

# Chapter 9

## The Impact of Interuniversity Exchange and Cooperation on Doctoral Programs in Southeast Asia

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### Background and Objectives of the Study

In the quest to attain a knowledge-based society, an emphasis on the importance of capabilities in technical knowledge, analysis, and decision making toward individual countries' economic development was already evident by the end of twentieth century (OECD 2000; World Bank 1999). Huge demands on the role of higher education toward socioeconomic development have risen alongside the social change from a capitalist society to the knowledge-based society of the twenty-first century. The status and enhancement of research capability, education outcome, and social responsibility of higher education in developing countries has

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With deepest sympathy, we extend our sincere condolences for the loss of Dr. Kazuo Tsutsumi, emeritus professor at Toyohashi University of Technology and former Chief Advisor of JICA Project for AUN/SEED-Net (2003–2011). Dr. Kazuo Tsutsumi made extensive contributions to the development of human resources, the economy, and society on the whole. In recognition of his particular devotion and effort in international cooperation initiatives, he was awarded the JICA President's Award in 2007. His distinguished service will serve as a lasting inspiration for the further development of cooperation between countries and Higher Education in Southeast Asia.

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been particularly emphasized: this is simultaneous with an enormous effort to improve the education and research capabilities in those developing countries.

In response to recent trends of drastic social change toward achieving a knowledge-based society, universities in Asia, led by those in the East, have been extensively discussing “world-class” and “international standard” of their top universities (Altbach and Balán 2007; Liu and Cheng 2011). With past observations on the Asian university, it has been observed from the world-systems theory perspective that although the current discussion has evolved from that of independence in educational institutions to working toward an international standard institution, the Asian university is also in the process of transcending from that of a subordinated institution to an independent institution (Altbach 2006; Altbach and Umakoshi 2004).

There has been drastic increase in both the quantitative and qualitative expansion of higher education and its improvement in Southeast Asia. For instance, in Thailand, the enrollment rate in tertiary education has risen to 46 %, in Malaysia to 42 %, and Indonesia 23 % in 2010. Especially in emerging countries, intensive effort has been focused on enhancing PhD programs. In the beginning of the 2000s, the Malaysian government had already declared its “Research University Development” policy, which emphasized increasing the proportion of highly qualified foreign students by up to 30 % at Malaysian universities (Sugimoto 2004).

It is thought that these policies are formulated on the recognition that the establishment and enhancement of domestic higher education is indispensable to promoting the development of advanced researchers and engineers who can correspond to a knowledge-based society. The goal is to establish “Scientific Self-Reliance” (Task Force on Higher Education and Society 2000, p. 79) by producing domestic human power with researchers and engineers who have the capability of contributing to the country’s development. However, there is not enough research on the impact and evaluation of the policy and implementation of enhancing domestic higher education as an independent institution, developing the curriculum, and autonomously producing next-generation researchers and specialists, especially in graduate schools.

On the other hand, the progress toward globalization activates a dynamic exchange of information, knowledge, and human resources beyond the border in the region and country in the higher education sector. More frequent exchange between the countries has been occurring on a bilateral, multinational, and multidimensional level. The ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN/SEED-Net, henceforth SEED-Net) was established in order to attain sustainable socioeconomic development of the ASEAN region through high-ranked engineering universities as a core member of the network. The purpose of SEED-Net is to encourage and enhance the development of human resources by exchanging education and research capability, research collaboration, high-level degree acquisition, open seminars on topics of specific interest, etc., within the region (AUN/SEED-Net 2011).

In order to analyze the results of internationalization, interuniversity exchange, cooperation, and globalization, this study investigated the influence of the

reforming process of engineering universities that are members of SEED-Net. Each emerging country where the selected engineering university (as a sample for this comparative case study) was located experienced an independent period after WWII—until the recent trends for globalization and particularly after the end of the Cold War. The advantage of this study is in comparing the engineering, science, and technology education, which has a similar education language both within and outside of the country. This is in comparison to the social sciences, which are complex to categorize because of their diversity; for instance, socioeconomic background, language, culture, and locality as social factors are not easily summarized into a common standard.

