in OECD countries, but also in emerging economies and increasingly in developing countries.

Indonesia is no exception in this respect. The government of Indonesia has recently launched the MP3EI (*Master Plan for Acceleration and Expansion of Indonesia Economic Development*), intended to drive the realization of high, balanced, fair and sustainable economic growth, through two key factors, i.e. acceleration and expansion [MP3EI, 2011]. Indonesia plans to accelerate its existing development programs, especially in boosting value added of the prime economic sectors, increasing infrastructure development and energy supply, and developing human resources as well as science and technology. Besides acceleration, the government also pushes for the expansion of economic development so that its positive effects can be felt not only at each and every region in Indonesia, but also by all components of the community across Indonesia. This economic development strategy requires a strong university, industry, and government (UIG) collaboration and partnership.

Figure-1.1: The economic corridors in the MP3EI



This study was commissioned by the Ministry of National Planning (BAPPENAS) and the Ministry of Education and Culture under the Analytical and Capacity Development Partnership (ACDP) program, funded by the EU and AusAID, administered by the Asian Development Bank (ADB). The main purpose of this study is to review the current status of universities[1] in Indonesia in terms of their

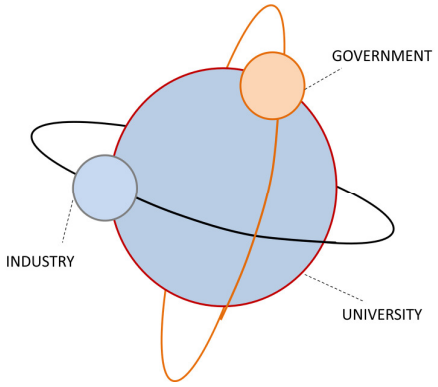
[1] The term "universities" is used throughout this paper to represent all types of higher education institutions, i.e. university, institute, college (*sekolah tinggi)*, academy, and polytechnics.

capacity to develop partnership with industry and contribute to this economic development strategy.

1.2 University role in the innovation space

Realistically, the role universities can play for economic development in regional economic development depends not only upon the level of interaction that they already have with government and industry, but also on whether they can play a proactive role with respect to other actors. In this connection, the extended triple helix model for regional development provides a helpful framework for our analysis (Etzkowitz 2002, Casas et al 2000, Etzkowitz and Ranga 2010). According to Etzkowitz's model, the three separate institutional spheres, universities, industry and government, operate independently from each other initially. In the first stage of the development of regional innovation systems, each develops a 'knowledge space', where knowledge institutions begin to concentrate certain R&D activities related to the region, with some networks emerging around them. In the second phase, the region develops a 'consensus space' where actors from three spheres begin work together to generate new strategies and ideas. In the third phase, the region develops a 'innovation space', in which new organizational mechanisms are developed or introduced to realize strategies developed in the previous stage.

Figure-1.2: Triple helix III innovation space



The model has also been extended to describe the positioning of the UIG spheres with respect to each other. In a statist regime (Triple Helix I), government plays the leading role, driving academia and industry. In a laissez-faire regime (Triple Helix II), industry is the driving force, with the other two spheres as ancillary support structures [Etzkowitz and Ranga, 2010]. In a knowledge-based society, university and other knowledge-producing institutions play an increasing role, acting in partnership with industry and government and even taking the leadership in joint initiatives, in a balanced model (Triple Helix III). In a university-led developmental model, the university takes the lead and becomes the gravitational center that initiates the partnership, as illustrated in figure-1.2. In this case, the very first step to come to a productive partnership is to have a preliminary encounter with industry and the government.

1.3 Mission differentiation

In order to understand the different roles that universities can play in economic development, we propose a framework which distinguishes four types of institutions: basic research institutions, relevant research institutions, teaching focused institutions and practically oriented institutions[2]. As

[2] This is a classification built upon conceptual framework proposed by Stokes (Stokes 1997), which proposed that fundamental research can be inspired by its application – in a striking contrast to the orthodox belief that fundamental science must be autonomous from interest in applications [Hatakenaka 2008].

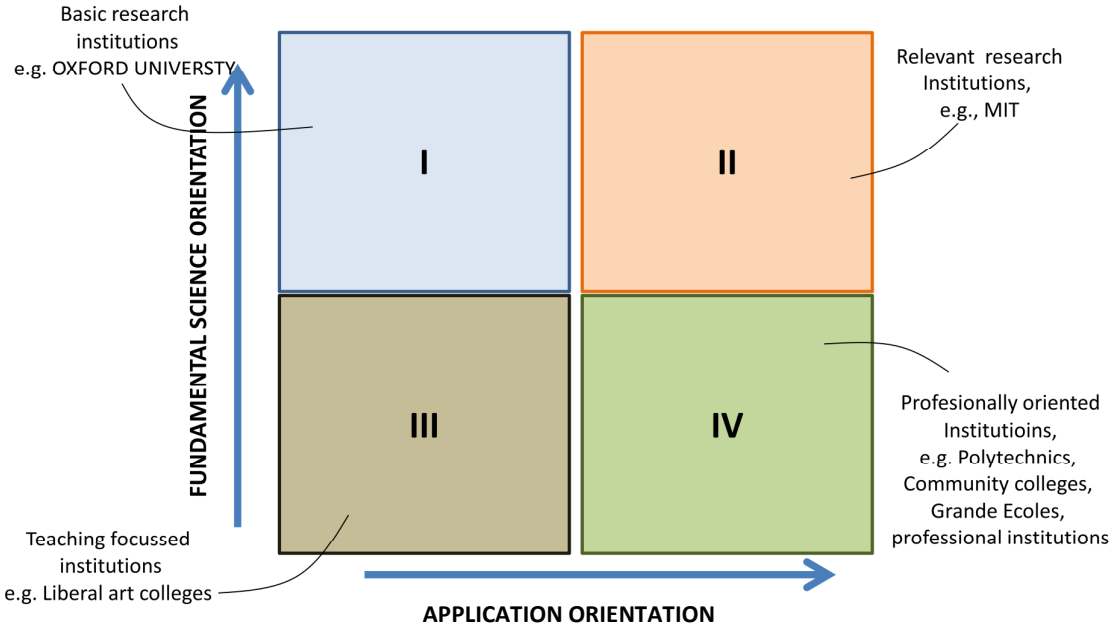
shown in Figure-1.3, the four types are distinguished by two dimensions which define the nature of their research interest: application orientation, and fundamental-science orientation.

In *relevant research* universities (quadrant II), academics conduct a fundamental research to create new knowledge that unravels fundamental principles but inspired by application and relevance to society. A primary example is a small group of American research universities which embrace the value of relevance, such as MIT, Stanford, and land grant universities which have the tradition of serving the needs of the society. Such institutions typically have extensive institutional systems to support academics to work with industry and other stakeholders in the society. They also emphasize and have institutional mechanisms to support interdisciplinary research that are relevant to societal challenges.

Basic research universities (quadrant I) are driven principally by the core values of fundamental science, with little interest in or institutional capacity for responding to external needs. This is where the classic ivory-tower universities with well-developed research capabilities belong; indeed the great majority of research universities in the world have belonged to this cell—at least until recently, since economic relevance became a global catchphrase.

The bottom right-hand cell contains *professionally oriented* (quadrant IV) institutions that aspire to meet the needs of economy for practical skills and knowledge. They offer courses relevant to employers and often conduct consulting and application-oriented research with and for industry. The objective of their research is not to discover fundamental principles for publication, but to develop solutions to specific problems. Examples are diverse; they range from the *grandes écoles* in France, which were designed to provide elite professional education (although they have begun to develop basic research capacity in the past couple of decades), the German university of applied sciences (previously *fach-hocheschules*), and many polytechnic schools and their equivalents in other countries. Such institutions may have multiple and direct linkages with employers and industries.

Figure-1.3: Institutional Characteristics [Stokes, 1997, Hatakenaka 2008]



In teaching-focused institutions (quadrant III), the main purpose of research in such institutions is to keep the academic staff updated of developments; their research can be more appropriately called scholarship. U.S. liberal arts colleges are good examples: they are committed to offering broad curricula, with an emphasis on generic skills rather than vocational or professional content.

In many developing countries, most institutions fall into the teaching-focused category by default – simply because they have not yet had the resources or capacity to be highly active in research, either fundamental or applied. Many institutions are also not fully developed, with only a limited range of subject coverage, or with less than fully qualified personnel. Indonesia is no exception. And yet, if Indonesia is to achieve the objectives of MP3EI, it will be essential for Indonesia nationally to have at least a handful of well-developed relevant research institutions (Quadrant II). Each of the key corridors must also have universities with relevant research capacity at least in a limited range of fields critical to the region, which we will call *regionally relevant research institutions* (Quadrant II). Each of the main 'centers' within corridors should have both professionally-oriented institutions capable of offering industry-relevant education quickly (Quadrant IV), as well as teaching-focused institutions capable of offering good education in a diverse range of academic specialization (Quadrant III), which can provide an adequate pool of flexible human resources.

1.4 Objective of the study

The objective of the study is to contribute to the achievement of the National Medium Term Development Plan (RPJMN) 2010-2014 and the Master Plan for Acceleration and Expansion of Indonesia Economic Development 2011-2025 (MP3EI), by supporting economic growth, productivity, and national competitiveness. The aim is to develop strategies for UIG partnerships and collaboration creating opportunities for innovation geared to stimulate economic growth. Although UIG partnerships require active participation from all three players, and the issues associated with the role of government and industries have been looked at, the central focus of the study is higher educational institutions and their roles.

The specific research questions that we addressed in this study are:

- *What are the development stages of Indonesia's innovation systems?*

  The study assesses the stage of development in the 6 economic corridors, in the context of the MP3EI strategy. Particular attention is given to the assessment of how far are they from developing the knowledge and consensus space. It further develops the strategies that might be needed to prepare higher education institutions to contribute to the national MP3EI strategy.

- *What roles should universities should play, what changes and development strategies are needed?*

  The study assesses the university capacity to take a leading role, particularly to understand the feasibility of achieving the Triple Helix III stage. In the context of MP3EI, some requirements to be able to play the intended role in developing the UIG partnership are defined. When the requirements have not been met yet, it recommends changes needed within the universities, government, and industries environment.

- *What specific actions and programs are needed, how they should be designed, and what resources are needed for developing UIG partnership?*

  The study develops a blueprint of programs to be supported with the government funding, the shape of institutional arrangements for its implementation along with possible options for its locale, and the needed resources.

The deliverable outputs are,

- *Inception Report*: The report was discussed in a preliminary workshop held on the 1st of June and presented as well discussed on 14 June 2012.

- *Paper etitled "University, Industry, and Government partnership: present and future challenges in Indonesia"*, presented at the 10th Triple Helix Conference, held in Bandung 8-10 August 2012. The paper has been accepted and published in the Elsevier's Procedia Social and Behavioral

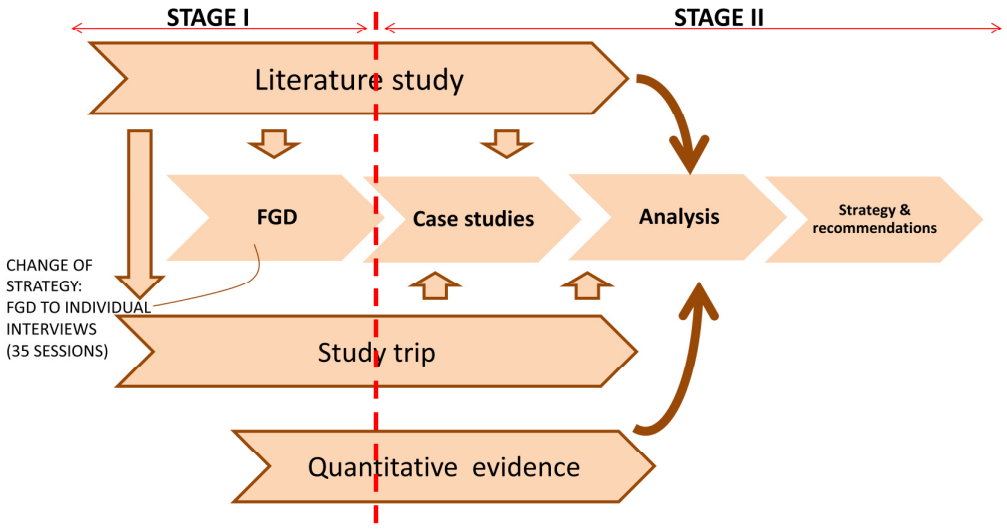
Sciences. The full text of the article is presented in Annex I of this document, and available at http://dx.doi.org/10.1016/j.sbspro.2012.09.468[3].

- *Interim report:* The initial plan was to focus the report on good practices and approaches in developing UIG partnership, drawing lessons from national as well as international experiences. However, the schedule of study trips to China and Korea was delayed due to technical reasons. At the same time we had the opinion that information solicited from local experiences have adequately provided materials to develop a preliminary analysis. Therefore we decided to adjust the report according to the newly developing circumstances, by expanding it to include analysis and at the same time limiting coverage of international experiences based on literature study. The interim report was presented at a stakeholders' workshop held on 5 September 2012. The report received a very good reception by the participants in the workshop, and they have provided many valuable suggestions for the final report.
- The study team was invited to present its findings before the USAID HELM workshop in Jakarta on 7 November 2012, and the Japan Indonesia Innovation Convention in Bandung on 1 December 2012.
- *Strategy for facilitating UIG partnership*: is part of the final report, which includes a report on higher education sector in its relevant aspects, the capacity in research and development, the needs of the industries, the issues in UIG partnership, and the recommended strategies. The report is scheduled to be submitted on the 26th of November 2012 and presented before the stakeholders workshop on the 5th of December 2012.

1.5 Methodology

This study began with a review of literature related to U-I-G partnerships, and overlapping with it, a series of discussion sessions and focused group discussions (FGD). The findings are based on a review of government documents, existing data within Directorate General of Higher Education (DGHE), and preliminary interviews with individuals and discussion with groups representing key players from university, industry, as well as the government.

Figure-1.4: Methodology of the study



[3] Facebook: http://www.facebook.com/share.php?u=http://dx.doi.org/10.1016/j.sbspro.2012.09.468
Twitter: https://twitter.com/share?original_referer=http://dx.doi.org/10.1016/j.sbspro.2012.09.468

During the course of the study, we had to make adjustments to overcome the problems we had encountered, as deliberated in the following points,

Study trip

In addition to the discussion sessions, we also planned to conduct a study trip to 2 overseas locations for a comparative study. The main purpose of the study trips is to learn from successful international experiences for which we submitted a proposal to China (industrial parks in Tsinghua University); and Korea (KAIST, and Daedeok Innopolis in Daejeon). The initial plan was to conduct the study trip in the early stage of the study but we decided that we would need a considerable knowledge about the condition in Indonesia before deciding the specific information we would like to acquire from the countries we have selected; hence we changed our plan to conduct the study in the second stage.

Unfortunately there were some technical problems which we had failed to anticipate in organizing these trips, i.e. late responses received from the host institutions. We, therefore, conducted the study trips in the second part of November 2012.

Case studies

From the beginning we realized that the available resources and time frame would limit our conducting an extensive and quantitative based survey. With only 4 members, the team were unable to cover the entire spectrum of sectors, corridors, and institutions; therefore, we selected some case studies to be further analyzed and studied. In the following sessions, discussions with experts and officers relevant to the cases were conducted. The purpose of the case studies was to explore and analyse factors that contributed to successful UIG partnerships in Indonesia. In order to identify the root cause, failure stories were also rigorously analyzed to find necessary remedies.

Initially we planned to focus our cases to a few cases representing institutions with different missions, i.e. research, professional, and teaching oriented institutions. But during the course of the study we found out that interesting cases were more distributed among many different institutions rather than concentrated in a few institutions. In selecting cases, we therefore, did not limit our selection to a particular unit / department / institution, but tended to be more flexible. Some interesting small cases were drawn from several different institutions. The selected cases are presented in this document as boxes.

Interview sessions

We realized that identifying the appropriate persons to be interviewed is quite an important factor in gathering the right information. Initially we had conducted group discussions by sending a formal invitation letter to the targeted organizations, but later we found that many attendees in the focus group discussion were not the right persons to represent the organizations.

Table 1-2: List of interviewees

	Workshop	Interview	Total
Public universities	5	63	68
Private universities	1	21	22
Central government	7	12	19
Regional government	0	5	5
International organization	2	4	6
Industries	0	17	17
ACDP	5	0	5
Study trip	0	6	6
Total	**20**	**131**	**151**

We then adjusted the strategy after the first session, from formal group discussion to direct informal interview with well- targeted individuals. We informally informed the targeted individuals about the intention to interview them through email or text messages by setting the date and time, and finally conducted the interview. This strategy seemed to be more effective, though it took more time and effort for the study team. Totally, we interviewed 131 individuals and conducted group discussions with 20 persons during this study, as presented in Appendix D.

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- *Government*

  Due to the limitation in resources and time frame, the team did not cover the entire spectrum of government research institutions in its interview. In some cases high ranking officers could not meet the requested schedule due to their conflicting schedule. However, extensive literature study was conducted to acquire more information on these research institutions. We interviewed key officials who are responsible of developing research policies in BBPT, MoRT, DGHE, MoI, and MoPW.

- *Industries*

  The industries did not only include large corporations, but also small and medium enterprises as well. In order to solicit the corporate's vision and future strategy, we tried our best to focus on the interview sessions with the top executive or chairman of the board. We interviewed executive and chairman from pharmaceutical, financial, property, fishing, manufacturing, plantation, food, and cocoa industry, while the small industries include food and software industry.

  We admit that we only succeeded in interviewing a number of industrial representatives as not all industrialists that we contacted had agreed to our request for having interview sessions with us. Nevertheless, the team was satisfied with the quality and weight of the interviewees who had proved themselves to be good representatives in depicting the views of the sector. The names in the list of interviewees depicted in Appendix E shows that the weight of the statements they carry with is very high.

Quantitative evidence

It turned out that acquiring secondary data from government institutions was not as simple as we thought. In many cases data are scattered and not properly consolidated so that they were difficult to analyze. The only fairly comprehensive information we acquired was based on a survey on government research institutions, conducted by LIPI's Pappiptek a few years ago.

Chapter 2. Economic context and needs for UIG partnerships

What is the economic context in Indonesia and what needs are UIG partnerships expected to meet in its future economic development? In order to explore these questions, this chapter describes Indonesia's past development, its current industrial structure, and looks to the future economic development paths.

Today, Indonesia is at a phase what WEF calls the efficiency-driven phase of economic development. It can no longer rely upon labour intensive industries based on low wages nor can it continue to depend on natural-resource based industries. Its competitiveness is increasingly driven by factors that enhance productivity. While Indonesia is ranked 50th globally for its competitiveness, its scores are low in three of the six critical factors upon which this phase of economic growth should depend. These critical factors include higher education and training (ranked 73rd), well-functioning labor markets (120th), and the ability to harness the benefits of existing technologies (85th). This section explores the current economic and industrial context of Indonesia to explore the nature of its needs for university-industry-government partnerships.

2.1 Economic context and industrial structure

Indonesia's economy has gone through a dramatic change and progress in the past two decades. The economy grew rapidly between 1990 and 1997, with an average GDP growth of 7 percent with a profound change in the employment structure, with shrinking agriculture and expanding service sectors [World Bank 2011]. Its rapid industrial growth was led by manufactured exports, the content of which evolved from labour-intensive simple consumer goods and basic resource processing to a wide range of manufactured products with increasing technological sophistication [Aswicahyono et al, 2010; Hill and Tandon 2010]. The Asian crisis hit Indonesian economy hard, leading to a massive economic contraction of over 13% in one year. Subsequent economic recovery has been remarkably swift, particularly given the fact that the country was also building new democratic processes [Hill and Tandon 2010]. Economic growth resumed in 2000, and by 2009, it was the third fastest growing economy amongst G20, with a projected GDP growth of 6.4% for 2012 [World Bank 2012].

Industry has recovered, but with the manufacturing sector slipping from its leading position becoming an average sector within the economy. The content of 'manufacturing' also changed, with labour intensive subsectors such as textile and footwear giving way to capital intensive subsectors including resource based industry as well as electronics. Indeed, the post-crisis manufacturing growth is described as 'jobless,' with increasingly restrictive labour regulations identified as one possible cause [Aswicahyono et al 2010].

There is a notable absence of an obvious group of businesses which can champion effective technology transfer or innovations [Hill and Tandon 2010, Aswicahyono et al 2010]. The high tech oriented state owned enterprises suffer from the past image of massive concentrated investments, and the successive democratic governments have done little to restructure them into viable force for Indonesia – though they do have concentrations of highly trained human resources [Brodjonegoro, 2012]. Their financial performance is generally poor, often 'saddled with social responsibilities and subject to political influence' [Hill and Tandon 2010]. Foreign-owned firms are major players in the Indonesian economy, and their role has continued to rise through the crisis. For instance, the share of manufacturing output from foreign owned firms rose from 22% in 1990 to 37% in 2005 with the greatest contribution in automotive products and electronics [Aswicahyono et al 2010].

Some of them who in the past were not major players on the innovation agenda, through an increasing interest in rapidly growing Indonesia's domestic markets, may become interested in

consolidating their positions within Indonesia with upstream and/or downstream investment[4] (see box: China and India: attracting R&D from Foreign Direct Investors).

China and India: attracting R&D from Foreign Direct Investors

The past decade has seen a sea change in the mode of operations of multinational companies in developing countries, with the rise of R&D type operations most notably in China and India. It is today widely acknowledged that foreign direct investors can be motivated to invest in R&D in emerging economies for several different reasons. They may be motivated to do R&D by the need to access new markets better and to develop products to meet local market needs, as in China. Proactive policies can help. The Chinese government has been particularly proactive in its joint venture policies to demand local content, technology upgrading and collaborations with local institutions including universities. Availability of highly educated cheap labour can also be an inducement – as was found in India.

The Czech Republic found that even as its main foreign direct investor in automobile, Hyundai, was not interested in establishing R&D facilities, the inflow of associated suppliers led to local capacity building with a much greater collaboration between them and local higher education institutions. Similarly, Shanghai's proactive policies not only led to local company capacity, but also many R&D projects, chairs and facilities in local universities funded by foreign investors (Tuijl et al. 2012)

2.1.1 Promoting higher value added in natural resource-based industries

The Indonesian government has been making special efforts to promote foreign direct investors to explore and exploit Indonesia's rich natural resources in agriculture and mining. While past efforts led to large volumes of commodities that generate significant additional revenue, the typical products were raw materials or those with relatively little added value. Most of the technology in agriculture and mining industries currently applied is foreign-based, and the foreign investor mostly employs overseas experts for middle and upper level management. Partly as a result of such efforts, and partly helped by the global commodity price boom in the mid-2000s, Indonesia's exports of primary commodities increased from 15% of the total non-oil and gas exports in 2001 to 34% in 2011. Non-oil and gas exports accounted for 80% of total exports in 2011, whilst agriculture-based manufactured exports increased from 18% to 22% [World Bank 2012].

Cocoa Sustainability Partnership [CSP, 2011]

Cocoa is important for Indonesia for at least 3 reasons. Firstly it provides employment for more than a million rural small cocoa farmers (large cocoa plantation is inefficient). Secondly, Indonesia is the third largest producer of cocoa bean in the world after Cote d'Ivoire and Ghana, producing 900 thousands MT bean in 2009 from more than 1.5 million hectares of smallholder plantation. Thirdly, the cocoa yield in Indonesia is the highest in the world (up to 800 kg/hectare with potential to reach 1-1.5 ton/hectare), compared to only 300 kg/hectare in West Africa. Experts said that Indonesia's primary competitive advantage was its ability to supply large quantities of beans.

However, the future of cocoa production in Indonesia is currently at risk due the problems of land conversion to palm oil plantation, and deteriorating productivity as well as quality as the consequence of farmers' unwillingness to use fertilizer, and improper post-harvest handling. Most cocoa beans in Indonesia are unfermented, which has an effect on their suitability to produce good quality of cocoa powder or liquor. To make it worse, the marketing structure of the value chain in the global market does not provide adequate incentive for quality, tends to be driven by volume based transactions regardless of its quality, and prefers low price beans.

[4] One Japanese businessman (interviewee) observed that the nature of Japanese investment is changing, with more supply chain firms arriving in automobile or electronics, which could lead to industrial deepening, providing opportunities for Indonesia to go well beyond simple assembly operations. Their motivation is different in neighbouring countries such as Malaysia, where the domestic markets are too small to 'anchor' foreign production

Cocoa Sustainability Partnership (cont'd)

In response to a call from the local cocoa processing industries, in 2006 a forum called the *Cocoa Sustainability Partnership* (CSP) was established. The membership of the CSP includes local and international industries, associations, university, individual experts, provincial and district offices (Dinas), MoA, and MoT. The mission of the CSP covers coordinating activities for development and transferring cocoa farming technology and cocoa farming business skills, identifying cocoa sustainability issues, empowering cocoa farmers, supporting a healthy and transparent free market cocoa economy, and guiding sustainable cocoa certification process. Currently 2 working groups have been established, namely the "*R&D and technical transfer"* and the "*Farmers empowerment and sustainable cocoa production"*.

In the early 2000, a modest demonstration plant was established in Hasanuddin University (UNHAS). The plant aimed to provide students with practical experience in cocoa industries and also provide training for cocoa SMEs. In conjunction with the establishment of CSP, the plot has attracted UNHAS to expand the facilities by providing additional IDR 10 billion investment.

Gerakan Percepatan Revitalisasi Kakao Nasional is perhaps the best example of partnership among university, industry, and government, initiated by mutual needs of the stakeholders instead of a government decree. The CSP foundation, established in 2011 to provide the initiative with a proper legal infrastructure, is currently funded by corporate donations, government, and other international donors (big bettor). In order to encourage local downstream industries, the government introduced 5% tax for exporting raw cocoa beans.

In 2012, Indonesia is expected to produce 400,000 tons of processed cocoa, a significant increase from 280,000 metric tonnes last year. The trend significantly affects the national economy and global cocoa industries in 2016, when it will reach a production capacity of 1 million tons of processed cocoa and exporting 250,000 ton of processed cocoa.

In an effort to boost exports of greater number processed commodities with higher added value, the government has actively encouraged the construction of new plants for processing raw agricultural commodities. New taxes on the export at primary commodities have been introduced and increased, while taxes on processed commodities have been lowered. The result is a significant increase in export of processed commodities and a declining export of raw commodities; at the same time the construction of new processing plants is booming.

A shift from exporting crude to refined palm oil

Palm oil, the world's most traded and consumed edible oil, is used mainly as an ingredient in food such as biscuits, margarine, and ice cream, or as a biofuel. Indonesia is the world's top producer exporting 17.6 million tonnes in 2011. Although the price has decreased to less than USD 1,000 per ton in recent months due to weaker market demand in Europe, China, and India, rising volumes have offset price declines.

Palm oil is part of Indonesia's efforts to attract investment and squeeze more from its agricultural resources, a policy that sometimes becomes controversial. Taxes on crude palm oil export were introduced in 1994 to ensure the availability of palm-based cooking oil for the Indonesian 200 million people. But the system fell apart when the Rupiah currency collapsed during the financial crisis in 1998, prompting palm oil firms to export more. With this in mind, export taxes on crude palm oil which were kept much lower than on refined oil to shore up domestic supply, frustrated the processing industry with many firms' thinking of exiting Indonesia, and pushing the government to raise tax on crude oil export to 20% (lowered to 13.5% recently) and slashing export duties for refined oil.

Responding to the message from the government, Indonesia expects a more than USD2.5 billion wave of investment to build a refining industry that will double its capacity to supply the entire needs of Asia's top consumers: India and China. A survey of 30 firms operating in Indonesia shows plans to nearly double refining capacity to 43 million metric tonnes of palm oil, or 80% of total world output [Reuters 2012]. Industries had aggressively lobbied Jakarta to cut duties on refined palm oil to half of those levied on crude. Under its refining plans, Indonesia will be able to meet domestic needs of around 10 million metric tonnes annually as well as supplying the combined 20 million metric tonnes of edible oil required by top buyers, China and India. India currently imposes a 7.5% tax on refined palm oil from Indonesia, and it is still USD15 cheaper a tonne to import Indonesia's processed palm oil than to ship in crude and refines it.

The government incentives to encourage businesses to move downstream have been successful, as exemplified by the cases of cocoa and palm oil (see boxes: Cocoa Sustainability Partnership and A

shift from exporting crude to refined palm oil). However, indigenous technology innovation and university R&D seem not to have any or a very limited contribution.

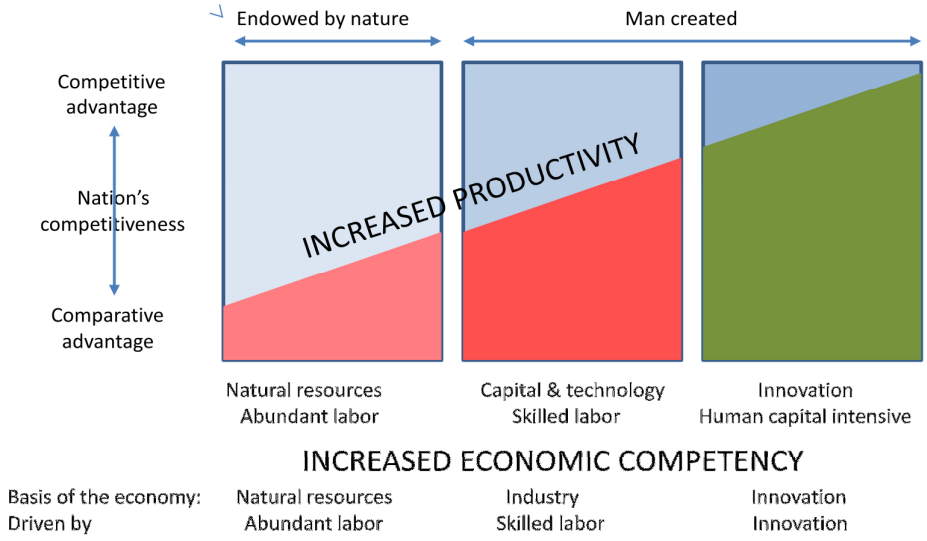
2.1.2 Future industrial development needs

For Indonesian economy to grow further, it is essential that further effort be made to increase added value of Indonesian industry. Figure 2.1 illustrates the strategy laid out in MP3EI to improve national productivity and competitiveness and excellence.

Even in the case of palm oil, which has succeeded in shifting from exporting crude oil to refined palm oil, there are still problems to consider. First, plantations were expanded aggressively, currently covering 8.2 million hectares which is about the size of the island of Ireland. This has raised strong criticism from environmental organizations worldwide due to its environmental destruction. The issue of biodiversity conservation is also complicated considering that many of the natural resources being destroyed could have been valuable economic resources if they had been exploited properly. Second, most new innovations in breeding, harvesting, and processing technology are currently supplied by Malaysia, while the role of local government is limited to providing licenses, and virtually no role being played by local universities to help the processes of technological adaptation.

It seems that a much more comprehensive strategy is needed to achieve the goal set in the MP3EI, and ensure university involvement by building relevant academic capacity where needed which will be critically important to ensure a better domestic capacity to innovate, even as technologies are imported, and to create a solid base for future engagement in the R&D.

Figure 2.1: Increased productivity for competitiveness and excellence [MP3EI 2011]



2.2 Skills as an emerging constraint

In 2008, the World Bank undertook a major survey of 473 manufacturing and services firms, mainly in Java, and concluded that skills mismatch had emerged, particularly as the growing segments of the economy, export-oriented and service sectors, were more demanding for skills requirements [World Bank 2011]. Their analysis was that the issue was not so much about the overall quantity of graduates, but about their quality and relevance to the labour market needs.

In another survey of over 1400 firms in Indonesia in 2009, the World Bank found that 'inadequately educated workforce' ranked fifth along with 'concern about transportation' among top 10 business environment constraints [World Bank, 2009]. It is, however, not that firms were voicing acute skills

shortages. The number of companies expressing concern was still only 4.3%, far less than the 23% in East Asia and Pacific or 27% in the world [World Bank 2009]. It is also not that firms were expressing extreme concern about the quality of higher education. In the 2008 World Bank survey, firms were surprisingly upbeat about the general quality of universities, with 88% of them rating universities as fair or very good [World Bank 2011]. The rating varies somewhat between 95% for public universities and 83% for private universities. It is interesting that the difference was not as big as one might have expected given the general perception about a massive and growing private sector where the low quality was just normal.

The World Bank's interpretation is that 'fair' is actually not a positive rating. Our own interpretation is that most established firms in services and manufacturing, particularly in Java, in the modern sector, have probably a fairly well identified set of institutions to recruit and are capable of identifying them from the best of the crop. For those, who are in the environment of 'jobless growth', the general quality of graduates should have improved over the years as upper tier institutions have upgraded institutional practices to enhance the quality of education as documented the next section. Therefore, they should have no reason to complain about any decrease in quality.

More serious is the prospect of the emerging future. If the current trajectory of growth continues, or worse, if the economic growth is to be accelerated, the mismatch identified in 2008 will rapidly become acute. This is because the current mode of 'jobless growth,' which arises as a result of stringent labour regulations and skills shortages particularly at the lower end [World Bank-c 2012], will demand firms to go for capital intensive growth, which typically requires a higher order in managerial and professional skills from future graduates, particularly in adapting to foreign technologies and in undertaking process-innovations.

Worse, if the growth is to be more geographically equitable and include regions outside Java, the rate of skills mismatch will be quite large. In our own interviews, which tended to focus on more global and larger companies, we did not detect a serious concern about the academic content of teaching for those recruited from the 10-20 top universities in Java. However, several voiced serious concern about the fact that it was extremely difficult to recruit for positions outside Java. Several companies also expressed a serious concern about differences in the academic quality across institutions – particularly about the low quality of most institutions outside Java, which suffer from triple jeopardy of generally poorer quality staff, worse equipment and facilities, and students who are less well prepared.

2.3 Employer/employee views about universities.

Referring to the same set of firms, over 80% of them thought that the strengths of universities were in the teaching quality (85%), teachers' skills (87%), facility quality (86%) curriculum balance (80%) and curriculum coverage (80%). However, only about half of those companies thought that they were strong when related to the labour market (55%), specific coverage within curriculum (53%) and linkages with industry (50%). Interestingly, they were also critical of their costs – however, only 30% of them thought that universities' strength was in costs.

A slightly different story appears in the employee survey where they were asked about weaknesses of universities. Nearly half of them saw the length of study as a weakness, with other weaknesses ranked as follows: quality of teaching and learning (13%), specific skills (11%), quality of facilities (8%), relevance to labour market (7%).

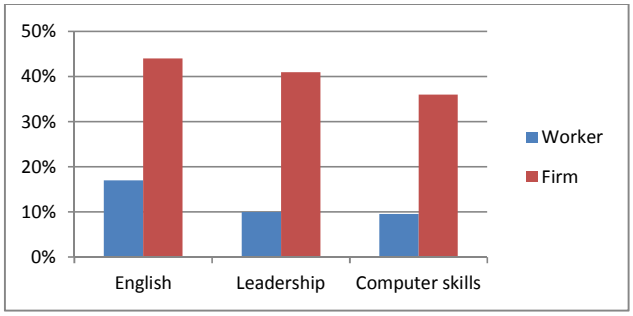
2.3.1 Nature of skills mismatch.

The World Bank 2008 survey sheds some lights on the nature of skills mismatch related to higher education, based on views expressed by firms about the skills of their managers and professionals,

who are largely graduates [World Bank 2010]. Later these findings are also confirmed further by the preliminary analysis of the tracer studies conducted by some universities [IMHERE, 2012].

The World Bank survey found that 80% of the surveyed firms had found difficulties in filling vacancies for managers and 60% found difficulties in filling professional positions. Although the relative importance of the 3 most important worker's weaknesses are the same, the number of those who selected these 3 aspects are strikingly different when firm and employee are compared as illustrated in figure. 2.1.

Figure 2.1: Dicrepancy between firm's and employee's assessment of worker's weaknesses

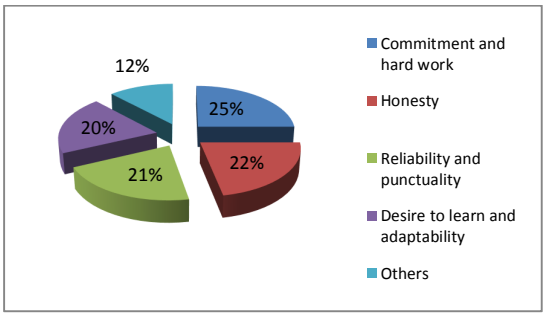


The lack of skills most felt by firms in recruiting managers and professionals includes English (44% of firms reported skills gap), leadership (41%), and computer skills (36%), followed by organization (35%), communication (33%), and thinking skills (33%). The firms also found out that managers and professionals lacked practical knowledge (18%) as well as theoretical knowledge (18%) associated with jobs.

While lacks felt by the young workers surveyed are skills in English (17%), problem solving (11%), leadership (10%), computer skills (10%), creativity (9%), and technical skills (8%). Leadership was not selected as an important weakness according to the workers surveyed.

Figure 2.2 presents the responses given by the surveyed firms when asked about the weakest manager's personality characteristics.

Figure 2.2: Weakest manager's personality characteristics [World Bank 2010]



The report suggests that skills shortages will likely to get worse as competition, increasing quality requirements, and changing work environments will all exacerbate business demand for such skills; this was also confirmed by our findings in this study. Our interview with the policy maker at MoI revealed that serious shortages of workers with specific skills had already been experienced by manufacturing industries, not only in Indonesia but in the Asian region at large. In response to the high demand of qualified welders in Batam Industrial Estate, MoI conducted a training program for 1,000 workers to acquire welding certificates. More than half of the graduates were directly recruited to work in Korea, leaving the Batam industries which then suffered a shortage of hundreds of welders.

A preliminary analysis of the tracer studies conducted by 19 universities covering 7,440 graduates under the I-MHERE project in 2012 converged with the World Bank survey[5] [IMHERE 2012]. Only 62.84% of the graduates thought that their current jobs were relevant with their field of education and 16% of them said that their current jobs were significantly irrelevant. Meanwhile, 17.10% needed more than 6 months to acquire their first employment. This indicates that job opportunities are available, but relevant positions and assignments are still difficult to acquire. At the university side, some leaders of universities seem not yet to have a clear understanding of the benefits of conducting a tracer study and consider it just a requirement to be met for accreditation process.

