

Ex-Post Evaluation Report of Japanese ODA Loan Projects 2008 (Thailand)

December 2009

**JAPAN INTERNATIONAL COOPERATION AGENCY
INTERNATIONAL DEVELOPMENT ASSOCIATES LTD.**

Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, external evaluations conducted by experts shall be enhanced.

This volume shows the results of the ex-post evaluation of Japanese ODA loan projects that were mainly completed in fiscal year 2007. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

December 2009

Atsuo KURODA

Vice President

Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA.

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PART I Project-Level Ex-Post Evaluation Report

Thailand

Thailand-Japan Technology Transfer Project

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On-site Survey: April and July, 2009¹

1. Project Profile and Japanese ODA Loan



Project Site



Discussing effects of this project with instructors who received Ph.D. degrees in Japan

1.1 Background

Since the 1970s, Thailand achieved rapid industrialization and thus high economic growth rates year after year. However, since then a shortage of highly-educated human resources in the science and engineering fields had been continuously pointed out: despite demand for engineers to cope with the advancement of technologies in the manufacturing sector and the need to strengthen research and development (R&D) capabilities to increase competitiveness and sustain economic development, the quantitative and qualitative enhancement of university instructors and improvement of education facilities lagged behind.

Chulalongkorn University is the oldest national university in Thailand with the highest academic standard. In response to the above-mentioned situation, this project has aimed to improve and expand the education and research activities at the Faculty of Science and Faculty of Engineering in terms of both “soft” and “hard” aspects.



Faculty of Science,
Chulalongkorn University

1.2 Objectives

To improve the level of science and technology (S&T) education and research and development (R&D) activities at the Faculty of Science and Faculty of Engineering of

¹ The first site visit was made for a week in April 2009, and the second site visit was made for three weeks in June-July 2009. The beneficiary survey was carried out during these periods, as well. In July 2009, at the last stage of the second site visit, a feedback seminar on the tentative evaluation results was held for relevant persons and organizations.

Chulalongkorn University situated in the capital city of Bangkok, by improving the academic standard of instructors as well as enhancing educational and research facilities, thereby contributing to the industrial development of Thailand.

1.3 Borrower / Executing Agency:

The Government of the Kingdom of Thailand / Chulalongkorn University

1.4 Outline of Loan Agreement

Loan Amount / Disbursed Amount	7,380 million Yen / 6,444 million Yen
Date of Exchange of Notes / Date of Loan Agreement	September 1995 / September 1995
Terms and Conditions	
- Interest Rate	2.7% p.a. (2.3% p.a. for Consulting Services)
- Repayment Period (Grace Period)	25 Years (7 Years)
- Procurement	General Untied
Final Disbursement Date	October 2006
Main Contractors (over 1 billion JPY)	-
Consulting Services (over 100 million JPY)	Japan Indonesia Science and Technology Forum (Japan). Linesman Limited (UK), Design 103 Limited (Thailand), Pacific Consultants International (Japan).
Feasibility Study	None

2. Results of Evaluation (Rating: A)

2.1 Relevance (Rating: a)

This project has been highly relevant with Thailand's national policies and development needs at the times of both appraisal and ex-post evaluation.

2.1.1 Consistency with Development Policies

First, in relation to the national development plans and policies of Thailand, the 7th National Economic Development Plan (1992-1996) held human resource development through enhancing S&T education and strengthening of R&D capacity as a priority policy program. The 10th National Economic Development Plan (2007-2011) after project completion also holds "restructuring of production framework in order to improve productivity and add value through innovation, knowledge creation" as the third out of seven objectives, and promotes higher education and research activities in S&T. Since the currency crisis in 1997, the government has continuously upheld its policy of structural reform from low-waged labor-intensive industries to highly value-added industries.

Second, in relation to its higher education and S&T programs, prior to this project the Thai government planned and implemented programs to increase the number of university students in

S&T and to improve the quality of S&T education, in line with the above mentioned national policies. After this project, similarly, the Second Higher Education Long-term Plan (2008-2022) continues to implement programs such as university reform², training of instructors, and promotion of partnerships among universities aiming to strengthen competitiveness of the country. The objective of this project is in line with the objectives of such programs. On the other hand, the National Science and Technology Strategic Plan (2004-2013) places as its center objective the development of Research Clusters (or science networks) to strengthen the technological innovation system of Thailand, and to build partnerships among education and research institutions, industries and governments for technology development. The priority industries for Research Clusters include food, automobiles, software, microchips, textiles, tourism, health and bio, many of which overlap with the academic fields that were supported by this project.

2.1.2 Consistency with Development Needs

Table 1 is a summary of higher education indicators of Thailand. It shows the increase in the number of students in high education, as well as the increase in the ratio of students in science and engineering, thus implying a need for an enhancement of educational infrastructure to cope with such increase. The ratio of instructors with PhD degrees had not yet reached the government target of 30% as of 2007 (however, the average among the 24 top-ranked former national universities was 36% in the same year).

Table 1: Higher Education Indicators of Thailand

	1997	2007
Number of students (Public)	749,522	1,765,409
Number of students (Private)	n.a.	283,588
Ratio of new entrants to S&T faculties	15%	22.8%
Ratio of instructors with PhD	n.a.	25%

Source: Commission on Higher Education, Thailand

Regarding the research aspect, the R&D budget of the government (including R&D budget for universities and research institutes) in 2007 was 18 billion Baht, or 0.24% of GDP. This percentage is low compared to other countries such as Japan (3.17%) and Malaysia (0.63%). The number of researchers per 1,000 population is also low at 0.57, compared to Japan (7.02) and Malaysia (0.7). Such figures have remained low since the early 2000s.

From the above, it could be said that higher education in science and technology and the level of R&D of Thailand still needs to be improved, and thus the objective of this project to upgrade S&T education and research at Chulalongkorn University is relevant.

At the same time, however, the approach of this project being based in a single top-class university does not necessarily fully serve the needs of the industrial sector: the industrial sector needs supply of a large number of engineers (mainly undergraduate degree holders) and skilled technicians (mainly graduates of technical colleges) from higher education institutions. On the other hand, the demand for researchers (mainly graduate degree holders) is limited, as the R&D sector is relatively small³.