The goal of this study is to investigate how the Southeast Asian engineering universities have developed their education and formulated their doctoral programs. The authors will subsequently examine higher education institutions since higher education is stated as providing the final education degree. The sample universities were selected from SEED-Net member universities. The impacts of the exchanges and cooperation were investigated between Japan, the USA, and EU universities through an interview of each sample university. Six universities were selected for the case study. These included Universitas Gadjah Mada (UGM, Indonesia), Institut Teknologi Bandung (ITB, Indonesia), University of the Philippines Diliman (UPD, Philippines), De La Salle University (DLSU, Philippines), Universiti Malaya (UM, Malaysia), and the Universiti Sains Malaysia (USM, Malaysia).

## Overview of SEED-Net

### *SEED-Net*

Receiving its main support from Japan, in 2001, ASEAN countries established SEED-Net to enhance education and research capabilities in engineering after the 1997 Asian Economic Crisis, believing that it was indispensable to develop engineering human resources that could respond to globalization of economy in order to survive in the more and more competitive world. SEED-Net is an interuniversity network composed of 19 universities, which represent each country chosen by the Ministry of Education from 10 countries in the region, and 11 Japanese supporting universities. From 2013, the project will implement Phase III, further expanding collaboration among members of leading Japanese universities.

The core program of SEED-Net is to support academic staff of the member universities to obtain higher degrees by studying abroad in the region. Academic staff or academic staff-to-be receives opportunities to study abroad with recommendation from the member universities, with the objective to improve the education and research competency of the member university through improvement of the educational qualifications of the academic staff. The major destination of international students from the ASEAN region has been developed countries such

**Table 9.1** The number of international students by country (2001–2009)

Country	Master	PhD
Malaysia	70	24
Thailand	147	39
Indonesia	75	19
Philippine	74	14
Total	366	96

AUN/SEED-Net Secretariat

as the USA, Europe, or Japan. SEED-Net, however, recognized eight universities within the region, which had English courses, as world-class graduate schools, and they were all selected to serve as a “Host Institution.” Each host university was appointed to provide the program in one fundamental engineering field (one out of nine) and receive international students from other member countries. The number of international students that each country accepted from 2001 to 2009 is shown in Table 9.1. At the end of 2009, the number of master’s degree holders reached 366 and the number of PhD holders was 96.

To enhance the educational attainment of the international students, the system was constructed using a multi-supervising system. A supervisor from a Host Institution is allocated for a student, but there is also a Japanese supervisor who will give joint supervision to the student. Students are able to obtain the requisite research capabilities through collaborative research with their supervisors and thus are able to obtain education from various professors throughout the network. The themes of the joint research was decided at a field-wise regional academic seminar, which was held once or twice a year. A total of 92 seminars were held for the 5 years after March 2003 in the ASEAN region. Over 2,000 researchers, including participants in the field-wise seminars, visit other member universities in the region.

### ***Role of AUN/SEED-Net in Higher Education Sector of ASEAN***

Higher education in the ASEAN region has achieved remarkable quantitative development in recent years, especially in the original members of ASEAN. Many scholars have argued that higher education in ASEAN region faces a quality problem, while it has attained quantitative growth for the past years. Enhancing the quality of higher education is one of these countries’ top policy priorities of education. Consequently, each government and university intends to install a quality assurance or accreditation system. Nonetheless, quality of education has remained a significant issue, as the increase of facility, teachers, etc. is not catching up with the rapid expansion of enrollment. Historically, higher education in developing countries has either formulated or transplanted the higher education system of the USA or a specific country in Europe as a model. However, the higher education in developing countries of colonial times was established to develop

human resources to serve as bureaucrats and specialists for the colonial government and not to enhance research capabilities. This had a strong influence on the development processes of higher education in most developing countries. Many higher education institutions in developing countries, even after attaining independence from their colonial countries, have not been able to fulfill their important role to create knowledge through research activities (Kim 2007).