The overall picture shows that there is a serious problem with the link between universities and employers, particularly in understanding their needs of skills needs, ranging from more obvious ones such as English and computing skills, to behavioural and thinking skills such as leadership, problem solving and creativity. Specific job related skills tend to be a problem, both in terms of practical and theoretical skills but they appear to be less binding compared with these other skills. In our interview, one company was also extremely articulate in expressing its concern about contemporary students from elite institutions being generally much more competent and motivated, but lack certain 'emotional intelligence' or ability to work with empathy with people from different backgrounds. It is interesting that both employers and graduates were critical about the 'value of money' in universities – employers expressing this by rating cost as the lowest, and graduates expressing this as the highest.

2.3.2 R&D needs

An interview study on 12 manufacturing and service companies in manufacturing and services in Jakarta found that most of their innovations which were called 'process innovations' required the adaptation of existing technologies including ICT, and little fundamental research or significant development work [Hill and Tandon 2010].

Industrially active academics

In our interviews with a small minority of academics who are highly active in industrial collaboration, we noted that there is a certain common element in their background: they all had an early exposure to industrially relevant research during or shortly after their PhD experience overseas.

One professor from ITB obtained a PhD from a university in Denmark and filed for several patents while he was a student. Before returning to Indonesia, he worked in several companies both in Europe and the US, and in a university in Australia.

Another professor from UGM had had an early interest in the commercial applications of a given technological field before he left the country for PhD education in Australia. As a result of his early interest, he used the years of study in Australia to take notes of industrial activities related to the technological fields, which helped him much in orientating his own work after returning to Indonesia.

Another professor from the engineering faculty in UNAND was appointed the position of department head as a fresh graduate from ITB, and had to work with local industries in developing an institutional development plan for the university which was relevant to local industrial needs before he went to Germany for his PhD. Upon his return, he certainly had no problem working with local industries, as well as with other academics who were brought in to the department in a similar manner.

Most of our interviewees already had some relationships with universities and looked forward to developing more in the future. There is a desire on their part for university academics to develop a much broader understanding of the application of things. One rep who were not so successful in working with universities - in spite of his efforts - thought that academics did not have the understanding to tell whether they could carry out the task or not. More generally, companies are eager to have greater opportunities to explore working relationships with individual academics, and welcomed opportunities such as structured meetings, science parks, exchange programmes, and institutional partnerships.

[5] I-MHERE Project is a World Bank assisted project aimed to improve education quality and management capacity of selected public and private universities. The list of universities involved in the tracer studies is presented in the Appendix C of thsi report.

The study noted that some companies had expressed the need to learn about international best practices, others had expressed frustration that their own staffs were too limited in international exposure. It is true that one thing that interviewees always wanted universities to do better was to develop better international linkages so that both academic staffs as well as students would get better international exposure.

In our interviews, we found a range of companies, from those working with fairly simple adaptation of existing technologies, such as plantation mechanization following the existing norms, say in Malaysia, to those that operate at a global level where they habitually contract out development work to professional technological consulting companies. Even the most R&D intensive companies were undertaking applied research and did not expect to be entering into innovations based on fundamental research. One chairman of a pharmaceutical company said, '*leave the fundamental stuff to advanced countries, we have enough to do on application*'.

There is a consistent expectation that Indonesia should have a far more strategic focus on agro processing in palm oil, rubber, cocoa, seaweed, with an emphasis on mechanization, first to catch up with Malaysia, and then to become leader in mechanized tropical agriculture, in which most advanced countries lack expertise. There was a 'huge role' that could be expected from universities in this respect, but one that they were not yet able to fulfil. Our own interviews found out that many of the future application related developments depended on understanding international practice. We also found that most industrially-active academics had not only an extensive overseas academic experience such as the PhD, but also exposure to commercial worlds while abroad, all appear to enrich their ability to assist Indonesian companies (see box: Industrially active academics)

2.4 Industrial needs on the role of government

Our interviewees were generally less optimistic about ambitious industrial paths as implied by MP3EI for Indonesia, largely as a result of regulatory impediments. One pharmaceutical company thought that serious work on drug development had not been able to be undertaken by companies until the regulatory environment of drug approval was streamlined, with less concentration of power in a single agency. One palm oil processing company did not see any future in moving into downstream biofuels, as it was impossible to compete with heavily subsidized domestic fuel. Such regulatory impediments, combined with poor intellectual property protection, are considered as the most serious obstacles in developing industrial R&D. This was not mentioned in our interviews, but found by others [Hill and Tandon 2010], and appeared to be more important than the lack of R&D specific incentives, which was mentioned by one company which had already conducted a lot of R&D. Our impression is that there are a lot more problems in creating a conducive environment to industrial R&D to increase value added than creating simple financial incentives for R&D.

Chapter 3. Higher education sector

This chapter provides the analysis of the condition of Indonesia's higher education whether it can meet the economic development needs, especially if the pace of growth is still high and its impact is felt equitably across regions. We first discuss the appropriateness of the sector in terms of (a) the scale of educational access offered, (b) the differentiation to deliver relevant education and R&D services both nationally and at different geographical locations and (c) the quality of education.

Although the size of the sector is considered appropriate and its speed of expansion meets the needs of the economy, there will be a critical need for further differentiation of institutional missions to serve the need of economic development, and to make geographical distribution even so that education and R&D services related to individual local needs can be offered. We also highlight the need for a continued national 'movement' for quality upgrading of undergraduate education. In the final two sections, we will focus on two underlying policy issues, funding and institutional autonomy, both of which are critical for shaping incentives for future institutional developments when there are urgent needs for change.

3.1 Size, differentiation, and distribution

The system of Indonesia's Higher Education system in Indonesia is a very large and highly complex system with more than 5.23 million students and gross enrolment ratio of 27.4% [DGHE, 2011]. Although the enrolment is small compared with China which has 31 million students (GER 26%) and India with 25.9 million students (GER 16%), it has still the largest number of students in the Asean region [Eastasia 2012]. In addition to its large enrolment, the diversity and its geographical spread have significant impact on the complexity.

The system appears to be highly diversed with 92 public and more than 3,200 private universities, dozens service institutions, 52 institutions under Ministry of Religious Affairs, and 1 Open University. However, they are not as diverse as it appears at the first sight. As it will be described in detail later the system is characterized by: (a) a small but growing group of practically oriented institutions (Quadrant IV); (b) a small number of research-oriented institutions which are not yet fully developed to be classified as basic research (Quadrant I) or relevant research (Quadrant II) institutions; and (c) a large number of institutions which cannot be classified.

The lack of adequate differentiation poses a problem for the implementation of MP3EI, as every corridor must be supported by a group of universities each of which can contribute in different ways. Regions must have nimble practically oriented institutions, which can quickly meet the emerging needs of nearby companies for specific professional skills. For any region, it would also be important to have general teaching institutions, which can create a diverse human resource pool essential for regional development. It would be essential for each corridor to have relevant research universities with appropriate specializations to support the corridors' industrial profile, so that the regions will have expertise and human resources to move to higher value added production and services.

3.1.1 Practically oriented institutions (Quadrant IV)

Indonesia has two types of institutions which should aspire to fit into this category: polytechnics which provide short-cycle training to secondary school graduates, and many private universities which offer undergraduate degrees in professionally oriented subjects popular for their apparent utility. However, it is not clear whether these institutions actually possess the necessary capacity to conduct activities that they are supposed to do, or are they distributed evenly across regions. We doubt whether they have the capacity to develop into brand new areas outside their main domain expertise to meet with new needs, or whether they can develop much more multidisciplinary education relevant to the world job market.

While all of the polytechnics should in theory fit into this category, not all of them have been successful yet. We assume that there are probably a dozen reasonably robust polytechnics in Indonesia including several excellent ones (see box on three exemplary polytechnics).

Three exemplary polytechnics

The Bandung Polytechnic for Manufacturing (Polman) has a good reputation as an institution dedicated to its mission by implementing the concept of "*production based education*", which attract industries to outsource production through contracts. These contracts enable Polman to emulate industrial environment in its workshop, provide invaluable industrial experience to students and staff, and generate revenue to top up the insufficient government budget allocated for operational and maintenance. Their expertise has been recognized internationally; they are now working for the Malaysian government to help them develop production based education and plan to work with Japanese universities to deepen their expertise in foundry technology.

ATMI Surakarta is another institution which has its own company to produce its own products and to undertake customized production for industrial clients, both of which are used to expose students to real work. They also undertake significant production oriented research and development work. Since 2001, ATMI has been collaborating with the Municipality Government of Surakarta and neighbouring industries in providing short vocational training to secondary graduates. Their success in this collaboration led to a joint establishment of Solo Technopark In 2011, the training of a thousand trainees who had been recruited by about 60 companies.

Electronic Engineering Polytechnic Institute of Surabaya (EEPIS) is another polytechnic with a good reputation offering relevant skills in electronics, IT and multimedia, perhaps with a little more emphasis on teaching theory which they carefully balance with practice both in their own laboratories and through internships and soft/general skills. They describe their emphasis on 'basics' such as theory and maths in their education in terms of their need to deal with the fast changing technological fields such as electronics in which simple vocational skills could be quickly become outdated. They have several production oriented 'R&D centres' in well defined fields such as 'hazard and disaster research' or 'education and agricultural robotics research' for which they conduct significant collaborative research often with foreign industries as well as foreign universities. They are expecting institutional development collaboration with Toyohashi Gijutsu University, one of Japan's best applied technology universities.

Polytechnic education in Indonesia does not live up to the expectation of leading directly to jobs. Table-3.1 shows that the unemployment rate for Diploma (including polytechnics) graduates is disturbingly and consistently higher than university graduates. Although the BPS does not elaborate Diploma into specific types of educational institutions (polytechnic, Diploma program within universities, or academy), it is clear that the bulk of short cycle diploma education is not serving the purpose of providing employment relevant education.

Table-3.1 Unemployment rate 2009-2011 [Statistics, 2012]

Education attained	2009 (Febr)	2010 (Febr)	2011 (Febr)	2012 (Febr)
Primary education and less	4.51	3.71	3.37	3.69
Junior secondary	9.38	7.55	7.83	7.80
Senior secondary	12.36	11.9	12.17	10.34
Vocational Secondary	15.69	13.81	10.00	9.51
Diploma/Polytechnic	15.38	15.71	11.59	7.50
University/Institute	12.94	14.24	9.95	6.95
Total	**8.14**	**7.41**	**6.80**	**6.32**

Why do many polytechnics fall outside of this category? While it was well beyond our present study to examine the sector in depth, our impression from experts interviewed is that many polytechnics have not yet had the well-established 'organizational culture' of practical orientation. Unlike some of the national champion institutions, most of them did not have the benefit of significant foreign assistance or inputs in their founding years, and many polytechnics are still struggling to stay loyal to the initial mission.

Several recent policies have made it particularly difficult for them to stay grounded as practically oriented institutions. DGHE's policies requiring all teaching staff to have S2 do not help these institutions to have most of their staff having practical skills rather than academic trainings. The inability to operate as financially autonomous institutions has also hit these institutions hard, as it has became extremely difficult for them to undertake and manage industrial contracts of any forms. And yet, it is critically important for such institutions to be seriously engaged in industry to keep themselves abreast of industry, to supplement their financial revenues with contract work, which also provide critical opportunities for enriching student learning as well as staff professional development. They must also be able to recruit freely outside of civil service norms, so that they can deal flexibly with their own skills needs.

What about private universities? We found that some established private universities fit well into this category of practically oriented institutions – more as professional education institutions with expertise in the fields such as IT, business, law and engineering. They offer full fledged S1 and often S2 degrees, sometimes even S3 degrees, but largely with syllabus more pragmatically defined commensurate with changing practices in the world. They have well established institutional culture and practices to ensure close linkages with industry and excellence, as shown through the examples of Universitas Bina Nusantara and Universitas Surabaya (see box: two examples of entrepreneurial private universities).

Two examplary of entrepreneurial private universities

Universitas Surabaya (UBAYA) provides undergraduate education in seven 'professionally relevant' faculties ranging from law, psychology, pharmacy, to industrial engineering. They pride themselves for differentiating their engineering education from those of more academically oriented institutions such as ITS, in that UBAYA's students learn much more practically relevant knowledge and skills and are far more 'job-ready'. And yet, the best graduates find positions in graduate schools in good overseas institutions such as NUS and NTU in Singapore.

They have well-structured linkages with employers who have well organized career service units having a five-full time staff, who organize biennial job fairs and obtain inputs from visiting employers systematically. Each programme has an annual review of employer relevance. Each faculty has its distinct collaborative relationships not only with industries but also with the public: ranging from 'teaching industry' which functions rather like, a 'teaching hospital' in engineering and business faculty which offers business and consulting services to industries, to a pharmacential centre which offers public information about traditional medicine. These centers also offer activities which serve as key professional development opportunities for their staff. Whenever there is a need to upgrade either skills or competence of their staff, they have industries teach industrial relevant practices.

Universitas Bina Nusantara (BINUS) started as a training program conducting computer short courses in the 1970s, and has since developed to become a full fledged entrepreneurial university offering S1, S2 and S3 degrees. It is still well known for its IT related programmes, but today it has a range of subjects from business, engineering, law to languages (Chinese and Japanese).

Similarly, UBAYA has also highly structured links with industries to define curricula and to ensure effective placement. It is extremely business-like in the way it manages its institutional strategy. It regards itself as a university capable of producing both global-level employees and entrepreneurs and capable of establishing key performance goals which it is determined to achieve immediately. Their senior staff regularly undertake international benchmarking trips to learn from best practices. They pay much attention to 'soft skills' such as team work, communications as well as foreign languages, and have entrepreneurship, English and character building as courses offered centrally to all students. Their entrepreneurship program, which started about a decade ago has recently been tripled in credit requirement to 6 sks, by regular inviting industry speakers, and business plan development activities undertaken by groups of students. They have an innovative 'tutor' system where some 300 students are engaged in teaching other students – forming 1000+ learning community. Their S3 programme offers students to learn international outstanding practices in management and to engage in internationally based research activities with a view to creating research skills relevant for academically oriented researchers, as well as consultants and business managers. Their aggressive institutional development strategies are beginning to look at future needs for international accreditation as well as global ranking. As such, their performance goals are beginning to include more conventional research metrics such as international publication. It will be interesting to see how long BINUS would stay within Quadrant IV.

Not only do they work systematically with industry to keep their curriculum updated and relevant, but also do they see the importance of how such content is taught so that students acquire skills, knowledge, and the key importance of generic skills, such as English or soft skills. The manner in which some of these institutions are taking institutional actions to meet such needs is quite impressive. Although we did not have enough time and opportunity to assess a larger number of private universities, from our past observations as well as current interviews, we could guess that only a small proportion would fit the bill. Judging from the patterns of recruitment of these institutions located outside Java, it is likely that the successful ones are those concentrated in larger cities of Java.

However, as it was the case with polytechnics, we suspect that the bulk of private institutions offering similar degree programmes do not operate at the appropriate quality standards to ensure relevance to the labour market. Though the sector-wide assessment of private institutions was well beyond the scope of our study, from our past observations, we found that only a small proportion of private universities have succeeded in sufficiently developing institutional practices to be classified into Quadrant II. We also note that private institutions tend to cluster in offering less equipment intensive subjects that are likely to leave gaps in subjects such as laboratory-based engineering, or medicine. It is also likely that the successful ones are those concentrated in larger cities of Java, where they have easier access to qualified staff and ability to work with modern businesses.

It is clear that Indonesia already has a group of institutions which are pushing the frontiers of cooperation with industries within Quadrant IV – to provide practically relevant education and skills (see box: An extreme case INSTIPER). However, it is not clear that they are evenly distributed across sectors, or across regions. We are not sure whether they have the capacity to develop into brand new areas outside of their main domain expertise to meet with new needs, or whether they can develop much more multidisciplinary education relevant to the world of work. Some private institutions have developed systematic and institution-wide linkages with employers to shape their education programmes.

An extreme case: Institut Pertanian STIPER Yogyakarta (INSTIPER)

Instiper has chooses plantation as its core competence since it was founded in 1958. The declining number of applicants has been the trend in the last 2 decades in all agricultural study programs across the country, and INSTIPER was not immune from this trend. Since private universities in Indonesia depend almost entirely their revenue from student's tuition and fees, the trend was a serious threat to their survival. In order to cope with the challenge, INSTIPER has shifted its education programs to cater more the employers' needs in 2005. It made use of its alumni to develop cooperation with almost all major palm oil industries. Each individual employer was invited to develop the curriculum suitable for the employer's needs together with INSTIPER. Full scholarships are provided by each company for students taking this specific program. In addition to the technical competence in the field of palm oil plantation and processing, students are also given training in company's organization culture, including one month basic military trainings. Students are even wearing the company's uniform while in campus, and it is not uncommon to see students with different uniforms inside the campus. Basically the education program has become an in-house training, outsourced to INSTIPER by the companies.

Despite the many criticism of its too narrowly focused learning outcomes, the number of applicants has been steadily increasing. The current enrolment is 2020 students, far beyond the 500-1000 enrolment commonly used as a survival threshold. Most of its graduates have been employed even before their graduation. INSTIPER perhaps represents an extreme example of how an educational institution responds to the call for more relevant education.

3.1.2 Research-oriented institutions (candidates for Quadrant I and II).

Today, none of the existing universities can be defined either as basic or relevant in their research orientation, but a small number of established universities (e.g. UI, IPB, ITB, UGM, and UNAIR), all located in Java, have sufficiently qualified human resources and are beginning to be research-active. At this stage, they are best described as broadly 'research-oriented', as they have some but insufficient track record either in internationally competitive fundamental research or strong enough linkages with industry to undertake application - inspired research. There are probably half a dozen

more institutions which are in a reasonable position-given the staff profile - to aspire to become research oriented at least in some areas. We see that these institutions being potential contenders may become relevant research institutions (Quadrtant II), though their main 'drive' today appears to become fundamental research institutions (Quadrant I), through internationally publishable research. This is not because none are interested in Quadrant II; in fact, most of them emphasize some aspects of 'relevant project work' particularly for generating income, while others are developing institutional support capacity for working with industry aggressively to become proactive. Indeed, for older institutions, whose academic profile was defined by the colonial power, utilitarian subjects relevant for the nation were the main components of their work; it is not surprising that they should have a sufficiently 'relevant' disciplinary coverage to develop into 'relevant research institutions'. However, their organizational ethos is not sharply focused on relevant research (see box: Chinese higher education reforms)

Chinese higher education reform

In China the government has, since the 1980s, been taking active steps to reform the higher education system to ensure economic benefits. The measures employed have been remarkably consistent in pushing key universities toward the American relevant research university model (Ma 2007). In the science and technology reform that began in the 1980s, the role of these fields in economic development was strongly emphasized. Public research institutes were to reorient the content of their research to meet economic needs, and universities were to develop research capacity relevant to society, for the first time. The official endorsement did not mean that government funding was forthcoming for research. Although the Chinese National Science Foundation was established in 1986 to provide competitive grants for basic research projects in public research institutions, as well as in universities, university budgets had been cut to become extremely tight. Universities had strong incentives to generate their own incomes through industrial contracting (Ma 2007). This was the context in which universities began to develop responsiveness to industry, through contract research, consulting, setting up their own enterprises.

The government has also supported the emergence of elite research universities through a series of special programs, from the key university and key laboratory programs in the 1980s to the more famous Projects 211 and 985 in the 1990s, which concentrated government funding on the top 100 and top 9 universities, respectively (Ma 2007). Together with the gradual development of competitive funding for research, these initiatives resulted in strong incentives for universities to be research oriented and compete globally to become world-class institutions (Ma 2007). It is not by chance that one of the first global rankings of universities was designed by a Chinese university; Chinese institutions were developing such indicators to gauge their positions in the world. .

For most of such institutions, many of their academic staff were engaged in consulting work to supplement their income – often individually called 'moonlighting'. These institutions also had a track record of engagement in a fair number of service contracts or projects, funded by external entities largely government agencies including industries. Some of those were staff development or training contracts, perhaps for government agencies, or academics from other universities while others were technical service projects, with government agencies or large companies. So, it is expected that academics will have significant experience in working with government or industries either through individual consulting or joint projects – this should form a solid platform from which to build more sophisticated UIG partnerships. However, even at ITB, where generally the engineering profession is closer to industry, the academic staff complain about the difficulty in moving from consulting to meaningful collaborative work with industry. This is in a striking contrast to the situation in other countries, where consulting experience is regarded as a valuable step in becoming a credible partner to industry. The question is, why is it different in Indonesia?

From our interviews with various academics from research-oriented institutions as well as industries, we saw two possible reasons for such a disconnection. First, the bulk of consulting or project work may not be technically demanding, or may not be directly related to the fields of expertise of individual academics, so that they are operating more as intelligent generalists rather than a qualified specialist. The second possibility is that academics are not yet sufficiently research active to have recognizable domain expertise that makes them important technical experts or collaborators for industries. This second possibility could arise owing to several different reasons. The under

developed domain expertise may arise because of a lack of appropriate research facilities. It may also be caused by the academics' unwisely selection of domain expertise which was conducted without reference to industrial needs.

Level of technological requirements and nature of engagement

We found out that two of our industry interviewees had diametrically opposed views about the value of ITB. One said that ITB had solved all of his company's problems over the years, and another said that in spite of repeated attempts over a period of time, ITB offered very little. In the ensuing discussion, we discovered that several differences might have been at work: the level of sophistication of technology, the nature of engagement; and different industrial expectations.

The happy company was a plantation company whose technical problems were by and large simple ones that could be resolved though intelligent combination of existing technologies. The unhappy company was a globally active defence manufacturer, whose technological requirements were much more stringent and closer to the cutting edge. It was not surprising that ITB had been able to solve the plantation problems more readily than those of the defence contractor.

However, there was another important difference. The plantation company had a manager who knew ITB well from his previous work experience. When he worked through LAPI, he regularly took his own initiative to identify specific individuals to bring into the projects (which LAPI should have done instead), and worked with ITB staff collaboratively in exploring the nature of the problem. It was never the case for a company to have ITB solve a problem and expect a solution within six months. They used to work together to explore the nature of the problems, which were usually quite unstructured to entail various risks and factors – and the company was willing to take the risk.

The defence company was much more accustomed to working with efficient technology consulting firms, which, when given structured problems, were able to work fast to give solutions. We suspect that the manner in which the company tried to 'use' ITB was similar to the way in which they 'used' such consultants. Again, internationally, universities are not good at working on overly structured problems with stringent deadlines – they are far better at solving unstructured problems with less time pressures.

In our view, neither of these companies was 'right' for ITB. The plantation company was probably pushing ITB downwards – to solve mundane problems that national leading institutions should not be asked to solve. The opportunity cost of ITB solving simple problems is too high for the nation. The defence company was probably too specific in the nature of demand, given that ITB's technical expertise was not geared to solving narrowly defined and specific problems against a tight deadline. – it did not know the best way to work with university academics. But the conclusion that the company had drawn might have been different; it might have concluded that ITB did not have the requisite technical expertise to cope with its sophisticated problems. Over time, these could introduce several dynamics that would not be helpful for the institutional development of ITB. The more ITB as an institution is asked to solve all sorts of mundane problems that are not technically demanding, the less time its staff will develop expertise in cutting edge technical expertise that the country truly needs. The more technically sophisticated companies grow suspicious of ITB's capacity, the less opportunities ITB will have to be engaged in to update technological frontier in the practical world. It is essential that (a) ITB works with companies having the right technological sophistication; and (b) companies which are given opportunities to learn to work better with universities.

The only way out for such a dilemma is to systematically create a second and third tier institution which are good enough at solving the problems of plantations – hopefully residing closer to them, so that ITB can focus on higher order issues, which are 'challenging' for their staff.

There may be other reasons why academics find it very difficult to find appropriate industrial partners. It may be that the 'search process' to identify appropriate industrial partner is problematic owning to a lack of information on both sides. It is a fact that institutions are doing very little to 'bridge' the gap between individual academics and potential industrial partners, either by providing better information to the public about their resident expertise or having professional units which function as intermediaries to undertake the 'match-making'. It is also possible that industries do not sufficiently understand how important it is to work with universities so that they tend to treat them as normal technical subcontractors – an unrealistic expectation which most universities around the world may find hard to fulfil. Our suspicion is that all of these factors are actually at work (see box on Level of technological requirements and nature of engagement).

Our final observation is that institutional leadership has not yet worked well in any of these institutions; therefore, it is not yet possible for them to become strategic in their institutional development. It is true that some of them do not have the ambition at all in trying to develop relevant research capacity.

3.1.3 Unclassified.

Although the majority of Indonesian universities can be described as teaching-oriented, by the virtue of the absence of research and practical education, vocational or professional, they cannot be categorized as 'teaching oriented institutions' because most of them are aspiring to become something else – usually research oriented institutions. What Indonesia lacks is a set of teaching oriented institutions which have both a diverse range of academic or interdisciplinary subjects taught and a demonstrated commitment to teaching. Most or all public universities aspire to become research universities, and have not considered the option of pursuing excellence as teaching universities. This is unfortunate because most of them do not have the resources or vision for such aspirations. Private institutions are more likely to be realistic in recognizing their limitations to become research oriented, but the best of these tend toward utilitarian subjects and towards Quadrant IV to become practically oriented rather than pursue excellence as the broad based teaching focused institutions as in Quadrant III (see box: Broadening undergraduate program).

Broadening undergraduate programmes [Chronicle 2010, Peterson 2012]

There is a strong international trend in broadening undergraduate education. Traditionally, there had been two models of undergraduate education; a European model of specialized disciplinary training and an American model of broad-based and interdisciplinary education. Over time, many institutions around the world have been moving towards the American model, by adding 'general education components' to disciplinary education programmes. The most significant development in this trend is Hong Kong's decision to develop a fourth year in all undergraduate education to add general education starting in 2012. There has been a similar trend in Indonesian universities to add general education components to all undergraduate education programmes.

In the last decade, however, there has been a more structural effort to broaden undergraduate education, both to develop a more integrated interdisciplinary experience and to develop teaching practices that are conducive to promoting critical thinking. One example is the Melbourne Model, which is Melbourne University's attempt to offer undergraduate degrees in six broadly defined fields to offer integrated interdisciplinary training starting 2008. The other is the emerging wave of interest in liberal arts education around the globe to introduce breadth of education combined with critical thinking to prepare the new generation of elite. Eight universities in the Netherlands have established liberal arts colleges in the last decade (Peterson 2012). Several Chinese universities have established liberal arts undergraduate colleges targeting the most able students (Chronicle 2010). A couple of UK universities have begun to offer liberal arts programmes starting 2011 (UCL and Kings College). Singapore is currently developing a liberal arts education in collaboration with Yale University.

The situation is worse when the regional distribution of higher education institutions is taken into account. The *Master Plan for Acceleration and Expansion of Indonesia Economy* (MP3EI) 2011-2025 sets 6 corridors for economic development, each with its own specific competitive and comparative advantages. The 6 economic corridors are 1) Sumatera, 2) Jawa, 3) Kalimantan, 4) Sulawesi and North Maluku 5) Bali, NTB, and NTT, and 6) Maluku and Papua [MP3EI, 2011]. Higher education institutions and student enrolment are not evenly distributed among the 6 economic corridors, as illustrated in table-3.2. When we consider the characterization and quality of such institutions, it is clear that the bulk of non-Jawa corridors are underserved by institutions with good potentials to play active roles.

Table-3.2: Distribution of higher education institutions in the MP3EI corridors [Dikti, 2012][6]

	Public		Private	
Economic corridor	**Polytechnics**	**Higher education institutions**	**Polytechnics**	**Higher education institutions**
Sumatera	7	16	17	762
Jawa	9	23	68	1102
Kalimantan	2	4	7	84
Sulawesi, North Maluku	4	8	6	336
Bali, NTB. NTT	5	6	11	151
Maluku, Papua	3	5	5	130
Total	30	62	114	2565

3.2 Quality of undergraduate education

'Quality' is an ambiguous concept, usually interpreted and defined differently by different stakeholders. For instance, for some parents, the quality may mean the ability of institutions to promote the likelihood of their children to be admitted to a world class graduate school. For others, the quality may be best represented by how well graduates are placed to get better jobs. Rectors might measure the quality by institutional success of acquiring competitive grants, better accreditation results, better graduates' performance in the certification process, or better resources, i.e. infrastructure, equipment, books, and teachers. To quote one senior official from international quality assurance organizations: "*quality is in the eye of the beholder"* [7] [Vroeijenstein, 1995].

This is the reason why it is critically important that the ultimate responsibilities for quality assurance should rest at the institutional level, where key stakeholders are directly visible, and internal quality assurance systems are used by institutions thoughtfully to make continuous improvement efforts. Compliance with "external requirements' is important to define accountability structures, though they by themselves rarely lead to sustained improvements in the quality of education since 'compliance' is not enough to create the 'culture of quality improvement' as shown by the example in the US (see box: Introducing the culture of quality in the US).

Indonesia has made significant national efforts on all fronts to improve the quality of education in the last twenty years, with incentives and institutions in place to develop 'institutional capacity to strive for quality' and with accountability structures established (as documented fully in Annex II).

Competitive funding for providing incentive to quality upgrading of undergraduate programs started in Indonesia in 1995 through the Quality of Undergraduate Education (QUE) project assisted by the World Bank. Competitive support for quality improvement was further developed through ADB-supported TPSDP in 1998, which provided key innovations such as inclusion of private institutions, and led to a range of other programmes funded directly by the government in the 2000s. The awards of grants have not necessarily provided yardsticks for the quality of programs, mainly because competition was conducted in tiered system, to ensure that even the 'weaker' institutions had a fair chance of winning grants given motivation and commitment. What is interesting is the fact that the competitive funding appears to have created a sense of 'quality movement' within the higher education sector in Indonesia, somewhat akin to foundation-supported programmes in the US (see box: Introducing the culture of quality in the US).

A system of accreditation was established in 1995 to develop an accountability mechanism for the quality of higher education. The proportion of undergraduate programs was rated 'excellent' or ranked A by BAN PT it has been increased from 9.1% in 2000 to 13% in 2006 (World Bank-a 2012)

[6] For private institutions: a) 2010 figure, and b) North Maluku is consolidated under corridor 6.

[7] Ton Vroeijenstijn was the Secretary General of the European Association for Quality Assurance in Higher Education (EAQAHE) and International Network of Quality Assurance and Accreditation of Higher Education (INQAAHE)

and to 14% in 2009. Table 3.3 shows that the proportion of programs offered by public institutions is significantly better in terms of accreditation result compared to private institutions.

Introducing the culture of quality in the US (Brint, 2009]

Quality of teaching and learning has been a key issue in the US in the past 30 years. There have been broadly two types of reform efforts in the US colleges and universities to this end: the teaching reform movement led by the liberal philanthropies, and the accountability reforms, led by the states and later regional accreditors. A well known education sociologist Steven Brint, who is today a vice provost of undergraduate education in one of California's universities, argues powerfully that teaching reform movement was far more successful in improving teaching practices than the reform measures enforced through 'accountability.' Philanthropy-supported teaching quality movement successfully questioned 'research-focused' university orientation, and helped spread preogressive education methods throughout academe. The accountability reforms, by contrast, has had little impact so far, partly because 'rules' or 'norms' to be supported by external agencies were not always consistent across time or space, but also because universities tend to 'comply minimally' with such demands of accreditors. Whereas the former movement captured the imagination of the academics and pushed educators in universities to re-think what they do, leading to better teaching practices bottom up, the latter merely pushed them to 'comply' with external rules, which did not lead to sustained changes in internal thinking.

Although the majority of programs in private institutions are lower in quality and have small enrolment, some programs offered by larger private institutions are better than programs offered by the weakest public institutions.

Table 3.3: Accreditation result [BAN-PT, 2009]

	Diploma program[8]				Undergraduate program[3]				Graduate program[9]		
	A	B	C	D	A	B	C	D	A	B	C
Public	12.81%	65.45%	21.51%	0.23%	30.63%	55.19%	13.84%	0.34%	49.62%	41.92%	8.46%
Private	6.57%	50.10%	42.02%	1.31%	8.41%	47.11%	42.36%	2.11%	18.73%	48.21%	33.07%
Islamic	0.00%	100.00%	0.00%	0.00%	10.42%	54.35%	30.34%	4.88%	64.71%	11.76%	23.53%
Service	4.00%	56.00%	40.00%	0.00%	5.88%	61.76%	29.41%	2.94%	0.00%	100.00%	0.00%
National	**8.38%**	**54.91%**	**35.74%**	**0.96%**	**14.27%**	**49.99%**	**33.77%**	**1.97%**	**39.85%**	**43.63%**	**16.52%**

In 2010 only 11,185 programs have gone through the accreditation process or around 63% of 18,298 study programs, either due to their inability to meet the quality standard or to the limitation of the National Accreditation Agency's (BAN PT) capacity to conduct assessment each year. In order to keep up with the ever increasing work load, in the future BAN PT is in the process of shifting its strategy to evaluating institutions rather than study programs.

There has also been a gradual tightening of regulatory requirements. In 2005, the DGHE began to require that all institutions had to establish a quality assurance (QA) unit. A training program was conducted nationally for teaching staff who were assigned to such units so that they could be more effective in conducting the QA process within their respective institutions. In 2008 all institutions were requested to submit a document describing its internal QA operation for which and a review team was assigned to assess the documents and conduct site visits. After the DGHE imposed the requirement to establish internal QA unit, in 2008 there were 24 public and 44 private universities considered already having a good QA mechanism. Currently almost all universities have already such unit in place, though its effectiveness needs still to be further assessed.

Nevertheless today, the quality of Indonesian universities remains highly diverse. Only three Indonesian higher education institutions have been ranked within the top 500 in the world ranking of any kind of university, as presented in table 3.4. As a few established universities have been ranked as world class institutions, many have not been accredited by the BAN-PT. Some study programs in the professional stream that we interviewed have also acquired the accreditation status

[8] A=very good, B=good, C=accredited, D=not accredited
[9] A=very good, B= accredited, C=not accredited

issued by international professional organizations such as ABET (Accreditation Board for Engineering and Technology) and WFME (World Federation of Medical Education).

Table 3.4: Institutional ranking according to THES and QS [THES 2009, QS 2012]

Institution	2009 (THES)	2012 (QS)
University of Indonesia	201	273
Gadjah Mada University	250	438
Bandung Institute Technology	351	555

Although we do not regard S-3 as a staffing requirement for teaching institutions, the availability of S-3 programs is a reasonable indication of an institutional capacity to undertake basic research. The fact that more than two thirds of S-3 holders are from universities in Java, as shown in table 3.5, a is an obvious illustration of a serious geographical disparity in the research capacity across regions. There is also a worrying qualitative disparity; the bulk of staff training for S-3 for institutions outside Java takes place in Java, with only a few going abroad.

While this provides a good flow of good talent for domestic graduate programs, it does not create a flow of human capital who can bring back home institutions' critical 'ethos of organizational culture' that is so important in higher educational institutions or any insights in the international economic contexts that are critical for region. If serious knowledge spheres are to be created outside Java, there must be a much more concerted effort to train a critical mass of staff in key fields with relevant advanced research training abroad.

Table 3.5 Qualification of teaching staff [DGHE, 2010]

	D3/D4	S1	S2	S3	Sp1/Sp2	Profession	Total
Public outer islands	214	12,001	18,238	3,337	525	756	35,071
Public Jawa	160	5,920	14,105	5,181	1,178	518	27,062
Private outer islands	2,218	33,057	10,919	458	176	526	47,354
Private Jawa	2,707	34,455	24,212	2,705	539	946	65,564
Total	**5,299**	**85,433**	**67,474**	**11,681**	**2,418**	**2,746**	**175,051**
All Jawa	2,867	40,375	38,317	7,886	1,717	1,464	92,626
All outer islands	2,432	45,058	29,157	3,795	701	1,282	82,425
% Jawa	**54.10%**	**47.26%**	**56.79%**	**67.51%**	**71.01%**	**53.31%**	**52.91%**

For higher educational institutions to become pioneers in continuous quality improvement of education, with careful analysis of labour market needs and career paths of graduates is an urgent need for the nation today. And yet, today's environment offers very little push for the movement of a continued quality improvement. The termination of competitive funding in 2010 which was a push towards regulatory enforcements depriving universities of the liberties that they once had, was pushing institutions into a 'compliance' culture. We noted that there had been a strong sense of crisis within the sector, particularly amongst leading lights in quality improvement of public institutions. If institutions were to be innovative in meeting the future economic needs, they would be expected to be able to operate independently. There never was a greater need for institutions to develop the culture of independence and accountability than today so that they tackle the complicated issues of the further quality improvement needed for Indonesia's future.

As the pressure to expand on higher education is mounting, it should therefore struggle to improve its relevance. Although the percentage of unemployed graduates is slightly decreasing in the last 2 years as illustrated in table 3.1, most industries are still complaining about the difficulties of recruiting competent graduates. The industries are particularly critical about the ability of universities to conduct relevant R&D and produce results that benefit the industrial sector.

3.3 Innovation-oriented initiatives

The last decade has seen a gradual change in the national context, which is shown in the increasing emphasis on the need for universities to better their cooperation with industries through new university roles and expectations in entrepreneurship or innovation voiced by not only by various government agencies, the Indonesian Academy of Science, but also by business organizations hosted events. These have been 'sporadic' and by no means consistent in pushing universities to develop better UIG partnerships.

3.3.1 Patenting

Universities are beginning to respond, mainly through renewed emphasis on patenting, entrepreneurship and science parks. These are the 'common' first institutional responses around the world, but as it will be later explained that this is by no means sufficient. The future success for each of these will not only depend on better expertise of individual professional involved in such initiatives but also on a much far deeper cultural change of higher education institutions themselves to be the 'source' of new ideas and innovations.

More universities have begun the process of patent applications with government support. This is in contrast with the past when the normal practice was for individual academicians to give away intellectual property rights to its industrial partner. DGHE has facilitated the application of patents for universities by providing some funding to support such activities. As shown in the table depicted in appendix D, universities with strong tradition of research dominate the number of patents granted. This number only represents a fraction of all patents granted to universities, while others are granted without the assistance of DGHE.

While the number of patents is certainly increasing, it is still true that universities only contribute to a small part of all patents application which has been granted by the Directorate General of Intellectual Property. It is important that universities develop better capacity for patenting in the future and it is also critically important to recognize that Indonesian institutions are barely making the 'first step' in this journey. Most institutions have only vague ideas beyond applying for patents; they have little capacity for marketing patents, with hardly any understanding about how 'revenues' might be shared by institutions and individual academics.

It is unlikely that institutions will get significant surplus revenues from IPR in the short to medium term. Such early push for patents typically emphasizes the 'number' of application without looking at the quality of underlying technologies. It requires not only a significant number of 'industrially active academicians' to be able to come up not only with better quality, patentable technologies, but also with institutional capacity to screen right technologies for patenting and to write the right kind of applications, and even to have greater capacity to market patents if they are to lead to successful licensing.