Meanwhile, the management policy of Chulalongkorn University shows a different stance: despite being established at inception as an education university, Chulalongkorn University is under transition aiming to become a world-class research university. This transition process involves promotion of research based on Research Clusters in interdisciplinary research areas, and education seems to have become a secondary objective.

2.2 Efficiency (Rating: a)

Both project period and costs were almost as planned; therefore, efficiency of the project is high.

² The Thai government has promoted the educational reform since the new Education Act became effective in 1999. As a part of the reform, the incorporation of national universities is ongoing for each individual university. The incorporation act for Chulalongkorn University passed the parliament in December 2007. As of the year 2008, there are 78 public universities (including 11 autonomous universities) and 68 private universities and colleges.

³ Based on an analysis made in a study by JICA (March 2009).

2.2.1 Outputs

The outputs of this project may be divided into the following: the “software” development components (i.e., human exchange), the “hardware” development components (facility development), and consulting services. One characteristic of this project is that, notably, the above project outputs were planned and implemented in close coordination with each other. It was found that a significant portion of the outputs produced were in accordance with planned outputs, although the degree of achievement was different by component. The Japanese ODA loan was used for all components except the In-house Joint Research Fund and the S&T Transfer Program.

(1) Software Development Components

The software development consisted of the following four components.

(i) Fellowship for Chulalongkorn instructors to Japan.

This component included the degree program and non-degree (short-term) program. As Table 2 shows, a total of 36 instructors received PhD degrees in Japan through the degree program, compared to the planned 47 persons⁴. As for the non-degree (short-term) program, the actual number of instructors sent to Japan was 198, which was nearly five times more than the planned number. However, the average duration of stay in Japan was shortened to 2 months, which was less than half of the original planned period⁵. The actual number of Japanese host universities/ research institutions was 11 for the degree program and 78 for the non-degree program, compared to one (University of Tokyo only) in the original plan⁶.



Chulalongkorn instructor who received PhD, with his supervisor and colleagues (photo provided by the supervisor at the host university)

(ii) Dispatch of visiting scholars from Japanese universities.

The number of visiting scholars was 562, which was more than double as planned, but the average duration of stay in Thailand was shortened to less than a fourth of the

⁴ 40 instructors were sent to Japan, out of which 3 persons withdrew and 1 person completed the coursework and returned to Thailand without obtaining a degree. According to the executing agency, the main reasons for the failures to obtain degrees were health problems and insufficient academic ability of the fellows.

The reason for the decrease in the number of instructors sent to the degree program was the decrease in eligible candidates due to (i) the suspension of recruitment of new instructors (civil servants) after the economic crisis in 1997, and (ii) that Chulalongkorn University introduced a condition on newly-recruited instructors to be PhD holders. Nevertheless, in response to a higher need for PhD degrees, the number of PhD obtainers through the program increased.

Before being sent to Japan, a six-month Japanese language training program was conducted for the candidates as planned.

The academic fields of the PhD obtainers were, in order of the number of fellows, material engineering, mechanical engineering, chemical engineering, information technology, biotechnology, environmental engineering, biology and power and energy.

⁵ According to the executing agency, the reasons for the increase in the number of non-degree fellows were (i) shortened duration of stay due to tight schedule of the candidates for reasons such as lack of instructors, and (ii) a consequence of more accurate estimation of the number of fellows based on Research Profiles (see (3) *Additional Output*).

⁶ The host institutions in Japan were diversified as it was found that a single university could not handle all fields of study planned by fellows. It is worth noting that thanks to the Academic Fellowship Services consultants carefully and meticulously matched fields of study and host institutions, and the cooperation of the Japanese host institutions, a large-scale dispatch was made successfully without any big problems.

planned duration, to 0.5 months⁷. A total of 11,640 students and instructors of Chulalongkorn University received advice and lectures from visiting scholars.

- (iii) In-house Joint Research Fund (under the Thai Government budget).
This Fund, planned to ensure funding for the fellowship program returnees to continue joint researches with Japanese universities, was not realized⁸.
- (iv) S&T Transfer Program (under the Thai Government budget).
Through this program, annual university-level workshops and approximately 60 smaller seminars/ workshops were held for fellowship program returnees and visiting scholars. However, “the development of a system of technology transfer to industries” planned during the project implementation stage was not realized due to the delays in implementation (see 2.2.2 *Project Period*).

Table 2: Fellowship from Chulalongkorn University to Japanese Universities (Plan and Actual)

	Planned at Appraisal					Actual				
	No. of batches	Duration (month)	From FS (persons)	From FE (persons)	Total (persons)	No. of batches	Duration (month)	From FS (persons)	From FE (persons)	Total (persons)
Degree Total	--	43.3	23	24	47	--	49.5	21 (19)	19 (17)	40 (36)
Master only	3	30	10	7	17	0	0	0	0	0
Master+Doctor	3	66	4	7	11	3	27.3	4 (4)	5 (5)	9 (9)
Doctor only	3	42	9	10	19	8	44.1	17 (15)	14 (12)	31 (27)
Non-Degree Total	5	5	16	24	40	8	2.3	134	64	198
Grand Total	--	--	39	48	87	--	--	82	156	238

Source: Chulalongkorn University

Notes: FS stands for Faculty of Science; FE stands for Faculty of Engineering.

Figures in parentheses are actual numbers of degrees awarded.

Figures under “Duration” show averages per person. On the “Master + Doctor” line, figures under “Duration” show average durations for Master’s Courses only.

Table 3: Visiting Scholars from Japanese Universities to Chulalongkorn University (Plan and Actual)

	Duration (month)	To Faculty of Science (person)	To Faculty of Engineering (person)	Total (person)
Planned	2.4	140	123	263
Actual	0.5	352	210	562

Source: Chulalongkorn University

Notes: Figures under “Duration” show averages per person.

(2) Hardware Development Components

The hardware development consisted of the following three components.