This is also applicable to selected sample universities and countries in this study: Malaysia, the Philippines, and Indonesia. In order to enhance research activities, it is necessary to construct an effective system for development of researchers who can verify latest research by researchers in other countries and set and verify their own research questions by improving graduate programs, especially PhD programs. However, the establishment of a doctoral program to develop researchers even at these top engineering universities in the region is a comparatively recent phenomenon. For instance, a doctoral program was established in 1992 at the University of the Philippines, Diliman, and in 1985 at the Universiti Sains Malaysia. It is imperative to improve PhD programs in order to develop the researchers, knowledge base, and technologies that support advanced industry and increased productivity.

Both the countries in the Southeast Asia region and ASEAN have launched different initiatives to address these issues that the higher education sector of the region faces. SEED-Net is one of these initiatives. The countries have been taking measures to establish their own PhD programs not just by copying any model from Europe or the USA but also by selectively applying a model among various alternatives based on their own needs. It is important to internationalize education programs and increase the number of international students in this process. In addition, interaction with researchers from other countries is an effective measure to improve the quality of research activities against international standards. Activities of SEED-Net, such as the graduate degree program, the collaborative research program, and staff exchange programs, are designed and implemented based on these needs of the countries in the region.

## Case Studies

The actual situation of the impact of interuniversity exchange and cooperation under regional cooperation frameworks including SEED-Net on internationalization and independence in higher education has not been adequately shared. This study focuses on revealing the reality of the interuniversity exchange and cooperation effects. The study focuses on the on-going establishment of PhD programs in selected countries in the region, a symbolic phenomenon that shows that the higher education sector in the region is moving toward independence. Higher education in Singapore has achieved equable educational standards to US/EU standards with its long history of PhD programs since, for example, the Faculty of Engineering at the National University of Singapore established its first doctoral program in 1977.

On the other hand, PhD programs in South East Asian countries, such as the Philippines, Indonesia, and Malaysia, have been expanding rapidly in the recent years.

The study selected six universities from these three SEED-Net host countries as cases. The study data is verified by document analysis, interviews to the dean of each engineering faculty. This study investigates (1) the reforming process of doctoral programs, (2) the results of the reform of doctoral programs, and (3) the impacts of SEED-Net on them. The selected universities are within the three top universities in each of the countries according to the QS University Ranking: Asia 2012.

Because Thailand implemented its own reform efforts after the Asian Economic Crisis of 1997, it is difficult to abstract the impacts of SEED-Net; thus, the study excluded Thailand, which is also a SEED-Net host country.

The interview raised the following questions to the Dean with regard to the reform of PhD programs in recent years:

1. How was the reform of doctoral courses implemented?
2. What kind of human resources do you intend to develop by reforming the doctoral courses?
3. What vision has the university been pursuing to achieve an “international standard” or to develop the “uniqueness (originality)” of the university?
4. Did you have any particular country as a model for designing and reforming the doctoral course for your university?
5. How do you compare your doctoral course with those at universities in other countries?
6. What is the impact of SEED-Net on the reform of your doctoral course?

### ***Universitas Gadjah Mada (UGM, Indonesia)***

The Universitas Gadjah Mada (UGM, Indonesia) is a SEED-Net host university in the field of Geological Engineering. UGM had already established its doctoral program at the time when SEED-Net was established. However, the program was only for domestic needs, and UGM restructured the program to be an international program in English to receive the first SEED-Net scholars in 2003. Since then, it has received six scholars within 4 years (2004–2008).

The interview with the Dean produced the following findings. As part of the reform of the doctoral program after 2003, the University redesigned the doctoral program in a more systematic manner so that students can complete the program in 3 years. Previously, the course requirements for the doctoral and master program were formulated in much the same way with subject credits for class attendance and paper writing for each subject. However, after the reform, classes were abolished and students now submit three papers for each subject under supervision of an academic supervisor for credits. In addition, higher English requirements were

established for admission in order to promote students' gaining knowledge from books and journals written in English. Students are given the opportunity to explain his/her interest at the time of entrance to the research group to which he/she hopes to belong. Based on his/her interests, the supervisor constructs an instructional "road map" for research, thereby presenting clear guidance and direction to students. The future direction of the program is identified: simultaneously attempting to pursue uniqueness and meet international standards. For uniqueness, the program was designed to support the social development of Indonesia and develop the university's uniqueness as an innovator of appropriate technology rather than the most advanced technology.