Generating surpluses from IPR is even harder. Patenting is expensive as it requires professionals to develop patent applications and market licenses. Even in the US, many universities found that it was not easy to break even in patenting / licensing unless they had a significant portfolio of patents, developed by a professional support unit, and a significant size of overall research activities from which to draw patentable ideas.

3.3.2 Incubator / spin off

The concept of entrepreneurship support has become popular, with many institutions developing entrepreneurship education or even entrepreneurship centres in the last 10 years. In the past, companies were occasionally formed by academic professors or graduates working closely with academicians, though they remained largely invisible. Nowadays more universities are engaged in incubation efforts and provide entrepreneurship education to their students.

PT Ecomindo Saranacipta

PT Ecomindo Saranacipta is a company founded by the Faculty of Computer Sciences UI in September 1999. It is considered by the Faculty as a pilot experiment for a spin-off company, whereby the initial paid up capital was provided by the Faculty, by allocating its self generated revenue. It survived difficult times of insufficient skills and knowledge of running a business, with limited assistance and mentoring. At the later stage it changed the strategy from spin-off to start-up, changed its focus from marketing its own product into outsourcer of services.

Started with 3 full time staff, currently it employs around 60 graduates, including 40 full time computer science graduates and 4 administrative staff. Its services are primarily in application sofware development and professional outsourcing, with a considerably wide spectrum of clients, from banks, financial industries, government agencies, to universities, generating around IDR 12 billions revenue in 2011. The involvement of the Faculty is currently limited to providing advices through the Board of Commissioners.

However, most initiatives appear to be at an early stage of development, with incubation programs not looking very different from generic entrepreneurship education programs (see box PT Ecomindo Saranacipta). Seed funding from DGHE was made available since 2009, when individual students could receive up to IDR 8 million support as seed grants.

A structured incubation program which makes use of external expertise, such as seasoned entrepreneurs and venture capital communities, to selectively provide mentoring to promising ventures is not yet observed. To the extent mentoring assistance was given, the implementation we found is still general in nature, and did not span the professional range necessary from market analysis to management team formation or venture finance. A very different experience is found in China, where universities have become active in creating enterprises since the late 1980s, even when they have little research capability (see box: Chinese university experience of spinning off).

Chinese university experience of spinning off

Although the newly established enterprises are sometimes described as spin-offs, they are significantly different from the normal practice in that they were owned and managed by universities (Eun, Lee, and Wu 2006). Some of these companies have been spectacularly successful; they include three of the most successful personal computer (PC) companies, Lenovo, Founder, and Tongfang, which were created by the Chinese Academy of Sciences, Beijing University, and Tsinghua University, respectively. About 40 university enterprises are already listed on stock markets in China and Hong Kong, China (Eun. Lee, and Wu 2006).

Interestingly, the knowledge content of these spin-off companies did not often derive from significant scientific research; rather, the spin-off was the mechanism through which skilled personnel moved from universities to the commercial sector (Chen and Kenney 2007). These enterprises were a simple mechanism through which universities could contribute to industrial capabilities in an environment of very limited industrial capability (Eun, Lee, and Wu 2006). They resembled in this respect Japanese university start-ups in the early phase of industrial development (Odagiri and Goto 1996), when academics could behave as arbitragers of Western technology and were in a good position to create companies, given the underdeveloped industrial context.

It is not clear how long this practice of university enterprises will continue in China. Both the government and many universities have gone through a rethinking process, as many enterprises have not been successful and managerial responsibilities are increasingly demanding (Ma 2007; Kroll and Leifner 2008), with various revisions made in their strategies [Wu and Zhou 2011]. It is likely that China's university enterprise experience was a phenomenon dictated by the specific context of underdeveloped industry and a high concentration of talent in universities.

3.3.3 Entrepreneurial training

Triggered by the high unemployment of graduates, the MoEC has been actively promoting entrepreneurial education in the last 3 years. Since 2010 the DGHE has allocated budgets for public universities to develop entreprenurial training program for students and staff. One academic who has been active in national efforts to promote entrepreneurship centres thought that there were probably some 100 entrepreneurship centres in Indonesia, with probably a third of them reasonably active.

In many cases the training conducted aimed to develop affective competency through 1 day workshop by national TV star motivators for incoming students, followed by 1-2 credits courses on business practices for more advanced students. Such training might work for those who have already a strong intention but less competence; however, it might be less effective for those who are less motivated. Unless the spirit is embedded within the teaching process of other courses and topics, it might be difficult to achieve the intended outcome. More serious efforts are shown by initiatives carried out by private universities, e.g. conducting competition for seed capital involving industries (see box: two exemplary of entreprenurial private universities, in section 3.1.1).

3.3.4 Science parks

Several universities, such as UI and UGM, are in the early process of establishing science parks either in or close to their campus, though the direction or content of the venture still need further clarification. According to the early information we acquired, most or all had not yet conducted meaningful R&D, and have limited activities such as providing advices and consultancy services for university staff on IPR related issues.

In addition to universities, some kinds of collaborative effort of several different institutions have been carried out to establish science and technology parks. Some initiatives driven by regional governments that are worth to mention are among others, Solo techno park, Jababeka in Bekasi industrial estate, and Sragen in Central Jawa. Others are jointly initiated by regional and central government and more focused on specific sector or field such as agro science parks in South Sumatera, Cianjur, and Jembrana (Bali). They are currently more focussing their attention on technology diffusion and dissemination through training and similar gatherings.

Bandung Techno Park (BTP) was established in 2010 as a merger of TDC (Telecommunication Design Centre), ISC (ICT Service Centre) of Telkom Institute of Technology, and one Business Incubation Centre. This institution occupies an area of 54000m^2 inside Telkom Education Park located side by side with Telkom Institute of Technology (ITT)[10], Telkom Institute of Management, Telkom Polytechnic, and Telkom School of Art and Design. BTP serves as an intermediary and synergy builders among Academics, Business Sector/Industry, Government and Community in ITC industry. Though still in its infancy, BTP can be considered as a good example of industry-support science and technology park.

Developing eco-system.

There has been a steady rise in science parks starting from the Stanford Industrial Park in 1951, first in the US and Europe, and then globally. In the US and in Europe, science parks tended to develop in close ties with universities, while in Asia, many of them emerged with no formal ties with universities. In China, science parks developed since the late 1980s as part of national policy to establish special technology zones. Today in China, there are 53 national and nearly 200 state-level science parks, along with 63 university-owned science parks.

Today, there is a common understanding that universities should play a much more interactive role in these parks. Some parks are literally designed to encourage a single community of university and industrial researchers to develop. It is also no longer adequate to recruit industrial and other R&D organizations into these parks; there is much greater interest in incubation of new high-tech companies. It is also common to add other 'ingredients of innovation eco-system' such as seed/venture capital arrangements, management support and business networking. Today, even though a larger number of venture capital firms operate globally, many of them are less willing or capable of funding and supporting early university spinoffs. Specialized arrangements for early venture funding and management support directly linked with universities are increasing, often backed by government money. But many fail as it is not easy to replicate the true expertise needed. Israel and Taiwan were unusual in taking early actions both in building direct relationships with Silicon Valley but also in making concerted effort in building expertise for domestic venture capital industry.

[10] ITT is a university founded and supported by PT Telkom, Tbk.

Older establishment that has been around for quite sometime are the Puspiptek in Serpong under MoRT, and Inter University Centers (IUC) within the universitiy auspices. But mostly have been less active in the last decade and many of its infrastructure as well as equipment have become outdated.

3.3.5 Small and medium enterprises support

Providing consulting or project support to small and medium scale companies in the vicinity of institutions can be an important role to be played by all institutions. For teaching oriented institutions, this may take place by providing special training or consulting work. For research oriented institutions, this may take the form of partnership in conducting R&D with technologically ambitious small companies. For both activities, external funding is usually needed, as SMEs are the last in the industry to be able to pay for university help. Examples which the study team have recently found are at the Bogor Agricultural University and Hasanuddin University, where training and assistance are provided to the neighbouring SMEs. Other universities might have similar programs, and further information has yet to be solicited at the later stage.

An interview with one quite successful SME in North Sulawesi reveals that it has not received any support from local universities. In this specific case the owner is a university lecturer and it is no secret for everybody in her department. Although dozens of students earn credits from the practical works conducted in this company every year, the institution nor its staff is not attracted to provide support. It illustrates the “mental block” that has to be overcome in developing a real partnership with industries.

3.3.6 Developing support infrastructures

The lack of opportunity for university academics to meet industrialists is one salient issue. In response to this perceived need, some higher education institutions begin to create events that bring together industry and government representatives with university academicians. The study team found that at least one leading university has initiated a series of UIG forums in several thematic areas of regional interest. A few other universities have taken proactive steps in organizing their own networking events to forge meetings between industrialists and their own academicians.

Some established universities such as LAPI in ITB, Daya Makara in UI, or Gama Multi Usaha Mandiri in UGM, are ‘commercial arms’ to provide contracting support between industry and university academicians. However, even in ITB-LAPI (the oldest of the theree), it appears to have a long way to go before it is ‘professionally capable to (a) identify and assemble ITB expertise to the benefit of industry; and (b) market ITB academics’ specific expertise to the outside world. UGM is perhaps one of a few exceptions in which the institution was developing its institutional capacity to identify appropriate industrial partners and topics of mutual interest, and is making progress in increasing cash support from industry for research. It even created a special outreach office in Jakarta to be able to connect specific academics with specific industrial partners. It is critically important that such an ‘institutional support infrastructure’ becomes a better developed means to assist academics in their relationship with industrial partners.

3.4 Funding

3.4.1 Government funding

The total higher education expenditure in percentage of GDP in 2011 was around 1.2%, which was still low compared to that of Malaysia (1.69%), but higher than that of Vietnam (1.18%), Thailand (0.71%), and the Phillippines (0.34%). In 2012 the allocated budget for the Directorate General of Higher Education (DGHE) has reached IDR 32.6 trillion, almost three times compared to the 2007 figure of IDR 12.9 trillion, which is approximately 53% of the entire MoEC budget shown in Table-3.6. This rapid increase in overall funding for higher education, was accompanied by a dramatic increase in the contribution of self generated revenues (largely coming from student fees) which increased from 24% to 34% of the total budget. The proportion of cost recovery in teaching costs, which can be

approximately obtained as a self generated income divided by non-investment expenditures increased from 28% to 53% in 5 years.

There was an aggressive increase in investments which rose by almost 4 folds between 2007-2012, while the operation and maintenance only increased less than twice. In order to cope with the rising operational costs, public universities had to raise student tuition and fees. The decoupled planning processes of investements on the one hand, and operations and maintenance on the other, have always been an issue, but during a period of rapid expansion, their consequences have led to an unannounced policy change in increasing fees and tuition.

A second important issue is the dominance of personnel expenditure in the operation and maintenance budget, which constantly squeezes non-salary expenditures. The situation has become worse now as the government also provides additional incentives for professors and certified lecturers in public and private institutions in addition to the regular salary allocated within the operation and maintenance budget[11]. In 2012, DGHE's allocations of more than IDR 1 trillion for such incentives, significantly affects its capacity to invest and maintain. Moreover the risk of the ever increasing budget due to staff expansion and promotion in the near future has also to be anticipated.

Table-3.6: Allocated budget for DGHE 2007-2012, in IDR trillion [Dikti, 2012]

	2007	2008	2009	2010	2011	2012
Operation & maintenance	5.062	5.269	6.315	6.849	7.409	9.817
Investment	4.746	4.521	7.380	9.764	10.753	11.672
Self generated	3.150	4.268	5.317	6.627	10.712	11.116
Total	**12.958**	**14.058**	**19.012**	**23.240**	**28.874**	**32.605**

Another issue is underfunding of research in universities. Research activities in universities are funded by various sources, i.e. DGHE, other government agencies, industries, philantropic organizations, and other private entities. The DGHE provides research fund under investment category, through 2 different channels. The first channel is through the Directorate of Research and Community Services (as elaborated in chapter 4 of this report), and the second is through direct allocation to some public universities as small block funding.

The budget allocated for the Directorate of Research and Community Services DGHE has been increasing and has reached IDR 436 billion or 1.34% of the entire DGHE's current budget. Within this allocation, the budget for R&D related activities in DGHE is only IDR 290 billion in 2012. If we compare it with the IDR 200 billion spent annually by PT Kalbe Farma[12] for its research and development [Setiawan, 2012], it clearly demonstrates the relatively low position of research and development in the government priority setting.

Universities receiving block funds have been previously selected based on their track record in research. The fund is earmarked for staff research through internal competition. The government budget allocation for 21 public universities with BLU status and 7 autonomous universities (BHMN) for this purpose is depicted in Appendix B of this report. The percentage of the block funding earmarked for this particular purpose is less than 1% of the total budget (investment, operation, and self generated) for each public university selected as sample. The recently passed Law 12/2012 on Higher Education creates a new 'source' of research funding by requiring public universities to allocate at least 30% of its operational budget for research and development[13].

[11] The incentives for staff in public institutions are allocated from operation and maintenance budget, whilst for staff in private institutions are allocated from the investment budget.
[12] PT Kalbe Farma is the largest pharmaceutical company in Indonesia, even Southeast Asia
[13] Article 89.6

However, since the total government funding of the education sector is 'capped' at 20% of the total government budget by constitution, this merely 'creates' additional pressures on operation and maintenance budgets. It is expected that this new regulation will only be effectively implemented in the 2013 government budget.

3.4.2 Self generated revenue

Before 2000, public institutions received most of its funding from the government budget allocation. Revenue from students was insignificant and contracts for services were rare until early 1990. The major shift began in 2000, with the change of the legal status of the 4 most established public institutions into autonomous universities. In the last decade the self generated revenue has increasingly gained importance as a source of funding for public institutions. In 2012 the self-generated revenue has exceeded the budget allocation for operation and maintenance, as illustrated in table-3.6.

The sources of self-generated revenue in public institutions are students, contracts, and other sources. It is not possible to extract accurately the value of revenue acquired from R&D and industrial contract in each individual institution based on the existing financial reporting system. The more detailed financial reports were only available for the 21 public institutions with BLU (*Badan Layanan Umum*)[14] status and the 7 BHMNs institutions, as presented in Appendix-B. In order to estimate the extent of collaborative activities between these universities with industries, we tried to estimate the revenues from various contract by subtracting student related revenues and "other" revenues (e.g. rental of facilities, parking) from the totals. It should be noted that activities under contracts also include non-R&D activities, such as training, data processing, and assessment.

Even in the 21 BLU and 7 BHMN institutions, which we expect to be better revenue generators from non-student sources, more than 80% self generated revenue comes from students such as tuition and other fees, and only 10.5% revenue comes from contracts. This means that contract incomes constitute about merely 3% of total revenues, which makes us conclude that R&D and industrial collaboration is still insignificant. Regardless of their status and stage of development, these 2 types of institution have a similar percentage of revenue from contract which is around 10 %. However, the nominal value from contracts is much higher in the BHMNs (IDR 448 billion for 7 institutions) due to their higher total self generated revenue, compared to BLU institutions (IDR 572 billion for 21 institutions).

BHMNs are considered the most established institutions since their capacity to generate revenue from sources other than students is commonly assumed as higher than other institutions. As demonstrated in Appendix-B, not all BHMNs lead in revenue generation. The nominal value of contract in a BLU institution such as UNHAS (IDR 70 billion) has far exceeded BHMN institutions such as USU (IDR 25 billion); it is even almost similar to that of UNAIR (IDR 72 billion).

Among the 21 institutions with BLU status, 6 do not report any revenue from these sources. We suspect that they do have some collaborations but unsuccessfuly managed it under the central administration. However, the proportion of revenue from industrial collaborations is not expected to be significant in these institutions. These institutions may still be in the process of restructuring their internal financial management and struggling to enforce "single account" policy, particularly after being converted into BLU status. In this contexts, Universitas Terbuka whose nature of operation does not require too many opportunities to conduct industrial collaborations is likely to be an exception.

[14] BLU is not a legal entity. It is still operated as an implementing unit under the Ministry, with a special authority in managing its revenue

3.5 The road toward institutional autonomy in Indonesia

Under the Indonesian legal framework, public universities are not self-standing legal entities, but legally defined as integral parts of the Republic of Indonesia and as implementing units of its legal entity. Therefore they do not have any authority to enter into legally binding agreements with other parties. Authority and autonomy currently enjoyed by public universities are delegated by the Minsiter of Education and Culture on behalf of the state, and consequently can also be revoked or cancelled depending on the government policy[15] - as has become clear in the recent past, when the government prohibited the teaching of Marxism or when the financial management regulations were tightened. This is to be contrasted with many other countries, where public universities have a much stronger legal basis for independence as well as for structures to ensure accountability to the public.

Institutional autonomy is not limited to the process of giving public universities a separate legal status. It is rather, a complex process of establishing a framework, both for different kinds of institutional autonomy ranging from academic to financial, and accountabilities which must include financial and quality accountabilities as well as governance structures to bring in key stakeholders. Today, it is internationally accepted that without autonomy, institutions cannot adapt themselves to the changing needs of the society or cannot operate efficiently. It is also well established that autonomy should come with a well defined set of accountability structures. An autonomy process does not only have to do with regulatory changes, but also with a serious institutional building process of capacity building to develop plan and strategies, as well as manage resources.

From the perspective of UIG, autonomy and accountability, structures are important for three reasons. First, a healthy UIG partnership demands universities to be able to make independent, innovative and different inputs to partnership that only universities can make. In education, unless universities are organizationally 'nimble enough' to respond to the changing needs of the society, and to be quality conscious as an organization to make constant improvements, they are unlikely to be able to deliver the kind of education that are needed in Indonesia.

Table 3.7: The structure of autonomy and acountability

AUTONOMY STRUCTURE	
Academic autonomy	Not only academic freedom for individual staff to undertake research and teaching, but also for institutions for granting degrees, determining curricula and pedagogy, deciding on areas and scope of academic research and teaching
Financial autonomy	for raising and managing funds without government permission, accumulating surpluses, flexibly planning budgets and spending without external approval
Structural autonomy	for setting university's own internal structures for academic units (e.g. faculties, department) so that university can adapt to meet changing circumstances
Administrative autonomy	for managing resources in ways that are consistent with their mission with good practice for transparency and internal accountability
ACCOUNTABILITY STRUCTURE	
Legal accountability	requirement that universities operate as independent legal entities which can be held legally accountable
Financial accountability	Financial audit requirements
Quality accountability	External accreditation and other requirements
Governance accountability	requirement that universities must have a governance structure to ensure accountability to its stakeholders, such as a governing board comprising key stakeholders, which can oversee their strategic decisions as well as operations.

The fact that private universities appear much more aggressive in 'innovating' and 'linking with skills needs' as discussed in the previous section, is a good indication that the institutional autonomy they enjoy enables them to become better organizations. However, private institutions are generally not strong contenders either in broader academic education or research. It is critically important that

[15] Actually similar situation is also applied to private universities, whereby the Foundation is the legal entity. Authority and autonomy is delegated to the universities by the Foundation.

the institutional structure of public universities be revamped so that their high calibre academics can play a far more proactive role in UIG than hitherto possible.

Second, proper management capacity is critical not only in developing appropriate partnership agreements but also in supporting an effective implementation. Businesses around the world are impatient with slow bureaucracies or inflexibilities under which some public universities operate. It is important to enable universities to become credible organizations with which businesses can work together.

Third, it is important that universities have mechanisms to have industry and government as key stakeholders. Governing boards in many countries operate as a key mechanism to enforce university accountability to the public, including industry and government, as individuals representing the board have a unique position to influence strategic decisions and operations of universities.

In Indonesia, the road for autonomy started two decades ago. Since that time the DGHE has decentralized its authority by providing institutional autonomy to universities. The first step is the issuance of Government Regulation PP 30/1990, which provided more flexibility to universities in designing its own organization structure according to the local needs. The introduction of block grants for research in the early 1990s marked a turning point as they were introduced explicitly with a view of building a better planning and management capacity in public universities. This is to prepare for the future introduction of a greater autonomy, i.e providing more autonomy and decentralizing some of its authority to universities, and later budgeting envelopes for developing study programs. It has to be noted that these changes had been introduced when centralization was still the national credo before the 1998 “reformation” took place.

An important milestone was the implementation of PP 61/1999, which provided opportunity for the 4 leading public universities to change their legal status, so that they are able to establish Boards of Trustees with a fairly autonomous financial as well as human resource management. Later the pilot program was followed 3 other public universities. When the bill on Education Legal Entity (BHP) was passed by the parliament and became the Law 9/2009, it was assumed that the ultimate goal was achieved. The law provided the foundation for a coherent legal structure and laid out an overarching regulatory framework to support all aspects of institutional autonomy. It was to allow all universities and schools, public as well as private, to convert their status into legal entities after meeting a certain set of prerequisites. Unfortunately the Law was short lived, and was cancelled by the Constitutional Court in 2010.

Higher education reform in Japan [MEXT, 2010]

In Japan, 89 national universities were awarded a new legal status, which made them legally separate from the Ministry of Education and Science and Technology for the first time in 2004. Their governance reform was similar to the one taking place in Indonesia both in its large scale, involving many organizations, and its broad scope which includes not only the legal change, but also changes in regulatory and funding frameworks. The objective was to provide greater organizational autonomy to national universities so that they could become strategic organizations, capable of developing unique characteristics in their education and research, to become accountable to meet diverse needs of the nation.

In 2010, the first post-autonomy review conducted by the Ministry concluded that national universities had become much better at orchestrating their efforts to contribute to the society (MEXT 2010). Their records of collaborative research and contracts with industry and other non-university organizations doubled between 2003 and 2008. Their contribution to regional development improved as they established themselves as significant collaborators for small and medium businesses, increasingly focusing their research and education efforts in areas relevant to regional needs. This was in contrast to other areas where improvement was only recognized with caveats.

In the absence of the necessary legal infrastructure, the DGHE depended critically on the use of the existing regulations on public finance as a basis for promoting financial automony (PP 23/2005, and its revised version PP 74/2012). The *Badan Layanan Umum* (BLU), or “Public Service Unit” concept

was designed by the MoF as a generic solution for all public institutions with the potential to generate revenue, e.g. hospitals, engineering workshops, and R&D units. However, as it was initiated by MoF, its coverage is also strictly limited in regulating the management of public finance, and other aspects of university management, such as governance and academic freedom which have not been covered by this regulation.

The BLU limits the university autonomy to merely financial management matters as autonomy in other aspects is delegated by the MoEC. Since there is no adequate legal protection, it implies that the delegation from the Minister can be revoked at any time. Nevertheless, the move is considered an attractive option by bureaucrats as well as by some academics, since it is practical and provides short term solution. In order to prevent public universities to operate in a vacuum, the government issued PP 66/2010 which provides guidelines allowing a transition period into BLU, to accompany PP 23/2005.

In August 2012, the Law 12/2012 on Higher Education was enacted. Although far from perfect, the new Law provides a legal basis to develop the derivative Government and Ministerial regulations as required by the new Law. Some academics are still sceptic and suspicious about whether the new regulations to be developed and then followed up will be able to move the national system back to the centralistic system. Others are worried since the new law tends to micro manage public universities, but at the same time does not provide adequate regulation for private universities.

The legal infrastructure is a critical issue in fostering UIG partnerships, as well as providing a conducive environment for conductng research and developing innovation in universities. University autonomy is necessary for universities to develop and to carry out a strategic plan by involving the stakeholders, among others the industry and productive sector. The mindset of being autonomous universities will provide the necessary platform for effective UIG cooperation. In Japan, where national universities went through a similar governance reform, the impact of which was particularly visible in terms of how they work with industries (see box: Higher education reform in Japan)

Chapter 4. R & D capacity in Indonesia

4.1 National Council on Innovation

In order to strengthen the national productivity and enhance national economic growth, a Presidential Decree 32/2012 has recently been issued. The National Committee on Innovation (*Komite Inovasi Nasional – KIN)* was established by a Presidental decree with a mandate illustrated in Annex III of this report.

Having observed the case of India (see box: Innovation system – the case of India), the government should strengthen and empower KIN as an advisory unit for the President. Unlike the committee in India, by law KIN has no portfolio and may not execute any innovation project/program. The power to execute and conduct innovation program is partly done by the MoRT, by the Indonesian Institute of Science (LIPI), and by the well-developed Indonesian HEIs.

Innovation system - the case of India [Mathew, 2010]

"Innovation is the central issue in economic prosperity – Michael Porter"

One of the success stories of implementing innovation system is India's innovation journey. It started on a strong foundation but its pace was stifled by an inward looking and disjointed agenda. Much of it in the earlier years was fueled by protectionism to drive self-reliance that coerced Indian industry, military, and the public sector to innovate within its means for subsistence that often resulted in substandard and low quality outcomes. Isolation of these activities from the outside world for over 44 years since independence meant that there were no external benchmarks or sharing of best practices or even a reference mechanism to judge process. This often meant that India re-invented its own wheel many times.

Recently, there has been change in such thinking. There is a pressure from governments in power to change India from within. And externally, there is a pressure from China to measure up. There is also criticism that India has not demonstrated any leadership in producing new products for its own markets although it claims to have the best and the brightest talent. India then believe that a National Innovation System can increase momentum, raise profiles, build transparency and scale, and increase focus on both national growth and global competitiveness.

What should the national innovation system achieve? Fundamental models for innovation globally have remained unchanged, but the nature of innovative activity has changed and grown more sophisticated. Notable shifts have occurred from a focus on new product and identifying critical technologies to processes and from individual outputs to the mechanisms for producing those outputs. Innovation is rarely seen as a set of isolated activities that somehow add up to the sum of the constituent parts of a national innovation agenda. Innovation is no longer an independent discovery activity but it is a collaborative process with multiple participants.

India looked at innovation as a three tiered model, primarily as a picture of layering and the scale of innovations required to impact massive populations and multi-pronged objectives. At the bottom of the model are the grassroots innovators engaged with the task of contributing to the improvement of rural GDP (i.e. farmers, artisans, housewives, and ordinary Indians – to innovate to solve a livelihood challenge).

In the middle tier of the model is a focus on entrepreneurial and social innovation, and the top layer of the innovation model is representative of the need for private-public partnership for cutting edge research and innovation for global thought leadership and competitiveness. Although a multi-tiered model conceptually clarifies the emphasis on the layered focus that is required to shape a national innovation agenda given the diverse need of the country, including the demands of India's mature industries, the need for accelerating domestic consumption and the need for multiplying rural GDP, what is missing is coordinated effort of national significance. This is where an NIS (National Innovation System) fits in, providing the required independence for each of the tier structures and at the same time providing an osmotic effect at the tier boundaries in such a way that innovation performance is enhanced.

Innovation system - the case of India (cont'd)

In effect, the NIS operates like a national grid in which innovation change agents can be plugged in. An NIS will also provide a framework where common issues can be abstracted and dealt separately and perhaps even horizontally, as a shared service. For example, basic scientific and engineering infrastructure, including the data required for researchers, technologies needed to conduct R&D, rapid prototyping, measurement, and test apparatus, can be centrally procured and developed for common use of all innovation system participants. The NIS should have an apex body that serves as a policy-oriented intellectual property think tank. It is at this level that the government and an innovation policy can help steer the agenda. First, to ascertain that there is a portfolio of national interest; second, to ensure that there is adequate funding and incentives for the actors at the various tiers to function independently; and third to ensure that there is sufficient collaboration and integration amongst the various actors in such a way that better results are achieved faster.

The role of government in an innovation system is vital and varied. First, government is a catalyst and mobilizer of different interests and helps to connect various disciplines, upstream and downstream activities. Governments can mobilize capital in directions that are difficult or of little interest to industry. Government is also a large and influential buyer of goods and services and thus has influence on how products are developed. The government is also responsible for the administration of policy that helps to keep the system healthy and honest. Rigid organizational structures and territorial mindsets negate and harm innovation. There are varying levels of resistance to new ideas, experimentation, process changes, transparency, and accountability.

In 2008 the government of India released a draft of the National Innovation Act. The purpose of the legislation was to facilitate public, private, or public-private partnership initiatives for building an innovation support system to encourage innovation. The Innovation Act visualized an integrated science and technology plan. The Act has given due thought to private and public partnerships, including an exchange or marketplace for trading in innovation. The Act represents a good start but fell short of expectations with regard to identifying a comprehensive agenda, a robust funding mechanism and innovation subsidy program, and most importantly incentives to collaborate and work together.

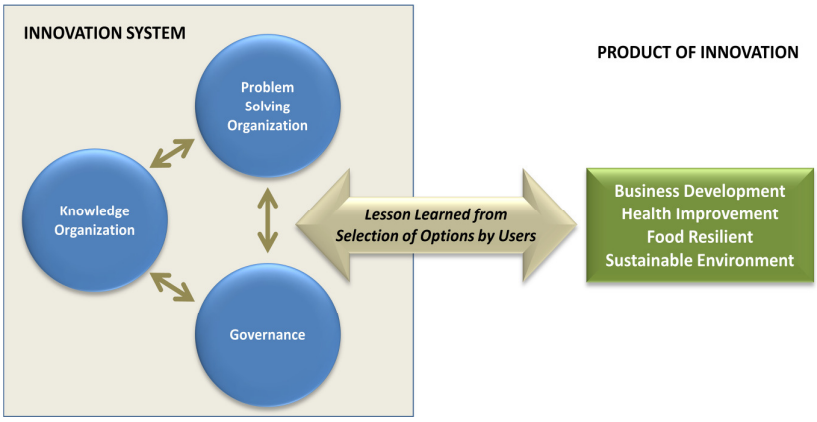
We visited Pekalongan, a city in Central Jawa which is one of the pilot implementations of the BPPT's program in developing local innovation system. It reveals that the level of understanding, strategy, implementation, and involvement is still at its infancy. Innovation is perceived by the municipal officers merely as performing better than last year, and universities involvement is still limited in conducting policy studies for the local government; so is the involvement of local industries which is very limited, while R&D strategies are yet to be developed. It seems that KIN still needs to learn from India on how it successfully implements National Innovation System, and at the same time the government needs to reposition KIN in order that there can be a synergy among R&D institutions as well as synergy with R&D policy makers.

4.2 Government policy

4.2.1 Coordination and synergy

By law, the national policy on science and technology is the responsibility of the Ministry of Research and Technology, which among others is to formulate the strategic policy and the direction of the national R&D. The strategic policy for national science and technology development recognizes the role of three important users of science and technology development and innovative activities; the users of which are government (who represents national needs), business & industry (for economic activities) and society (who needs science and technology to support the day to day needs). Within the context of innovation system, figure 4.1 presents the interaction of the three elements of UIG partnership.

Figure 4.1: Main Structure of Innovation System [MoRT, 2010]



Interaction among business entity, among S&T organizations, and between government institutions, and society is a fundamental process that enables the improvement of capacity and performance of innovation system. The university and other R&D agencies (public and private) which are the prime mover of innovation system, will give significant contribution to the productive sector through commercialization of research or technology transfers by means of training and development of technology capabilities. Government agencies and their regulations should play an important role in creating conducive environment for creation, testing and adoption of new technology, as well as the formation of new business entities.

The Strategic Policy on National Development of Science and Technology 2010-2014 as stipulated in the Ministry of Research and Technology's decree 193/ M/Kp/IV/2010, aims at,

a) Increasing the capacity and capability of science and technology resources to conduct productive R&D beneficial to the national production sector;
b) Increasing the capacity and capability of R&D institutions and supporting institutions to support transfer process from the idea-laboratory of prototype-industry to prototype-commercial product (strengthening the national innovation system);
c) Developing and empowering institutions or individual researcher networks at national and international levels to support the productivity improvement and empowerment of national R&D;
d) Increasing the creativity and productivity of national R&D to meet the demand for technology in the industrial sector and improving competitiveness of national products and innovation culture;
e) Improving the application of national science and technology for economic development, creating new jobs to increase people awareness of the importance of science and technology.
f) Setting seven science and technology priorities: *i*) food resilient, *ii*) energy, *iii*) information technology and communication, *iv*) transportation technology and management, *v*) defense and security technology *vi*) health and medicines, and *vii*) advanced material to support other priority area of focuses.

MoRT decree 193/ M/Kp/IV/2010 is the implementation of article 31 - paragraph 4 of 1945 Constitution (amendment 4) and Law no 18 – 2002 on National System for Research, Development and Application of Science and Technology (Sisnas P3 Iptek), and Law no 17 – 2007 on Long-term National Development Plan 2005-2025. This decree clearly stated that the National Research Agenda 2010-2014 should be applied to all executing elements of science and technology of the national development. Therefore, the science and technology executing element is defined as:

a) individuals and or groups of people who are doing research, development and application of science and technology, and
b) b) science and technology institutions, such as universities, R&D institutes, business entities and supporting institutions (which create the required atmosphere, support and limitations, that may influence the development of universities, R&D institutes and business entities).

While this decree recognized the importance of having the National Innovation System - NIS, the function of National Research Agenda (NRA) which is the basis for all science and technology programs, and the needs for better synchronization and coordination amongst various science and technology executing elements, does not clearly describe how its fuction will be executed and what the policy for the national R&D funding incentives will be. In reality, NRA, for example, is only applicable for R&D programs at units and agencies under coordination of MoRT, whereas other ministries such as MoEC, MoH, MoPW, Ministry of Transportation, Ministry of Agriculture, and other ministries have their own R&D programs, which may or may not be synchronized with the NRA. Except for those who are seeking funding from MoRT's incentive program, even though they are also using government budget, R&D in other government institutions are not required to follow the NRA. In a broad scope, R&D programs in government institutions are focused on either supporting the development of science and technology and engineering, or supporting the policy formulation for the ministry.

The success of government policy on the national R&D can be measured among other things by the number and quality of researchers and the number of R&D budget allocated for R&D activities (input), as well as the output of R&D activities. So far, the effectiveness of such R&D policies has not yet been measured, simply because the data are scattered and there is no integration among actors in national R&D activities.

4.2.2 Government budget

Budget for national R&D is mainly from the government, which currently stands at approximately 0.08% of the national GDP. Compared with other new world emerging countries (Brazil, Russia, India, China - BRIC), Indonesia is a distance part in its R&D spending. Similarly, when compared to its neighboring countries in the region, such as Australia and Singapore or Malaysia, Indonesia still remains behind.

Table 4.1: Gross Domestic Expenditure of R&D (GERD), in billions of US Dollars for Selected Countries

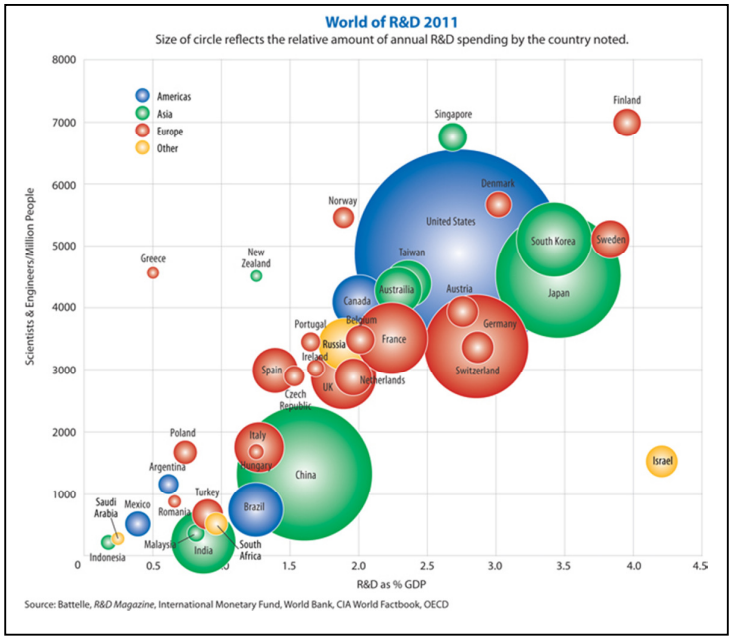
Global Rank	Country	2010 GDP PPP	2010 R&D as % GDP	2010 GERD PPP	2011 GDP PPP	2011 R&D as % GDP	2011 GERD PPP	2012* GDP PPP	2012* R&D as % GDP	2012* GERD PPP
1	United States	14,660	2.83%	415.1	15,203	2.81%	427.2	15,305	2.85%	436
2	China	10,090	1.48%	149.3	11,283	1.55%	174.9	12,434	1.60%	198.9
3	Japan	4,310	3.44%	148.3	4,382	3.47%	152.1	4,530	3.48%	157.6
4	Germany	2,940	2.82%	82.9	3,085	2.85%	87.9	3,158	2.87%	90.6
5	South Korea	1,459	3.36%	49	1,549	3.40%	52.7	1,634	3.45%	56.4
6	France	2,145	2.21%	47.4	2,227	2.21%	49.2	2,282	2.24%	51.1
7	United Kingdom	2,173	1.81%	39.3	2,246	1.81%	40.7	2,305	1.84	42.4
8	India	4,060	0.80%	32.5	4,472	0.85%	38	4,859	0.85%	41.3
9	Brazil	2,172	1.10%	23.9	2,294	1.20%	27.5	2,402	1.25%	30
10	Russia	2,223	1.03%	22.9	2,367	1.05%	24.9	2.491	1.08%	26.9
13	Taiwan	822	2.30%	18.9	883	2.35%	20.7	938	2.38%	22.3
14	Australia	882	2.21%	19.5	917	2.25%	20.6	958	2.28%	21.8
22	Singapore	292	2.52%	7.4	314	2.60%	8.2	331	2.65%	8.8
33	Malaysia	414	0.64%	2.6	445	0.70%	3.1	472	0.70%	3.3
36	**Indonesia**	**1,030**	**0.08%**	**1**	**1,120**	**0.08%**	**1.7**	**1,203**	**0.09%**	**2.4**
40	New Zealand	118	1.18%	1.4	123	1.20%	1.5	129	1.22%	1.6

The total government budget allocated for R&D activities is depicted in Appendix D of this report. From the total budget of IDR 1,344,476 billion, it allocates almost IDR 10,063 billion for R&D, or merely 0.75% of the total 2012 government fiscal year budget. Of course this is a very small amount compared with other nations, and one can expect that with such a limited amount the process of disbursement will be smooth as planned, if the R&D succeeds in achieving the planned target (Government Regukation 38/2012).

4.2.3 R&D personnel

In terms of human resources, the total number of R&D personnel in Indonesia is also considerably low. As depicted in figure 4-2 the number of scientists and engineers in Indonesia remains the lowest among countries in the world. It is lower than that of Singapore but almost the same as Malaysia's. The majority of R&D personnel in Indonesia employed in government sectors, are either researchers in government institutions or professors/lecturers-researchers in public universities. On the other hand, since R&D has not yet considered seriously by industries, the number of R&D personnel in the industry is consequently much lower than those available in government R&D institutions and universities. Unfortunately this study was unable to collect current data on the total number of R&D personnel.