- (i) Education and research equipment (actual total purchase value: approx. 2.9 billion Yen).
The number of departments and laboratories where the equipment were installed was mostly as planned. The types and the number of items of the equipment was varied following the detailed plan prepared during the project (Table 4).
- (ii) S&T information network equipment (actual total purchase value: approx. 1 billion Yen).
Equipment such as terminals (personal computers), servers, printers as well as software

⁷ According to the executing agency, the main reason for the shortened period of stay by Japanese visiting scholars was difficulties in longer-term visits due to conversion of Japanese national universities into independent corporate entities.

⁸ The Fund was not realized because the executing agency could not make the budget request in a timely manner as the project was delayed (see 2.2.2 *Project Period*) and the budget years of Thailand and Japan were different. Instead, a maximum 200 thousand Baht/ two years of research grant was provided to each degree returnee, though this grant was applicable not only to the returnees through this project but to anyone who returned from foreign countries with degree.

were installed to the computer centers of both Faculties mostly as planned.

(iii) Library books (actual total purchase value: approx. 8 million Yen).

A total of 3,930 titles of textbooks, reference books and CD-ROMs was planned, but the number of titles actually purchased was 591 (275 titles for Faculty of Science and 316 titles for Faculty of Engineering)⁹.

Table 4: Education and Research Equipment (Plan and Actual)

	Planned at Appraisal			Actual			
	Faculty of Science	Faculty of Engineering	Total	Faculty of Science	Faculty of Engineering	STREC ^{*4}	Total
No. of Departments ^{*1}	12	8	20	13	8	1	21
No. of Laboratories	37 ^{*2}	29	66	46	23	1	70
No. of Items ^{*3}	444	454	898	323	223	14	560

Source: Chulalongkorn University

Notes: 1) The total numbers of departments are 22 in Faculty of Science and 12 in Faculty of Engineering.

2) Including equipment to be centrally-managed.

3) Including first and second priorities.

4) Science and Technology Research Equipment Center of Chulalongkorn University (STREC).



Analysis equipment of Chemistry Department, Faculty of Science



Computer Center of Faculty of Science



Dynamometer with endoscope of Mechanical Engineering Department, Faculty of Engineering

The procurement methods of equipment and library books were largely changed from the originally-planned methods (Table 5). This change was made due to difficulties in applying international competitive bidding (ICB), the original planned method, for the procurement of equipment/ books that were various in terms of type, quantity, specification, manufacturer and price, and thus is considered as an appropriate measure.

Table 5: Equipment Procurement Methods (Plan and Actual)

Component	Planned at Appraisal	Actual
Education and research equipment	2 ICBs with Pre-qualification	3 ICBs with Post-qualification (out of which, 1 ICB fell through) (Total 17 contracts concluded)
		7 Direct Purchases (Total 50 contracts concluded)
		1 International Shopping [*] (Total 10 contracts concluded)
S&T information network equipment	1 ICB with Pre-qualification	2 ICBs with Post-qualification (Total 5 contracts concluded)
		1 Direct Purchase (Total 2 contracts concluded)
Libraries	1 ICB with Pre-qualification	1 Optional Contract (Total 1 contract concluded)

Source: Chulalongkorn University

Note: "International shopping" is a procurement method based on comparing price quotations obtained from several (usually at least three) foreign and/or local suppliers to ensure competitive prices.

⁹ The reason for the decrease in the number of titles of books/ CDs was the prolonged processes of the changes in procurement method (because the originally-planned international competitive bidding was not an appropriate method) and procurement preparation.

(3) Additional Output (Research Profiles)

In order to harmonize different components of software development and hardware development for effective project outcome, this project included a set of plans of conducting joint research with Japanese universities, to perform as a foundation for programming of personnel exchange and equipment purchase. These plans were called the “Research Profiles” and included research plans and descriptions of necessary project components for individual research themes. Through joint undertakings by instructors sent to Japan, Chulalongkorn University, Japanese counterpart universities and the project consultants, a total of 42 Research Profiles (21 Profiles for 11 departments of Faculty of Science and 21 Profiles for 6 departments of Faculty of Engineering) were prepared.

(4) Consulting Services

This project involved various kinds of consulting services. Although some types of services were cancelled (as shown below), the total work volume was largely increased following the development of Research Profiles, the additional output described above.

- (i) Software Development Support Services (SDSS) (including curriculum development and development of university management improvement plans).
Total 69 person-months of SDSS were planned, but the whole SDSS was cancelled as the legal framework following the educational reform of Thailand had not been completed and thus the project could not specify the plan in accordance with the framework.
- (ii) Hardware Development Support Services (HDSS) (including selection, procurement, installation and management of equipment).
HDSS was integrated into the Overall Project Management Services.
- (iii) Overall Project Management Services (OPM) (including project implementation supervision and selection of visiting scholars).
The work volume increased.
- (iv) Academic Fellowship Support Services (AFS) (including selection of host universities in Japan, pre-departure training, support for immigration and accommodation).
The work volume increased.

The implementation process of this project is characterized by the fact that the core activities of project implementation and management were undertaken by university instructors who are busy in their education and researches, and that the project involved various faculties and departments independent from each other, and that many Japanese universities also participated in the process. In order for such a project to produce multiple outputs with high quality, detailed implementation support and sufficient coordination among different parties was necessary. Therefore, the content and volume of the consulting services conducted for this project were appropriate. This is backed by the high appreciation by the executing agency for the performance of the consultants.

2.2.2 Project Period

At the time of appraisal, the project period (defined as the period from the signing of the Loan Agreement to the final disbursement) was planned to be 116 months from August 1995 to March 2005. The actual period was 134 months from September 1995 to October 2006, or 116% of the planned duration. Although the simple comparison of the planned and actual numbers of months shows a slight delay, the project period is considered as mostly appropriate for the following reasons.

- (i) Despite the delays in the selection of consultants and the procurement of equipment due to insufficient experience of the executing agency in project management, differences in

budget years and in regulations between Thailand and Japan, and the relatively weak authority given to the implementing agency (the Office of Development Projects of Chulalongkorn University), the major outputs were mostly produced during the originally-planned period¹⁰, and the delays were kept at minimum.