These reforms have been implemented based upon a review of the doctoral curricula at several universities in the USA, the UK, and Japan. Alumni members who were working in national and international companies advised the reform design effort. Institutional reform was achieved at a certain stage on the one hand; but on the other hand, it is also still necessary to further develop even the most advanced facilities.

As to the role of SEED-Net in the abovementioned process of the doctoral program reform, it has improved the quality of the doctoral program by the inflow of continuous international students, financial support, the installation of new equipment, and supervision on research by Japanese professors. While the university itself initiated institutional reform, the enhancement of quality was necessary in order to shorten the program duration and achieve efficiency, which was substantially supported by SEED-Net.

### ***Institut Teknologi Bandung (ITB, Indonesia)***

The Institut Teknologi Bandung (ITB, Indonesia) is the SEED-Net host university in the field of Mechanical and Aeronautical Engineering. ITB already had an established doctoral program in the fields of Mechanical and Aeronautical, Civil, Electric, and Electronic Engineering; however, these were all for national education. With SEED-Net, it upgraded the program in Mechanical and Aeronautical Engineering to become an international doctoral program, which received the first SEED-Net scholar in 2004. Between 2006 and 2008, it received another four students.

The Dean of ITB informed us that in 2003, the University launched a doctoral program reform for the entire university. Five years were set as a limit by the reform for the registration period of doctoral programs, which had been indefinite in the past. Under the new education system, it has been structured such that a student is assigned with a supervisor and research group and then has to enroll in coursework and develop a research plan in the first year, the progress of which will be monitored periodically by a supervisor and his/her research group. Additionally, the requirements for the doctoral degree were restructured to include publication of manuscript in one refereed international journal in addition to one refereed paper in one domestic journal in order to enhance the international reputation of the University.

The goal of the doctoral program is to produce independent researchers who have the capability of making research proposals, obtaining research grants, and individually conducting research. The future direction is to pursue international standards and at the same time uniqueness by conducting research and development activities which enhance the competitiveness of Indonesia. As part of the efforts in this direction, ITB has started to give credits to students for internship in the private sector.

In the beginning, the program was constructed using the model of the Netherlands as a basis. It was then redesigned to be a unique program by integrating different systems of different countries based on input from teaching staff who obtained their degrees in different developed countries. The admission system was modeled on that of the UK, coursework was from the USA, and some systems of Japan and other EU countries were also integrated. At ITB, the characteristics of foreign university PhD holders are diverse: 25 % from the USA, 16 % from France, and 11 % from Japan, with others from Australia, the Netherlands, and other countries. The teaching staff who return from developed countries play a special role in the development of different systems at the doctoral level.

When compared with their counterpart programs in Thailand and Malaysia, ITB considers that it has a disadvantage in facilities and equipment. However, in terms of the number of students and faculty involved with the teaching profession, there is a comparative advantage. Japan and Western countries conduct comparatively more strategic research activities. ITB aims to develop a "Research Road Map," through which research activities will be conducted, leading to more research grants.

Since the reform had already been initiated when SEED-Net was established, SEED-Net was not a direct factor for ITB to start the reform. However, assistance from SEED-Net accelerated the reform and enhanced its quality by starting its programs at the very time when ITB started the reform. SEED-Net promoted collaborative activities with other ASEAN countries, internationalized teaching staff, and as a result, enhanced quality of education and stimulated domestic students. ITB has been developing the monitoring and evaluation system with advice from Japanese academic faculty members.

### ***University of the Philippines Diliman (UPD, Philippines)***

The University of the Philippines Diliman (UPD, Philippine) is the SEED-Net host university in the field of Environmental Engineering. UPD developed the first doctoral program in Material Engineering in 1992 and then in 1994, Chemical Engineering; 1999, Electric and Electronic Engineering; and 2005, Civil Engineering. Each program was established for national students. Although there was no doctoral program in the field of Environmental Engineering, when UPD was appointed as the SEED-Net host university in the field of Environmental Engineering in 2004, it newly built a doctoral program getting support from several



departments across the faculty of Engineering, which received its first students in one and half year time. In 2006, six national and three international students enrolled. In 2007, nine national and two international students enrolled. Another 11 students, including two international students, and nine students, including four international students, enrolled in 2007 and 2008, respectively.