Figure 4-2: R&D Spending and science and technology personnel



Data collected from the 2006 survey [LIPI 2009] showed that the ratio of R&D personnel in government institutions was only 11.04 per 1,000 employees consisting of 40.77% researchers, 27.78% technicians, and 31.45% supporting staffs. Today, the percentage has slightly increased for personnel with different educational background: 5% for doctoral degree holders, 14.8% for master degree holders and 21% for S1 holders and lower.

Not only the quantity and the quality of R&D personnel are relatively low, but their performance is also considered less satisfactory which is reflected by the number of its full time equivalent – FTE. According to the LIPI survey in 2006, the personnel of government R&D institution only spent 0.57 of their time doing R&D activities. Although this shows an improvement compared to R&D activities performed in 2005 and 2004, it was still far from satisfactory. The current FTE in government R&D institutions might become better.

Although there is no accurate figure available, we could roughly estimate that the maximum number of R&D personnel of universities accounts for 25% of the total number of lecturers, while others focus more on teaching and perhaps a little research. In some universities, such as UI, UGM, ITB, IPB, UNAIR, and ITS this percentage might be higher, but in most universities (especially in small private universities) the number is considerably lower. In most universities only a handful lectures are able to earn research grants from DGHE, MoRT and other sources. The heavy workload of teaching given by the universities which mostly focus on teaching, and the lack of research capability, as well as inadequate funding and research infrastructure often become the main reasons for the lack of research activity of many university lecturers.

4.3 Funding mechanism

R&D activities are executed using limited funds for a limited span of time. In all cases, the R&D personnel sign a contract for R&D project with the funding provider. There are various mechanisms of R&D funding, depending on the sources of funding. For the government funding, all R&D activities, regardless where they are performed, must follow government budgeting, disbursing, reporting, and auditing mechanisms. Government funding also determines the ceiling and allowable cost item, which are often not compatible for all R&D activities. R&Ds using government funding are also required to follow government regulation concerning procurement of research materials. Researchers complaint about this complex and strict regulations are often heard in universities and government research institutions. This long and bureaucratic process that comes along with government funding mechanism is in many places often considered being the source of ineffectiveness of R&D activities.

The problem of government funding not only continues due to its complex process but also due to the delay in disbursement. Due to delay in disbursement, researchers have to find ways to pre-finance their research activities. This problem becomes worse due to the lack of competency and capacity of the supporting staffs who are responsible for the administrative procedure for funding disbursement.

As for the funding from private sectors (non-government budget), as long as the capacity of the administrative system and competency of the supporting personnel remains inadequate, similar problems will emerge. For private companies working on their own R&D facilities using their own fund, such a problem does not exist. However, in university-industry R&D collaborations, complaints were made by the external partners about universities not being quite responsive to the request of industries. For the industry, commercial benefit of research output is essential, so that research schedule will determine the success of the R&D. In many cases university researchers cannot carry out research activities as scheduled because of university bureaucratic financing and procurement process. Therefore, althrough the amount of R&D fund is adequate, the execution of R&D activities requires effective support from the administrative office.

To promote R&D in the industry, the government has provided incentives for industry that are willing to invest in research and development in Indonesia. Although the government has implemented various tax incentives and other policies related to investments in R&D, the industry has yet to spend more in in-country R&D. Some companies in the industry even utilized foreign R&D agencies to do the job for them. Again, this can be interpreted as the signal that the industry is either yet interested in or have the needs of doing R&D, or simply assume that local R&D capacity is not yet available.

Likewise in many practices, funding for R&D are typically very limited, and therefore the competitive funding mechanism is the most often chosen mechanism for the award for R&D projects. Therefore the competitive mechanism is applied in allocating the government research fund, allocating the university internal research fund, both at universities as well as government R&D institutions.

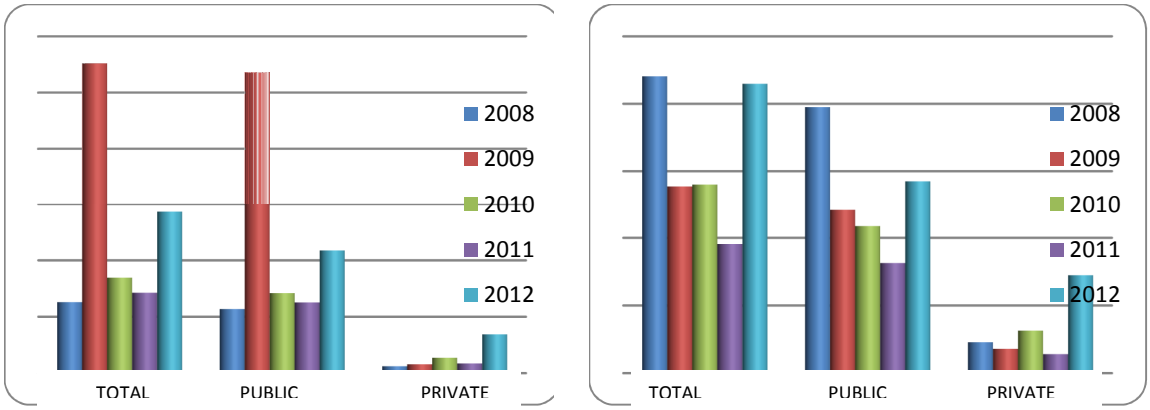
4.4 R&D activities in universities

The science and technology activities in Indonesia are performed in various institutions, extending from universities to government agencies to industry's R&D units. As the largest system that comprises the highest involvement of intellectual resources, university system plays a dynamic role in the national science and technology activities. The Indonesian university system is a very complex mix of public and private universities, including those under the coordination of MoRA. Such a complexity increases with the variety of capability and capacity as R&D institutions. However, universities are still considered as having the greatest potential in science and technology development through their role in producing capable science and technology personnel.

At the university, R&D institutes are established to facilitate part of the three functions of higher education (teaching, research, and community services). The research functions in universities are conducted at centers for research & studies which are generally under the coordination of university institute for research and community services. However, there are also R&D activities carried out at the faculty and department levels, which are not affiliated to any of the R&D centers.

Traditionally, the main role of universities has been to provide education and to produce graduates to meet the needs for workforce in industries. However, the rapid growth of the national economy and the expansion and changes in the industry call for more relevant graduates and education; and the universities have responded accordingly by shifting their roles and characters. While a majority of universities remains to focus on teaching, more universities are moving toward research-oriented institutions. To facilitate such moves, the DGHE has consistently launched a number of initiatives to support university research and community service.

Figure 4.3: Distribution of research grants [DP2M, 2012]

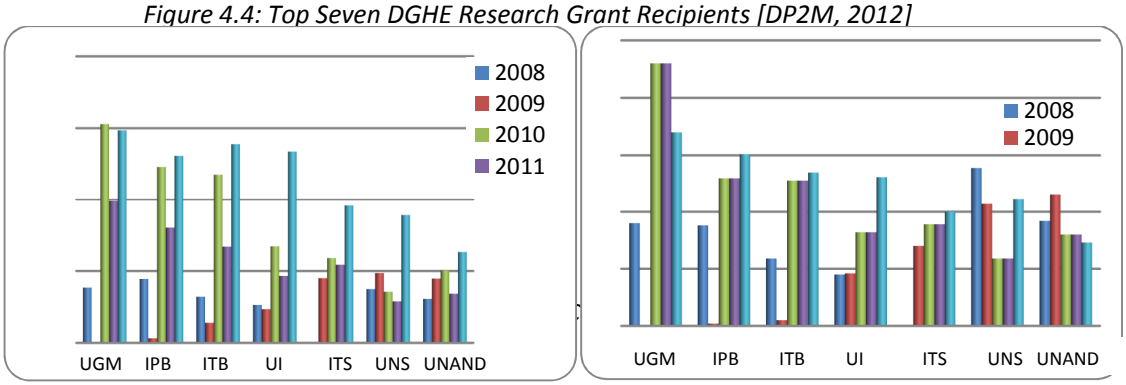


a) Contract Value *(b) Number of Research Contract*

Since early 1990s the DGHE has provided more than 20 different grant schemes, ranging from grants for fundamental research to applied and collaborative researches, in addition to various schemes of community service programs. Initially, those programs aimed at improving the quality of higher education through the enhancement of university R&D capacity, but through years of implementation the quality of university R&D has received higher appreciation. As the capacity is improving, the focus of research also shifts towards more industrial application. In recent years the DGHE has put considerable attention on establishing and fostering university - industry research collaborations. Although still small compared to the allocation for other activities, the government-research funding has increased more than three-folds in the last 6 years; from IDR. 76 billion in 2006 to almost IDR 290 billion in 2012, in addition to IDR 10 billion for research related to community service programs [DP2M, 2011]. Out of those figures, a significant number of grants are allocated for collaborations with industry and community.

In 2012, DGHE awarded 4,297 grants, totalling IDR. 286,441,722,162 for various grant schemes to researchers in both public and private universities. The distribution of grants in the last five years is shown in figures-4.3. The distributions signify a considerable gap between public and private universities, suggesting either lack of R&D capacities in private universities or focusing more on teaching orientation. A more detailed analysis into the data reveals that even amongst public universities, research excellence is concentrated in a group of elite universities. As shown in figure 4-4, the top five universities consistently dominate DGHE's research grants.

Figure 4.4: Top Seven DGHE Research Grant Recipients [DP2M, 2012]



a) Contract Value *(b) Number of Research Contract*

The ability of winning competitive grants by the top public universities is correlated with the quality of research output as depicted in figure 4.4. The number of patents granted and scientific papers produced by those top universities, as illustrated in Appendix E of this report, indicates the quality and capability of universities as the main R&D institution in Indonesia.

With regard to university-industry collaboration, to promote the relevance of research at university toward the application and commercialization of research output, DGHE facilitates various schemes of university-industry collaborative research grants. Although in general all DGHE-supported research grants are potential for collaboration, two programs are specifically designed to accommodate the needs for university and industry collaboration.

The first program is called RAPID, which is oriented to synergize the university R&D and the industry. Under such schemes the industry will be the entry point for the university researchers to support and supply the technology needed by the industry. Researches under these schemes are grouped into 6 science fields, namely energy, ocean & fisheries, health, agriculture & food, information technology, and manufacturing. RAPID program was first launched in 2007 and is still continuing until today. As illustrated in table 4.3, while universities with strong R&D background continue to dominate this scheme, with regard to the total number of grants in the last five years, the participation of other universities cannot be ignored. It is also worth mentioning that some private universities are also listed as the grant recipients which shows an encouraging fact that they too are able to establish collaboration with the industry.

The Hi-Link program is another form of university-industry collaborative program, which was first launched in 2006. Unlike RAPID, this program also brings Local government as partner in research collaboration. Under this scheme the university is to team up with an SME company in a multi-years research collaboration program, whereas the local government is expected to facilitate its implementation and assure the benefit to society. This tripartite mechanism has been acknowledged as successful by DGHE and the number of grants given to the university has risen significantly.

In addition to RAPID and Hi-Link programs, other grant schemes such as national strategic (Stranas) and Petranas MP3EI also require the university to collaborate with the industry and government agency to conduct research in one of twelve strategic/priority areas. While the number of grants of

these schemes is on the rise, the outcome and benefit of these multi-years programs is yet to be determined.

Table 4.3 RAPID grants distribution 2008-2012 [DP2M, 2012]

Universities	Grants	Value (IDR)	Size per Grant (IDR)
INSTITUT TEKNOLOGI BANDUNG	13	3,584,970,000	275,766,923
INSTITUT SEPULUH NOPEMBER	7	1,756,550,000	250,935,714
UNIVERSITAS NEGERI SEMARANG	6	1,478,500,000	246,416,667
UNIVERSITAS PADJADJARAN	6	1,289,220,000	214,870,000
UNIVERSITAS HASANUDDIN	5	1,281,150,000	256,230,000
UNIVERSITAS MUHAMMADIYAH SURAKARTA	5	1,175,500,000	235,100,000
UNIVERSITAS BRAWIJAYA	4	1,003,800,000	250,950,000
INSTITUT TEKNOLOGI TELKOM	4	929,700,000	232,425,000
UNIVERSITAS TADULAKO	3	809,620,000	269,873,333
UNIVERSITAS MUHAMMADIYAH MALANG	3	790,000,000	263,333,333
UNIVERSITAS INDONESIA	3	708,000,000	236,000,000
UNIVERSITAS MURIA - KUDUS	3	702,500,000	234,166,667
UNIVERSITAS SUMATERA UTARA	2	567,650,000	283,825,000
UNIVERSITAS SAM RATULANGI	2	540,000,000	270,000,000
UNIVERSITAS WIDYA GAMA	2	533,333,000	266,666,500
UNIVERSITAS PENDIDIKAN INDONESIA	2	525,000,000	262,500,000
UNIVERSITAS MATARAM	2	490,000,000	245,000,000
INSTITUT PERTANIAN BOGOR	2	479,700,000	239,850,000
UNIVERSITAS WIJAYA KUSUMA	2	415,000,000	207,500,000
UNIVERSITAS GADJAH MADA	1	299,650,000	299,650,000
UNIVERSITAS SEBELAS MARET	1	287,300,000	287,300,000
UNIVERSITAS JENDERAL ACHMAD YANI	1	275,000,000	275,000,000
INSTITUT TEKNOLOGI ADHI TAMA	1	272,500,000	272,500,000
POLITEKNIK MANUFAKTUR BANDUNG	1	272,100,000	272,100,000
UNIVERSITAS CIPUTRA	1	270,760,000	270,760,000
UNIVERSITAS NEGERI MALANG	1	270,000,000	270,000,000
UNIVERSITAS NEGERI YOGYAKARTA	1	270,000,000	270,000,000
UNIVERSITAS HALUOLEO	1	250,000,000	250,000,000

A similar approach is implemented for university community service programs. Starting from traditional community service program, DGHE initiates S&T based service schemes for the universities to engage with small-medium enterprises and community [DP2M, 2011]. Unlike traditional community service program, under this program the university is to collaborate with the community to establish new S&T based entrepreneurs or to improve the S&T capacity of SMEs (see box: Center for research in Development of Cultural Product – ITB). In addition, Hi-Link is a program with the objective of building capacity of the university in applying S&T through collaborative works with industry and local government [DP2M, 2012].

Center for Research in Development of Cultural Product – ITB

R&D units in public universities are not commonly considered as government R&D institutions. However, because of their strategic role in national R&D, they are often asked to serve the government (central and local) in performing R&D activities for them. One of many good examples of this role is played by center for Research in Development of Cultural Product.

This center was established in 2000 as one of many research centers at ITB, and focuses itself on promoting and developing local and indigenous culture trough the empowerment of small and medium enterprises. In 2009 with the abolishment of the National Design Center in 2009, this institution became an alternative unit to continue the Indonesia Good Design Selection award, which is formerly under the Ministry of Industry and Trades. However, the needs for being independent from the government, position this center as part of ITB, under the coordination of LPPM-ITB.

Currently this center works closely with small and medium companies in the development of design and production engineering of cultural product using locally available material, mainly bamboo and other natural fabrics. With support from engineering faculties at ITB, this center was able to introduce technology into the creation of local cultural product.

4.5 R&D activities in government institutions

In general, R&D in government institutions can be categorized into three groups: *a*) R&D institutions under the coordination of the MoRT, *b*) R&D divisions of technical Ministries, and *c*) Local R&D institutes which are either under the coordination or a part of local government organization. These institutions operate using government budget (central and local)

Research and development activities in government institutions are carried out using government budget (central and local) under the coordination of the ministry or the local government.

4.5.1 Non-ministerial R&D Institutions.

There are seven non-ministerial R&D institutes or government bodies whose activities are under the coordination of MoRT:

- National Nuclear Agency (BATAN),
- Nuclear Energy Regulatory Agency (BAPETEN),
- Agency for the Assessment and Application of Technology (BPPT),
- National Coordinating Agency for Survey and Mapping (BAKOSURTANAL),
- National Institute for Aeronautics and Aerospace (LAPAN),
- National Standardization Agency of Indonesia (BSN), and
- Indonesian Institute of Science (LIPI).

Besides the above-categorized institutions, the government also owns other R&D facilities serving both government and private sectors. The Center for Research in Sciences and Technology or PUSPIPTEK, for example, is an integrated research infrastructure environment with various states of the R&D art activities. This facility also serves other activities, such as for science and tehnology training centers and technology transfers. This institution was established in 1976, and is currently under the coordination of Ministry of Research and Technology. Later it was dedicated to become the model for national science technology park. The ministry of Research and Technology also coordinates and manages the following R&D institutions: Eijkman Molecular Biology Institute, Center for Research in Sciences and Technology (PUSPIPTEK), Agro Techno Park in Palembang and Business Technology Center.

4.5.2 R&D institutions in line ministeries

R&D units at line Ministries are under the auspice of relevant Ministerial organization structure. Their duties are to execute R&D activities relevant to and supporting the main functions of the government ministry, such as R&D units at Ministry of Public Works, Ministry of Health, Ministry of Education and Culture, Ministry of Energy and Mineral Resources, Ministry of Agriculture, etc. The functions of these units vary according to their duties and scope of responsibility of the ministry.

R&D units under the technical / line ministries are responsible for national resources and infrastructures in performing research which supports the development of science & technology, and the development of engineering within the scope of authority of the ministries (Ministry of Energy and Mineral Resources, Ministry of Transportation, Ministry of Health, Ministry of Forestry, Ministry of Public Works, Ministry of Maritime Affairs and Fishery, Ministry of Communication and Informatics, and Ministry of Education and Culture – DGHE). Meanwhile, R&D units under the other government ministries (such as Ministry of Religious Affairs, Ministry of Justice & Human Rights, Ministry of Trade, Ministry of Education and Culture, etc.) perform R&D activities which are focused to support policy formulation for the government ministries..

R&D at the Ministry of Public Works

Ministry of Public Works – MoPW is an example of the implementation of R&D in the government sector. As an institution that is responsible for the planning, construction, operation and maintenance of public infrastructure, although it often relies on external resources, this ministry needs to have its own R&D. Formerly, all R&D facilities under this ministry function as research divisions that serve the technical needs of the MoPW. The R&D units under this ministry are structured according to the technical scope of the General Directorates; 1) Roads and Bridges (BINA MARGA), 2) Water Resource Management (PENGAIRAN), and 3) Buildings and Human Settlements (CIPTA KARYA).

Each Directorate General is supported by several centers giving technical support (BALAI or BALAI BESAR), mainly engineering support for the day to day operation of technical units at central and local level (provincial, district, and municipality). While in the past the main and only function of BALAI and BALAI BESAR was to provide technical solution for the Ministry, with the expansion of works and the limitation of funding and other capabilities, some BALAI and BALAI BESAR have gradually shifted the focus of their R&Ds to areas that are no longer the sole responsibility of MoPW.

Center for Human Settlement or Pusat Pemukiman is an R&D center under the Directorate General Cipta Karya. About 10 years ago this center started to apply research in building construction and other human settlement facilities, such as sanitary system, simple housing, and many others. Unlike the other two Directorate Generals, PUSKIM was no longer the sole entity responsible for the availability of affordable and reliable human settlement infrastructures, as more and more private sectors are investing in buildings and other human settlement facilities. Such a condition enables PUSKIM to compete with the private sector in producing innovations to meet the needs for buildings and human settlements. With JICA's technical assistance, PUSKIM often collaborates with private companies to develop innovative technology. This moves improves PUSKIM's capability, professionalism, as well as the ability generate additional revenue. But this does not come easy.

The leadership of PUSKIM has developed this institution to become a model for other R&D centers and BALAI within the Ministry of Public Works. A strong leadership that believes in the strong value of professional researchers has changed the traditional government employee into professional researchers. Currently this center manages 250 personnel including 80 full researchers at the main offices, and another 340 personnel with 95 full time researchers at its regional branches. With the assistance of AusAID and other grants, PUSKIM regularly provides scholarships for its researchers to get their master and doctoral degrees.

As this institution was able to convince the management of their capability, it succeded in increasing its annual budget from around IDR 50 billion to IDR 100 billion in 2012. With the enactment of Government Decree no 38 – 201, PUSKIM is expected to generate more revenue from external contracts in order to be able to optimize the use of PNBP (non-tax government revenue). In addition, this center is also able to produce, among many others, two prototypes of building/housing construction (RISA and RIKA) which are specifically developed for small and medium construction companies. Its focus on SME is one of the principles that drives the move of PUSKIM to become a professional government R&D institute.

Of course what was successful at PUSKIM would not necessarily be successful in other BALAI or R&D centers as the nature of public infrastructure which is mostly not for commercial proposes still needs government full support and control. Therefore, all efforts similar to those conducted in PUSKIM must be carefully examined before they are applied elsewhere.

4.5.3 Local Government R&D institutes (LitBangDa).

These are local government units the main task of which is to perform R&D activities at local governmental levels (provincial, district, and municipality). These institutes can be in the form of an agency or division within the local government structure, depending on the organizational structure of the local government. These R&D institutes are funded by local government budget, and focus only on the R&D areas that are considered important and/or relevant to the local needs. In performing their duties, these local government R&D institutes often work in cooperation with the local branches of other government R&D units.

To improve the capacity of R&D institutions in Indonesia, the government, through the Ministry of Research and Technology, supports the establishment of Science Parks or Techno Parks, where the productive interaction among researcher industries and community can be facilitated. Moreover, the Ministry of Research and Technology also administers programs for the development of a center of excellence in science and technology. In 2012 grants were given to four institutions: 1) Center for Palm Oil Research, Ministry of Agriculture; 2) Center for Study on Suboptimal Land, Sriwijaya University; 3) Foundation for Tropical Diseases, Airlangga University; and 4) Center for Horticulture Research, IPB. And for 2013 the grants will be awarded to: 3 research centers and 4 consortiums of research centers.

4.6 R&D activities in industries

R&D activities in industries in Indonesia remain exceptional, in the sense that they have not yet become a part of most industrial activities. While many companies, for economic reasons, are more interested in production using imported technology, others have started seeking to find perfection in their products and production process through R&D activities. Some of the reasons for the lack of R&D activities in industries which were gathered during the interview, are due to: a) their not recognizing the availability and capability of local R&D institution, b) available restrictions from principals (overseas company), and c) lack of immediate needs for R&D because the current product and production system are generating good revenue. The last reason clearly resembles the mentality of the industry that prefers short-term economic gains based on availability of abundant resources than investing into long-term added value products.

Table 4.4: Source of R&D budget in Indonesia [LIPI 2009]

SECTOR	Budget (IDR billion)	%GDP
Higher education	1,821	0.031%
Manufactiring industries	880	0.017%
Government	2,019	0.036%
TOTAL	4,720	0.084%

As illustrated in table 4.4, a subtantial share of R&D expenditure is currently taken from the government budget. According to a survey conducted by LIPI in 2009, the total expenditure was as small as 0.084% of the GDP in 2009, which was less compared to the neighboring countries in Asia. While the trend shown in table 4.4; of the share of industrial R&D expenditures in other countries showed an increasing trend, its share in Indonesia was merely 880 / 4,720 or 18.64%.

Palm oil plantation is perhaps the best example to illustrate the situation. It is quite easy for the investor to open new plantations and expect to harvest palm oil fruits which they can readily export at a reasonable price. As long as the land is available, opening new plantation is a promising business, as the cost can be easily covered by the selling of raw materials at an attractive margin. Meanwhile, government efforts to encourage investors to preprocess the crude oil into refined palm oil might not be as attractive, since the additional cost and benefit do not match. As long as

exporting raw materials or crude palm oil remain attractive, research in the area of palm oil processing will not be worth.

However, some individuals still believe that research at any degree will benefit the industry. A simple problem to increase productivity in the harvesting process may need some touches of R&D in engineering. The induvudual who has this problem may go to friends or a university to solve the problem. For example, a professional at one palm oil plantation (CT Argo), who used his engineering knowledge to find solution by applying engineering R&D to solve his problem, constantly maintains networking with his old engineering school (ITB) in order that he can conduct R&D in his work.

A large company such as PT PINDAD might have a slightly different approach to R&D. Having limited in-house R&D capacity, PT PINDAD can ony cope with small production problems. But when it comes into a more sophisticated challenge, it has to seek help from outside; and one of the options is to go to the university. However, university R&D is not always compatible with the nature of the industry, which is highly accurate and require a quick turn around. The university is simply not equipped with instrument and equipment as required by the industry, except in highly specialized institutions such as Polman. This sort of mismatch often leads to dissatisfaction from the part of industry, and as an alternative the industry simply goes and purchases the off the shelve product instead of developing it through a long process of R&D.

PT PINDAD is not an isolated case, as many other similar industries are facing the same problems. Other state owned enterprises, such as PT INKA, PT PAL, has limited R&D capacity and as the demand grows the need for more R&D becomes apparent. Unfortunately, the universities, as the main source of R&D outsourcing are not quite ready either. Not only are they not equipped with adequate facilities if the collaboration went through regular university bureaucratic channels, the R&D process may also be delayed or disrupted.

From the above we can learn that, most if not all university R&D facilities are not prepared to be part of the industry, even at the smallest scale. There is always a gap between the output of university R&D with what the industry needs, and this gap should be narrowed or even eliminated.

Chapter 5. Issues in UIG partnership

5.1 Lack of understanding and mutual trust

We found that too many universities develop their research strategy in isolation from industry, apparently assuming they know what is best for industry and the nation. In some cases, they even look down on industry as 'greedy' or 'lacking idealism'. From the perspective of industry, higher education institutions are an ivory tower, bureaucratic, and too focused on consensus building to be able to provide a useful help. Many academics do not understand the problems faced by the industries, and worse, many industries do not have the capacity to present their problems in a structured manner. The analogy is when a patient comes to the doctor complaining about his/her symptoms, it needs an experienced doctor to conduct anamneses (or analysis) before reaching the diagnosis, as the basis of developing a treatment plan. Both parties are still in the state of *"institutional sphere"* instead of *"consesus space"* lacking mutual trust [Etzkowitz, 2002].

Unfortunately, the government is not in a good position to help either, as both university academics and industrialists are deeply suspicious of government intentions or ability to operate effectively. There is a pervasive lack of understanding about the respective roles and different characteristics of the three sectors, particularly the fact that they could each benefit from different insight and strengths others bring. For instance, universities are not generally 'specialized enough' to be able to solve routine problems or to work under pressing deadlines. Their intellectual resources and creativity are far better suited to solving 'unstructured problems' over a period though in collaboration with industrialists. They would not make a good 'contractor' for simple tasks, they are better as partners for complex tasks. But unless industry understands that, they would not give universities a chance to excel. On the part of the universities, unless academics understand the complexity of industrial operations, and respect what they do, they would equally not be able to grasp the nature of the problems they face.

Part of the problem is the lack of long term commitment from industry, both to stay in Indonesia or to invest in R&D to remain competitive in the local as well as global market. Once Indonesia has industries committed to a given locality for a foreseeable future to achieve productivity that requires innovations and technological development, and if universities can demonstrate expertise capacity in relevant fields, there should be much greater interest on the part of industry to work with universities either as potential partners or as sources of competent human resources, resource for solving their technical problems, or as state of the art laboratory facilities. It is critically important that industry begins to invest its own production-oriented budget including R&D – rather than CSR funds – in working with universities, with professional commitment and interest in the outcome, so that they become true working partners.

PT Semen Padang

PT Semen Padang is the only sizeable industry in West Sumatra, located in the proximity of Andalas University (UNAND). The close collaboration between the company and the Laboratory of Structural Dynamics, Department of Mechanical Engineering was initiated by a professor, who was then just returned from his study in Germany.

Back in 1990s for almost one year he routinely visited the plant without any compensation neither from the company nor from his Department. With a strong support of the then company's Director, Ir Johan Samudera, he had successfully earned trust, not only from the top ecxecutive but also from the middle managers at the floor plant, who are the key personnel in identifying problems. Once the trust is given, the problem identification comes just naturally. Currently he has been considered as an insider, a person to whom top and middle managers consult whenever problems arise, and most of his proposed solutions are accepted. Some successful solutions are currently even duplicated at sister plants in PT Semen Tonasa in South Sulawesi and PT Semen Gresik in East Jawa. In 2011 the partnership between the Laboratory and PT Semen Padang reached around IDR 300 million in contract value.

What is missing is an entry point, or a forum for 'structured encounters' where university academics and industrialists can start building a better understanding about each other's functions and operations, and thereby gain mutual benefits. Many universities around the world recruit academics with industrial experience, or allow their staff to take a leave to work in industries, and regularly have postgraduate students who end up working for industries, and in turn provide a critical link with industries.

Indonesia may need to think about its own alternatives in providing for such an exchange, such as encouraging industry to dispatch its R&D staff to work as special research fellows at universities, developing industrial R&D emersion program for university staff, and providing better incentives for conducting collaborative research. Alumni already employed by the industries could play a critical role in fostering mutual understanding and trust between the two parties. The initiative of one of the largest plantation's CEO in developing various collaborative research and development activities with ITB are examples of such good practices. Such a research is a long term endeavour for which both parties should be prepared for a long-term commitment.

Networking opportunities or structured encounters

It is clear that academics and industrialists live in very differently defined professions, with goals, performance targets, values all differently configured. It is not surprising that they experience 'cultural difference' and find it difficult to understand each other or to work with each other.

There are a number of ways in which individuals can overcome such a cultural gap. One of the ways how induviduals may overcome this cultural gap is by taking the opportunity to work together in a'board'or 'committee'to do some specific tasks. From 'competitive councils' to 'technology foresight committees' there are a number of examples to which individual experts are invited to undertake some common task. These also provide excellent opportunities for individual academics or industrialists to get to know each other, to share their perspectives, and often come to respect each other.

Some organizations deliberately arrange 'structured encounters' between academics and industrialists. MIT's Industrial Liaison Office offers services to set up meetings for industrialists to visit MIT campus to meet academics with relevant expertise. Since this is something that happens on a regular basis with a number of academics visited by industrialists, in meetings small and large, they effectively 'train' young academics to be able to talk about what they do to a non-academic community. They develop ability to conduct what they call, 'dog and pony show' – to be part of a group of academics presenting their research results to industrialists. Over time, these prepare academics to be able to communicate better with industrialists. In Scotland, a non-profit network organization CONNECT used to organize network meetings – for instance, a breakfast gathering where academics were invited to present their research to industrial audience of relevance, mimicking a similar but more entrepreneurially driven meetings in UCLA. Some Japanese universities started out with 'open campus day' events for industrialists so that industrial representatives were invited to campus to meet multiple academics. Over time, the need for structured meetings can change, as networks become denser and other set-ups such as academic or professional conferences develop providing alternative structured encounters, where industrial as well as academic participants meet.

Meanwhile, our study has identified several close partnerships which individual academics have managed to develop through years of perseverance and efforts to win the trust of industries (see boxes: PT Semen Padang and Cocoa Sustainability Partnership). This indicates that there should be a greater effort made on the part of universities, preferably with more adequate institutional support, to engage themselves with industies.

The key question is what kind of research and/or education capacity universities should build, how to make them relevant to the future of Indonesian industry, and whether universities can gain from knowledgeable stakeholders in industry and government. Indeed, international experience shows that proactive universities have done much more to work with industries compared with Indonesian universities.

Many proactive institutions around the world including MIT, have specific units dedicated to ensure strategic contacts with key industries, and its leaders and researchers are routinely engaging themselves in dialogue with industries, through memberships in various boards both within

companies and within universities, through researches and other collaborative projects, through contacts with alumni, and through consultancy work (see box, MIT's relationship with industries).

MIT's relationship with industries [Hatakenaka 2004]

There is a strong belief at MIT that its contribution to society takes place principally through well-educated students. It is widely believed that academics themselves must be intellectually engaged with real world issues if they were to educate students with relevant science in preparation for the changing world. As an institution, they make much effort to this end, through a variety of mechanisms through which they interact with industry.

Industrial liaison program is considered as an 'entry-level' membership programme for companies relatively new to MIT, to get access to academics and research information in return to modest membership fees. It is organized by dedicated professional staff whose job is to connect individual companies with specific academics on the basis of their interest, through arranged visits where company representatives can meet MIT academics. The programme provides some incentives for faculty to engage in these discussions with industry, and has contributed to providing connections to a range of industrialists particularly for junior academics.

Consulting activities

MIT, like many US universities, has a policy that faculty may spend up to an average of a day a week on working as consultants outside MIT, so long as it does not interfere with accomplishing the duties of the institution. What is interesting is that most MIT academics believe that getting engaged in real problem-solving for industry provides a critical feed back into their teaching, keep them abreast of developments in industry and increases their understanding.

Industry funded research projects either by individual companies or by consortia of companies.

This is an avenue through which MIT works with over 1000 companies at any given time. Consortia are membership programs which bring together a group of interested companies to give them access to research results from a given research group. The so called 'industrial affiliate programs' in Stanford, this system of working with multiple companies is often characterized by an advisory group or board with key industrial representatives. It is very helpful in creating access to multiple perspectives from industry on a topic, while preventing the possibility of undue influence by any single company. It also provides valuable network opportunities for companies. However, it is not easy to set up, and is demanding to run – the reason why it helps institutions to develop a certain collective understanding about how to manage well.

Strategic partnerships

In the late 1990s, MIT began developing large-scale, longer-term partnerships with a select group of companies. Today, having strategic partners is a standard practice in large interdisciplinary research programmes, each of which will have a small number of 'strategic partners,' who are more actively engaged in the research programme financially and otherwise. Developing and maintaining strategic partnerships, however, is not an easy task, one in which MIT had to put in significant institutional level effort. MIT's corporate relations office has professional staffs who work tirelessly to identify and attract potential major companies not only for special relationships in research and education such as strategic partnerships but also for enticing corporate gifts and endowments.

Visiting Committees.

Advisory committees including industry representatives are common across universities globally. However, as a couple of former MIT Presidents acknowledge, it is a well calibrated and effective system, which is critical for defining MIT's strategies. In MIT, a Visiting Committee reviews strategic issues related to content and directions of research and education of a department, and reports ultimately to the MIT's Board of Trustees. Each one typically comprises 15-20 individuals, carefully selected by the President, Provost, Deans and Department Heads on the basis of individual expertise and merit, with roughly a third of members coming from industry, a third from alumni and the other third representing the leading lights in academia in that field. They visit the department every year to review education programs and departmental activities including proposals for new developments through a 1-2 day visit, where they meet academic staff, undergraduate and graduate students behind closed doors, so that they can really hear about what is going on in the department. Their findings are reported informally to the president and provost at the end of the visit, and its formal report is sent first sent to the department, discussed by the dean with his/her academic council, and finally sent to the Board of Trustees, where the chair of the visiting committees makes an oral presentation to the Board. In a word of one former President of MIT, "It is much more valuable than accreditation."

The international study visits also confirmed the facts that having such specific units is the key to establish and maintain productive university-industry partnerships. KAIST's OUIC and Tsinghua's UICC have shown to be effective in facilitating the engagement of industry sector with the university' R&D (see Annex VI).

Universities also need to define their mission in the context of MP3EI, i.e. research, professional education, or human resource development through academic education. This might be the hardest task for universities to take, since most institutions unrealistically aspire to become research oriented without sufficient capacity. But once the appropriate mission is defined, resources allocation could be focused to achieve the mission's objectives. For institutions with sufficient capacity to conduct research, activities need to be directed toward more applicable result. The applicability of research result and fundamentalism in research should not be conflicting with each other, since many applicable research results are very fundamental in nature.

5.2 Inadequate institutional framework for culture innovation

The current institutional framework of public higher education institutions is critical for them to engage in serious partnerships with industry or government. According to the prevailing regulations, only the Government of Indonesia has the status of legal entity. Public universities are considered as merely the government's implementing units (s*atuan kerja*), and its authority is granted by the Minister of Education and Culture (MoEC) instead of inherently owned and protected by the law. With such a legal status, collaborations with other organizations are difficult to be sanctioned under the rule of law, and are subject to unduly cumbersome bureaucratic procedures. Particularly serious is the complications around the intellectual property rights and the use of funds.

Without a legal status, universities cannot operate as an effective owner of intellectual property rights. So, to the extent that any discussions about collaboration with industry requires resolution about ownership and use of intellectual property rights, Indonesian institutions cannot meet such expectations. Various 'workarounds' solutions such as setting up separate foundations or companies 'associated' with universities exist, but they are only second best solutions, as there is no systematic mechanism to ensure 'accountability' relationships between a university that does not have a legal independence from the rest of the government and such foundations/companies.

Government fund channelling norms are as onerous. Any external revenues from industry from collaboration has to be deposited in the state treasury, and can be used only after submitting a proposal for approved specific activities, using a standardized tariff. The process is extremely complicated and lengthy. The same issue about complex bureaucratic requirements apply to all government sponsored research grants that are supposed to be used to promote university - industry partnerships. Worse, public funding is today saddled with other bureaucratic problems. For instance, most public funding comes with seriously delayed disbursement (in some cases up to 6 month delay). Funds are subjects to annual disbursement rule, where no funds may be carried across financial years, and creates a serious obstacle to multi years projects which would be the norm for R&D projects. Government standard procurement procedures are often unfit for operational procurement needs of universities, particularly in their needs to purchase specialized equipment.

In order to avoid bureaucracy, many academics opt to carry out industrial collaboration as individuals without involving institutions. Such arrangements are not optimal either for the individuals themselves or for the institutions. Individual contracts leave the academics at risk because they engage in contracts without the benefit of legal counsel, without considerations about liabilities, and without institutional mechanisms to reconciliate disputes. For institutions, it is a serious loss because the rest of the institution cannot benefit from or contribute to the tie, and staff may neglect their regular campus duties. The most serious problem is the fact that the partnership will not become an institutional asset, which means that the partnership cannot grow beyond what an individual academic can offer, and can be lost as soon as the individual leaves the university. This is an ultimate loss for all concerned.

Much more fundamental is the issue of the role and culture of universities. Globally, when universities are considered a critical party in innovation or in UIG partnership, it is because they are

independent knowledge players, capable of generating, reflecting, integrating and disseminating knowledge. They are key players because they bring different insights from industry or government, and are 'creative' in offering unique solutions by generating knowledge. The problem with inappropriate institutional framework is that it does not allow Indonesian universities to develop into full-fledged independent knowledge organizations that universities are expected to be. The bureaucratic regulatory environment affects the very 'mindset' of the academics – to force them to be bureaucratic rather than creative in their contributions. Without an appropriate framework for academic freedom and institutional autonomy, it is not possible for universities to develop into organizations that are guardians of creativity and innovation (see box: Introducing culture of relevance).