- (ii) As this project is aimed at capacity and capability development, it is more difficult to clearly define project completion, compared to infrastructure projects. Therefore, a strict comparison between planned and actual implementation periods is relatively of less significance.
- (iii) The Loan Agreement was extended not because of the delays but for realizing additional outcomes.

2.2.3 Project Cost

While the total project cost was estimated at 8,596 million Yen (out of which the Yen loan portion was 7,380 million Yen) at the appraisal, the actual total project cost was decreased to 6,879 million Yen (out of which the Yen loan portion was 6,440 million Yen) (Table 6). The main reasons for the decrease are the downward adjustment of unit costs for the fellowship program in accordance with the regulation of the Thai government, and the shortening of periods of stays by Japanese visiting scholars in Thailand. No negative effect of these changes is seen on the production of the outputs.

Table 6: Project Cost (Plan and Actual) (Unit: million Yen)

	Planned at Appraisal		Actual	
	Total	Yen Loan	Total	Yen Loan
Fellowship to Japan	1,162	1,152	976	977
Visiting Scholars from Japan	736	423	413	339
In-house Joint Research Fund	82	0	0	0
S&T Transfer Program	58	0	4	0
Facility Development	3,945	3,945	3,896	3,838
Price Escalation	516	469	0	0
Contingencies	239	214	0	0
Taxes and Duties	167	0	0	0
Consulting Services	1,691	1,105	1,583	1,290
Total	8,596	7,308	6,879	6,444

Source: Chulalongkorn University

2.3 Effectiveness (Rating: a)

This project has largely achieved its objectives, and its effectiveness is high.

The following sections show that the quantitative and qualitative indicators of education and research, respectively, have generally improved. These indicators reflect not only the effects of this project, but also effects of other individual projects, such as joint researches with Thai- or foreign institutions, scholarships and donation of equipment. As a result of the survey conducted to direct beneficiaries of this project (instructors, students and graduates of Faculty of Science and Faculty of Engineering) and other stakeholders (companies and Japanese universities) at the ex-post evaluation¹¹, the key factors cited as contributing to the effectiveness of this specific

¹⁰ The outputs that were completed by the original loan expiry date (March 2005) include 30 out of 36 PhD awards (the original target was 30), 152 out of 198 participants in the non-degree fellowship program (the original target was 40), all of the three ICBs for equipment procurement, and 6 out of 9 direct purchases of equipment.

¹¹ The following beneficiary survey was conducted for the ex-post evaluation (see the thematic evaluation report for details):

(1) Focus group discussions. Total five focus groups were formed: (i) participants in the degree program (10 instructors); (ii) participants in the non-degree program (16 instructors); (iii) instructors of the target Faculties but not sent to Japan (15 instructors); (iv) graduate students of the target Faculties (8 students); (v) instructors of

project were the building of a collaborative relationship with Japan through the close human exchange and the large-scale development of facilities. See the thematic evaluation reports for this project for details of the beneficiary survey.

2.3.1 Upgrading of Education

(1) Increase in Students

The numbers of both undergraduate and graduate students at the Faculty of Science and Faculty of Engineering (the target Faculties of the project) are increasing, particularly in the total number at Faculty of Science students and in the numbers of Doctoral students at both Faculties (Table 7). Such increases are due to Chulalongkorn university policies and opening of new departments and programs rather than as a direct effect of this project. However, it is positively assessed that more students benefit from improved educational content which is a direct effect of this project.



Graduate students being supervised by an instructor who participated in the project

Table 7: Number of Students of Chulalongkorn University

(Unit: person. Figures in parentheses are growth rates from 1995)

	Undergraduate	Master	Doctor	Total
Enrolment (2008)				
Faculty of Science	3,011(66%)	1,102(89%)	401(2,573%)	4,514(87%)
Faculty of Engineering	3,863(32%)	1,604(39%)	294(2,162%)	5,761(40%)
Chulalongkorn Total	23,979(48%)	11,247(73%)	2,199(848%)	37,425(63%)
Graduation (2007)				
Faculty of Science	568(53%)	276(121%)	51(--)*	895(80%)
Faculty of Engineering	680(3%)	46(49%)	35(1,650%)	1,161(21%)
Chulalongkorn Total				8,325(53%)

Source: Chulalongkorn University

Note: The number of graduated students from Doctor's course of Faculty of Science was zero in 1995.

(2) Increase in Instructors with Higher Degrees

The number of instructors holding Doctorate degrees (PhD) largely increased at both the Faculty of Science and Faculty of Engineering: the ratio of instructors with PhD degrees to all instructors increased from 44% prior to implementation of the project to 70% after the project (Table 8). This increase reflects the University's policy to require newly hired instructors to have PhD degrees, but the 37 instructors¹² who received degrees from this project have all stayed in Chulalongkorn University and are included in the above increase in PhD holders (most

other Faculties such as Commerce and Dentistry (5 instructors) (in order to obtain third-party opinions about the project).

- (2) Written questionnaire survey: (i) 92 instructors of the target Faculties (all of 36 participants in the degree program and 56 others); and (ii) 16 supervisors of the degree-program participants in Japanese universities).
- (3) Semi-structured interviews: (i) 28 instructors of Chulalongkorn University (4 from the project implementation team, 9 from the university and faculty management, 17 other instructors from Faculty of Science and 12 from Faculty of Engineering); (ii) 2 staff members (instructors) of the S&T Research Equipment Center (STREC); (iii) 9 graduates from the target Faculties (2 from Faculty of Science and 7 from Faculty of Engineering); (iv) 3 companies (2 Thai and 1 Japanese); (v) 3 instructors of other universities in Thailand; and (vi) instructors of Japanese host universities.

¹² In addition to the 36 participants in the degree program, there was one instructor who received PhD through several short-term visits to Japan joining the non-degree program.

of the other instructors have obtained PhD degrees in western countries or Japan)¹³.

According to Chulalongkorn University, turnover is low at all Faculties. In addition to the government regulation to oblige instructors returning from foreign universities to continue services¹⁴, some instructors have pointed out that the attractiveness of Chulalongkorn University itself, which is in now in the middle of a big transition to becoming a world-class research university, has helped to keep the instructors to stay at the University.