The results of the interview with the Dean indicated that there was no special arrangement in the design of the program. It applied the same program structure as with other programs. The basic philosophy of the program is to put more emphasis on practical aspects than theoretical aspects considering the nature of the field, which deals with practical environmental issues. The program aims to develop human resources of engineers who are capable of solving environmental issues in the ASEAN region. The program was designed to develop its originality as reflected in the diversification of environmental issues in the ASEAN region, which differ from those of the USA or EU. UPD does not aim to develop an international standard program that is simply equivalent to those in developed countries, but to develop a program characterized by its originality.

During the process of program development, UPD did not apply any specific foreign model, but it referred to its energy engineering program, which was also a cross-departmental program. The distribution of the teaching staff with PhD in terms of the country where the degree was obtained was diverse. There were nine teaching staff with degrees from the USA, nine from Japan, five from the Philippines, two from the Netherlands, and two from Australia. The program was designed by mixing different ideas from those teaching staff with different backgrounds. It should also be highlighted that there are five teaching staff that graduated from UPD. This indicates that UPD has produced the human resources from its own program, who now are involved in the reforming process of its program. The proportion is good and they have had a positive impact on the reforming process.

UPD considers that their programs are sufficiently appealing to attract international students from within the region, when compared to their counterpart programs in other countries in the region. When compared to programs in Japan and Western countries, it considers that their program is unique in that it is a cross-departmental one.

The influence of SEED-Net has been significant when we look at the fact that the program was newly developed in a relatively short period with the strong initiative of the university and faculty management because UPD became the host university in Environmental Engineering under SEED-Net. In addition, Japanese academics have contributed to the quality enhancement of research activities through guidance in the research of doctoral students.

### ***De La Salle University (DLSU, Philippines)***

De La Salle University (DLSU, Philippines) is a SEED-Net host university in the field of Chemical Engineering. In 1995, DLSU established its first doctoral programs in Chemical Engineering and Electric and Electronic Engineering. It

established Mechanical and Industrial Engineering courses. These courses are formulated for domestic students. When DLSU became a SEED-Net member and was appointed as the host university in Chemical Engineering, there was a transformation from a domestic program to an international program. In 2004, DLSU received its first three international students. Between 2005 and 2007, it received two international students each year and one student in 2008.

Results of the interview with the DLSU Dean revealed that the only change in the design of the doctoral program after 2003 was a change in the English requirement for admission, which was not only a reform for the Faculty of Engineering but also for the entire University. On the other hand, effort has been paid to make the program more systematic. All students have to prepare a “Program of Study” and “Plan of Study” under the supervision of a supervisor, which is periodically reviewed to support students to implement and complete research within the predetermined period. The Program of Study is prepared even before admission, so that the university can know the interest of students in advance. The goal of the program is to develop researchers who can conduct research independently. The future direction is to achieve international standard. It aims to fulfill requirements from different accreditation bodies and actively promotes collaboration with international organizations.

DLSU applied several models from around the world in establishing its doctoral program and its reforming process. For instance, it applied “Laboratory-Based Education” from Japan and Direct Research-Based PhD Program from the UK and invites external dissertation examiners from Australia. Teaching staff of DLSU who graduated from these countries played a significant role in adopting these systems.

Compared with counterpart programs at other ASEAN universities, Japan, and Western countries, because English is the primary language, it has provided high-quality education. However, DLSU has a disadvantage in the quantity and quality of facilities and equipment.

DLSU established its PhD program in the late 1990s, with subsequent reforms not having originated directly with SEED-Net. Nonetheless, participation in SEED-Net helped DLSU improve the quality of its doctoral program in accordance with the strategy of the university by increasing the number of research projects and papers through promotion of collaborative activities with Japan and other ASEAN countries and by getting advice from Japanese professors on direction of the program. It has also been pointed out that local students were stimulated by international students.