Introducing the culture of relevance

International experience shows that there are several avenues through which a culture of relevance may be introduced into higher education institutions.

One avenue is in founding new institutions – particularly as a group. The most famous example is the Land Grant institutions in the US, which were institutions created in the late 19th century to provide key economic functions such as agricultural extension and industrial arts. Their 'founding ethos' has had a powerful impact on their subsequent development. MIT is one example which although a has developed from a teaching dominated technical institution into a world class research university, has a founding ethos of practical relevance which always providie a key guiding principle. Ireland provides a more recent example as they founded multiple new practically oriented education institutions in the 1970s, which collectively pushed other established ivory tower research institutions to pay more attention to practical relevance.

Another avenue is when there is a sense of national (or regional) crisis. Many US universities became more serious about their contribution to the economy during the 1980s when the US was undergoing a competitiveness crisis. In Japan, after a decade of economic stagnation, all the politicians, industrialists and the media urged the universities to become active agents for economic restructuring. The societal needs were so compelling that many academics felt a moral pressure to meet the obligation which is however changing fast now.

A lack of funds can also help push universities to forge ties with industry as they seek alternative funding. Katholik University of Leuven (KUL) in the late 1960s experienced a turning point as it had little funds; it had to become entrepreneurial and work with industry. MIT in its early days had insufficient funds to pay full salaries to professors so that they were encouraged to undertake consulting activities. In the 1980s and 1990s the perception that federal funding was less available caused many US institutions to turn to industry. However money as a driver often leads to only superficial changes. For instance, in many countries, academics moonlight extensively and have extensive ties with industry, and yet their institutions may have little to show in terms of relevant research or updated curricula. The difference between those and 'relevant' institutions lies in the level of organizational commitment; KUL and MIT not only legitimated industrial ties, but actively built them and used them as an organizational mechanism to remain connected to the external world.

Changing academics' attitude usually requires more than changing rules and policies; role models which can provide active support and guidance are an effective route for cultural change. Chalmer University of Technology in Sweden provided one of the early examples for recruiting an industrially active academic to serve as a role model and support particularly for younger academics. More universities are following suit; some through new categories of 'academics' such as adjunct appointments, professors of practice, or entrepreneurs in residence.

5.2.1 Lack of shared vision about the autonomy process

One key issue in the autonomy process has been the availibility of a little shared understanding about what autonomy means in Indonesia. Many academics take for granted that academic freedom and institutional autonomy are already embedded in the existing governance system, and do not understand that the autonomy they enjoy is not legally protected and can be revoked at any time by a change of the Ministerial policy.

There are other misconceptions. Some assume that autonomy is limited to managing financial matters. Others including some officials in MoEC and MoF further assume that the BLU concept could solve the issue of inadequate institutional autonomy. They do not understand that autonomy

in financial management should only be granted if a proper governance system and organizational mechanisms are in place, and such system could only be implemented when a proper legal framework for institutional autonomy is provided.

Some high ranking government officials are still confusing autonomy with privatization, by publicly defining university autonomy as the ability of a public institution to generate revenue to substitute government funds. Such misinterpretation and misunderstanding are also shared by a significant part of the society, demonstrating the ineffective dissemination of the concept of autonomy. Worse, Faculties and Departments are commercializing their education programs by charging exorbitant admission fee to incoming students. Among the smaller group of the society, however, there will be an endless ideological debate between those who consider higher education as fully public good and those who consider it as entirely private good.

5.2.2 Impact of uncertainty in autonomy policy

The recent developments in policies have not only left the university community deeply suspicious of government intentions in the autonomy process, but also seriously undermined university willingness to take strategic initiatives. Since the early 1990s the DGHE had been taking gradual steps to prepare public universities for autonomy, by developing the necessary internal capacity essential for institutional autonomy. The introduction of “block grant” and “budget envelope” in fund channeling marked the fundamental shift in policies. The concept applied in the new funding scheme, popularly called “the new paradigm”, was first introduced by allocating budget for research activities, whereby proponents were requested to submit proposals to be competitively reviewed and evaluated. For the first time in their history, study programs were given an opportunity to develop their own proposals, defining objectives, designing activities, planning implementation and developing its performance indicators. They had to conduct resource planning and implement their plans; this was intended as the critical first step in implmenting autonomy granted to grantees. The managerial impact of competitive grants were significant.

This was to be contrasted against the system where under the government bureaucracy, staff’s accountability is limited to his/her direct supervisor, until the introduction of the new funding scheme. The “stakeholders” was an alien concept to them when the new paradigm concept was introduced, and many confused it with “shareholders”. The civil servant status does not encourage university staff to be accountable to their stakeholders, i.e. students, parents, employers, and public at large. The momentum of preparation for autonomy was strengthened when the Government Regulation PP 61/1999 was enacted in 1999, The culmination of the momentum was reached with the passing of the Law 9/2009 by the Parliament, opening opportunities for all public and private universities to become legal entities.

Therefore the cancelation of the Law 9/2009 by the Constitutional Court had pushed back the efforts for providing institutional autonomy and effectively eliminated the momentum gained. When the higher education experienced a legal vacuum until the new Law 12/2012 was passed by the Parliament in July 2012, the entire sector was in limbo. Even after the Law 12/2012 was enacted, the uncertainty is still lingering on due to the large number of Government Regulation required for its implementation.

The uncertainty of the legal framework and lack of confidence on the government’s commitment to provide institutional autonomy has dampened any appetite for new initiatives in universities. Many institutional leaderships prefer being in the sideline to of leading a new initiative, particularly when they are given the current climate of punitive measures and risk of being indicted. For some such a situation is too much and frustates those who are actively championing to develop partnership with industries. They have given up to use the institutional bureaucracy, and just take the initiative in their own hands. An example of an individual endeavour we found is the initiative of one interviewee in ITB, who holds international patents and has successfully developed cooperation with international industries [Tempo, 2012].

Currently such individual initiatives tend to be discouraged, either formally by university regulations in an attempt to control and discipline its staff, or socially by the academic community who still consider individual initiatives as betraying academic ethics of "disinterestedness". In the academic world, publications are used as performance targets, and industrial collaboration is still considered as revenue generating activities that do not deserve credits. It might be important for universities to provide organizational support to encourage any initiatives, including individual initiative, to develop industrial partnership. Recognition and credits are also needed to encourage champions who have successfully develop partnership with industries. In order to be successful in developing partnership with industries, it is considered important to foster champions within the university environment.

5.3 Financial management

Public universities' capacity to manage its financial resources poses serious bottlenecks for their effective participation in UIG partnerships. Recently, driven by the need to have a better financial control over all units within the university, public university leaderships have been taking steps to centralize management, which is endorsed by the MoF through the requirement to impose a "single account" at each university accounting system. In most cases the system has successfully centralized all revenues that had been scattered over several dozens different accounts. However, most universities do not have yet adequate capacity in effective financial management, including planning, budgetting, disbursing, reporting, and evaluating. Complaints about long and difficult disbursement processes are numerous, demonstrating the insufficient capacity of the universities' central administration to carry out effective financial management. One possible reason is that most financial officers are trained to disburse the budget allocated by the government, without any concern of efficiency and effectiveness, since their performance is measured by disbursement capacity. Another reason is that the government move to fight corruption has driven financial officers to prefer "extreme prudence" actions to taking any risk of being indicted in the future. Clearly, industrial partners are not likely to tolerate such bureaucratic operating conditions.

Under the existing regime of public finance, all revenues in public universities are state revenues. The implication is that all disbursement and procurement have to comply with the bureaucratic and cumbersome mechanism of public finance regime. Moreover, goods procured should become state assets, whilst in most cases the industry demands full ownership of the product prototype (including the goods procured).

Another potential problem is the inability for public universities to undertake fundraising, which is a common practice in the US universities, and increasingly adopted by others. Unless donation is channeled through other separate legal entities, e.g. foundation or cooperative, all the funds raised will need to be deposited in the state treasury, removing any possibility for endowments. But getting around the regulation through a separate legal entity, such as Foundation, does not comply with the norms of good governance.

It is important to note that the success of Tsinghua university and KAIST in developing and maintaining university-industry partnerships depends largely on the ability of those universities in implementing good financial management policy and mechanism at both departmental and university levels. In addition KAIST's OUIC and Stinghua's UICC models, Tsinghua's TusPark is an excellent example on how the university can establish alternative funding generation mechanism. (See Annex VI on TusPark).

5.4 Balancing individual with institutional interest

It is ultimately the individual staff in universities who will develop partnerships with industry and come up with innovations. Institutions, however, have a critical role to play in enabling, facilitating and enhancing what individual staff can accomplish, and through doing so, they also enrich the nature of partnerships with industry.

Researchers and professors at both KAIST and Tsinghua universities are very active and successful in engaging research collaboration with the industry. The keys to that success are the ability of the university to establish policies and mechanism that enable professors/researchers to carry out research within the university premises and facilities without placing too much administrative and bureaucratic burden. Units at departemental levels as well as at university level (KAIST' UOIC and Tsinghua's UICC) have been successful in creating condusive university-industry partnership environment that involves staff (professors-researchers), students, alumni and private/industry sectors (see Annex VI for university-industry partnership model).

Currently in Indonesia, the relationships between 'institutions' and 'individuals' within universities are still not what it should be. Individual academics often have much more freedom in what they do than their peers in more developed systems of higher education. They are free to undertake outside project activities, consulting, teaching in private universities, with almost no time limit or restrictions on the content of activities. Although it has been much improved in recent years, staff absenteeism is still a problem with missing lecturers, but was too often tolerated because of low staff salaries, particularly in relatively lucrative fields, e.g. accountancy, management. Such a situation is not unusual in developing countries where universities do not have organizational capacity to 'manage' the conditions around staff work – partly not only because of their lack of administrative and managerial autonomy, but also because of the lack of institutional capacity to develop and enforce organizational norms and rules. The situation has been improving in many universities, but the problem can still be found in the majority of universities.

As Indonesian economy matures, however, inadequacies in human resource management in universities are increasingly problematic, particularly if academics are to play roles that are so critical in the acceleration of economic development. The recent emphasis on university autonomy, along with the significant increase of staff salaries, have created a new institutional environment in which universities as organizations are expected to be much clearer about what responsibilities individuals in the staff should take to be accountable for the positions assigned within the organization – more specifically, by clarifying how much, and what kind of work they expect from their staff.

The 'norm' to be reached by Indonesian universities over time will probably be similar to those executed by their international peers. They will expect specific time and professional work commitment in exchange for an academic status and salary. This may be expressed in terms of rules and norms such as limits to time they spend outside universities, requirements that some/all external activities must be reported to institutions or even approved by them, and/or rules about conflict of interest and commitment.

However, reaching such a norm is by no means simple. This is because inexperienced institutions are usually too clumsy in developing rules/norms. There is a tendency to impose too many rules too quickly, wtihout adequate explanations to academics to show why the change is needed, or without adequate upgrading of administrative staff to make smooth transitions without becoming a source of intolerable bureaucracy. This issue of administrative capacity is particularly critical: rules can quickly become bureaucratic nightmares, when enforcing officers are unable to be 'reasonable' in making pragmatic judgements about how rules/policies are to be implemented.

5.5 Incentives to promote R&D culture in industry

Another problem industries are facing now is the apparent lack of technology-orientation in companies; however, does this matter considering that Indonesia is now still at its stage of economic development in which industries are on the stage of adapting the existing technology rather than creating new technologies? In our view, it does, because even though our study is limited in scope, we heard too many claims made against a policy environment that was detrimental to long-term technological ambitions in private firms.

We learned from several interviews that several government initiatives to provide incentives tend to fail at the level of implementation for one reason or another. The Government Regulation PP 35 / 2007 on incentive for industries, Presidential Decree Perpres 28 / 2008 on National Industrial Policy, and Law 25/2007 on capital and licensing facilities, are just few examples. The claim against these regulations had been caused by the lack of coordination between sectoral ministries which had resulted in unworkable regulations. In the case of PP 93/2010 - which was the regulation to introduce tax deduction for R&D expenditures adopted in 2010, an interviewee complained that in reality it was difficult to get tax deduction, even with the clarifying decree from the Minister of Finance No 76/PMK/2011 which elaborates procedures of deducting R&D expenditures in the available tax forms. We suspect that a possible reason for this may simply be the inability to make tax officers able to interpret what R&D qualifies. In this particular case, it is possible that implementation capacity will improve over time given that it has merely been a year since the regulations were enacted.

However, the loss of confidence or will on the part of the private companies is also a factor that can perpetuate ineffectiveness of policies. Another example of policy failure was the MoI allocation of IDR 50 billion grant for developing a battle tank technology to one of the state-owned enterprises. The program was endorsed by the President himself, and yet, the company declined the assignment and returned the grant, as in the company's financial report such grants could significantly lower the profit to asset ratio. In this case the risk for the CEO is to be sacked because of this particular criterion.

The government is clearly making consistent effort to create a 'conducive environment' for domestic capacity building. The Parliament has just passed the bill on Defence Equipment that makes it mandatory for the Indonesian Arm Forces to use defence related equipment produced by state owned enterprises. Procurement of imported equipments could only be done when local capacity is not available within these industries. The idea is to make technology transfer embedded in the procurement process – which is a reasonable objective and policy undertaken by other governments with the expectation of being able to contribute to the domestic capacity building among the most technology conscious companies.

However, the lack of confidence in the policy environment is pervasive. Some interviewees pointed out that companies often prefer giving away donations in order to reduce taxable incomes to bothering themselves with cumbersome schemes such as R&D deduction. Donations for sports or scholarships are easier, pose little risk, and improve the company's public image. Investing in R&D activities is risky and requires a long term commitment.

It is clear that the existing competition in the domestic market of manufacturing goods does not create sufficient pressure to the existing manufacturing players to invest in R&D. As for now, wholesaling and retailing are more attractive due to its higher margin and less risks. The policy environment must be much more coherent and consistent and credible to make a cultural change in companies.

5.6 Agricultural based downstream industries

In recent years, Indonesia's exports have increasingly shifted towards agricultural resource-based manufactures and primary commodity exports at the expense of the share of non resource based manufactured exports. The importance of exports of agricultural commodities e.g. rubber and palm oil, has increased significantly as a result of the global commodity price boom between 2003 and 2008. In the last decade, Indonesia's exports of primary commodities have expanded from 15 percent of total non-oil and gas exports in 2001 to 34 percent in 2011 (non-oil and gas exports accounted for 80 percent of total exports in 2011), whilst agriculture-based manufactured exports saw a rise from 18 percent to 22 percent [World Bank 2012].

In the effort to boost earning by exporting more processed commodities with higher added value, the government pushes the construction of new plants for processing raw agricultural commodities. New taxes on the export of primary commodities were introduced, whilst taxes on processed commodities are decreased. The result is a significant increase in the export of processed commodities and a decline in the export of raw commodities, while the construction of new processing plants is booming. In this report we would like to present a case of two different agricultural based primary commodities, namely palm oil and cocoa (see boxes: Cocoa sustainability partnership, and A shift from crude to refined palm oil).

The government incentives for downstreaming seems to work and it is interesting to observe these two distinct strategies: initiative in palm oil industries was primarily taken by the central government and the initiative in cocoa industries was bottom up led by the industries and universities. The central government joined the cocoa initiative at a later stage. University's involvement was mainly initiated by an individual which later acquired support from the Rector.

In the case of palm oil, Indonesia focused on expanding its plantations which has currently covered 8.2 million hectares, about the size of the island of Ireland; however, the cultivation of which is often blamed for destructing rainforests. Despite strong criticism from the world wide environmental organizations of its impact on the environment, the contribution of universities in developing sustainable palm oil industries is still limited. Most new innovations in breeding, harvesting, and processing technology are currently supplied by Malaysia, whilst the role of local government is limited to providing licenses. Expanding processing industries to meet the large domestic demand of biofuel is not attractive due to the current government policy of high fossil fuel subsidy.

It seems that a much more comprehensive strategy is needed to achieve the goal set in the MP3EI as illustrated in figure 2.1. A fiscal policy will only work for short term objectives, and will not attract industries to invest in a long term R&D endeavour as elaborated in the following section.

5.7 Research in biological resources

MP3EI emphasizes that Indonesia needs to move from the exports of natural resources to products with higher value added. MP3EI focusses on some specific industries based on natural resources such as palm oil or minerals, but Indonesia is facing as greater challenge since it is one of the mega-biodiversity countries, with the world's second largest tropical rain forest and strategic marine resources. However, realizing such a potential requires a significant research and development capacity, not only to identify the potential economic use, but also to develop the extraction and production technology, and to take appropriate action for the conservation of biodiversity in order that it remains valuable and sustainable in the future.

Though our study is too limited to fully address the current situation in Indonesia, the few cases that we came across as examples of collaborations between universities and industry around biological resources did not assure us that everything was true. In many cases, we found Indonesian academics playing a secondary or relatively minor technological role. Industries – particularly the multi-national companies - appeared to be motivated to work with universities principally to access biological resources, rather than to collaborate technologically. The bulk of R&D work which produced economic value in terms of identifying the use of biological resources, or in developing production technologies, appeared to come from foreign sources, thus leading to a little value added for Indonesia. Only a handful of such collaborations appeared to be enriching the expertise of Indonesia to do better in the future. The impression of the team was that academics were often engaged in such collaborations without understanding the risk of having potentially conflicting interests among industries, government and society. Individual academics were only too happy to be engaged in projects benefitting their personal academic performance, and institutions were also providing limited support to them to do better or to develop future strategies about building relevant expertise.

Our interviews with experts in relevant fields indicate that there are differences in their view on the adequacy of Indonesia's human resource capacity for R&D in biological resources. Some were pessimistic. For instance, the capacity in R&D for biotechnology that Indonesia had built in 1990s was seriously depleted after the Asian crisis; the leading position Indonesia once held in Asia is in contrast with the current position as it trails behind other neighboring countries. Others were much more optimistic that some established institutions including leading universities as well as national research institutions collectively have sufficient capacity to carry out the needed research and training. It has an adequate number of staff holding PhDs, excellent research track record, and adequate research laboratories, with such resources and capacity that it is considered capable to enter collaborative research activities on biologcal resources.

STORMA

The Stability of Rainforest Margins in Indonesia (STORMA) is a research collaboration project conducted by Bogor Agricultural Universityy (IPB), Tadulako University (UNTAD), Georg-August-University of Göttingen, and University of Kassel, which focuses on integrated concepts of sustainable land use stabilizing rainforest margins - the concepts of which have been identified as a critical factor in the protection of tropical forests. The main sponsors of this cooperation are the Deutsche Forschungsgemeinschaft (DFG), Federal Ministry of Education and Research (BMBF), and Federal Ministry for Economic Cooperation and Development (BMZ) representing the Federal Government of Germany, and the DGHE representing the Government of Indonesia.

The Germany DFG provides research fund for the German's staff and students, including back and forth travel to Central Sulawesi. On the Indonesian side, however, most university researchers had to compete individually for various available research and scholarship schemes provided by DGHE and MoRT, e.g. Hibah Bersaing, BPPS. Since the research topics submitted for funding were not coupled with the project objectives, the Indonesian researchers tend to propose topics that increase their chance to be accepted for the funding. The government scholarship scheme (BPPS) is in some cases also difficult to be synchronized with the initial schedule, thus making many graduate students fail to meet the deadline for getting involved in the project. Such obstacles might have been solved if the DGHE had been able to provide a previlege by allocating a special quota of research grants and scholarship for this project so that the institutions involved were able to play on more pro-active role in finding alternative solutions.

Without specific guidelines requiring a research umbrella as a reference in choosing research topics, coherence is difficult to maintain and critical mass in specific topics is also diificult to achieve. Whilst the personal benefits for individuals involved in the project is undeniable, institutional benefits (except increased in number of PhD holders) seem less than its potential. The inadequate government guidelines and support, as well as insufficient leadership have contributed to the final result.

Our own suspicion is that while Indonesia has certainly a good stock of human capital not only in academic and government research organizations, but also increasingly in active civic organizations, the framework for balancing private economic interests, national economic interests, and conservation needs related to biological resources is yet to be established. The absence of appropriate national framework is partly due to the inadequacies in the international conventions, in which siginificant issues on intellectual property rights surrounding biodiversity remain to be resolved (ICTSD 2010)[16]. We also suspect that the research capacity may be patchy and not necessarily cover the whole spectrum of expertise needed in related domains, with expertise scattered around the country mostly in silos, with insufficient institutional abilities to fill the gaps or to integrate into serious national effort. It is obvious that still a lot of efforts need to be done for capacity building, not only in basic research, but also in institutional capacity building and in the raising of awareness among key research institutions so that the intellectual community can play an evolutionary role which they must play on behalf of Indonesia.

Although the Indonesian Biodiversity Strategic and Action Plan (IBSAP) has been published, the level of compliance is still unsatisfactory. The absence of national framework for exploiting and conserving biodiversity, however, is exactly the reason why there is a critical role to be played by

[16] For instance, issues around revenue sharing of intellectual property rights on rare biological resources between inventors and countries of origin, and issues around traditional knowledge and practices versus IPR.

Indonesia's intellectual community – to help build the needed framework. It is the role of national experts to not only keep abreast of the scientific and technological progress of extraction and production, but also to make significant contributions in R&D to improve the efficacy of such technologies. It is the task of national experts to understand scientific and technological development issues related to conservation and to learn from the rest of the world. It is also their task to be engaged in such activities, by being fully aware of what is at stake for Indonesia. It is essential that more Indonesian academics gain first-hand experience in working with the international community both in industry and academia, in a full range of domains related to biodiversity.

In this respect, the increasing number of international collaborative research projects on biodiversity is a promising trend. However, we also see that in (many) of these projects, Indonesian academics are not yet playing leading or proactive roles. If it were true that well resourced teams from developed countries tended to take a leading role in defining the initiation of a project - which is in reality understandable - Indonesian counterparts would certainly be able to get the benefit. However, what we found was their Indonesian counterparts were not sufficiently resourced to participate properly and benefit fully from such projects.

The government standard guideline currently does not exist or is too general to be used as a reference. The involvement of an established institution is sometimes is in many cases considered a guarantee that national interest will be well protected. But in some cases the legal aspects of research involving biological resources have not been adequately considered in the collaboration, and implications to the community at large have not been well understood by those involved. In such cases institutions involved in the collaboration could play a critical role in filling the gap caused by too generic government guidelines.

5.8 Regional disparity

Geographical disparity in Indonesia is mostly due to the unavailability of social and economic infrastructure in the less developed regions, though the unavailability of natural resources has also a significant impact. Table 5-1 shows the striking disparity in economic development between regions. The highest provincial gross regional domestic product (GRDP) per capita (Kalimantan Timur) is more than 16 times higher compared to the lowest (Maluku Utara).

The most serious challenge is to provide the necessary infrastructure and facilities, as well as teachers in remote and isolated locations. The disparity becomes potentially structural, since school leavers from basic education cannot afford financially and academically to be admitted to better schools in more developed regions, and have to stay at local senior secondary schools with inadequate quality due to lack of quality teachers and sufficient infrastructure. After graduating from the secondary education, they have less ability to compete with graduates from more developed regions to get into quality higher education institutions, so that as university graduates they do not have the capacity to compete for better jobs outside the region. Companies investing in such regions do not have a choice to recruit human resources from other regions, for fear that it may create envy among the locals thus causing social friction. The segregation based on geographical location will then become a threat to national integrity.

Table 5-1: The highest and the lowest per capita GRDP by province (IDR thousand) in 2007 [BPS, 2010]

HIGHEST		LOWEST	
Province	**GRDP**	**Province**	**GRDP**
Kalimantan Timur	70,120.04	Maluku Utara	3,346.52
DKI Jakarta	62,490.34	Maluku	4,377.09
Riau	41,412.85	Nusa Tenggara Timur	4,301.53

5.8.1 Institutional capacity

Implementing the strategies developed by the National Commission on Innovation (KIN), BPPT introduces a pilot program which develops innovations based on the local initiative of a few Kabupaten / Kota (districts). Our visit to Pekalongan, a city in Central Java, reveals that the level of understanding, strategy, implementation, and involvement is still at its infancy. Innovation is perceived by the municipal officers merely as performing better than last year: universities' involvement in conducting policy studies for the local government is still limited, so is the involvement of local industries, while R&D strategies are yet to be developed.

Since Pekalongan is located in a relatively well developed region and is only a few hours drive from Jakarta, it seems that other regions without such advantages are in a worse condition. Perhaps only a few regional governments located in the proximity of more established universities, e.g. Kota Bandung, have already developed an innovation strategy involving universities and industries.

5.8.2 Limited human resources

It would be logical to have a high expectation for university staff to play a proactive role in initiating the innovation in the outer island regions. A significant number of them have been trained in more established universities or even overseas. In most cases universities have the most capable human resources compared to other institutions in the outer island regions. Unfortunately most universities as an institution are still shackled by bureaucracy which believes that it is the individual staff who should take the initiative.

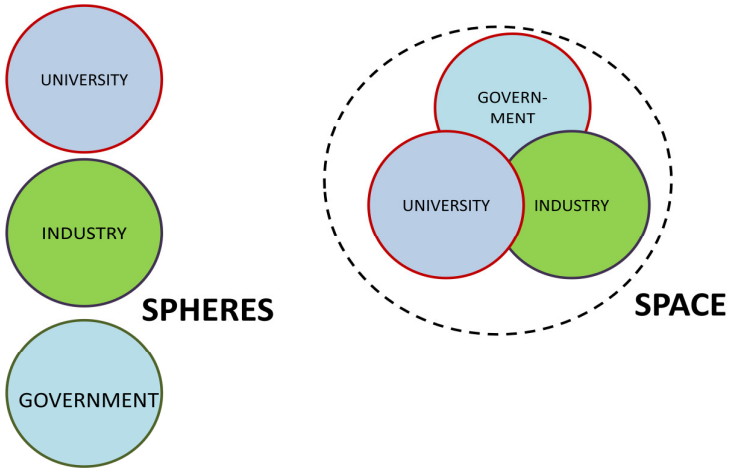
Some individual initiatives from local champions have been quite successful as illustrated in section 5.1 of this report. In the scarcity of highly educated human resources, it is essential to make use of the available local potentials. But it needs outside intervention, such as DGHE, for recognizing the achievement and institutionalizing the mechanism. It also needs a leadership quality to capitalize the fullest of the champion's potentials.

Due to their experiences during their study in more established universities, champions in local universities are in many cases also good teachers. They might have to make difficult choices between teaching students and carrying out industrial related activities. Although there are only a small number of staff holding advanced degree in his/her university, the expectation from the surrounding academic community is high for them to provide leadership in teaching and research. Umfortunately, these local prominent fugures are of the opinion that having a busy and highly demanded career would be much preferable to wasting their time in doing unproductive activities.

Chapter 6. Recommendations

Our study found that the Indonesian government, universities, and industries are still in their respective 'institutional spheres', isolated from each other, and unable to interact productively with each other. A strong commitment as well as hard work is needed to develop the creation of 'knowledge, consensus, and innovation spaces' with greater interactivity, as illustrated in figure-6.1. Much progress has been made in the past decade, with a wider range of experimental partnerships emerging, and with more institutions building capacity to play a more proactive role in fostering better relationships. A decade of exploration has seen some successes, but there is a growing awareness amongst university communities that there are still a host of efforts to be done which require high professionals.

Figure-6.1: Institutional spheres and knowledge, consensus, innovation space



Our conclusion is that developing universities which become strategic institutions has a special significance for Indonesia in its endeavor to develop regional innovation systems. This is because we think it is unlikely that government-led UIG partnerships in a style similar to China would work in Indonesia, due to the countries' different political system. We also think the industrial circumstances in Indonesia makes it extremely difficult to expect industries' leading in this respect. We believe that universities offer the only feasible entry point to push for UIG partnerships which are essential for accelerated and geographically dispersed economic development strategies as outlined in MP3EI.

We would like to recommend our vision for institutional development in the following sections.

6.1 Universities

Universities can offer powerful and unique inputs in partnerships with industry and government. But for Indonesian universities to do so, they must become autonomous institutions capable of developing and undertaking strategic initiatives to work with industry. They must be able to make strategic decisions about what new fields of expertise to build and take steps to create interdisciplinary work environment. They must be capable of creating high calibre support facilities for UIG partnerships and provide better incentives for individual academics to work with industry.

6.1.1 Developing relevant expertise and promoting interdisciplinary works

Universities can be much more strategic to ensure that the distribution of expertise in universities is appropriate to meet the needs of the region and the nation. They can have good mechanisms to keep its academic content current and relevant as many universities do worldwide – by creating new fields based on a sound analysis of societal needs, closing/reducing of out-dated fields, and by

enabling bottom-up interactivity across different disciplines through interdisciplinary work. In many cases universities are eager to open new programs but reluctant to close, merge, or terminate irrelevant programs.

Developing internal mechanisms for interdisciplinary work.

Many universities are undertaking interdisciplinary research and education to address real world issues, but developing internal mechanisms for interdisciplinary work is not easy. American universities have a long tradition of interdisciplinary research units which draw on academics from multiple departments. From Beckman Institutes at the University of Illinois in the 1980s, Huckman Institutes at Penn State in the 1990s, to Bio-X at Stanford in 2000s, larger pioneering interdisciplinary initiatives continue to emerge. MIT's Energy Initiative is an institute-wide initiative to address the world energy crisis. It is not a research institute; it is set of programmes, covering not only research and education but also campus energy management and outreach. In Stanford and MIT, such initiatives today will automatically have affiliated industry partnership programmes – to ensure that interested industrial partners can participate and contribute.

Most industrial problems are so interdisciplinary in nature that a mono disciplinary approach to solution is inappropriate. Therefore the starting point is that university leaders themselves must be in touch with the external worlds – with leading industrialists and government thinkers (see box: developing internal mechanism for interdisciplinary work).

6.1.2 Quality support facilities

Universities must develop 'support facilities' to enable academics to keep in touch with the industrial world. Proactive universities elsewhere have typically a broad range of support offices such as,

- high calibre corporate relations or industrial liaison support office, which help channel relevant industrial contacts to individual staff;
- efficient and effective support offices for administering research and other project contracts;
- specialized expertise to offer realistic advice/services for commercialization activities such as starting up support (which is distinct from student entrepreneurial program), intellectual property protection and management; and
- special facilities such as science parks, incubation or entrepreneurship centres to enable different types of interaction environment

It is critical that the primary goal of such support offices for collaboration must not be to generate revenues. We found many university offices established to develop collaborations, e.g. Vice Rector for Cooperation, with unrealistic targets of revenue generation. Instead of improving its services support indvidual and unit initiatives, many officers responsible for collaboration are pushed to meet the revenue target by collecting "taxes" from subordinate units. While external revenues are certainly one important indicator of universities' external orientation, revenues should never be the objective of partnerships. These officers and units should shift their focus back to its initial mandate, which is fostering and developing collaboration to improve relevance.

6.1.3 Rewarding the champions

Universities must develop appropriate rewards/incentives for individual academics to engage in the desirable type of work. They must create an environment so that "champions" of industrial partnerships are supported and rewarded, rather than being allieniated, as they are often today.

Recruitment as well as promotion criteria must take into account 'relevance' and impact of individual expertise. In research oriented universities, promotion criteria are typically narrowly focussed on internationally peer reviewed publications - however, it is crucial that research expertise is judged more broadly, taking into account any significant industrial projects, commercialization experience and other contributions to the society.

It is not enough to simply add 'patents' or 'spinoffs' to 'publications' as promotion criteria. Successful patents as well as well-cited papers are certainly good indicators for making the first cut judgment; however, any tendency to simply rely on the numbers of such 'products' can and will result in distorted incentives, which encourage staff to indiscriminately file to patents or to artificially jack up efforts to produce more and more international publications irrespective of their true impact or quality. Ultimately, it is essential that universities develop internal capacity to evaluate qualitatively the value of research – and that institutional capacity will be the key asset to be built, if universities are to become key players in accelerated economic development.

6.1.4 Flexible human resource management practices

It is important that universities develop the capacity to manage human resources more flexibly in order that intensive industrial project needs can be met effectively. Most universities around the world has a system of recruiting fixed-term staff for R&D activities or teaching assistance, and have mechanisms to allow their academic staff to take special leaves, to focus their energy on particularly intensive UIG initiatives, short-term work within an industry, or development of spinoff companies. This is particularly important, given that one key obstacle raised by many academics in Indonesia is the heavy teaching load. Flexibility is also needed for providing "professorship" or "lecturership" to industrial R&D staff temporarily assigned to universities to teach and conduct R&D in universities.

In the long term, autonomous universities should be able to make such policies on their own. In the short term, the DGHE needs to facilitate such initiatives by relaxing the mandatory promotion credits for lecturers, or even granting academic credits for successful and high calibre industrial collaborations.

6.1.5 Leadership, strategic and managerial capacity

The ultimate goal is for institutions to create a better environment so that individual academics' efforts are broadly aligned with societal interest and needs. It is essential that university leaders become champions in working with industry, for instance, by proactively reaching out to other leaders in industry and government to work together. Universities will also need to develop central capacity for decision making and management as indicated above. This is not something that institutions can do overnight; rather it is an essential part of institutional development process associated with autonomy.

For most universities, there is a need for certain centralization of control that will be resented by individual academics as well as academic units. But in the case of fostering partnership with industries, universities must develop a better balance between centralizing control and allowing individual academics or units to have the desire to flourish.

6.2 Strategies for central government

6.2.1 Confidence building through structured encounters

The important objective for the central government is to win back the confidence of private businesses. The credibility of government in the eyes of private business leaders is less than expected, shown by the fact that many of them were not even present to attend events organized by government bodies, let alone collaborating actively. We believe that building trust between government, industry and universities requires a multiple action strategy, which in the first instance must be taken by the government.

There must be a national fora where leaders from government, industry and universities meet and work with each other. The recent establishment of the National Commission on Innovation is a critical step in this direction, but we believe that unless the Commission has 'work' to do, and decisions to make, it will be unlikely to be effective in helping bridge the distance across three

sectors. There should also be 'regional fora' bringing together leaders from three sectors at the provincial and kabupaten/kota levels.

Whenever government provides funding relevant to industry, leading lights from industry must be involved in the decision-making process. For instance, if the government is providing strategic research funding, it is critically important that industry leaders are involved in the process of 'fore sighting the future needs of the country.' If the government were engaged in funding UIG collaboration, it would be important for some industry experts to be involved in the process of program design as well as grant award, monitoring and evaluation processes.

We also recommend that governing boards for autonomous universities should include key leaders from industry, which should provide a direct opportunity for them to participate in the governance of universities. All of such 'forums' will provide opportunities for structured encounters across sectors, ensuring better dialogue and understanding across them.

6.2.2 Consistent policies

The government must develop a consistent set of policies and public investments to support the vision of economic growth filled with innovations. The government, in particular, must ensure an effective development of autonomous higher education institutions (as will be discussed in the next section); and promote industries with higher value added, particularly in downstream industries of agricultural and mining products. Affirmative industrial policies are needed to support high value added strategic industries, such as defence industries.

The 'incentive structure,' arising from various taxes, subsidies and licensing conditions must be right to promote private investment in high value added industry, and to create a better environment for Indonesian businesses including some state owned enterprises to compete in more sophisticated products and services. It is also critically important that there are sufficient incentives for foreign investors to work with Indonesian businesses and universities, so that key technology transfer takes place to pave the way for the future. Philantropic donation should be proactively promoted with sufficient incentives, as they can powerfully shape university development, and provide effective alternative to government funding (see box: the role of philantropy)

Role of Philanthropy

Philanthropy can play a critical role in transforming universities to the benefit of society. In the US, foundations such as Ford and Carnegie played a pivotal role in shaping university capacity to undertake 'useful research' in the early 20th century (Geiger 2004). The foundations such as Carnegie, Pugh and Ford continue to play critical roles, as they have been powerful in shaping and disseminating best practice in teaching and learning between 1985 and 2010 (Brint 2009). In 2012, philanthropy contributed a lion's share with 30 billion USD raised by colleges and universities in the US in 2011 (CAE 2012). Stanford University, the top performer in fund raising in 2011, managed to do so through a powerful campaign, which 'sells' institutional vision to develop critical capacity to meet societal needs.

6.2.3 Increase R&D funding

The government must dramatically increase and revamp its investment in R&D. It is urgent that the current low level of government R&D spending must be corrected. As stated in the MP3EI, the country's R&D expenditure will be increased from the current 0.084% to 1% of the GDP in 2025. In addition, it is equally important to develop the 'right structure' for channelling government funding to avoid expensive waste of financial resources. It is quite improper that the government pays for R&D in its own dedicated laboratories; therefore, it is essential that 'roles' of such government laboratories must be carefully defined to be truly supportive for innovations in private businesses, and to be complementary to what universities can offer. The significant amount of government R&D funds must be spent for laboratories outside government laboratories in order to be able to develop a more generic capacity for research and training in universities, and to develop key linkages with the private sector.

Government fundings are the most appropriate for the following five types of funding which support innovation agenda, particularly to support the development of innovative universities.

- Significant funding can be provided either to fund or support cultural change in existing universities. In England in the late 1990s, competitive grant programmes were introduced to encourage institutional experimentation and innovation in so called 'third leg' activities. These programmes have since then evolved into a formula-based allocation, and cultural change is now explicitly recognized as being a major objective of the funding.
- Governments should fund basic science relevant to strategic fields of application. There are different ways of doing this. Foresight programmes have become widespread, starting from the Japanese experience; the US approach of having diverse mission-oriented funding agencies is another.
- Governments should serve the needs of intelligent customers for the public goods and services that universities can provide. The Department of Agriculture (USDA) and the Department of Housing and Urban Development (HUD) in the US provide good examples of funding made available for universities to provide services to the relevant communities (e.g. for agricultural extension or for community development).

Diverse R&D funding in the US

The US has an extraordinary environment in which R&D funding is made available through diverse avenues. In the early 20th century, a group of corporate foundations emerged to become effective sponsors for university research, thereby consolidating their capacity for research useful to the society (Geiger 200?). Subsequently, many US government agencies also developed to become critical clients for strategic research, creating a funding context in which universities were pushed to conduct 'relevant research' (Geiger 2004, Mowery et al 2004). From energy to agriculture to housing and urban development, there is a dominant culture among government departments to invest in research and experimentation in universities – not just to contract out studies. When the Department of Homeland Security was established in the aftermath of 9/11, one of its early activities was to invest in basic research – to create the basis for future technologies. Together with private foundations, which have an even longer history of funding universities than the government, these agencies collectively represented future technological and social needs for research for the nation.