Table 8: Number of Instructors of Chulalongkorn University by Type of Degree Held

(Unit: person. Figures in parentheses are shares)

Faculty	Before the Project (1995)				After the Project (2008)			
	Bachelor	Master	Doctor	Total	Bachelor	Master	Doctor	Total
Science	34(9%)	170(47%)	159(44%)	363	19(4%)	111(25%)	307(70%)	437
Engineering	40(14%)	114(41%)	123(44%)	277	20(7%)	71(23%)	216(70%)	307
Medicine (for reference)	8(10%)	76(60%)	42(33%)	126	8(7%)	37(31%)	74(62%)	119
Architecture (for reference)	7(10%)	47(64%)	19(26%)	73	8(8%)	59(60%)	32(32%)	99

Source: Chulalongkorn University

(3) Improvement of Coursework

According to Chulalongkorn University, coursework improved¹⁵ as a result of his project in total 53 courses taught in 10 out of total 11 departments targeted under this project within the Faculty of Science, and in 40 courses taught at 5 out of total 8 departments targeted under this project within the Faculty of Engineering. In addition, new courses were established in both Faculties: a follow-up study conducted after the completion of this project (*“the Follow-up Study 2007”*, March 2007¹⁶) found that more than 30 new courses were established (18 in Faculty of Science and 14 in Faculty of Engineering) as a result of this project. Positive opinions regarding the coursework were also obtained from graduate students during the ex-post evaluation.

(4) University Ranking

In 2009, the THES-QS World University Rankings, a leading international ranking conducted of universities, ranked Chulalongkorn University in 35th place among overall Asian universities in 2009, and 30th in natural sciences and 24th in technologies among Asian universities¹⁷. Among worldwide university rankings, between 2007 and 2008, Chulalongkorn University advanced from 223rd to 166th place in overall worldwide rankings, and from 100th to 86th place in technologies, respectively.

2.3.2 Upgrading of Research

(1) Increase in Academic Publications

In line with its policy to develop towards a research university, the total number of research publications produced by instructors at Chulalongkorn University has largely increased. The rate of increase of publications issued from the target Faculties of this project are higher than

¹³ Including scholarships from the Thai governments, other countries and private sponsors of Thailand and abroad.

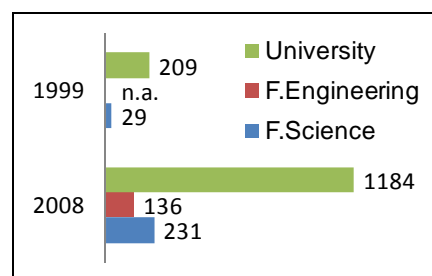
¹⁴ According to the government regulation, returned instructors must stay in the current universities for at least twice as long as the period of study abroad, and those who leave earlier than this must pay the government the amount three times than the cost for study abroad.

¹⁵ The Project Completion Report (2007) defines improvement of coursework as deepening or widening of topics handled in a course.

¹⁶ *“The Follow-up Study on the Thailand-Japan Technical Transfer Project”*, JBIC, 2007.

¹⁷ University of Tokyo was ranked no. 1 in the rankings of Asian universities in both natural sciences and technology. Those ranked close to Chulalongkorn University were Waseda University (29th) in science and Tohoku University in technology (23rd).

that of the entire University (Figure 1)¹⁸. According to the University, many of the outputs of research conducted based on new methods acquired by instructors through the project, and using equipment purchased through this project, have already been publicized. However, the average number of publications (on international journals) per instructor remains at relatively low levels as of 2008; 0.42 for the entire University, 0.53 in Faculty of Science, and 0.44 in Faculty of Engineering¹⁹. Regarding this point, some instructors of Chulalongkorn University and from Japanese host universities have pointed out that the number of publications vary depending on individual instructor (in other words, some instructors write several articles a year, while some do not write any), and that generally instructors seem to not have sufficient time to spend on research as they are busy with teaching classes and other works.



Source: Chulalongkorn University

Figure 1: Number of Publications on International Journals

Recent figures on the number of publications produced by participants in the degree programs of this project were not available. According to the Follow-up Study of 2007, however, 30 (or 86%) out of the 35 instructors who had received PhD degrees in Japan by that time had produced at least one paper for international journals or academic journals after their return. The total numbers of journal papers produced by them were 139 papers by 20 instructors at Faculty of Science and 52 papers by 15 instructors at Faculty of Engineering. From these numbers, the average numbers of journal papers per instructor could be calculated as 3.0 for Faculty of Science and 2.9 for Faculty of Engineering. Considering that the average time passed since their return is 3.4 years, the annual average number of international journal papers per instructor could be estimated at 0.68 or larger, which is better than the faculty-wide average mentioned above²⁰. Many of these publications are joint papers with Japanese researchers: up to January 2007, returnees from Japan through this project had produced 170 joint papers with Japanese researchers in Faculty of Science and 221 in Faculty of Engineering.

Therefore, it can be concluded that this project has generally contributed to the increase in the number of research publications, though such number varies among individual instructors.

(2) Acquisition of Research Funds

As per academic publications, the amount of research funds awarded to Chulalongkorn instructors has also been increasing. According to the data from the Follow-up Study of 2007, the average amount of research funds awarded from Chulalongkorn University or other organizations to returnees from the degree program of this project is calculated at approximately 850,000 Baht per instructor per year²¹, which is higher than faculty-level averages (320,000 Baht in Faculty of Science and 470,000 Baht in Faculty of Engineering). According to some returnees, the upgrading of research facilities and improvement of research outputs through this project have led to the acquisition of more funds. Acquisition of funds was also seen for joint researches with Japanese universities.

¹⁸ In 2008, Faculty of Science produced 242 journal papers (of which 231 were for international journals), and Faculty of Engineering produced 176 journal papers (of which 136 were for international journals) and 230 conference papers (of which 150 were for international conferences).