### ***University of Malaya (UM, Malaysia)***

The University of Malaya (UM, Malaysia) is the SEED-Net host university in the field of Manufacturing Engineering. UM had already established its doctoral program and was already receiving some international students when SEED-Net

started its programs. SEED-Net, however, increased the number of international students from the ASEAN region, which had not previously been great. UM received the first SEED-Net students in 2004, and it received nine students in total from 2004 to 2008.

Results of an interview with the former Dean revealed that prior to 2007, PhD degrees had only been granted through completion of a research program, whereas the reform introduced the granting of PhD following the completion of both a research program *and* coursework. In addition, a supervisor or faculty member can make it compulsory for a student under PhD by Research program to take coursework if they think it is necessary. The reason behind the reform is that UM now considers that not only research skills but also academic knowledge are required for the development of competitive human resources in the global market as the needs from industry and academic have changed along with globalization of the economy particularly after the 1997 Asian Economic Crisis. The Faculty pursues international standards based on this principle.

The program at UM had received significant influence historically from UK, which is the former suzerain and has the strong academic linkage with UM. The PhD by Research program, which was the main program in the past, was applied from the model of UK. However, newly introduced “PhD by Coursework and Research” under the reform modeled US system. While most external examiners on doctoral dissertation examination panels were from the UK in the past, recently they are selected based on field and theme of research, thus they are not only from the UK but also from other countries including the USA and Japan. UM considers that they have achieved the equivalent level of education with counterpart programs in ASEAN countries, the USA, EU, and Japan.

As mentioned above, the reform was not initiated by SEED-Net. However, UM considers that SEED-Net strengthened the reform process. For example, the program has been redesigned with more emphasis on the needs and cutting edge technology of industry, with the influence of Japanese professors who have stronger linkages with industry. In addition, the increase of the number of international students from within the region diversifies the composition of international students in terms of countries of origin and strengthens networks with researchers and universities in the region.

### ***Universiti Sains Malaysia (USM, Malaysia)***

In 1985, the Universiti Sains Malaysia (USM, Malaysia) established its PhD program in the fields of Material Engineering and Mineral Resources as its first doctoral programs. The second was later established in the field of Civil Engineering and Polymer. While those programs were already receiving international students when SEED-Net started, becoming a host university of SEED-Net increased the number of international students from within the region as

UM. USM received its first SEED-Net scholars in 2004. Between 2004 and 2008, it received ten new students in total.

Although USM has not recently conducted any significant reform, the Malaysian Ministry of Higher Education selected USM as the university with the highest international competitiveness in Malaysia and decided to allocate a significant amount of funding under the Accelerated Program for Excellence (APEX) in 2008. USM is attempting to achieve a place within the top 100 in World Rankings by 2013. To achieve this goal, the following reforms are scheduled to be implemented: (1) enhance research capability, (2) strengthen linkage with industry, (3) increase the number of research papers, (4) increase the number of international students, (5) hire foreign teaching professionals, and set the doctoral program as a foundation for achieving these objectives. Specifically, the doctoral programs will take the measures such as to implement more research activities and to strengthen English requirement at admission to assure the language ability of students. Research activities are emphasized more than ever after being selected as the APEX University in addition to being one of four Research Universities in Malaysia.

As at UM, the design of doctoral programs at USM received significant influence from the UK. Even at present, all doctoral programs are PhD by Research programs because of that. On the other hand, after independence, the University implemented reforms modeling different systems of other countries, resulting in the establishment of its original program, which aims to respond to both academic needs and the needs of industry and community.

USM considers that it has achieved a certain standard compared with counterpart programs in other ASEAN countries, while it is still necessary to improve facility and equipment in comparison with those in Japan and Western countries. It considers that SEED-Net is the most successful platform for international collaboration, which has had a significant impact on USM. It has contributed to the enhancement of the quality of the doctoral program through networking with other universities in the region, sharing of knowledge and skills, and enhancement of quality of research activities.