What is particularly interesting is the fact that diversity of funding sources also mean diversity in the way in which they select what to fund. The Defence Advanced Research Projects Agency (DARPA) is a particularly interesting funding body which has helped US universities engage in strategic research.[17] Its funding is characterized by programme directors (who are themselves scientists) who have a powerful influence not only in deciding what to fund, but in setting the directions for research through key interactions with scientists. DARPA is designed to be risk-taking and forward looking – and indeed its funding has led to many practical innovations whose influence has gone well beyond military applications. It is very different from research funding determined by academic peer review which tends to be conservative with respect to breaking into new fields or promoting selective applications. Peer review by other scientists can ensure that good single disciplinary science is supported, but the results are often an under-investment in interdisciplinary research and a lack of strategic interest in practical applications. The role played by the Defence Advanced Research Project Agency (DARPA) in funding application oriented basic research was legendary; so much so that the American National Academies recommended a creation of a 'DARPA-like' agency in energy to ensure the continued competitiveness of US science (NAS 2007). ARPA-E was created precisely for that purpose in 2007 – and today invests in research seeking to make fundamental breakthroughs in energy.

- Governments should support key interactions between universities and industry, particularly with small businesses. This provides experimental opportunities for companies to engage in research and to work with universities. In the US, Small Business Innovation Research (SBIR) provides financial support for small businesses to engage in R&D, and each of the multiple funding agencies designates a small proportion of their funding for this purpose. In the

[17] Although the organizational direction of DARPA has not been stable over time – it has had its own fluctuations and changes [ref].

Netherlands, the government offers a voucher support for small businesses to be able to gain consultancy help from universities. It also helps the process of cultural change in industry – including the need to change their mind-sets about the role of science before they can be active participants in collaborative work.

- Governments should subsidize the development of future scientists and engineers so that there is a sufficient supply of well-trained scientists and engineers who can work in industry as well as in academia. This means that it is important to provide funding for research postgraduate students, particularly for S-3 students. There is a great difference for example between the US, where any bright student could hope to get financial support for S-3 study, and Japan, where students have to pay to continue their graduate study. In the former, a large number of S-3s were produced as early as in the 60s, creating 'real world markets' for S-3 graduates which resulted in the overproduction of S-3s. The result was that many S-3s left academia to join industries and government, which in turn leads to a creation of a better absorptive capacity in both spheres. In contrast, in Japan, S-3 studies have remained a narrow pursuit for those who are academically-minded as they are often expected to inherit particular academic positions. Industries have typically recruited bright but less qualified candidates for all positions, including those of research.

6.2.4 Channeling government funds effectively

It is clear that government funding of UIG collaborations will be of critical importance in the short to medium term. And yet, industries are particularly sensitive to 'bureaucratic requirements' around government funding because they are impatient for faster turnaround, have far more demanding deadlines, and do not have enough patience to work with academics who are burdened with bureaucracy. It is essential to use the block grant scheme for channeling any government funds to support industrial partnerships.

In the long term, when all higher education institutions operate in an autonomous manner, it is clear that block grants will become a norm implemented without problem. During the transition period of autonomy process, there will be serious issues, as government use of block grants is limited to "*bantuan sosial*" scheme, which can be used only for universities with the status of legal entity (PTN-BH)[18]. For the other public universities not included in this schemes the funds from industrial partners also meet onerous requirements as they are deposited as non tax state revenue (PNBP), and are subject to all public financing regulations.

In the near future, we recommend that the government take steps to create certain work relevant to:

- Creating 'research' as a single budget line item so that expenditure within such a cagetory can be flexible – as proposed by DGHE
- Creating 'Fraunhoffer' type legally separates organization around some target institutions so that they can undertake specific industrially relevant activities with universities, with the needed flexibility as those found in Germany. This is a serious option particularly for regions with weaker institutions, which may not be ready for autonomy (although we believe that autonomy is eventually important for all categories of institutions, the newly-established as will as the well-established ones. Indeed, we would argue that autonomous governance and management structure should be built from the start in order that institutional capacity can develop naturally).
- Introducing other 'flexibility' around grants to be awarded to universities for specific activities, such as the ability to spend funds over multiple years, and to get quicker disbursement

[18] Previously called BHMN, and under the Law 12/2012 called PTN-BH

- Taking Initiatives such as the Indonesian Academy of Science's (AIPI) creating a special endowment funding body, outside the government.

The current governance norms rightly discourage "off-budget" schemes, such as funds channelled from different foundations, due to national commitment to good governance. We fully agree with such principles, but universities represent a special case. The government plans to give them autonomy, but the process cannot be made 'hastilly.' At the same time, the nation needs them today to function effectively as 'productive units' similar to state owned enterprises, as they must rapidly develop innovative capacity to work with industry and government to accelerate economic development. 'Workaround' options are essential so that we do not have to wait for another 10 years for all universities to develop into autonomous and accountable institutions.

6.3 Strategies for DGHE

6.3.1 Supporting the development of autonomous universities

It is critical that DGHE demonstrates leadership and commitment to the development of institutional autonomy so that all higher education institutions will have appropriate governance and management arrangements in the medium to long term. It is clear from the Law 12/2012 on Higher Education that dozens of government regulations (PP) have to be designed as follow-ups, and will collectively determine the nature of autonomy process. It is essential that such regulations are consistenly written with the spirit of decentralizing authority and providing greater autonomy to universities. During the transition process, it is particularly important that all officials representing DGHE should have a common understanding and interpretation about university autonomy, and speak consistently about future directions in setting up regulatory frameworks and transition arrangements.

DGHE's role in the internal reforms within universities also needs to be clear. It is important that the government is supportive of the development of better leadership and management structures within universities, which will require certain centralization of power as well as the introduction of new rules and policies. However, its support should be expressed not through mandating detailed rules to be enforced by the central administration, but by making principles clear – for instance, in expecting a dramatic change in the way institutions clarify staff accountabilities and their responsibilities after given recent salary increases, and making additional resources available for the central administration to exercise its allocative functions.

6.3.2 Supporting the improvement of universities in the Eastern regions

It is esential that higher education institutions in the Eastern regions are given a special boost to serve the critical human resource needs of regions essential for the MP3EI strategy. Industries could only operate in those regions when adequate capable human resources are available, and measures such as recruiting from developed regions such as Jawa, Sumatera, and Bali are unlikely to be sustainable as it creates jealousy among locals which becomes the root of social and political problems.

Using economic development plans such as MP3EI as a trigger, DGHE should initiate a significant programme of capacity building for higher education institutions in such regions so that they develop education and research capacity vital for regional economic development.

National experts as well as leading universities in the Western regions would be mobilized to assist such institutional development initiatives with twinning arrangements lasting from medium to long term, and supported with adequate resources to ensure institutional commitment.

Table 6.1: Recommended strategy and its possible mitigation actions

	Strategy	Time frame	Probability of Failure	Impact	Risk	Possible Mitigation Action
6.1	**Universities**					
6.1.1.	Developing relevant expertise and interdisciplinary works	**short**	**Low**	**Medium**	**Medium**	(1) Development and implementation of solid dan consistent university's interdiciplinary academic roadmap; (2) Strating up industrial linkage program
6.1.2.	Quality support faclities	**medium**	**Medium**	**Medium**	**Medium**	Changing attitude and paradigm of supporting administration from revenue to program orientation through training and nurturing
6.1.3.	Rewarding the champions	**short**	**Medium**	**High**	**High**	Developing and implementing policies that to provide reward key players in successful industrial collaboration
6.1.4.	Flexible human resource management	**long**	**High**	**High**	**High**	Development clear, strong but flexible carreer path between academic, administrative posts, and involvement in industrial collaboration
6.1.5.	Leadership, strategic, and managerial capacity	**long**	**Medium**	**High**	**High**	Creating better balance between centralized control, academic units, and individual staff
6.2.	**Central government**					
6.2.1.	Confidence building through structured encounters	**short**	**Medium**	**High**	**High**	(1) Create UIG fora at both central and regional level (2)Secure government funding and policy that would encourage industry to collaborate and conduct R&D
6.2.2.	Consistent policies	**medium**	**Medium**	**High**	**High**	Better coordination to implement policies on R&D to support the achievement of national economic growth
6.2.3.	Increase R&D funding	**medium**	**High**	**High**	**High**	Educate the public to secure government and parliament's commitment on increasing R&D funding up to 1% GDP by 2025
6.2.4.	Channeling government funds effectively	**medium**	**Medium**	**High**	**High**	Pilot program to implement new funding mechanism that allows more flexible fund channelling

	Strategy	Time frame	Probability of Failure	Impact	Risk	Mitigation Action
6.3.	**DGHE**					
6.3.1.	Developing autonomous universities	**Short**	**Low**	**High**	**Medium**	Securing university autonomy through the implementation of policies and regulations that inline with such spirit
6.3.2.	Improvement universities in the Eastern region	**medium**	**Low**	**High**	**Medium**	Maintain government and parliament commitment to improve universities in the Eastern region; develop capacity building program through twinning; creating condusive business atmosphere and infrastructure in Eastern region
6.4.	**Creating better information and strategies**					
6.4.1.	Improving information base in DGHE on UIG	**Short**	**Low**	**High**	**Medium**	(1) Enhance DGHE's units in providing information through better implementation of higher education database (PDPT)
6.4.2.	Strategy for promoting high value added industry and industrial innovations	**Short**	**Medium**	**Medium**	**Medium**	Establish and implement policy and regulations that provides incentive for industry R&D
6.4.3.	Strategy for capacity building in biological research	**Short**	**Medium**	**Medium**	**Medium**	(1) Establish program and R&D roadmap for biological research; (2) Provide assitance for universities to develop their technical and managerial capacities

6.4 Follow-up actions for creating better information and strategies

Our study identified several important gaps in information, which makes it difficult to monitor progress or to develop more specific strategies. Three areas described below require particularly urgent attention on the part of the government.

6.4.1 Improving information base in DGHE on UIG

Our study found that there was no comprehensive data or information available at the national level to gauge the level of university engagement in UIG partnerships. For UIG partnerships to become an important policy objective, it is essential that the government develops a better information base to monitor progress. The first step is to change financial reporting requirements in order that 'contract and grant revenues' can be separated both by nature of incomes: separating R&D contracts and grants from other incomes, and by source: separating those from DGHE, other governments, and industry. Steps to develop such information base can be taken immediately, though it may take some time before the quality of information becomes adequate.

One viable method to information improvement is to conduct a periodic and repeated survey of all public institutions and select a good sample of private institutions (perhaps selected on the basis of their excellence in accreditation). This is the route taken by the UK universities with which an annual survey helps create viable metrics for university to work better with industry and community. For Indonesian universities, such an effort will have an added value of informing university communities about valuable activities, including setting up support offices, providing better incentives for academics, and developing specific arrangements to work with local industry. What we expect first from such surveys is the need to include significant qualitative components to ensure that surveys go well beyond 'bean counting' and to conduct the survey perhaps every five years.

6.4.2 Strategy for promoting high value added industry and industrial innovations

There is a significant concern about the lack of industrial interest in the R&D or the moving to a higher value added production. Our impression from various industry representatives is that it is not a simple task to provide tax incentives on R&D, or develop a better environment for intellectual property, but there is a much broader issue of 'incentive structures' that results from a wide range of industrial policies. It is also the case that while there is a 'belief' that there are hardly any R&D in industry, there is paucity of information about the true state of industry-based R&D. Our own interview revealed that industry consists of a wide range of sectors, rangging from food processing, defence, palm and cocoa plantation, to pharmaceutical industry to be conducting something like R&D. To develop proper strategies, it is essential that a much more comprehensive study is conducted to capture the changing state of industrial R&D and their constraints.

6.4.3 Strategy for capacity building in biological research

An important subset of Indonesia's innovations in the future will have to do with research around its rich biological resources. It is not clear that there has been sufficiently focussed efforts made to upgrade biological research capacity in Indonesia. This is an urgent need, given the way in which biological sciences are changing rapidly around the world today. One possible step will be to conduct an expert commission on the capacity building of biological research, involving international experts, to develop a national strategy and an investment programme.

6.5 Proposed funding programs

In financing UIG programs, the government should not be the only source of funding. Indeed, universities should be encouraged to raise funds from multiple sources for the development of relevant research and education capacity building. Fundraising is a powerful mechanism to align

university capacity and societal/industrial needs, because when universities ask for funding, sponsors will naturally demand explanations as to why and what the money will be used for. For instance, endowed chairs for professorships is a mechanism used in many countries, often extremely useful for creating new academic positions designated to specific fields of key relevance to industry/society. Certain proportion of government funding of UIG should be made conditional upon matching funds from industry.

The DGHE as well as MoRT have implemented quite a few of different ideas in its offered grant schemes, including several ongoing programmes that encourage team level research collaboration with industry, establishment of entrepreneurship centres as well as centres of excellence. Our recommendation is first to make existing grant programmes much more usable as outlined above in the section about fund channelling.

We believe that the most urgent need is to promote a new culture of industrial engagement and relevance among universities through the reintroduction of competitive funding. The use of competition is important as it provides incentives for institutions to innovate. The specific requirement that proposals be developed in consultation with industrial stakeholders and government officials for all programs will also help push collaborative planning for institutional development.

6.5.1 Capacity development grants

6.5.1.1 Programs description

Some of the funding programs can be started immediately; we recommend a certain sequencing of grant programs to ensure effective preparation and implementation, as elaborated in the following section. We recommend the following types of programs,

a) Individual level – short-term fellowships (up to 12 months). It is critically important to provide opportunities for individuals to have a first-hand experience across sectors – particularly during the early formative years of in their careers, so that they gain an insight which they would otherwise not have as university academics or industry experts. To this end, two types of programme are recommended:

    - **Program-1: Pre-PhD exploration grants** for students to have a short-term exposure in local industry before they go abroad to undertake a PhD study. The size of the grant should not exceed IDR 40 million per person year.
    - **Program-2: Industry university exchange** for young academics to have one or two short stints internship in local industries, or for staff from industries to have a short-term R&D assignment in a university to develop specific expertise or to undertake projects. The size of the grant could be up to the order of IDR 40 million per person year.

b) Institutional level grants would include:

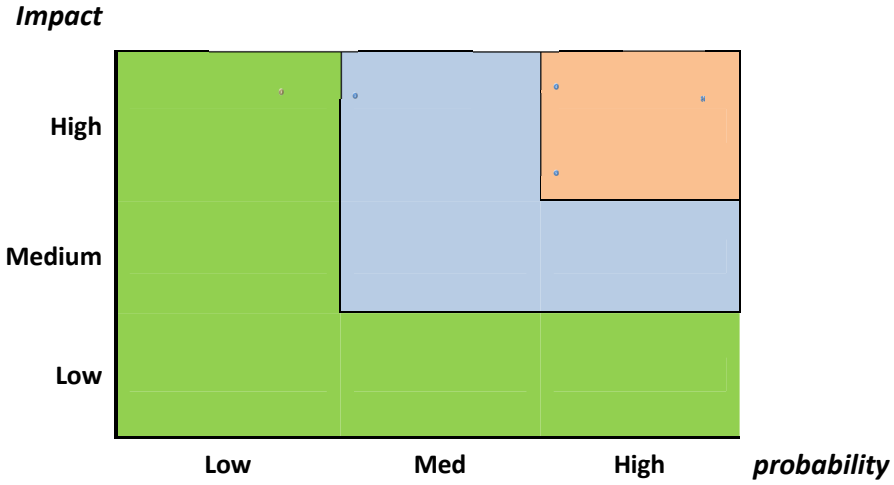
    - **Program-3: Small proposal development grants** to be given to units to develop full institutional development plans and proposals to become better linked with local industry needs. Funding support will be given to personnel (time support) for systematic interviews with local industry, examinations of different options and feasibility studies. The size of the grant should not exceed IDR 200 million and should last for 6-10 months. This program actually 'funds' the development of 'full proposals' which will then be able to be funded under Program 4 and 5. Preparation of detailed guidelines for pre-proposal development of this program and review mechanisms involving industrial experts can start immediately. Pre-proposal solicitation process and award will begin as early as 2013.

Table 6.2: Recommended new funding programs for UIG

	Program/grant	Fiscal year	Beneficiary	Type of grant	Objective	Duration	IDR	Eligible components
1	Pre PhD fellowship	2015	Individual S2	Competitive	Provide support for S2 staff to find relevant R&D topics in industries for his/her S3 study	< 12 mos	< 40 million	Fellowship for internship, small R&D grants, additional training
2	Industrial fellowhip	2015	Individual	Competitive	Provide support for exchange: academics work in industries or industrial R&D staff work in universities	< 12 mos	< 40 million	Fellowship for internship, small R&D grants, additional training
3	Developing strategy for institutional UIG partnership	2013	Unit, Lab., Dept., Faculty	Proposal based	Seed money for developing strategy	1-2 yrs	< 200 million	Domestic technical assistance, travel, training, workshop
4	Strengthening UIG support facilities	2014	Unit, Lab., Dept., Faculty, university	Competitive	Strategy development, staff training, workshop, technical assistance	1-2 yrs	< 200 million	Technical assistance, travel, training, workshop
5	Capacity development grant for UIG partnership	2014-2018	Unit, Lab., Dept., Faculty	Competitive, proposal based	Tiered grant support for units for improving capacity to work with industry in education and research	3-5 yrs	15-20 billion	Pre-PhD fellowships, domestic and international graduate fellowships, R&D grant, technical assistance, travel, twinning program, laboratory equipment, industrial exchange

Table 6.3: Risk and impact assessment of the recommended funding programs[19]

	Program	Time frame	Probability of Failure	Impact	Risk
1	Pre PhD fellowship	Medium	Low	High	Medium
2	Industrial fellowship	Medium	High	High	High
3	Developing strategy for institutional UIG partnership	Short	Low	High	Medium
4	Strengthening UIG support facilities	Medium	Medium	High	High
5	Capacity development grant for UIG partnership	Medium	Medium	High	High



[19] Mitigation actions are presented in section 6.5.1.2 and 6.5.2

- **Program-4: UIG support facilities grants** to be given to institutions with a plan to upgrade or create administrative support units for better UIG partnerships (see Annex V). These could include corporate relations or industrial liaison offices, technical transfer offices, entrepreneurship centres, science park planning and management and incubation support. Funding support could be given for expenditures such as, professional staff recruitment/training, short-term experts, equipment and facilities, studies. The size of the grant should not exceed IDR 200 million and should last for 2-3 years.
- **Program-5: Capacity development grant for UIG partnership** to be given to institutions to develop centres of excellence in a field relevant to the target industry, which may be local/regional for most universities, and national/international for some institutions. Any successful proposals must demonstrate involvement and support of local industries and government. Funding support will be given for, among others staff training/scholarships, research grants, laboratory equipment, twinning arrangement, short-term experts, and other facilities. The size of the grant should not exceed IDR 15-20 billion, and should last for 3-5 years. A detailed description of this program is presented in Annex IV of this report. Grantees in this program are grouped into the following 3 tiers based on the following aspirations:
  - Tier 1: those aspiring to work with local (or potentially local) industry and government to provide relevant undergraduate and diploma level education
  - Tier 2: those aspiring to work with local (or potentially local) industry and government to develop strategic R&D capacity to address emerging or future industrial needs of regions
  - Tier 3: those aspiring to work with national and international industry and government to develop S2 and S3 programmes relevant to industry so that they can contribute to R&D capacity development of industry

We expect that the capacity development grants for UIG partnership (program-5) will be jointly supported by the government fund and contributions from local industries as well as government. To ensure organizational accountability as well as capacity to create interdisciplinarity, it may be worth developing new units/organizations akin to Fraunhoffers in Germany to interface university work with industry, with a separate governing structures, such as a governing board established to monitor the implementation of grant related activities. The institutional arrangement shall be in such a way that the financial management is in compliance with the prevailing regulation, while at the same time provide sufficient felxibility for the implementation of the program (see section 6.5.2).

A piloting exercise will ascertain the needs of tier II institutions with identification through open solicitation of interest to participate in the pilot phase. Special invitations should be given to the following potential candidates identified by this study:

- CSP (Cocoa Sustainability Partnership) in Makassar with Universitas Hasanuddin as its anchor;
- There were other possible candidates visited by our study, such as UNAND, ITB, UI, and UGM, but we have not had the opportunity to explore and deepen our analysis yet.

6.5.1.2 Necessary steps in preparing UIG grant programs

The abovementioned programs as well as Annex IV and V provide a blueprint for capacity development grants, the details of which will need further elaboration for implementation. One aspect which requires particular attention during such a preparation stage is the design of potential technical assistance as well as twinning arrangements to be provided to weaker institutions.

While we expect tier 3 institutions to be able to identify their own technical assistance needs as well as potential foreign collaborators as part of the proposal development, we are less certain of such prospects either for Tier 1 or 2 institutions. For Tier I institutions, we expect that a structured technical assistance seems to be needed during the whole proposal preparation process as well as implementation. We expect that technical assistants will be available nationally, and twinning arrangements will likely be less problematic than when they are domestically.

For Tier 2 institutions, the issue is slightly more complex, as the need for applied research capacity will call for the involvement of international experts and twinning arrangements. It is also not clear how well the 'local collaborative discourses' across three sectors will work to identify the focal areas of research capacity to be developed. We therefore suggest some form of piloting exercise involving several potential candidate instituions to make the program design tightened to meet the reality.

In the selection of pilot elements, we recommend a simple open process of pre-proposal solicitation from eligible institutions, for which they are required to indicate:

a) the expected area where they want to develop their research capacity,
b) the rationale, and
c) the track record of work with industry and local government.

Our study has identified a couple of potential candidates for such pilots who might be included in the pre-proposal solicitation. However, they could not be directly selected as pilot as our study was by no means comprehensive, and we have no idea to which extent these elements are representative. The open preproposal solicitation process has an added value of providing a better national picture of the state of UIG partnerships in Eastern islands.

Fellowships to be awarded for individuals look simple, but their implementation entails two issues:

(a) the extent of 'subsidy' to the industries in accepting young academics/graduates or for sending their employees to universities; and
(b) the worthiness of beginning to 'invest' in such activities without any institutional readiness.

While it is possible to start such programmes on a small experimental basis, a simpler option is to start supporting such activities as part of institutional grants for capacity development, and to gradually develop separate programmes for them as experience grows nationally.

6.5.2 Institutional arrangements for channelling UIG partnership grants

We believe that government funding to encourage UIG partnerships with universities should be channeled through institutional arrangements, the input of which reflects the input of the industry. For instance, a significant funding program may have a high level decision-making board including industrial leaders whose views are reflected in the strategic directions and design of funding programmes. Industrial representatives may also become key members in 'selection commissions' and take part in review of grant proposals.

In the short to medium term, however, it is not easy for government agencies to identify individuals who are suitable for undertaking such functions. We therefore recommend that the design and implementation of the above capacity development grant programs be actively used to identify such candidates, by engaging multiple industries both during program preparation as well as piloting and implementation. The cultural change programs is suggested to be initiated by DGHE, but with a concerted effort to ensure that industrial views are solicited in (a) program design through individual consultation with industrial experts; (b) selection, monitoring and evaluation by experimental engagement of industrial experts; and (c) individual grant proposals, through requirements that universities cannot submit proposals without consulting the stakeholder industry.

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Appendix A: *Projection of self generated revenue in 2012*

in IDR billion [Dikti, 2012]

BHMN	Sources of revenue			Total self generated revenue	Percentage of contract
	Student	Contract	Others		
INSTITUT PERTANIAN BOGOR	322,240	0	0	322,240	0.00%
INSTITUT TEKNOLOGI BANDUNG	590,021	123,850	42,736	756,607	16.37%
UNIVERSITAS AIRLANGGA	293,162	72,788	1,990	367,940	19.78%
UNIVERSITAS GAJAH MADA	709,735	100,000	213,645	1,023,380	9.77%
UNIVERSITAS INDONESIA	891,975	125,973	61,172	1,079,120	11.67%
UNIVERSITAS PENDIDIKAN INDONESIA	302,037	0	0	302,037	0.00%
UNIVERSITAS SUMATERA UTARA	399,603	25,300	19,372	444,275	5.69%
TOTAL BHMN	**3,508,774**	**447,911**	**338,915**	**4,295,600**	**10.43%**
BLU					
UNIVERSITAS NEGERI JAKARTA	121,743	15,183	148	137,074	11.08%
UNIVERSITAS PADJADJARAN	494,428	29,534	113,177	637,139	4.64%
UNIVERSITAS DIPONEGORO	317,046	58,207	30,774	406,027	14.34%
UNIVERSITAS NEGERI SEMARANG	86,175	6,246	22,053	114,474	5.46%
UNIVERSITAS SEBELAS MARET	193,725	-	34,884	228,608	0.00%
UNIVERSITAS JENDERAL SOEDIRMAN	116,136	30	3,468	119,634	0.03%
UNIVERSITAS NEGERI YOGYAKARTA	139,305	11,000	18,485	168,790	6.52%
INSTITUT TEKNOLOGI SEPULUH NOPEMBER	150,599	73,677	23,249	247,526	29.77%
UNIVERSITAS NEGERI SURABAYA	117,098	43,676	7,188	167,961	26.00%
UNIVERSITAS BRAWIJAYA	232,380	171,275	44,783	448,438	38.19%
UNIVERSITAS NEGERI MALANG	147,082	81,426	21,476	249,984	32.57%
UNIVERSITAS ANDALAS	165,232	327	28,567	194,125	0.17%
UNIVERSITAS RIAU	146,766	-	1,050	147,816	0.00%
UNIVERSITAS SRIWIJAYA	209,497	6,520	12,233	228,250	2.86%
UNIVERSITAS LAMPUNG	90,818	-	4,082	94,900	0.00%
UNIVERSITAS MULAWARMAN	127,070	4,210	17,527	148,808	2.83%
UNIVERSITAS HASANUDDIN	185,056	70,000	4,944	260,000	26.92%
UNIVERSITAS HALU OLEO	54,670	1,200	2,146	58,015	2.07%
UNIVERSITAS BENGKULU	82,789	-	1,945	84,734	0.00%
UNIVERSITAS TERBUKA	1,265,590	-	2,485	1,268,075	0.00%
UNIVERSITAS NEGERI GORONTALO	33,126	-	900	34,026	0.00%
TOTAL BLU	**4,476,331**	**572,511**	**395,563**	**5,444,406**	**10.52%**

Appendix B: *Budget channeled as block to be competed internally for research*

in IDR [Dikti, 2012]

	Public university[20]	Alloated for research	Total budget	Percentage
1	INSTITUT TEKNOLOGI SEPULUH NOPEMBER	4,275,450,000	591,524,822,000	0.72%
2	UNIVERSITAS ANDALAS	1,652,244,000	561,552,706,000	0.29%
3	UNIVERSITAS BENGKULU	753,500,000	225,753,396,000	0.33%
4	UNIVERSITAS BRAWIJAYA	4,142,500,000	835,655,163,000	0.50%
5	UNIVERSITAS DIPONEGORO	1,934,500,000	724,023,293,000	0.27%
6	UNIVERSITAS HALU OLEO	1,199,250,000	246,652,997,000	0.49%
7	UNIVERSITAS HASANUDDIN	3,370,000,000	1,054,199,744,000	0.32%
8	UNIVERSITAS JENDERAL SUDIRMAN	1,401,551,000	321,038,910,000	0.44%
9	UNIVERSITAS LAMPUNG	1,531,007,000	306,508,921,000	0.50%
10	UNIVERSITAS MULAWARMAN	517,500,000	305,967,560,000	0.17%
11	UNIVERSITAS NEGERI GORONTALO	507,750,000	291,994,149,000	0.17%
12	UNIVERSITAS NEGERI JAKARTA	740,000,000	500,069,572,000	0.15%
13	UNIVERSITAS NEGERI MALANG	1,325,249,000	438,697,295,000	0.30%
14	UNIVERSITAS NEGERI SEMARANG	1,590,250,000	424,733,134,000	0.37%
15	UNIVERSITAS NEGERI SURABAYA	1,049,000,000	490,985,799,000	0.21%
16	UNIVERSITAS NEGERI YOGYAKARTA	1,215,000,000	367,770,896,000	0.33%
17	UNIVERSITAS PAJAJARAN	4,995,984,000	1,101,278,672,000	0.45%
18	UNIVERSITAS RIAU	955,500,000	349,132,674,000	0.27%
19	UNIVERSITAS SEBELAS MARET	5,221,500,000	657,733,338,000	0.79%
20	UNIVERSITAS SRIWIJAYA	1,362,762,000	444,918,657,000	0.31%
21	UNIVERSITAS TERBUKA	247,500,000	1,423,810,394,000	0.02%
22	INSTITUT PERTANIAN BOGOR	4,352,750,000	630,204,212,000	0.69%
23	INSTITUT TEKNOLOGI BANDUNG	5,433,400,000	840,737,456,000	0.65%
24	UNIVERSITAS AIRLANGGA	4,789,000,000	670,248,086,000	0.71%
25	UNIVERSITAS GAJAH MADA	6,304,000,000	1,503,445,727,000	0.42%
26	UNIVERSITAS INDONESIA	6,304,000,000	1,932,098,130,000	0.33%
27	UNIVERSITAS PENDIDIKAN INDONESIA	1,407,410,000	480,140,259,000	0.29%
28	UNIVERSITAS SUMATERA UTARA	1,665,405,000	673,050,711,000	0.25%
	TOTAL BLU	**39,987,997,000**	**11,664,002,092,000**	
	TOTAL BHMN	**30,255,965,000**	**6,729,924,581,000**	
	GRAND TOTAL	**70,243,962,000**	**18,393,926,673,000**	

[20] No 1-21 are universities with BLU status, whilst No 22-28 are autonomous universities (BHMN)

Appendix C: *List of universities conducting tracer studies in the I-MHERE project*

1	Universitas Trunojoyo
2	Politeknik Negeri Bali
3	Universitas Malikussaleh
4	Universitas Negeri Makassar
5	Universitas Padjadjaran
6	Institt Pertanian Bogor
7	Politeknik Manufaktur Bandung
8	Universitas Negeri Malang
9	Universitas Airlangga
10	Universitas Pendidikan Indonesia
11	Universitas Bengkulu
12	Universitas Islam Malang
13	Universitas Riau
14	Politeknik Pertanian Pangkep
15	Politeknik Perkapalan Surabaya
16	Universitas Negeri Padang
17	Universitas Syiah Kuala
18	Universitas Udayana
19	Universitas Gadjah Mada

Appendix D: *Government budget for R&D in 2012 (IDR)*

		Budget Allocation
A	**Allocation for Ministry of Research and Technology and Other National science and technology Institutions**	
	Ministry of Research and Technology	672,266,000,000
	LIPI	727,928,300,000
	LAPAN	547,120,700,000
	BATAN	659,374,100,000
	BPPT	851,620,400,000
	BAPETEN	84,217,900,000
	BSN	97,996,500,000
	TOTAL	3,640,523,900,000
B	**Allocation for Ministries and State Institutions to Support the Development science and technology and Engineering**	
	Ministry of Energy and Mineral Resources	671,991,100,000
	Ministry of Transportation	207,047,400,000
	Ministry of Health	460,274,600,000
	Ministry of Health	266,339,000,000
	Ministry of Maritime Affairs and Fisheries	536,913,500,000
	Ministry of Public Works	419,822,000,000
	Ministry of Communication and Informatics	163,690,700,000
	Ministry Education and Culture (DGHE – Research and Community Services	693,700,000,000
	TOTAL	**3,419,778,300,000**
C	**Allocation for Ministries and State Institutions for Supporting Policy Formulation**	
	Ministry of Education and Culture	1,304,538,200,000
	Ministry of Internal Affairs	6,347,500,000
	Ministry of Defense	143,810,700,000
	Ministry of Justice and Human Rights	2,026,700,000
	Ministry of Finance	447,612,500,000
	Ministry of Religious Affairs	595,646,000,000
	Ministry of Labors and Transmigration	7,105,800,000
	Ministry of Social Affairs	187,157,500,000
	Ministry of Trade	4,456,000,000
	National Police	5,852,200,000
	National Population and Family Planning Board	8,044,000,000
	TOTAL	**3,002,597,100,000**
D	**GRAND TOTAL (A+B+C)**	**10,062,899,300,000**

Appendix E: *Patents produced and publications by universities*

DGHE's supported patent applications in 2011 [DGHE, 2012]

Universities	Patent granted
Institut Pertanian Bogor	35
Institut Teknologi Bandung	28
Universitas Brawijaya	14
Universitas Gadjah Mada	11
Universitas Sriwijaya	10
Institut Teknologi Sepuluh Nopember	6
Universitas Hasanuddin	5
Universitas Negeri Semarang	4
Institut Teknologi Nasional	3
Universitas Negeri Yogyakarta	3
Politenik Negeri Semarang	2
Politeknik Negeri Bandung	1
Universitas Indonesia	1
Universitas Mercu Buana - Yogyakarta	1
Universitas Syah Kuala	1
Universitas Widya Gama - Malang	1
TOTAL	126

Number of Scientific Articles in Scopus Index

Rank	University	Location	Number of Document
1	Institut Teknologi Bandung	Bandung	2491
2	Universitas Indonesia	Jakarta	2280
3	Universitas Gadjah Mada	Yogyakarta	1375
4	Institut Pertanian Bogor	Bogor	977
5	Institut Teknologi Sepuluh November	Surabaya	597
6	Universitas Diponegoro	Semarang	458
7	Universitas Airlangga	Surabaya	440
8	Universitas Padjadjaran	Bandung	417
9	Universitas Hasanuddin	Makassar	380
10	Universitas Brawijaya	Malang	313
11	Universitas Udayana	Denpasar	295
12	Universitas Andalas	Padang	291
13	Universitas Syiah Kuala	Banda Atjeh	266
14	Universitas Lampung	Bandar Lampung	166
15	Universitas Sam Ratulangi	Manado	137
16	Universitas Sumatera Utara	Medan	135
17	Universitas Trisakti	Jakarta	112
18	Universitas Kristen Petra	Surabaya	109
19	Universitas Sriwijaya	Palembang	109
20	Universitas Riau	Pekanbaru	107

Appendix F: *List of interviewees*

	Name	Title	Organization	
INDUSTRY				
1	Boen Setiawan	Chairman	PT Kalbe Farma	
2	Erik Ridwan Santoso	President Director	PT Sanco Indonesia	
3	Kamaluddin Zarkasie	Vice President Director	PT IPB - Sigata Animal Pharmaceuticals	
4	Mochtar Riady	Chairman	Lippo Group	
5	Maya Ludong	Director	CV Trikora Home Industries, Manado	
6	Jos Luhukay	Director of Technology	National Banking Association (Perbanas)	
7	Mohammad Nadjikh	President Director	PT Kelola Mina Laut	
8	Adik A. Soedarsono	President Director	PT Pindad	
9	Noel Janetski	Immediate past President Director	PT EFM, MARS Incoporated, Cocoa Industries	
10	Christian P. Somali	Corporate Communication Division	PT Indofood Sukses Makmur	
11	Nurulita Novi Arlaida	Corporate Public Relations Manager	PT Indofood Sukses Makmur	
12	Stefanus Indrayana	GM Corporate Communications	PT Indofood Sukses Makmur	
13	Ahmad Firdaus	Director	PT Ecomindo Saranacipta	
14	Nike Farida Poespitarini	Director of Human Capital, General Affairs, Legal & System Development	PT Katim CT Agro	
15	Tony Hermawan	Immediate past VP	PT Astra Agro Lestari	
CENTRAL GOVERNMENT				
16	Kokok Haksono	Chairman	Polytechnic Education Development Unit	
17	Sangkot Marzuki	Director	Eijkman Institute	
18	Nizam	Secretary	Board of Higher Education	DGHE
19	Dadang Sudiyarto	Head of Planning	DGHE	
20	Tatang A. Taufik	Deputy for Assessment of Technology Policy	BPPT	
21	Derry Pantjadarma	Director for Assessment of Competitiveness Policy	BPPT	
22	Dading Ahmad Gunadi	Assistant to the Deputy for Relevance of Research in S&T	MoRT	
23	Agus Subekti	Director of Research and Community Service	DGHE	
24	Subandi Sardjoko	Director Education and Religion	Bappenas	
25	Illah Sailah	Director of Learning and Student Affairs	DGHE	
26	Bambang Indriyanto	Head, Center for Policy Studies	R&D MoEC	
27	Mesdin Kornelis Simarmata	Director, Science d Technology, Industry, and State Enterprises	Bappenas	
28	Usman Ch. Warsa	Board of Higher Education	DGHE	
29	A.A. Ma'tjiek	Board of Higher Education	DGHE	

	Name	Title	Organization	
30	Mahdiansyah	ACDP Team	MoEC	
31	Sabar Budi Rahardjo	ACDP Team	MoEC	
INTERNATIONAL ORGANIZATION				
32	Sutarum Wiryono	Project Officer	ADB	
33	Wolfgang Kubitzky	Principal Social Sector Economist	ADB	
34	Destriani Nugroho	Project Officer	EU - Delegation	
35	Kay Ikranegara	USAID/HELM		
36	Siwage Negara	The World Bank		
37	Christopher J. Smith	The World Bank		
ACDP				
38	Alan Prouty	Team Leader	ACDP	
39	Abdul Malik	Core Advisory Group	ACDP	
40	David Harding	Core Advisory Group	ACDP	
41	John Virtue	Core Advisory Group	ACDP	
42	Basilius Bengoteku	Program specialist	ACDP	
PUBLIC UNIVERSITY				
43	Mohammad Nurdin	Vice Director for Business and partnership	Politeknik Manufaktur Bandung	
44	Suharyadi Pancono	Vice Director for Academic Affairs	Politeknik Manufaktur Bandung	
45	Armyn Langie	Professor	Department of Electrical Engineering	ITB
46	IGA Wenten	Professor	Department of Chemical Engineering	ITB
47	Heru Wibowo Poerbo	Professor	Department of Architecture	ITB
48	Intan Ahmad	Professor	School of Life Science and Technology	ITB
49	Bagiono	Professor	Department of Chemical Engineering	ITB
50	Tutus Gusnidar	Professor	School of Pharmacy	ITB
51	IB Ardhana	Lecturer	Department of Engineering Physic	ITB
52	Trio Adi	Lecturer	Department of Electrical Engineering	ITB
53	Sri Widiantoro	Dean	Faculty of Earth Sciences and Petroleum Eng	ITB
54	Tutuka Ariadji	Vice Dean Academic Affairs	Faculty of Earth Sciences and Petroleum Eng	ITB
55	Eddy Agus Basuki	Vice Dean Resources	Faculty of Earth Sciences and Petroleum Eng	ITB
56	Budi Isdianto	Head	Research Center for Cultural Product and Environment	ITB
57	Srihadi	Dean	Faculty of Veterinary Sciences	IPB
58	Anas D. Susila	Director	ADC	IPB
59	Djoko S. Pamungkas	Director	Primate Center	IPB
60	Lilis Nuraida	Deputy Director	Seafast Center	IPB
61	Nuri Andarwulan			IPB
62	Dyah Iswartini		Biopharmaca	IPB
63	Damayanti Buchori	Lecturer	Biology	IPB
64	Aman Wirakartakusumah	Professor	Food science	IPB