¹⁹ The average number of international journal papers per instructor is higher in some universities other than Chulalongkorn University: in 2008, it was 1.3/year for Faculty of Science of Mahidol University, known as a top-class research university, and 0.79/year at the International Institute of Technology of Thamassart University.

²⁰ The ratio of international journal papers was estimated with reference to the number of publication from Faculty of Engineering as a whole.

²¹ The calculation divided 2,880,000 Baht per instructor (accumulated amount between their return to Chulalongkorn University and the time when the Study was conducted) by 3.4 years (average time passed).

Thus, it can be said that this project has contributed to the increase in acquisition of research funds, although as per increase in the number of research publications issued, the amount of funds acquired largely varies among individual instructors.

(3) Evaluation from Inside and Outside of the University

During the implementation period of this project, Chulalongkorn University and a Japanese host university conducted project evaluation several times. Such evaluations were made mainly on the progress and outputs of research activities, which generally produced high marks.

Besides those evaluations, many of the research plans prepared for this project (Research Profile) (see 2.2.1(3) *Additional Outputs*) were designated by the University after the project as “Centers of Excellence” or “Research Units”, statuses given to highly significant and excellent research groups, and awarded research funds. More specifically, 11 out of 21 Research Profiles of the Faculty of Science were expanded to 13 Research Units. In the Faculty of Engineering, 4 out of 21 Research Profiles became 4 Centers of Excellence (which represents a higher valuation than Research Units) and 13 became 13 Research Units²².

According to Chulalongkorn University, this project brought to the University the method of conducting research in groups, as exemplified in Centers of Excellence and Research Units. In Thailand, researchers of universities were used to conducting research on an individual basis. When this project started, members of the project management team visited universities in Japan and observed its laboratory system where research is conducted in groups under one single theme. The system was introduced under this project, and now it is widespread among other major universities in Thailand.

Regarding external evaluations, the Commission on Higher Education of the Ministry of Education has classified Chulalongkorn University as one of the excellent research universities²³. Also, the target faculties and their members involved in this project have received a number of awards (for example, the Department of Chemical Engineering of the Faculty of Engineering received the S&T Award 2008, one of the highest awards in the field of S&T in Thailand, for its laboratory facilities and research outputs). In addition, the university rankings mentioned above show high marks for Chulalongkorn University not only for its level of education but also for its high level of research activities.

2.3.3 Improvement of Academic Services

Academic services include training, consulting and testing services provided to other faculties of Chulalongkorn University and to outside institutions/ organizations, and constitute one of the functions of the University. The enhanced levels of education and research capabilities through this project have also contributed to the improvement of academic services.

Table 9: Academic services from Faculty of Engineering to Industries (2007)

	Entire Faculty (12 Departments)	Target Departments of this Project (8 Departments)
Training/seminar	27	22
Testing	842	271
Consulting	47	22

Source: Chulalongkorn University

From certain available information, Table 8 shows the number of academic services provided from the Faculty of Engineering. Many of the training programs and seminars were provided by the project-assisted departments. According the University, a large part of testing services provided were analysis of component materials and calibration²⁴.

In addition, the S&T Research Equipment Center (STREC) uses some analytical instruments provided by this project (10 items, such as transmission electron microscope, out of 38 items

²² The total numbers of Center of Excellence (CE) and Research Units (RU) at the time of the ex-post evaluation were: 22 CEs and 108 RUs for the entire Chulalongkorn University; 4 CEs and 37 RUs in Faculty of Science; and 6 CEs and 24 RUs in Faculty of Engineering.

²³ The Commission said the official university accreditation system was under preparation.

²⁴ Many of testing services are provided by departments other than those assisted by this project. According to the University, most of them are provided by Department of Civil Engineering.

used) to provide analytical and testing services to Faculties of Science and Engineering and other faculties of Chulalongkorn University as well as to outside customers, and such services are highly reputed²⁵. The Food and Research Testing Laboratory established in the Faculty of Science started to provide testing services such as testing of microorganisms and residual pesticides to outside customers (food manufacturers for export, etc.), but the number of customers is still limited.

2.3.4 Utilization of the Project-assisted Facilities for Achievement of Project Objectives.

According to the Faculty of Engineering of Chulalongkorn University, 80% of the education and research equipment purchased under this project were used at the time of the ex-post evaluation. This is a good utilization rate considering opinions from Japanese universities and compared to utilization status in other similar projects. In the Faculty of Science, an inventory of education and research equipment purchased by the project was prepared: out of 420 items listed in the inventory, 399 items (95%) which is a significant number were recorded as being used²⁶.

It was observed that most of the 12 laboratories in the Faculty of Science, the Faculty of Engineering and STREC utilized the project equipment together with equipment purchased using their own funds or donated²⁷. Five laboratories said they use all equipment procured through this project. Frequency of use varies depending on purposes of the equipment or field of study²⁸. The purpose of use of equipment were reported to be education, research and academic services, thus it can be said that the equipment are being used for the objectives of this project.

As for information network equipment, it was reported that all of them were utilized except some servers and terminals that had already been replaced.

The reasons for non-utilization of some equipment at the time of the evaluation include (i) research projects that required the concerned equipment had not yet been conducted (but is planned in the future), (ii) generally, equipment are not shared with other departments and faculties, (iii) spare parts are no longer produced, and (iv) repair of broken equipment is taking time. See also 2.5 *Sustainability*.

Although the utilization status of books and CD-ROMs procured by this project for libraries was not identified, the status of use is inferred as being satisfactory from the fact that approximately 800 persons use the Faculty of Engineering Library per day and also students were observed viewing database procured under the project upon the evaluator's visit to the Library.



S&T Research Equipment Center (STREC)



Engineering Library

²⁵ STREC was established in 1981 with Japanese Grant Aid. In 2009, STREC was certified according to ISO17025 (General requirements for the competence of testing and calibration laboratories). The Food and Research Testing Laboratory of the Faculty of Engineering is also preparing to obtain ISO17025.

²⁶ Among the listed equipment valued at 1 million Baht (approx. 3 million Yen), only 2 items were recorded as not being used.