## **Findings of the Study**

### ***The Reform Process and Its Results***

The findings from the above case studies can be summarized as follows. First, doctoral programs in ASEAN countries were commonly established modeling a program in a certain Western country, a suzerain country in most cases. However, after independence, all the universities have redesigned and established their own doctoral programs by selectively adopting different elements of different systems from several other countries. However, this does not mean the doctoral programs in

each country have originality. For example, ITB, which originally modeled the system of the Netherlands, introduced coursework from the USA while adopting some other systems from the UK and Japan. On the other hand, UM, which had implemented “PhD by Research” only for long time based on strong relationship with the UK, added American “PhD by Coursework and Research” to their programs in 2007. These reforms can be seen as part of the international standardization movement toward the American system with a focus on coursework, which we see in Japan, China, South Korea, or other European countries. As a result, more coursework is required for graduation at host universities. For example, graduation requirements at DLSU are now 18 credits from coursework and 12 credits for the dissertation. At ITB, 6–8 credits of coursework are necessary for graduation out of 54 credits.

Second, teaching staff with degrees from abroad played an important role in the reforming process. They have made inputs based on their experiences. On the other hand, there are universities such as UPD which have many teaching staff who were educated in their own country. There is a possibility that this can lead to the autonomous development of a university in the future. Moreover, there are universities such as UGM, which tried to reform the program based on the needs of industry by gaining inputs from their alumni members who are now working at national or international enterprises.

Third, the study found several similarities in the reforming structure of doctoral programs across universities included in the case studies. In most of the universities, reform was undertaken to systematically develop an education program with an aim to shorten the program period. Several universities have students prepare a plan for coursework and research under supervision of a supervisor at the time of entrance, based on which a research group of several teaching staff review progress of research for students to complete their program within the set term (e.g., DLSU, ITB and UGM). One university tries to know the interests of students at an early stage by having them prepare their plan for coursework before entrance (DLSU). This is a response to international trends, whereby universities design their programs for 2 years for a master’s degree and 3 years for a doctoral degree. This trend has been established because particularly in the Engineering field, technological innovations take place at a more rapid pace than ever, and therefore, it is no longer effective to pursue a higher degree by conducting research on one particular theme for long time. As a result, many international students who graduated from host universities in the region before the end of year 2008 completed their programs within 3 years or 4 years with a 1-year extension. For example, a Vietnamese student whom UPD received as the first doctoral SEED-Net scholar in 2004 completed her program in two and half years, which is shorter than the regular, 3-year period. This is much shorter compared to 6.7 years, which is the average duration of study of the 10 students who graduated with a doctoral degree between 2000 and 2005. The shortest among these 10 students was 4 years. The reform has shortened the duration of the programs and redesigned the programs to be more systematic, which we can call efforts for international standardization.

Fourth, the entrance requirements for English have been redesigned (e.g., DLSU, UGM, and USM). In the process of attaining international standards, research output, and outcomes, it is essential to be able to access international journals, research papers, and other resources, which are predominately in English. Therefore, competence in English is mandatory for the students; some universities also have an international publication included as part of their PhD graduation requirements to enhance international reputation of the university (ITB). This is a response to the social and economic need to develop global human resources as the globalization advances.

Fifth, a dilemma has been found in the future direction of the universities, between the pursuit of uniqueness and the pursuit of international standards. Many universities have set their goals as to be able to educate “self-reliant researchers,” who have the capability to conduct research individually (e.g., DLSU, ITB, and USM). However, it is interesting to see that UPD sets its goal clearly as to develop human resources who can address the issues of the region, which are different from those in the USA or Europe, although it may be partly because of the uniqueness of the field of environment, whose issues differ across regions. On the other hand, answers vary to the question “What do you aim to pursue – ‘international standards’ or ‘uniqueness (originality)’ of the university?” The two universities in Indonesia (UGM and ITB) responded that they are pursuing both, while USM, UM, and DLSU responded that they are pursuing international standards and recognition as a world-class university.

Last, many universities consider that they are equivalent to their counterpart universities in the region when compared in quality, while they consider they are disadvantaged in facility/equipment and research funds in comparison with their counterparts in Western countries and Japan.