	Name	Title	Organization	
65	T. Basaruddin	Dean	Faculty of Computer Science	UI
66	Abdul Muthalib	Director	Computer Science Center	UI
67	Widijanto S. Nugroho	Lecturer	Faculty of Computer Science	UI
68	Mirna Adriani	Vice Dean	Faculty of Computer Science	UI
69	Yugo K. Isal	Secretary	Faculty of Computer Science	UI
70	M. Ivan Fanany	Researcher	Faculty of Computer Science	UI
71	Hisar Maruli Manurung	Lecturer	Faculty of Computer Science	UI
72	Wisnu Jatmiko	Lecturer	Faculty of Computer Science	UI
73	Zainal A. Hasibuan	Professor	Faculty of Computer Science	UI
74	Yusril Yusuf	Research Institute		UGM
75	Lilik Sutiarso	Dean	Faculty of Agriculture and Technology	UGM
76	Wahyu Supartono	Researcher	Faculty of Agriculture and Technology	UGM
77	Ali Agus	Dean	Faculty of Animal Science	UGM
78	Cahyono Agus	KP4	Faculty of Forestry	UGM
79	Gede Bayu Suparta	Dept of Physics	Faculty of Mathematics and Natural Sciences	UGM
80	Alva Edi Tontowi	Dept of Mechanical and Industrial Engineering	Faculty of Engineering	UGM
75	Sutiman B. Sumitro	Professor	Faculty of Agriculture	UB
76	Djoko Agus Purwanto	Research Institute	UNAIR	
77	Niniek Fajar Puspita	Research Institute	ITS	
78	Dadet Pramadihanto	Director	PENS	
79	Eddy Rasyid	Professor	Faculty of Economics	Unand
80	Dedie Tooy	Researcher	Faculty of Agriculture	Unsrat
81	Jane Onibala	Researcher	Faculty of Animal Husbandary	Unsrat
82	Robert Molenaar	Vice Dean for Academic Affairs	Faculty of Agriculture	Unsrat
83	Arie Lumenta	Researcher	Faculty of Engineering	Unsrat
84	Erny Nurali	Researcher	Faculty of Agriculture	Unsrat
85	Meis Jacinta Nangoy	Researcher	Faculty of Animal Husbandary	Unsrat
86	Jefferson Longdong	Researcher	Faculty of Engineering	Unsrat
87	Romels Lumintang	Researcher	Faculty of Engineering	Unsrat
88	Mulyadi Bur	Professor	Deapartment of Mechanical Engineering	Unand
89	Zaidir	Professor	Deapartment of Civil Engineering	Unand
90	Henmaidi	Researcher	Deapartment of Industrial Engineering	Unand
91	Ramdan Panigoro	Director of Cooperation	Faculty of Medicine	UNPAD
92	Rina Indiastuti	Vice Rector for Finance And Administration	Faculty of Economics	UNPAD
93	Agung Kurniawan	Researcher, Plant Breeding	Faculty of Agriculture	UNPAD
94	Setiawan	Researcher	Faculty of Medicine	UNPAD
95	Arief Anshory Yusuf	Director, Center of Economic Development	Faculty of Economics	UNPAD
96	Miranda Misang Ayu	Head of IPR	Faculty of Law	UNPAD
97	Abdul Madjid Sallatu	Development Economics	Faculty of Economics	UNHAS
98	Deddy Tikson	Department of Sociology	Faculty of Social and Political Sciences	UNHAS

	Name	Title	Organization	
99	Sikstus Gusli	Department of Agronomics	Faculty of Agriculture	UNHAS
100	Salengke	Department of Agronomics	Faculty of Agriculture	UNHAS
101	Baharuddin Hamza	Department of Architecture	Faculty of Engineering	UNHAS
102	Elyas Palantel	Department of Electrical Engineering	Faculty of Engineering	UNHAS
103	Junaedi Muhidong	Department of Agronomics	Faculty of Agriculture	UNHAS

PRIVATE UNIVERSITY

104	Stevanus Hadi Darmadji	Vice Rector Finance and resource development	Universitas Surabaya	
105	Nemuel Daniel Pah	Vice Rector Academic Affairs	Universitas Surabaya	
106	Joniarto Parung	Rector	Universitas Surabaya	
107	Yoan Nursari Sianjuntak	Institute of Research and Community Service	Universitas Surabaya	
108	Adi Tedjakusuma	Office of International Affairs	Universitas Surabaya	
109	Andreas Alfianto	Lecturer	Universitas Surabaya	
110	Dina Natalia Prayogo	Department of Industrial Engineering	Head	
111	Gunawan Tjahyono	Rector	Universitas Pembangunan Jaya	
112	Andre Sugijopranoto SJ	Director	ATMI Surakarta	
113	Saryono	Chairman of the Foundation	INSTIPER Yogyakarta	
114	A Ayusrie	Vice Rector II	INSTIPER Yogyakarta	
115	Idam S. S.	Research and Community Service Institute	INSTIPER Yogyakarta	
116	Sri Gunawan	Faculty of Agriculture	INSTIPER Yogyakarta	
117	Ida Bagus Banyuso P.	Faculty of Agricultural Engineering	INSTIPER Yogyakarta	
118	Nita Ratna Juwita A	Vice Rector I	INSTIPER Yogyakarta	
119	Purwadi	Rector	INSTIPER Yogyakarta	
120	Harjanto Prabowo	Rector	Universitas Bina Nusantara	
121	Iman H. Kartowisastro	Vice Rector I	Universitas Bina Nusantara	
122	Boto Simatupang	Vice Rector IV	Universitas Bina Nusantara	
123	Melly	Vice Rector II	Universitas Bina Nusantara	
124	Stephen G. Kurnia	Institute for Development of Collaboration	Universitas Bina Nusantara	
125	Lily Manoharan	International Collaboration Specialist	Universitas Bina Nusantara	

STUDY TRIP

141	Jeong Guon Ih	Chair, Department of Mechanical Engineering	Korea Advanced Institute of Science and Technology (KAIST)	
142	J.M. Bae	Professor	Department of Mechanical Engineering	KAIST
143	Seung Bin Park	Dean	College of Engineering	KAIST
144	Lu Xiao Jun	Deputy Director, UICC	Tsinghua University	
145	Chen Hongbo	Vice President	TusPark	
146	Wei Zhang	Vice Chair, Department of Industrial Engineering	Tsinghua University	

Annex I: Paper prepared for the 10th Triple Helix Conference 2012

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University, Industry, and Government partnership: its present and future challenges in Indonesia [21]

Bagyo Y. Moeliodihardjo[22], Biemo W. Soemardi[23], Satryo S. Brodjonegoro[24], Sachi Hatakenaka[25]

Abstract

This paper presents the current situation of the university – industry – government partnership in Indonesia, in the context of university readiness to contribute to the government strategy for economic development as outlined in the recent MP3EI (*Masterplan for Acceleration and Epansion of Indonesia Economic Development*) 2011-2025. Since the higher education system is highly diversified in term of its capacity to contribute to the MP3EI, the paper reviews the current status in terms of three different types of institutions: research oriented, production oriented, and human resources development oriented ones.

Initial finding shows that the government allocated very small budget for research (0.08% of GDP) and universities play a critical role in the national research capacity. Although research is still considered as very low in the government priority setting, the number of patents and international publications have significantly increased in the last few years. Collaborative activites have been carried out to date include, service and training, patenting, collaborative R&D, networking events, industrial collaboration for education, incubators, SME support, and science parks.

University and industry appear to be still in the state of *"institutional sphere"* instead of *"consesus space"* lacking understanding about each other. The uncertainty about institutional framework available for universities drives academics to develop partnership with industries individually instead of institutionally. Universities feel that there are only few domestic companies with interest and/or capacity to innovate, with the bulk of industry concentrated in assembly operations. Implementatio of MP3EI outside Jawa might require expertise and capacity that are only available in institutions in Jawa, that it is essential to develop mechanisms for building local institutional capacity.

We conclude that all three institutional spheres require further development before each can take purposeful action. Having said that, the study team found a number of cases whereby the three parties are willing, even eager, to develop partnerships. With an appropriate and comprehensive strategy, there is significant potential to create productive environment potentials could be developed into knowledge, consensus, and innovation space.

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1 Introduction

Today, it is widely accepted that higher education is critical for economic growth and national competitiveness. Excellence in scientific research and better linkages to industry and government are regarded as key policy priorities in practically all OECD countries, with more governments developing explicit innovation strategies with various support programs to encourage universities to take on greater economic roles. Emphasis on university-industry-government partnerships is a global trend not only in OECD countries, but also in emerging economies and increasingly in developing countries.

Indonesia is no exception in this respect. The government of Indonesia has just recently launched the MP3EI (*Masterplan for Acceleration and Expansion of Indonesia Economic Development*), intended to drive the realization of high, balanced, fair and sustainable economic growth, through two key factors, i.e. acceleration and expansion [MP3EI]. Indonesia plans to accelerate its existing development programs, especially in boosting value adding of the prime economic sectors, increasing infrastructure development and energy supply, as well as the development of human resources as well as science and technology. Besides acceleration, the government also pushes for the expansion of economic development so that its positive effects can be felt not only at each and every region in Indonesia, but also by all components of the community across Indonesia. This economic development strategy requires a strong university, industry, and government (UIG) collaboration and partnership. The objective of this paper is to review the current status of universities[26] in Indonesia in terms of their capacity to contribute to this economic development strategy.

In this connection, we use the triple helix model as a framework for our analysis. Etzkowitz extended the triple helix model to describe the development of regional innovation systems (Etzkowitz 2002, Casas et al 2000). According to his model, the three separate institutional spheres, universities, industry and government, operate independently from each other initially. In the first stage of the development of regional innovation systems, the region develops a 'knowledge space', where knowledge institutions begin to concentrate certain R&D activities related to the region, with some networks emerging around them. In the second phase, the region develops a 'consensus space' where actors from three spheres begin work together to generate new strategies and ideas. In the third phase, the region develops a 'innovation space', in which new organizational mechanisms are developed or introduced to realize strategies developed in the previous stage.

The model has also been extended to describe the positioning of the UIG spheres with respect to each other. In a statist regime (Triple Helix I), government plays the lead role, driving academia and industry. In a laissez-faire regime (Triple Helix II), industry is the driving force, with the other two spheres as ancillary support structures [Etzkowitz and Marina, 2010]. In a knowledge-based society, university and other knowledge-producing institutions play an increasing role, acting in partnership with industry and government and even taking the leadership in joint initiatives, in a balanced model (Triple Helix III). In a university-led developmental model, the university takes the lead. The university is the gravitational center that intiates the partnership. In this case, the very first step to come to a productive partnership is to have a preliminary encounter with industry and the government.

The specific questions that we address in our endeavour to develop regional innovation systems across Indonesia in this paper are:

- What stage of development is Indonesia at in creating regional innovation systems?
- Can universities play a leading role in regional innovation systems as in triple helix III?

[26] The term "universities" is used throughout this paper to represent all types of higher education institutions, i.e. university, institute, college (*sekolah tinggi)*, academy, and polytechnics.

Our findings are based on a review of government documents, existing data within Directorate General of Higher Education (DGHE), and preliminary interviews with individuals and focus group representing key players from university, industry, as well as the government. When this paper was submitted, we have conducted in-depth interview sessions with 32 individuals and focus group meetings with 30 persons, and the number will keep growing throughout the study period.

Table-1: Number of interviewees in the study

Public universities	**37**
Private universities	3
Government officials	20
Industries	2

In order to explore the full scope of contributions of higher education institutions for MP3EI, the paper reviews the current status in terms of three different types of institutions: research oriented, production oriented, and human resources development oriented ones.

2 Indonesian higher education system: an overview

The higher education system in Indonesia does not have a long history, but today constitutes a very large and highly complex system, with more than 5.23 million students and gross enrolment ratio of 27.4% [DGHE, 2011]. There are 92 public institutions, more than 3,200 private institutions, dozens service institutions, 52 institutions under Ministry of Religious Affairs, and one Open University. The *Masterplan for Acceleration and Expansion of Indonesia Economic Development* (MP3EI) 2011-2025 sets 6 corridors for economic development, each with its own specific competitive and comparative advantages. The 6 economic corridors are 1) Sumatera, 2) Jawa, 3) Kalimantan, 4) Sulawesi and North Maluku 5) Bali, NTB, and NTT, and 6) Maluku and Papua [MP3EI, 2011]. The distribution of institutions and enrolment is not evenly distributed among the 6 economic corridors, as illustrated in table-2, that a different strategy is needed to foster the UIG partnership.

Table-2: Distribution of higher education institutions in the MP3EI corridors [Dikti, 2012][27]

	Public		Private	
Economic corridor	**Polytechnics**	**Higher education institutions**	**Polytechnics**	**Higher education institutions**
Sumatera	7	16	17	762
Jawa	9	23	68	1102
Kalimantan	2	4	7	84
Sulawesi, North Maluku	4	8	6	336
Bali, NTB. NTT	5	6	11	151
Maluku, Papua	3	5	5	130
Total	30	62	114	2565

The circumstances around higher education funding have changed significantly in the past several years. With the 4th amendment of the Constitution by the Supreme Consultative Assembly (MPR) in August 2000 requiring 20% of the government budget to be allocated to the education sector, the level of funding has increased dramatically. In 2012 the allocated budget for Directorate General of Higher Education (DGHE) has reached IDR 32.6 trillion, almost three folds compared to the 2007 figure of IDR 12.9 trillion, as illustrated in table-3. However, there is considerable concern being expressed within the sector about the effectiveness of such funding increase. For instance, the level of investment increased almost 4 folds between 2007-2012, while the operation and maintenance only doubled. While the four fold increase of self-generated revenues raises the possibility that universities can supplement the shortfall of operation and maintenance from their own resources,

[27] For private institutions: a) 2010 figure, and b) North Maluku is consolidated under corridor 6.

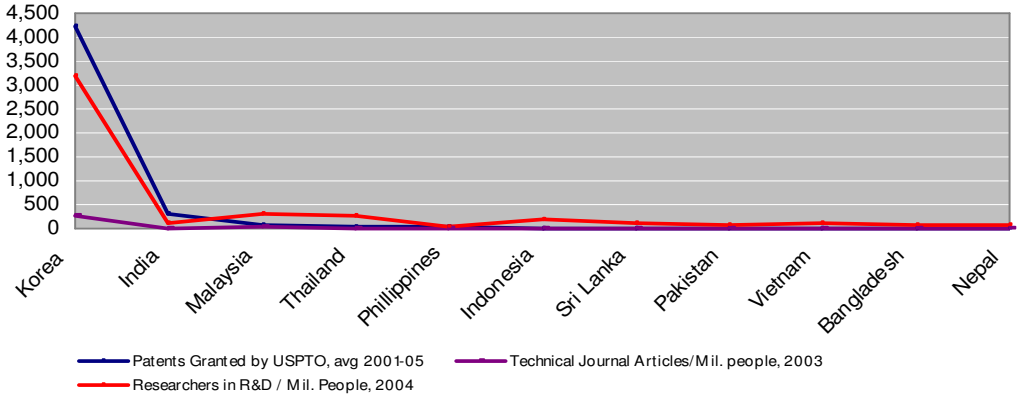
the regulatory environment does not make flexible management of financial resources easy in public universities.

Table-3: Allocated budget for DGHE 2007-2012, in IDR trillion [Dikti, 2012]

	2007	2008	2009	2010	2011	2012
Operation & maintenance	5.062	5.269	6.315	6.849	7.409	9.817
Investment	4.746	4.521	7.380	9.764	10.753	11.672
Self generated	3.150	4.268	5.317	6.627	10.712	11.116
Total	12.958	14.058	19.012	23.240	28.874	32.605

In spite of such a large scale increase in funding, the proportion allocated for the Directorate of Research and Community Services has been low and stagnant for some years at around IDR 436 billion or merely 1.34% of the current DGHE budget. A quick comparison with one leading Indonesian pharmaceutical company, PT Kalbe Farma[28], which spends IDR 200 billion annualy for its research and development [Setiawan, 2012], demonstrates the low level of government funding for research in higher education. Indeed, it is not just funding of research in higher education that is low; the overall government R&D budget is extremely low at 0.08% of GDP [Tradingeconomics, 2012], reflecting the higherto low government priority given to R&D. The low R&D investment has resulted in relatively low number of patents, journal, and researchers, compared to the neighboring countries, as presented in figure-1.

Figure1: Patents, Journal and Researchers in R&D {Watkins, 2007]



Since research capacity is a key factor in the context of fostering UIG collaborations, it is important to take into account the disparity in research capacity among institutions in Indonesia. The first type of institutions is for those who possess a certain level of capacity to conduct research and innovation, and they are mostly located in Jawa. The second type of institutions is the polytechnics, which focus more on production oriented academic activities. An obvious example is the "*production based education"*, currently implemented by the Polytechnics Manufacture Bandung (Polman). Therefore it is important to understand the distribution of polytechnics in the 6 corridors, as illustrated in table-2. The third and the last category is for institutions considered as the main supplier of competent and relevant graduates for the labor market, particularly the industries.

There has been recognition amongst policy makers that Indonesian higher education system is too large a system to manage in a centralized fashion. Therefore the Directorate General of Higher Education (DGHE) has begun to gradually decentralizing its authority and providing more autonomy to the institutions since the early 1990s by introducing the new paradigm concept. The first step was

[28] PT Kalbe Farma is the largest pharmaceutical company in Indonesia

encouraging institutional planning and financial autonomy through competitive grants introduced in the mid-1990s.

Since the year of 2000 the government gradually converted the legal status of 7 public universities into a separate entity, called BHMN (*Badan Hukum Milik Negara*) through the Government Regulation 152/2000 for UI, 153/2000 for UGM, 154/2000 for IPB, 155/2000 for ITB, 56/2003 for USU, 6/2004 for UPI, and 30/2006 for UNAIR. The legal status provides these universities with autonomy and self governance through its Board of Trustees, including managing its own financial and human resource matters. The Higher Education Long Term Strategy 2003-2010 also consistently supported the development of autonomous institutions through its 3 pillars: namely, nation's competitiveness, ddecentralization and autonomy, and organizational health.

To provide a stronger legal basis for autonomy, the Law 9/2009 on Educational Legal Entity was passed by the Parliament in 2009. However, the Law was challenged at the Constitutional Court on the grounds that it introduced legal inconsistency and it was ultimately cancelled in 2010. The recent attempt to pass a new Higher Education bill at the Parliament has been unsuccessful yet, and a new revision of the bill is currently being debated in Parliament.

3 Government policies on UIG partnership

Traditionally, the main role of universities has been to provide education and to produce graduates to meet the needs for the workforce in industry and government generally. Rapid economic growth combined with structural change in industry today, call for greater emphasis on relevance of education, and new needs for research based collaborations. While a vast majority of universities remains focused on teaching, more universities are moving toward research-oriented institutions. To facilitate better interaction with industry and promote greater research orientation, DGHE has consistently launched a number of initiatives to support university research and community service.

Since early 1990s the DGHE has provided more than 20 different grant schemes, ranging from grants for fundamental research to applied and collaborative research. Initially, those programs aimed at improving the quality of higher education through the enhancement of university R&D capacity. Through years of implementation, the quality of university R&D is receiving higher appreciation by industries. And as the university research capacity is improving, the industry is also increasingly demanding for more applicable results from university research.

In recent years the DGHE has put considerable attention on establishing and fostering university - industry research collaborations. Amongst the 12 grants schemes currently administered by DGHE, RAPID (*Riset Andalan Perguruan tinggi dengan InDustri*) is the one specifically designed to foster synergy between the university and the industry R&D. Under such scheme the industry becomes the entry point for researchers to support and supply the technology needed by the industry. At a lesser degree, other grant scheme such as national strategic research (*STRANAS*) also requires the university to collaborate with the industry or government agencies in conducting research in one of twelve research themes [DP2M, 2012a]. In relation to MP3EI program, DGHE also launched *Penprinas MP3EI* which requires collaboration with local governments and/or other government agencies. Although remains relatively small, the government-research funding has increased almost four-fold in the last 6 years; from IDR 76 billion in 2006 to nearly IDR 290 billion in 2012 [DP2M, 2011]. Out of those figures, roughly 15% are allocated for various collaborative research activities.

A similar approach is implemented for university community service programs. Evolving from traditional community service program, DGHE initiates S&T-based service schemes for the universities to engage with small-medium enterprises and the community [DP2M, 2011]. Unlike traditional community service program, under this program the university is to collaborate with the community to establish new S&T-based entrepreneurs or to improve the S&T capacity of SMEs. In addition, Hi-Link is a program with the objective of building capacity of the university in applying S&T through collaborative works with industry and local government [DP2M, 2012b].

Universities are also actively engaged in research activities funded by other government agencies, such as the Ministry of Research and Technology (MoRT). Currently MoRT is administering the National Incentive Research Program, which is divided based on R&D stages (basic, applied, improvement of production system capacity, as well as diffusion and application of research) in 7 areas (food resilience, energy, ICT, transportation, defence & security, health & medical technology, advanced material) and two supporting factors (basic science and social science). The objective of this program is to strengthen the national innovation system in supporting MP3EI. The achievement in this program is indicated by the establishment of centre of excellence in research and the development of research consortium, facilitating improvement of research productivity and effectiveness, as well as increasing participation and investment of private sector. The development of research centres in excellence (CoE) opens to all R&D units, including university, government, and industries [Ristek, 2012]. This program highlights the importance of R&D unit's capacity in absorbing technology, developing demand driven technology, disseminating technology, and utilization of local resources.

Unlike those at DGHE, this incentive research program opens to ministerial R&D units, government research agencies, universities, local government as well as private entities [Ristek, 2011]. Although this program opens to wider applicants, the proportion of university researchers involved remains significant. In 2012, for instance, approximately 51% of incentive research grants were awarded to universities, amounting roughly to 47% of the IDR 90 billion budget [MoRT, 2012].

Aside from the two aforementioned major government-support programs, quite a number of research activities are also conducted by various organizations using various public and private funding. Again, university researchers are involved, either institutionally or individually, in various forms of these activities. Therefore, at least at this current stage, the university researchers are regarded as the most valuable asset for the national R&D.

There are many examples where government-led programs have successfully initiated and fostered UIG partnerships, while many others have yet to deliver satisfying results. Regardless of the outcome, such experiences and recent government attempt to increase R&D capacity should still be considered as important keys for the development of future strategy for UIG partnership. It is also important to acknowledge that the universities, especially individual researchers, are still the engine of research. Unfortunately, the strength of university research is not evenly distributed across the nation, where domination of top universities on the national research programs is noticeable. Consistently, UGM, ITB, UI, and IPB post the highest number of research grants in DGHE program, followed by UNAIR, UB, UNPAD, ITS, UNS and UNDIP. These universities are responsible for about 43% of high profile research activities (RAPID, strategic research, etc.) in 2012. Similar concentration is also apparent on researchers under MoRT's incentive research program.

There have been at least 3 government's attempts to introduce incentives and facilitate industries to invest in R&D activities made to date, though none has been effective. The first is the Law 25/2007 on Investment, initiated by the Board of Investment, provides incentives and facilities for investment, i.e. land ownership, income tax, and import tax, in certain industrial sectors; the second is the Government Regulation 35/2007, initiated by the MoRT, provides tax incentives to drive industries to make investment in R&D; and the third is the Presidential Decree 38/2008, initiated by the MoI, aimed to encourage industries to invest in R&D. The main reason for their ineffectiveness appears to be the lack of detailed implementation planning. While these laws/regulations are presumably established with the best of intensions, claiming any support under them is practically impossible given that applications must take in to account conflicting or overlapping laws and regulations. In the current "reformation era", officials prefer not to take any risks when challenged with conflicting regulations.

4 Current status of UIG partnerships: initial findings

The last decade has seen a significant change in terms of how universities work with industry and government in Indonesia. Traditionally, in the absence of coherent government policies that allow institutions to take proactive roles in orchestrating UIG, many university-industry partnerships have been developed through individual professors largely privately. Since 2000, with the experimental introduction of institutional autonomy in seven top tier institutions, central university administrations became much more active in orchestrating institutional actions, particularly in promoting income generating activities. Sometimes, this was done through the establishment of foundations to facilitate legal and monetary transactions, as the legal basis for such activities were not fully in place. The national context has also been ripe in emphasizing the need for universities to work better with industry, as various government agencies, the Indonesian Academy of Science (AIPI), as well as business organizations hosted events and forums on innovation, entrepreneurship, and partnerships. The result is a diverse array of activities emerging as various types of institutions began to explore different options to pursue new relationships with industry.

Activities that are emerging include:

More service and training contracts: A number of universities have stepped up effort to procure service and training contracts with various government and industrial clients. The desire to generate income prompted by the move to autonomy has been the critical driver for this.

Patenting: More universities have begun the process of patent applications with government support. This is in contrast to the past when the normal practice was for individual academics to give away intellectual property rights to its industrrial partner.

Collaborative research and development: Many academics find difficulties in identifying industrial partners with interest and trust to engage in collaborative research or development, and there is a much greater recognition that institutional effort are needed in this respect. Gadjah Mada University is one example of an institution developing its institutional capacity to identify appropriate industrial partners and topics of mutual interest and is making progress in increasing cash support from industry in research.

Networking events: Lack of opportunities for university academics to meet industrialists is one salient issue. In response to this perceived need, higher education institutions are themselves beginning to orchestrate events that bring together industry and government representatives with university academics. ITS is an example of an institution which has initiated a series of UIG forums in several thematic areas of regional interest. A few other universities has taken proactive steps in organizing its own networking events to forge meetings between industrialists and their own academics.

Industrial collaboration for education: Good practices to enhance relevance of education are emerging in some units within public institutions as well as private institutions. These include: surveying/obtaining feedback from employers systematically, getting industry staff to teach specific subjects of emerging importance, upgrading staff knowledge in new areas in collaboration with industry.

Incubation/entrepreneurship education: In the past, companies were occasionally formed by academic professors or graduates working closely with academics, though they remained largely invisible. Nowadays more universities are engaged in incubation efforts and provide entrepreneurship education to their students. However, most initiatives appear to be at an early stage of development, without a firm track record of success, and with the content of support such as mentoring of seed funding still evolving.

Small and Medium Enterprises (SME) support: Universities have traditionally seen community service as a legitimate part of their work, and as such working with local SME has been established activities

in some universities. Working with SME, however, appear to be receiving renewed emphasis in some universities.

Science Parks: Several universities are in the early process of establishing science parks close to their campus, though the direction or content of the venture are not yet clear

5 Preliminary analysis

From our interviews and focus group discussions, several distinct issues emerged that could jeopardize the further development of UIG. The following section presents the result of our analysis.

5.1 Lack of mutual understanding and trust between university and industry

There appears to be a significant lack of mutual understanding and trust between university and industry communities. We found universities habitually developing their research strategies in isolation from industry. Some academics have little respect for industry as they see industrialists as far too money-oriented or too practical and lacking certain idealism. From the perspective of industry, higher education institutions often look like ivory towers, bureaucratic, too focussed on academic research and far too slow to be able to provide useful help. The lack of trust is confounded by the fact that many academics do not understand the problems faced by industry or their needs, and the fact that industrialists often cannot present their problems in a coherent manner. The analogous situation might be found between an inexperienced doctor and an inarticulate patient; only if the doctor has a solid understanding of the underlying problems related to symptoms that patients are able to convey would he/she be able diagnose properly. Both parties appear to be in the state of *"institutional sphere"* instead of *"consesus space"* lacking understanding about each other or mutual trust [Etzkowitz, 2002].

Nonetheless, the study team have come across a number of successful collaborations between individual university staff and industrial partners, where they developed understanding and mutual trust over time. The question is whether there are ways in which better understaidng and trust can be developed more systematically.

5.2 Institutional framework

Institutional framework is a serious problem in developing partnership, particularly for public institutions. Most of the interviewees saw the uncertain future of institutional autonomy for higher education institutions as a serious threat for developing better UIG partnerships. At the minimum, universities must be able to engage in discussions and negotiations with industry as independent organizations that can hold discussions and negotiation with industry as equal partners; they must be able to work on legal contracts with industry as well as government as independent entities. They also must be able to deal with ownership of intellectual property rights or companies, to implement projects as needed in a timely manner, and to hire staff flexibly to undertake tasks as needed. According to the prevailing regulation, only the Government of Indonesia has the status of legal entity. Public universities are considered as merely the government's implementating units (s*atuan kerja*), and its authority is granted by the Minister of Education and Culture. The issue is particularly acute in financial management as cumbersome bureaucratic procedures must be adhered to for all financial transactions; and revenues from any collaboration have to be deposited to the state treasury, and can be used only after submitting a proposal for activities, according to a standardized tariff. Since the government sponsored research grant cannot be disbursed as a block grant, researchers must also pay considerable attention to detailed administrative rules and procedures. The current uncertainty about what kind of autonomy will be available to universities is casting serious doubt about the future of UIG partnerships particularly amongst academics who have been most actively engaged with industry.

Many of the government funding rules or norms are also not conducive to innovation and creativity, i.e. late disbursement (in some cases up to 6 month delay), the requirement that all the money must

be spent within the financial year, government standard procurement procedures. There is also fear that the rigidity of government bureaucracy has strongly affected the staff mind set and mentality, and becomes a serious hindrance for developing a conducive environment for creativity and innovation to blossom.

The tendencies for individuals (or even institutional units) to avoid the bureaucracy, by conducting collaborations without involving the central administration can lead to other problems. Individuals may be exposed to unreasonable risks; reconciliating disputes may be much more difficult for individuals to handle. Academic staff may also become overloaded with non-campus work and become negligent of their campus obligations. Perhaps, the most significant problem is that fact that any lessons from collaborations will then stay with individuals, and not shared across the institution.

5.3 Uncertain industrial policy context

In an emerging economy such Indonesia, the industrialization process has just begun to enter the deepening process from labor intensive to skill intensive. Therefore it is not surprising that universities feel that there are not enough companies that they can collaborate with on reesarch. There are few domestic companies with technological sophistication and interest and/or capacity to innovate, with the bulk of industry concentrated in assembly operations or extraction of natural resources with little value added. And yet, without industries playing a more proactive role in the UIG partnership, the Triple Helix will just remain as an abstract concept. Worse, overreliance on government support could lead to further weakening of industrial competitiveness. The role of industry within UIG triple helix scenario has to be at least at par with university and government.

State owned enterprises seem to play a special role in this respect, as many university interviewees gave examples of more robust working relationships with them (e.g. BioFarma, Pertamina, Krakatau Steel), given their interest in domestic capacity building and relatively higher R&D orientation. The cases of the government intervention in PT Dirgantara Indonesia (debt restructuring) and PT PINDAD (manufacturing armored personel carier for the army in partnership with ITB) are taken as examples of good practices by some [Kompas,2012]. In general, most stakeholders we interviewed called for far clearer government policies to selectively support the development of domestic industry. There has also been some suggestions to revitalize the state owned enterprises, particularly those with high added value to ensure that there are key knowledge-oriented industrial firms which could engage in productive partnerships with universities.

5.4 Regional disparity

The regional disparity in the level of economic development is very clear, and has been a source of concern for policy makers. The metropolitan Jakarta is far more advanced economically than other economic corridors outside Jawa; universities there are also more developed, well resourced, and diverse than in many other regions. As presented in section 2, universities with stronger research capacity are mostly loicated in Jawa, whilst 5 of the 6 economic corridors in MP3EI are located outside Jawa.

There is significant concern that the development of economic corridors outside Jawa requires expertise and capacity that are only available in institutions in Jawa. It may be possible to solve short term problems by mobilizing expertise from Jawa, but that could create other problems which may be social, cultural, or political. It seems essential to develop mechanisms for building local institutional capacity.

6 Concluding remarks

Our conclusion is that currently the government, universities, and industries are still in their respective institutional spheres in Indonesia, and a strong commitment as well as hard work are needed to develop the knowledge, consensus, and innovation space. Much progress has been made in the past decade, with a wider range of partnerships emerging, and with more institutions building

capacity to play a more proactive role in fostering better relationships. A decade of exploration has seen some successes, but there is growing awareness amongst university community also that much more needs to be done, and that it is not easy to do so.

Broadly, the directions that Indonesia needs to move appear reasonably clear. All three institutional spheres require further development before each can take purposeful action. The government needs to be able to develop effective policies that are implementable, and not at odds with the prevailing legal framework. The universities has to develop institutional capacity to opearate strategically. Indonesia must at least have a small critical mass of industrial firms that are ambitious enough to develop into knoweldge-based industry.

The gap between universities and industry continues to be wide – indeed, some would argue that it is getting wider as a result of changing industrial structure with increasing foreign investors and weakening of state owned enterprises, or because of the changing nature of academy. It is not clear whether universities develop their capacity taking into account industrial development objectives. Identifying opportunities in an ever more complex industrial environment requires much more than isolated efforts of individual academics. As more universities become research oriented, academic publications are becoming performance targets; it is not easy to promote academics to work on industrial collaboration, which requires much effort with little promise of reward.

There is much that institutions can do to close the gap; it could develop strategies, build support structures, and create incentives for academics. And yet, the current environment does not look promising in facilitating them to do so. Internally within universities, the appetite for more institutional initiatives may not be strong amongst the very academics who have been movers and shakers of UIG. To some of them, many institutional changes looked more like additional tax and bureaucracy without producing benefits such as support, expertise or incentives. The process is complicated further by the broader decentralization process taking place, where relationships between the central administration, academic units and individual academics are being re-defined. To make the matters worse, the regulatory environment is actually becoming much tighter. In the absence of established autonomy law, institutions are thrown back to old rules which are being enforced more rigorously. There is precious little room for institutions for maneuver.

Our preliminary analysis would suggest that the principal lever for overcoming such difficulties would lie in the hands of government. It would be critically important to establish a firmer basis of institutional autonomy through the autonomy law. The subsequent autonomy process would also need to be set appropriately both through an appropriately defined regulatory environment as well as various funding arrangements. However, the details of how best to proceed needs to be explored through a more focused review of government side perspectives including key agencies such as DGHE, MoRT, MoI, MoA as well as MoF. This is particularly the case given that there are indications that different parts of governments think and react differently, and policy intentions as expressed by one part is not necessarily implemented by another.

We have also seen indications that the overall level of commitment to R&D may be low. Research-based UIG partnerships are potentially important, particularly in fields such as biological sciences, which could enable Indonesia both to extract appropriate value from its rich biological resources and to support appropriate conservation efforts. It would be important to examine the need for national research capacity building effort in key areas of strategic importance.

Indonesia has some government research capacity both under MoRT and other line ministries. In order to explore the future role of university research, it would be important to obtain an overview of governmental research, so that their roles, potential complementarity or collaboration potential can be explored.

Another area that requires further examination is the perspective of industry in Indonesia. Their view about the hopes and fears of the small number of companies that are known to be working

with universities within Indonesia, and obstacles do they see in the way of industry developing working relationships with universities, are of importance for this study.

The findings of our paper have also been limited by the coverage of our interviews and focus groups, which so far were largely limited to participants from Java. Further investigation would be critical to illuminate the current status and issues unique to regions that are less developed economically, particularly to explore potential development paths for universities so that they can play the appropriate economic roles for developing economic corridors.

Having said that, the study team found a number of cases whereby the three parties are willing, even eager, to develop partnerships. With an appropriate and comprehensive strategy, there is significant potential to create productive environment potentials could be developed into knowledge, consensus, and innovation space.

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Annex II: MEASURING QUALITY OF UNDERGRADUATE EDUCATION

a) Internal quality assurance

Many implement quality assurance in their institutions just because it is required by the law and regulations, i.e. accreditation and certification. However quality assurance should basically be an internally driven initiative, instead of merely to meet external requirements. It is deemed important to disseminate to all relevant parties within the institution, i.e. Rector, Dean, teachers, students, parents, and Trustees, that the primary beneficiary of quality improvement is the institution itself. Only by understanding this concept the continuous quality improvement can be sustained and becomes an important culture in the organization.

In order to impose a continuous process of internal review and evaluation, the DGHE requires that all institutions should establish a quality assurance (QA) unit. A training program was conducted for teaching staff who are assigned to conduct the process. In 2008 all institutions were requested to submit a document describing its internal QA operation, and a review team was assigned to assess the documents and conduct site visit. After the DGHE imposed the requirement to establish internal QA unit, in 2008 there were 24 public and 44 private universities considered as already had a good QA mechanism. Currently almost all universities have already the unit in place, though its effectiveness needs still to be assessed.

Internal QA mechanism implemented requires that the education process at each study program in compliance with the agreed upon standards. Examples of the standards applied are teacher attendance, time lag between student grade submission and the examination, employers' involvement in curriculum review, graduates' tracer study, etc. A few study programs, such as management and accountancy, are still having difficulties to comply with such regulation. However, most study programs in more established universities have been successful to meet the compliance with the regulations. Even the Faculty of Medicine, which was previously considered as difficult due to obligation to the clinical works in the hospital, has successfully implemented a very discipline and demanding competency based curriculum.

b) Accreditation

In addition to internal QA, one of the parameters used for defining quality is the result of accreditation, which basically represents external QA. In 2010 only 11,185 programs have been through the accreditation process or around 63% of 18,298 study programs, either due to their inability to meet the quality standard or the limitation of the National Accreditation Agency's (BAN PT) capacity to conduct assessment each year. In order to keep up with the ever increasing work load, BAN PT is in the process of shifting its strategy to evaluating institutions rather than study programs in the future.

The table 3.3 shows that the proportion of programs offered by public institutions is significantly better in term of accreditation result compared to private institutions. However the accreditation process only measures quality against the minimum standard that performance above that level is difficult to be rated against each other. Although the majority of programs in private institution is lower in quality and has small enrolment, some programs offered by larger private institutions are better than programs offered by the weakest public institutions. Due to time constraint, it not possible to extract from the BAN-PT's database the results for Institution in Jawa vs outer islands.

c) Competitive grants

One approach to assess quality is using the result of various competitive grants administered by the DGHE. The objectives of each competition vary between schemes, but the selection process is more or less similar. The process is conducted by involving independent reviewers, mostly a combination of subject specialists and experts in university management. Since the evaluation and selection process includes an in-depth thorough desk review and rigorous site visit, the result might better reflect quality. Grantees were evaluated every year to assure that the good practices had been well implemented. DGHE has a long experience in carrying out internationally reputable review process since 1995, and considered as objective, transparent, rigorous, and reliable process conducted by highly experienced reviewers. These experts provided assistance and played a leading role in designing similar funding scheme for the Government of Sri Lanka in 2003-2006.