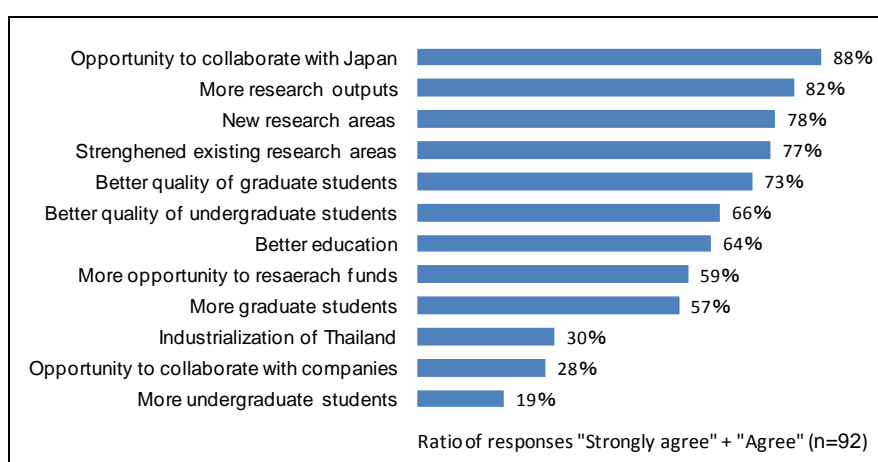
²⁷ The utilization rate of the project equipment at each laboratory visited varies in the range of 20-80% in terms of both value and the number of items.

²⁸ The hours of use vary among equipment. For example, a gas chromatograph at the Faculty of Engineering is always used by graduate students by rotation. Also, the weekly usages of analytical instruments installed at STREC are between 8-28 hours, and there is a two month or longer waiting list for electron microscopes. While less frequency of use does not mean less necessity of the equipment, there is an opinion that use of inactive equipment by other department, faculties and researchers should be promoted.

2.3.5 Satisfaction of Beneficiaries

At the time of the ex-post evaluation, a satisfaction survey (questionnaire survey) was conducted towards instructors of the Faculties of Science and Engineering, and it was found out that 82% of total 92 respondents answered that they are either “highly satisfied” or “satisfied” with both the implementation process and the outcomes of the project.

Answers obtained regarding individual outcomes²⁹ show high satisfaction with the creation of opportunities to collaborate with Japan. At the same time, satisfaction levels were low with respect to the increase in the number of students and project effects such as the promotion of industrialization of Thailand and the creation of opportunities to collaborate with industries. However, it can be explained that the change in the number of students is not directly attributed to this project. As for satisfaction levels concerning promotion of industrialization and collaboration with industries, such project impact from Chulalongkorn University to industries are expected in future as described in 2.4 *Impact*, the next section.



Source: Beneficiary survey

Figure 2: Satisfaction of instructors with individual points

2.4 Impact

With regard to the overall goal of this project, namely, the contribution to industrial development of Thailand, it was observed at the time of the ex-post evaluation that the technology transfer to industries was progressing through supply of human resources (i.e., production of graduates) and provision of academic services. Meanwhile, the transfer of new knowledge and technologies (i.e., commercialization of products and services based on R&D outputs) is now at the stage where the environment to promote such transfer has now been provided, and the effects of such efforts are expected to come in the future³⁰.

2.4.1 Contribution to Promotion of Industrial Development in Thailand

(1) Supply of Human Resources in Science and Technology

As shown in Table 1 of 2.1 *Relevance* and Table 7 in 2.3 *Effectiveness*, respectively, the

²⁹ Questions about individual outcomes were set with reference to the opinions raised during the focus group discussions with beneficiaries conducted before the questionnaire survey.

³⁰ In this ex-post evaluation, the evaluator assumed two paths through which the project impact may be brought to industries: (i) supply of human resources (through graduates from the target faculties getting jobs in companies); and (ii) direct technology transfer by instructors of the target faculties. The latter type of technology transfer was further divided into the contribution to promotion of R&D through provision of academic services and the contribution to commercialization of products and services through provision of new knowledge and technologies.

number of S&T students is increasing in both the entire country and at Chulalongkorn University. Most of graduates from the target faculties of Chulalongkorn University found jobs at private companies³¹. During interviews with some of those graduates, they commented that the basic knowledge and technologies they learned from the University are useful for their current jobs (at production sections or R&D sections). Also, the human resource manager of a Japanese machinery manufacturer in Thailand gave high marks on the performance of Chulalongkorn University graduates working there.



Graduates from Master's and Doctor's programs working in R&D section of a big chemical company of Thailand

(2) Direct Technology Transfer from Chulalongkorn University to Industries

This project assumed technology transfer in two stages: from Japanese universities to Chulalongkorn University in the first stage, and from Chulalongkorn University to Thai industries in the second stage. The first stage was expected as a direct outcome of this project, and the expectation was met as described in 2.3 *Effectiveness*. As for the second stage, the improvement of academic services provided by Faculties of Science and Engineering and thus the contribution to R&D activities of companies were observed. However, evidence such as the number of patents and the conclusion of licensing agreements with companies, which would show concrete effects of R&D activities brought by this project were not identified³². Several informants pointed out the following reasons:

- (i) In Thailand, the scale of R&D especially in advanced technologies is still small in scale (see also 2.1 *Relevance*).
- (ii) Generally, it takes a long time for research outputs to come to fruition. In particular, as Chulalongkorn University (as a research university) focuses on basic research, a long-term perspective is needed to assess the outcomes of research (comments from Chulalongkorn instructors and Japanese researchers).
- (iii) Compared to Japan, there are fewer cases of joint research with other researchers and universities, except some limited fields (such as particle technology and automotive engineering) (comments from Chulalongkorn instructors and Japanese researchers). As academic societies are not active in many fields, collaboration with other institutions and companies is made mainly using personal connections of instructors (comments from Thai and Japanese researchers).

The on-going university management plan aims to promote research activities and thus to

³¹ According to the data received from Faculty of Engineering, 70-80% of graduates from undergraduate programs got jobs in the private sector, while around 20% went on to graduate school, and very few entered government service. In case of graduates from Master's and Doctor's programs, around 80% went to the private sector, around 10% to government service, and in very limited cases to become instructors at Chulalongkorn University and other universities.