## Impacts of SEED-Net

This section discusses what role SEED-Net has played in the reform process. First of all, all universities mentioned that reform was not initiated as a result of the initiation of SEED-Net. Most of the universities had started making reforms before SEED-Net started in 2001. However, they all pointed out that SEED-Net accelerated the reform and enhanced its quality. UGM said, “While the institutional reform itself was the initiative of UGM, inputs from SEED-Net supported UGM reforms in a substantial manner, with a continuous flow of international students, financial support, provision of equipment and research guidance from Japanese professors.”

To be more specific, first, SEED-Net increased the flow of international students, which promoted the reform of the doctoral programs. Except for Malaysia, the study found that the flow of international students in PhD programs had not been occurring and that programs were for local students only. However, SEED-Net

started to send international students to these universities, which then established international programs for these students. This happened only with SEED-Net host departments at each university, which have a significantly higher number of international students than other departments. It has been necessary for the universities to shorten the program period to the international standard of 3 years in order to continuously attract these international students, which has been a strong push factor for reform.

Second, SEED-Net has spurred the internationalization of university teaching staff by promoting exchanges and collaboration in research with researchers in other countries in the region and Japan, which further resulted in the quality enhancement of the educational programs that they offer.

From 2003 to 2008, there were 92 field-wise seminars held within the ASEAN region. Approximately 2,000 researchers visited their counterpart universities in the region. While the framework of the doctoral program now responds to international standards because of the reform, it is inevitable to strengthen educational capability of teaching staff in order to produce quality graduates within the set period under the new framework. Teaching staff have been strengthening such capabilities through participation in regional exchanges and collaboration in research.

Last, interuniversity exchanges have provided a valuable opportunity to exchange information and knowledge about systems among the members. SEED-Net organizes Steering Committee meetings once or twice a year with a vice-president or dean of the engineering faculty of the member universities to discuss the direction of the network. In January 2007, the committee exchanged information about the composition and requirements of their doctoral programs and decided that the regular study period of doctoral programs at SEED-Net host universities was 3 years. The member universities have promoted their own reforms with information about systems, and reforms of their counterpart universities gained through this kind of information exchanges.

## Conclusion

We have discussed the reforms of the doctoral programs in the advanced ASEAN countries and the role of interuniversity exchanges under SEED-net in the process so far. The result of analysis can be summarized as follows.

First, the Southeast Asia region has been seeing multilayered and multilateral cross-border exchanges and collaboration among universities within and outside the region, in today's world where mobility of information, knowledge, and people is more and more active along with globalization. ASEAN countries have been utilizing SEED-Net as a network for such exchanges and collaboration. One output from such effort is the internationalization of host universities. The universities have internationalized their education programs by having more international students from within the region under SEED-Net. At the same time, they have

internationalized their research activities by collaborative research activities with researchers in other countries in the region.

The universities consider that this internationalization of their education and research programs have led to the enhanced quality of doctoral programs. It also accelerated and improved reforms of doctoral programs originally initiated by themselves. Each university has been transforming the design of their programs to have more coursework, to have higher quality, and to be more systematic, so that students can graduate within the international standard period of 3 years, with the aim to enhance international competitiveness. They have improved the international competitiveness in their research activities through the implementation of collaborative research projects with researchers outside the country. With these improvements, they have developed themselves in a more independent and self-sustainable manner.

We can conclude that interuniversity collaboration within the region through a university network of SEED-Net has contributed to independent and sustainable development of the region's higher education sector by enhancing the quality of doctoral program reform among member universities.

It should be noted that reforms are still in progress. The universities have reformed their programs in a relatively short period and increased the number of international students. However, they should continue to advance their reform efforts and improve the quality of their programs, in order to continuously attract students from inside and outside the country in the coming years.

This paper discusses only one facet of SEED-Net, with a focus on host universities that have started to accept and exchange international students. Remaining research questions include (1) how SEED-Net can be compared with other various types of interuniversity collaboration activities in the world and (2) how we can discuss reforms in Singapore or other countries who have not started to receive international students at the doctoral level.

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