In 2009 the DGHE funded 9 public, 17 private, and 5 BHMN universities, whilst in PHKI-2009 12 public, 31 private, and 1 BHMN universities were selected. In 2010 the I-MHERE World Bank assisted project funded 79 grants, comprises 37 study programs in Jawa and 42 study programs in outer islands. Unforunately in 2009 DGHE changed its strategy of providing competitive grants and shifted more toward direct allocation funding scheme. Until 2009 there were hundreds of study programs in public as well as private universities have received such grants and adopted the good practices into their management. In addition, there are thousands more study programs that have not received any grants but have changed to the betterment of their education process through the dissemination of good practices by their peers. Nevertheless competition were mostly conducted in tiered system, that recipients from one tier cannot be compared with recipients from other tiers. The track record of a study program in acquiring various competitive grants indicates that the institutional commitment for continuous improvement; hence could become an important indicator that reflect quality.

d) Teaching staff

Although the education process is probably the most important aspect in the provision of quality education service, the qualification of teaching staff is a deemed important aspect. Its importance is reflected by the only input based parameter used in this report. Table 3.5 presents the qualification of teaching staff in public as well as private institutions. More than 2/3 of S3 holders are from universities in Jawa, an obvious illustration of disparity in the capacity to conduct research and innovatoon between between economic corridors in the MP3EI. The condition in private institutions located in outer islands is the worst in term of S2 and S3 holders.

According to the Law 14/2006 teaching staff in undergraduate program should have at least S-2 qualification. Table shows that more than 87,500 lecturers have to be upgraded into at least S-2 within the next few years. It also indicates that a lot of work has still to be done to improve qualification of teaching staff, particularly in private institutions.

e) International recognition

International reputation is represents among others by world ranking, though an endless worldwide debate on whether institutional ranking represents the quality of education offered is still going on. Table 3.4 presents the ranks according to the Times Higher Education Supplement or THES[29] and Quacquarelli Symonds or QS.

[29] THES changed its criteria that the ranks for these universities are not available anymore after 2009

DGHE continuously encourages institutions to improve their international reputation and recognition by providing grants for potential and prospective universities. New schemes have been introduced to provide incentives, among others supporting staff to publish their articles in refreed and reputable international journals and incentives for inventor of patents.

Some study programs in more established universities are preparing themselves for accreditation process by international professional agencies, such as American Board for Engineering and Technology (ABET) and World Federation of Medical Education (WFME). Some have successfully acquired the accreditation status, but we do not have the information yet on the number and the university's names that has acquired the acrreditation.

Annex III: NATIONAL COMMITTEE ON INNOVATION

The Council is assigned with the following specific mission,

- increase IPR from research activities and industries which directly relevant to economic growth;
- increase the number of niche products and industrial added value from many regions;
- improve science & technology infrastructure with international standard;
- achieve self-sufficiency in food, medicine, energy, and clean water which sustains;
- achieve self-sufficiency in defense, transportation, and ICT related product and industrial system;
- double export volume of creative industry products; and
- achieve continuous economic growth, prosperity with equity, and to strengthen Indonesia.

The 30 KIN members are grouped into 5 divisions, namely Government-led Innovation Program; Business and Industry Innovations, Innovation; Incentive and Regulation Policy for Innovation; and Economy, Social, and Culture Innovation. The Council has submitted the recommendations of empowering all ministries, government agencies, state enterprises, and public universities. The recommendations covers the following strategies,

a) Top down model recommendation for development of innovation in human basic needs, including food innovation and Innovation in medicine;

b) Recommendation for development of innovative industrial zone based on national and local excellence (combined top down and bottom up model), including revitalization of Puspitek (quick win), establishment of Bandung Raya Invation Valley (quick win), and establishment of East Java Agrotech Innovative Industrial Zone (quick win);

c) Recommendation to increase the innovative R&D fund;

d) Recommendation to create innovative culture; and

e) Recommendation to plan road map towards national innovation system

Annex IV: Capacity development grant for UIG partnership

Detailed description

1. Background

The government of Indonesia has recently launched the MP3EI (*Master Plan for Acceleration and Expansion of Indonesia Economic Development*), intended to drive the realization of high, balanced, fair and sustainable economic growth, through two key factors, i.e. acceleration and expansion [MP3EI, 2011]. MP3EI envisions national development based on seven economic corridors, with aspirations to promote geographically balanced growth. Universities are expected to play critical roles not only in providing key human resources to meet the national and regional development needs, but also in becoming key 'knowledge base' for the regions so that regions can develop appropriate economic activities with increasingly higher value added. Given the status of economic development in Indonesia, the roles expected of universities are different in different locales, but can be categorized into the following three levels:

Level 1: Working with local (or potentially local) industry and government to provide relevant undergraduate and diploma level education

Level 2: Working with local (or potentially local) industry and government to develop strategic R&D capacity to address emerging or future industrial needs of regions

Level 3: Working with national and international industry and government to develop S2 and S3 programmes of relevance to industry so that they can contribute to R&D capacity development of industry

Today, none of Indonesian universities are equipped to perform such roles adequately. Inadequacies to deal with level 1 needs are demonstrated by the fact that there are many locales particularly outside Jawa, where industry is hard pressed to recruit relevant undergraduates or diploma holders. There are hardly any established R&D centres known for their collaborative work with industry in themes relevant to regional economic needs – to meet level 2 needs. As far as level 3 is concerned, most research programmes in established institutions are still academically oriented, with research degrees such as S3 designed for academic jobs with little attention given to emerging or future industrial requirements.

Currently such roles have not been actively played by universities, mainly because their capacity to engage with industry has been limited. It is essential that this tradition of isolated institutional development for universities is broken so that universities begin to develop along with the needs of the society. It is critically important that universities in outer islands plan new S1 programmes in consultation with local emerging and future needs. It is essential that applied research centres are developed in key locales to meet regional needs. As R&D interests emerges in some segments of industry (e.g. as found in pharmaceutical companies in Indonesia today), it is the right moment for research oriented institutions to engage with them to plan research-oriented degrees at S2 and S3 so that university research capacity develops in conjunction with R&D capacity in industry.

This capacity development program proposes to provide significant grant assistance to universities, so that they can build better institutional capacity to deliver more relevant education and research on the basis of close dialogue with industrial and government stakeholders.

2. Objectives

The objectives of this funding program are to,

a) Improve university ability to work with local stakeholders such as industry and government in planning its capacity development,
b) Improve university capacity to deliver (i) undergraduate and diploma programmes, (ii) applied research and development services to assist industry to move up to higher value added production and services; and (iii) research-based post graduate education to meet the needs of emerging R&D activities in industry

3. Scope of the program

It is critical for universities to acquire the commitment of relevant stakeholders from industry and government, in order to participate in this program. The program will include support for graduate fellowship, start-up R&D grants, domestic and international technical assistance, travel, laboratory equipment, industrial exchange program, and twinning arrangement with national as well as international institution.

Depending on the strength of the proposal, the fund provided by this program is in the range of IDR 15 to 20 billion over 3-5 years period, excluding the contribution from the local industries and government partners. A twinning arrangement with more established national or international universities would be strongly encouraged, and may be 'required' when proposing institutions are deemed to have in adequate expert capacity in the domains envisaged..

4. Eligible proponents

Eligibility will be different for different level proposals:

Group 1: only universities located in the economic corridor of Sulawesi – North Maluku, Maluku – Papua, and Kalimantan are eligible to submit proposal. The proposal must be developed in partnership with the local industries and government.

Group 2: only universities located in the economic corridor of Sumatera, and Bali – Nusa Tenggara

Group 3: only universities with a good track record in research, as demonstrated by the research training and track records of academic staff, credibility of establishing S3 programmes

Since the heart of capacity building lies in successful collaboration between universities, industry and local government in the planning process, the program could start with seed grants to fund planning and proposal development in collaboration with industry and government, which will be selectively provided based on pre-proposals submitted by institutions. The capacity development grants to support the actual implementation will be awarded based on full proposals thus developed and evaluated.

The up to IDR 200 million seed grant can provide support for time-relief for university staff, national technical assistance, workshops, and travel to the local industries, e.g. plantation, mining, hatcheries, or breeding sites. For some pre-proposals, where aspirations make sense, but where institutional capacity to develop full proposals seems inadequate, the funding agency may assign technical assistance to help develop the full proposals.

The full proposals should outline what kind of education/research capacity would be developed and how, and should include some matched funding from local government and industry.

5. Institutional framework

The program requires institutional capacity building of the kind that has never taken place before. It will be necessary to explore new implementation arrangements at local as well as national levels, with flexibility to involve industry as well as government partners. It is also likely that capacity building will require international collaboration on specific topics. For this reason, we strongly recommend an involvement of an international donor agency, to provide a better framework for experimentation, involving international expertise. The actual capacity building would be funded mainly by the government fund, but with contributions from local industries as well as local government.

In order to ensure smooth planning and operation, with expected interdiscipolinary capacity, it is likely that the program requires universities to establish new units/organizations that are legally separate and can be accountable along with the universities, rather like Fraunhoffer in Germany. With or without such a new structure, it is anticipated that a special tri-partite board shall be established to oversee the implementation of this program at the institutional level. The institutional arrangement shall be in such a way that the financial management comply with the prevailing regulation, whilst at the same time able to provide sufficient felxibility for the industrial collaboratiive activities.

An oversight committee should be established to regularly monitor the implementation. The committee comprises representatives from local universities, industries, local as well as central government.

Annex V: UIG support facilities grants

Detailed description

1. Background

The government of Indonesia has recently launched the MP3EI (*Master Plan for Acceleration and Expansion of Indonesia Economic Development*), intended to drive the realization of high, balanced, fair and sustainable economic growth, through two key factors, i.e. acceleration and expansion [MP3EI, 2011]. MP3EI envisions national development based on seven economic corridors, with aspirations to promote geographically balanced growth. Universities are expected to play critical roles not only by providing key human resources to meet the national and regional development needs, but also by becoming key 'knowledge players' in working much more productively in partnership with industry and government, and in embracing spinoffs and other commercialization efforts.

If universities are to play such proactive roles, it is essential that they explore new ways of connecting with industry and working with them. A number of Indonesian universities have already began such a process of exploration, by establishing industry facing activities in a range of areas covering networking, corporate relations, technology transfer, to science parks or incubation. However, most of such efforts are still at an early stage of development, and they require significant further work in clarifying strategic objectives, refining operational processes, and in professional development of staff. Indonesia does not yet have 'best practices' in most of such support functions, and most initiatives have the appearance of self-made plans with little learning from international best practices.

There is also a tendency all types of institutions to try to develop the same set of functions, irrespective of their institutional mission and capacity. While this is not surprising given the early stage of thinking about UIG partnerships, international experience shows that not all institutions are fit to engage with industry in similar ways. It is important that institutions are pushed to engage in increasingly sophisticated experimentation, taking into account their institutional capacity as well as orientation.

2. Objectives

The objectives of this funding program are to,

a) Promote excellence in developing new ways for engaging and working with industry
b) Improve university ability to develop realistic strategies for working with and for industry, given institutional mission, orientation and capacity
c) Promote the development of 'best practices' in a range of support facilities based on well informed strategies and learning from international experience

3. Scope of the program

The program will provide highly selective support to a small number of initiatives in each category of support facilities. Funding support could be given for expenditures such as, professional staff recruitment/training, short-term experts, equipment and facilities, studies.

The size of the grant should not exceed IDR 200 million and should last for 2-3 years.

4. Eligibility and selection criteria

There is no formal requirement for eligibility, but proposals are expected to provide strong rationale why a given institution is fit / suitable to develop a particular type of support facilities.

Since the key objective is to promote better strategy development and planning for such support functions, the program will start with seed grants to fund planning and proposal development, providing small seed grants to a small number of best pre-proposals in each category. The up to IDR 100 million seed grant can provide support for time-relief for university staff, national and international technical assistance, domestic and limited international travel.

The selection criteria will include: (a) appropriateness of the choice of support facilities given institutional character/development plans; (b) track record in preparing for such a function; (c) evidence of clarity in planning

The full proposals should outline what kind of support function capacity would be developed, clarifying expected roles, organization, and operations, and proposing an investment program to develop such a function over a period of 2-3 years, beyond which, all running costs are to be funded by universities themselves.

5. Selection process and program level technical assistance

The selection of pre-proposals will be undertaken by a small group of international experts with a range of support function expertise. They will provide a workshop for selected grantees for seed grants, to assist in their proposal development process.

Annex VI: REPORT ON STUDY TRIPS

OBJECTIVES:

1. To gather information from experts and researchers from the international perspectives on the experiences and practices in conducting university-industry R&D partnership
2. To study and explore good practices of the universities in developing policies, strategies for creating and fostering effective university-industry collaboration.
3. To study the role and the policy that the government have set supporting university-industry collaborations.

COUNTRIES VISITED:

Republic of Korea: - Korea Advanced Institute of Science and Technology (KAIST)
- Daedeok Innopolis

Korea is well known for its early industrial success, most notably in developing domestic conglomerates (Chaebols) with significant technological capabilities. In spite of such a success, Korean higher education institutions are not known to have developed good U-I relationships, or to have become key players in national or regional innovation systems. This is not because of the lack of effort. For instance, Korea has been making significant investments to develop a scientific hub, Daedeok Science City, by collocating government laboratories as well as key higher education institutions such as KAIST and industrial R&D laboratories for the past 30 years.

Since 2008, the Korean Government has made another round of concerted effort, most notably by concentrating resources for specific themes of research, and to strengthen further key eco-system features which had been hitherto missing.

People's Republic of China: - Tsinghua University
- TusPark – Tsinghua University Science Park

The experience of China was proved to be illuminating as it successfully re-built its higher education system in the last thirty years, with universities given responsibilities to contribute to national economic development. Some of their elite universities have been particularly successful in their contribution. They created new companies with better technological capabilities, when their domestic industry was weak. Some are developing ties with multinational companies to help in the industrial catch up process.

Zhongguancun is a large industrial district within Beijing which is particularly well known for its success based on contributions from academic institutions such as Tsinghua University, Peking University, and the Chinese Academy of Sciences. New companies such as Founder emerging from Peking University, or Tongfang and Ziguang from Tsinghua University, have been national success, and created the core of Zhongguancun. Over the years, Zhongguancun has become a nationally recognized model of China's Science Parks.

Korea Advanced Institute of Science and Technology (KAIST)

Visit to KAIST includes discussion with head and academic staffs (professors) from Department of Mechanical Engineering, visit to laboratory facilities, discussion with research students (masters and doctoral students), discussion with professors/researchers at laboratory; discussion with Dean of College of Engineering; and visit and discussion with officers at KAITS Office of University – Industry Cooperation

Some specific notes on KAIST ME:

- ME department has 56 faculty members, including 9 emeritus professors, 2 assistant professors and 10 associate professors, serving 886 undergraduate and graduate students (all under scholarships). Faculty members are active participants in Korea and International Engineering Societies.
- ME department currently has 6 strategic research areas that are highly relevant with the industry. Each professor is researching in those 6 areas as their major and minor fields of research. The department keeps track of the research conducted in research centres and/or research group using matrix system. Each research centre and research group is headed by a director (professor).
- Number of master students: 205 (119 government scholarships, 28 department scholarships, 41 industry scholarships, 17 scholarships for foreign students). Numbers of PhD students: 327 (238e government scholarships, 31 department scholarships, 47 industry scholarships, 11 scholarship for foreign students).
- Large number of graduate students is the backbone for research, which in 2011 generated over US$ 20.3 million (US$ 5.3 million from Industry research grants and US$ 14.9 million from Government research grants). Research output includes: 472 IF in scientific publications (9.84 IF per professor), and 108 domestic and 13 international patent registered.
- To promote and maintain industrial relevant, KAIST ME established Industrial Cooperation System in the form of Industrial-Academia Consortium (IAC) This consortium focuses on 2 things: 1) to survey difficult technical problems of the industry, and 2) to create research strategies for industry, which is implemented in industry sponsored research programs.
- KAiST ME also established Industrial Advisory Board (IAB) that advices and evaluates the education and research activities at KAIST ME. IAB systemizes the industry-academia cooperation and providing the industry with on-demand high-quality human resources and industrial training (non-degree short courses)
- Professors at ME have start-up companies. As the founder, KAIST allows professor to become the CEO of Start-up Company up to two years, which after that will be taken over by non-professor. KAIST retains share of ownership of the companies.
- ME alumni's spin-off companies totalling 56 companies, is a proven success of diffusion entrepreneurial spirit within ME department.

Some specific notes on KAIST Office of University Industry Cooperation (OUIC):

- This unit is headed by Dean of the Office of University and Cooperation, under the Vice President of Research. This unit functions to support KAIST in transferring research achievement and technology to the industry, which is implemented in three units or groups:
  - Technology Commercialization team that promotes technological transfer and commercialization through creation patent portfolio, construction of patent information system, and intensification of technology licensing. Total Patent registration is 4.481, including 909 overseas patent registrations. Number of technology transfer in 2010 is 40 cases resulting in US$ 1.8 million licensing fee.
  - Project Coordination and Activation Team that helps create collaborative relationship among industry, industry and KAIST institutes of research. This unit is responsible for operation of Industry Liaison Program (ILP) membership, the foundation and operation of KAIST Technology holding company, management and operation of KAIST trademarks, and constitution of Incubation Complex.
  - Technology Business Incubation Centre that is responsible for incubation of venture companies. OUIC allows incubator tenants to remain in the incubation complex up 5

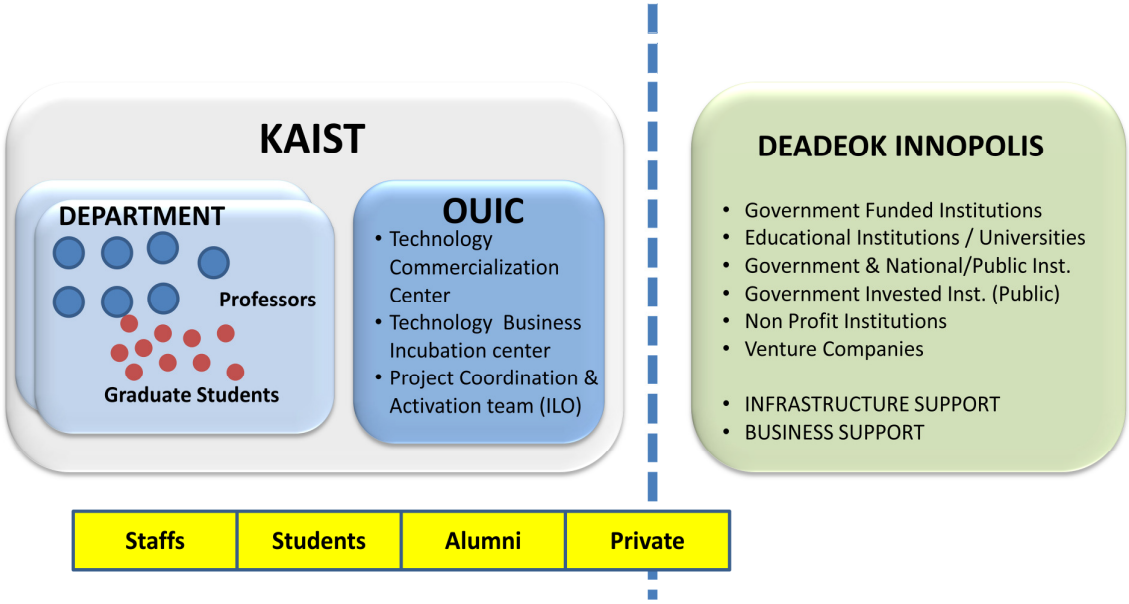
years. Capitals for new venture companies can come from government support or university support (loans). Average number of tenants is 100 tenants per year, with success rate of less than 40%. More than 90% of incubator tenants are from outside KAIST.

- OUIC is operating professionally with support from 25 competent full-time administrative staffs. When needed OUIC will invite external professional (outsourcing) to assists tenants and or member from industry, such as for market research, banking & investment, etc.
- OUIC serves academia, students, alumni and external parties (industry and individual investors).
- Revenue sharing policy: 50% for inventor, 30% for KAIST; 10% for Department; 10% for OUIC.

DAEDEOK INNOPOLIS

- This government-support facility complex is one of three Innovation Metropolis; the others are in Deagu and Gwangju. This Techno Park facilitates R&D and support S&T commercialization for universities, government R&D agencies, as well as industry sector. Daedeok Innopolis currently houses 1,266 resident institutions (public institutions, government-funded institutions, national/public institutions, education institutions, other non-profit organizations, and enterprises. The total number of personnel at Daedeok Innopolis is 55.615 persons, including 9,005 PhDs and 9.736 Master's degree holders.
- Daedeok Innopolis provides benefits to resident enterprises: tax deduction (national and local) for high-tech enterprises, utilities discount for R&D institutes and enterprises, institutionalized supports, and specialized funds.

In summary, UIG partnership in Korea (KAIST and Daedeok Innopolis) can be illustrated as follows:



University staffs (professors) and graduate students are the main engine for R&D at the university. Scholarship for graduate students enables the department to recruit talented students to work on research. The availability of research groups and/or research centres, as well as IAC and IAB allows professors and graduate students to execute researches that are highly relevant to the industry.

Professors will have access to research grants provided by the government, industry and university, and are also free to choose to work within the department, faculty or college, KAIST OUIC or even with the industry sector at Daedeok Innopolis, as long as the contract is formal (institutionalized) and they have fulfilled all their academic obligation (teaching, etc.) the university.

A clear and consistent policy and regulations concerning R&D activities at university will be very important for researchers (professors), which include regulation on ownership of IPR, share of ownership of start-up companies etc.

In particular, the success of University-Industry collaboration depends strongly on the quality of organization and professionals that run the university-industry collaboration offices. This organization must not only play active role in promoting S&T advances at university but should also know how to commercialize it to the industry. Professionals that that fully function as business liaison is definitely needed to bridge the gap between the university research and the industry. Such professional role cannot be double-played by academic staffs.

Business incubator must be run by professionals who know business, business network and sense of entrepreneurships; although outsourcing for experts in various area of expertise can also be done.

DETAILED PROGRAMMES

LOCATION 1: DAEJEON - SOUTH KOREA

Date: 15-16 November 2012

Delegation:	1. Prof. Dr. Agus Subekti	Director of Research & Community Service – DGHE
	2. Dr. Amich Alhumammi	Directorate Education and Religion – BAPPENAS
	3. Prof. Dr. Mulyadi Bur	Andalas University
	4. Dr. Alfa Edi Tontowi	Gadjah Mada University
	5. Dr. Junaedi Muhidong	Hasanuddin University
	6. Dr. Andi Isra Mahyudin	Institute Technology of Bandung
	7. Dr. Biemo W. Soemardi	Study team member, Head of delegation

no	Date - Time	Location	Program	Remarks
	16 November			
1	11:00 – 12:30	Department of Mechanical Engineering Korea Advanced Institute of Science and Technology - KAIST	Welcome by head of ME department, Prof. Jeong-Guon Ih Introduction to ME department Presentation from visiting team by head of delegation Discussion with head and professor from ME department	Historical development of ME department followed the progress on KAIST in the early development of KAIST Department-Industry research collaboration has become routine program because the industry recognizes the capacity and competency of the university research. Laboratories are equipped with state

				of the art equipment Number of doctoral and master students are substantial, providing ample resources for research Many doctoral students are under the scholarship from university or industry Most doctoral students will to industry as researchers 53.4% research funding are from industry, the rest are from university and government competitive grants No rigid and comprehensive research plan, but follows the industry needs
2	13:00 – 15:30	Laboratory and research facilities in ME department	Meeting PhD and master students Visit laboratories: – Precision Eng. And Metrology – NOVIC (sound and vibration) – New energy conversion – HUBO Meeting with Professor	Prof. J M Bae, (energy conversion system lab.), is working on invention of new energy conversion devices. Established startup company H2-Energy, and KAIST allows the position of CEO for two years After two years, leadership (CEO) is handed over to professional engineer (PhD) KAIST holds part-ownership of the company with a certain arrangement of profit sharing.
3	15:40 – 17:40	International Center	Meeting with Indonesian students	Satisfy with facility at KAIST Opportunity to get scholarship
	16 November			
4	10:00 – 11:30	Office of University – Industry Collaboration	Introduction to KAIST OUIC	KAIST OUIC is located at ICC campus (old campus). OUIC is and independent unit of KAIST, headed by vice Rector Fully managed by 25 professionals; other duties are outsourced Facilitates U-I partnerships: – Technology commercialization – Technology Transfer / Licensing – Business incubator Total tenants 500 companies, with more than 90% came from outside KAIST Share KAIST in every new venture is 5% Share of royalty: 50% inventor, 30% KAIST, 10% OUIC, 10% department Student's start up business can get financial support from the government grant. Term of incubator tenant up to 5

				years; with average failure rate of incubators is 60%
	11:30-12:00		Visit to tenant of business incubator	i-KAIST became the first business venture (incubator tenant) that allow to use KAIST as its identity ownership by ex-KAIST design student, and now employing PhDs
	12:00-13:30	KAIST faculty club	Lunch hosted by Dean of College of Engineering, Prof. Seung bin Park	Information on the historical background on Korea R&D and general affairs
	14:00-15:30	Engineering Building E2	Meeting with young professor with experience in US industry	Information how young professor works and role in the department. Previous experience and expertise working with industry in USA is important capital. Inter-departmental works can run smoothly
	16:00-17:300	Daedeok Innopolis	Presentation of Deadeok Innopolis S&T park Discussion	Deadeok Innopolis was a government initiative to house all R&D facilities in one place, where university, government and industry can work together. All government R&D units, including defense, will be moved to this facility. Become the model for other S&T park across Korea. Currently host annual conference of World TechnoPark Association – UNESCO. Provide office space and business assistantship for tenants Provide assistantship to other S&T Park

TSINGHUA UNIVERSITY

Visit to Tsinghua University includes discussion with Deputy Director of Overseas R&D Management Office – University Industry Cooperation Committee and a discussion with Prof Zhang Wei for Industrial Engineering department, as a sample of individual professor/researcher at university.

Some specific notes on Tsinghua UICC:

- Tsinghua UICC was founded in 1995, which functions somewhat like enterprise club. Current membership is more than 160, including well-known international companies such as IB, GM, P&G, Motorola, Toshiba, Hitachi, Samsung, EDF, and France Telecom. These enterprise members are membership fee, and in return UICC provides office support for the industry in terms of:
  - Strengthen cooperation between university and industry
  - Study trends of technology development
  - Helping companies solving technical problems arising from production, strengthening competitiveness
  - To assist companies in creating joint laboratory and/or research centres, between Tsinghua academic department and domestic industry
  - Serving the bridge between domestic and overseas companies
  - Set up in-house engineering master training station (non-degree) for domestic companies
  - Established more than 100 distance learning stations in 30 provinces
  - Organizes workshops, conferences, seminar between academia and the industry; creating communication platform for exploring potential cooperation.
  - Promoting Tsinghua technology to the members
  - Assisting member for special events, such as recruitment, setting up scholarship, etc.
- The role and position of UICC at Tsinghua University is as a broad platform for accelerating Tsinghua's technology transfer and specific instrument for strengthening university-industry collaboration. In a sense Tsinghua UICC is operating as the window for the industry to engage with Tsinghua University for R&D and technology transfers.
- UICC is run by executive operation office, with two divisions, domestic and overseas; and coordinates the following units:
  - Business Intelligence Centre
  - Development Strategy Research Centre
  - Technology Diagnosis
  - Consulting on Finance & Investment
  - Talent Training
  - Information Services
- UICC also coordinate several centres, such as Business Intelligence Centre – BIC and Development Strategy Research Centre - DSRC. BIC provides intelligence consulting to companies and organization. This centre also provides information to client companies to support their product development, technological innovation and market expansion. Whereas SRC provides analysis and consultation for companies and government administrations.
- At the department level, before 2008 professors engaged (in R&D) with the industry on individual contract basis, and not regulated by the university. After 2008, with the promotion of high technology by the government, research in that area become important and the university began institutionalization of university R&D. At that time China understand the importance of having its strength on own technical capability, as most of the technology is still imported by the companies. Since then all R&Ds by the professors are obligated to be contracted by the university, either at university level, faculty level or department level.

- Accompanying that policy, the university set up regulation concerning the share of revenue or overhead charge to R&D contract: 5.5% for government tax, 5% for university overhead charges, 5%-10% for department overhead charges, and the remaining for the professor's research account. This policy and regulation are implemented with support of strong system and professional administrative staffs.
- Professors are free to engage to as many research project (including consultation works), as long as they fulfil their obligations to the university (e.g., teaching, student advising, etc.). To maintain academic staff performance, the university imposes professor evaluation base on the criteria on teaching, production of research/academic papers, number of research fund (especially government funding), and professional impact at national and international level.

TUSPARK:

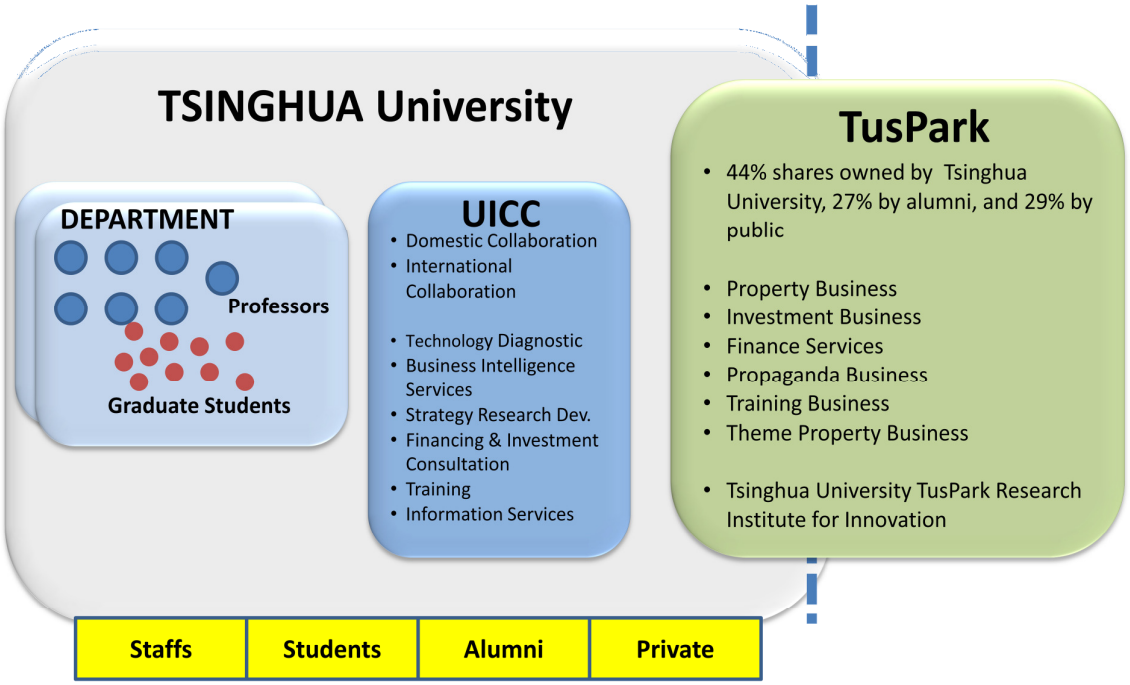
Visit to TusPark includes discussion vice President of TusPark, Dr Chen Hongbo. Dr Chen's motto is to change from "made in China to created in China".

Some specific notes on TusPark:

- TusPark is an independent company solely functions to facilitate the university science and technology park. TusPark Co Ltd was established in July 2004, as the realization of university leaders to have a place where Tsinghua University strive its advances in science and technology. Tuspark Co. Ltd was formerly established as the Development Centre of Tuspark in August 1994. TusPark concept was formally proposed and approved by Beijing Government in 1993.
  - Currently TusPark ownerships consists of:
    - 44% shares belongs to Tsinghua University
    - 27% shares belong individual shareholders (alumni)
    - 49% shares belong public
- According to Dr. Chen, to succeed an STP needs 4 elements (space, resources, services, and tenants) that must be managed in an integrated manner. In this context Tuspark is responsible for the development, construction, operation and administration of Tsinghua University Science Park (TusPark).
- TusPark core product is Science and Technology service platform centering on the Innovation service system, and is implemented in the following services:
  - Incubator base for innovative enterprises
  - Cultivation base for innovative talents
  - Transformation base for technological result
  - Human resource services
  - Capital services
  - Information exchange
- TusPark business includes:
  - Property business
  - Investment business
  - Finance Service
  - Promotion business
  - Training business
  - Theme property business

- Tsinghua University TusPark Research Institute for Innovation is TusPark organization unit, an institution jointly founded by Tsinghua University and Central and local government agencies. This is considered as the think factory for regional innovation, corporate innovation and technological innovation.

In summary, UIG partnership in Tsinghua can be illustrated as follows, where R&D can be implemented fully at university (at department level or through the office of University-Industry Cooperation Committee) or through TusPark:



Unlike KAIST, S&T Park at Tsinghua relies on university brands. Although the alternatives are always open, most R&D and university-industry collaboration at this park is related to Tsinghua University.

Similar to the KAIST case, the success of Tsinghua U-I collaborations depends strongly on the strength of organization and the people who ties the knots between university R&D and the industry. Independency of the organization from academic function should be very clear so that the organization can be functioning fully as professional unit that has the responsibility, authority and capability as business entity. Staffing for such organization requires professional support units, such as industrial/business liaison, technology transfer and technology commercialization, etc., that should also understand the university R&D capability.

DETAILED PROGRAMMES

LOCATION 2: BEIJING - CHINA

Date: 15-16 November 2012

Delegation:	1. Mr. Noor Arifin Muhammad	Directorate of S&T, BUMN - BAPPENAS
	2. Prof. Dr. Ali Agus	Gadjah Mada University
	3. Prof. Dr. Lilis Nuraida	Bogor Agricultural University
	4. Dr. Armein Z. Langi	Bandung Institute of Technology
	5. Mr. Purwanto Somali	PT Indofood Sukses Makmur
	6. Dr. Biemo W. Soemardi	Study team member, Head of delegation

no	Date - Time	Location	Program	Remarks
	19 November			
1	14:00 – 15:30	Office of University-Industry Cooperation Committee, Tsinghua University	Welcome and introduction to Tsinghua UICC by Dr. Lu Xiao Jun, Deputy Director of Overseas R&D Management Office	The role and position of UICC at Tsinghua University as a broad platform for accelerating Tsinghua's technology transfer and specific instrument for strengthening university-industry collaboration. UICC is run by executive operation office, with two divisions, domestic and overseas. UICC coordinates the following units: – Business Intelligence Center – Development Strategy Research Center – Technology Diagnosis – Consulting on Finance & Investment – Talent Training Information Services Tsinghua UICC was founded in 1995, and also functions somewhat like enterprise club. Current membership is more than 160, including well-known international companies such as IB, GM, P&G, Motorola, Toshiba, Hitachi, Samsung, EDF, and France Telecom. Members are paying membership fee. UICC provides office support for the industry for: – Strengthen cooperation between university and industry – Study trends of technology development – Helping companies solving technical problems arising from production, strengthening competitiveness – To assist companies in creating joint laboratory and/or research centers, between Tsinghua academic department and domestic industry – Serving the bridge between domestic and overseas companies – Set up in-house engineering master training station (non-degree) for domestic companies – Established more than 100

				distance learning stations in 30 provinces – Organizes workshops, conferences, seminar between academia and the industry; creating communication platform for exploring potential cooperation. – Promoting Tsinghua technology to the members – Assisting member for special events, such as recruitment, setting up scholarship, ect. UICC also coordinate several centers, such as Business Intelligence Center – BIC and Development Strategy Research Center - DSRC. BIC provides intelligence consulting to companies and organization. This center also provides information to client companies to support their product development, technological innovation and market expansion SRC provides analysis and consultation for companies and government administrations. In a sense, Tsinghua UICC operates similarly with university LPPM in Indonesia, in terms of linking client form industry to academia at the university campus, but with more independent for the administration and more professional
2	15:40 – 17:00	Office of TusPark	Introduction and discussion on the role and function of TusPark by vice President of TusPark, Dr Chen Hongbo	TusPark is an independent company solely functions to facilitate the university science and technology park. Dr Chen motto is to change from made in Chine to created in China TusPark Co Ltd was established in July 2004, as the realization of university leaders to have a place where Tsinghua University can strive its advances in science and technology. Tuspark Co. Ltd was formerly the Development Center of Tuspark set up in August 1994. TusPark concept was formarly proposed and approved by Beijing Government in 1993. TusPark ownership: – 44% shares belongs to Tsinghua University – 27% shares belong individual share holders (alumni) – 49% shares belong public

				4 elements of STP: Space, resources, services, tenants Tuspak is responsible for the development, construction, operation and administration of Tsinghua University Science Prak (TusPark) TusPark core product is Science and Technology service platform centering on the Innovation service system. TusPark services: – Incubator base for innovative enterprises – Cultivation base for innovative talents – Transformation base for technological result – Human resource services – Capital services – Information exchange TuskPark has network in every region of the country where the economy and industry are booming. TusPark business includes: – Property business – Investment business – Finance Service – Promotion business – Training business – Theme property business Tsinghua University TusPark Research Institute for Innovation is TusPark organization unit, an institution jointly founded by Tsinghua university and Central and local government agencies. This is considered as the think factory for regional innovation, corporate innovation and technological innovation.
	20 November			
3	09:00-11:30	Department of Industrial Engineering, Tsinghua University	Discussion with Prof. Wei Zhang, Vice Chair of Industrial Engineering Department	Discussion on various aspect of academic and professional engagements with the industry The last 10 years Tsinghua has been focusing more on academic (theoretical) research than on applied research. This is the consequences of being a world class university. On the other hand, industry has its

				own R&D capacity. Before 2008, professor engaged individually with the industry, but since2008 Tsinghua tried to bring academic engagement as institutional basis at department level. 2000 was the best time to start engagement with the industry because at that time companies are importing technology, and professor has the opportunity to help industry to create their own competitive strength. To promote the creation of innovative SME, the government provides incentive of 3 years tax free and additional3 years of tax deduction. The university provides freedom and flexibility for professor for doing research with the industry, and providing conducive environment to do so. Professor are charged US$ 1.000/ year for their 18m^2 office, such a policy that drive professor being competitite to get as much research project as possible. Overhead charges to research projects: 5.5% for government tax, 5% for university charge, 5%-10% for department charges. Academic excellence is a group responsibility; one does academic research the other does applied research and other does the teaching