³² The number of patent applications and the number of licensing agreements made from the university and in collaboration with companies have been increasing in the university as a whole, and several to more than 10 cases are with Faculty of Science and Faculty of Engineering after the project. According to Chulalongkorn University, however, none of those cases are meaningfully related to this project. According to the Intellectual Property Institute of Chulalongkorn University in charge of patent application and agreements with companies, collaboration with companies does not always lead to the conclusion of formal agreements through the Institute except in fields such as medicine and pharmaceuticals. The reasons explained include that the level of research has not yet reached the level where new knowledge and technologies are developed and intellectual properties become an issue (comments from Chulalongkorn instructors and companies), and the conclusion of formal agreement is cumbersome (comments from Chulalongkorn instructors).

contribute to society by forming "Research Clusters", interdisciplinary research fields expanding beyond departments and faculties³³. Considering this together with the fact that the first-stage technology transfer has been successful and that cases of collaboration with companies have been accumulated, it could be said that the environment necessary for promoting the second-stage technology transfer to industries has been established, and thus the effects are expected in the coming years.

2.4.2 Creation of Collaborative Relationship with Japanese Researchers

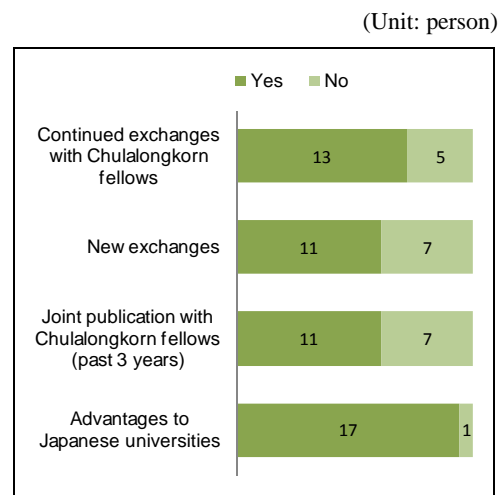
As mentioned above, the biggest benefit of this project raised by Chulalongkorn instructors is the creation of relationships with Japanese universities. Many of the instructors who participated in the fellowship program of this project have had no contacts with Japanese researchers until then. However, as a consequence of exchanges through this project, they have started new exchanges (such as re-visits to the laboratories in Japan, sending their students to Japan for study, inviting Japanese instructors, holding joint seminars, etc.) as well as new joint research. There are several cases in which participants in this project have received Japanese S&T grants to conduct R&D or provide academic services to Japanese companies in Thailand.

At the same time, naturally in some cases contacts have ceded. Also, it might take more time even for the on-going active contacts to yield results that would contribute to society. Nevertheless, good relationships are generally well-maintained and have continued to develop over the years even after project completion, and thus future further effects are expected.

Japanese host universities also pointed out that the participation in this project benefited the Japanese side as well: according to the questionnaire survey to instructors who supervised Chulalongkorn instructors for degrees, almost all of the respondents (16 in writing and 2 through interviews) said that the participation was advantageous to themselves. Advantages cited include the start of exchange with Thai researchers, opportunity for Japanese students to acquire international way of thinking, and the continuation of their researches by Chulalongkorn instructors who joined the research groups, which increased research outputs from the universities in Japan.

2.4.3 Effects on Other Universities in Thailand

Some spill-over effects were observed of Chulalongkorn instructors who participated in this project being dispatched to other universities and the education and research facilities being utilized by them. For example, instructors of Department of Chemical Engineering (established in 2004), at the Faculty of Engineering, Silpakorn University located in the outskirts of Bangkok, are all graduates from the Department of Chemical Engineering, Faculty of Engineering, of Chulalongkorn University. There are some cases in which those instructors have received advice from their ex-supervisors at Chulalongkorn University and use analytical instruments at the University for their education and research activities. In 2008, this department produced the first graduates, and all of the eight instructors produced at least one research paper (13 papers in



Source: Beneficiary survey

Figure 3: Questionnaire answers from Japanese instructors about continuing communication and exchanges with participants in this project

³³ Chulalongkorn University is planning large-scale investment for this. One of them is called the second phase of this project (but to be financed by a Thai organization), and plans to develop facilities to promote business-academia collaboration.

total) on international journals.

In case of Thai-Nichi Institute of Technology, established in Bangkok City in 2007 with support from Japanese companies, Chulalongkorn instructors and one Japanese ex-supervisor of a Degree Program participant teach students there (the latter was dispatched by JICA). Graduates from this Institute are expected to play important roles in Japanese companies.

2.4.3 Environmental Impact

Environmental impact of the laboratory facilities developed by this project is all manageable under the standard disposal procedures of Chulalongkorn University. According to the University, both Faculty of Science and Faculty of Engineering observe the environmental consideration guidelines set by the University, and no particular environmental problems have been noted.

2.5 Sustainability (Rating: b)

There is some concern as to whether the education and research equipment improved under this project will be properly operated, updated, and maintained until such time the long-term effects of the project (particularly the transfer of technology to industrial sector) comes to fruition. Though some problems have been observed in terms of the above, sustainability of this project is fair.

2.5.1 Executing Agency

2.5.1.1 Operation and Maintenance System

The operation and maintenance (O&M) organization of this project is Chulalongkorn University. The responsibility to operate and maintain the facilities and equipment developed by this project, including the securing of the O&M budget, lies with the users of the respective facility/equipment (see below), and there is no single central organization of the University to oversee this matter.

- (i) Education and research equipment: O&M by respective department or laboratory
- (ii) Information network equipment: O&M by the Computer Center of each faculty
- (iii) Library books: O&M by the library of each faculty

At the time of the appraisal, it was planned that Chulalongkorn University would prepare an equipment O&M plan during the project implementation. In response, the project consultants prepared a plan to utilize S&T Research Equipment Center (STREC) as the university-wide O&M unit for education and research equipment. However, this plan was not realized due to such factors as the highly decentralized organizational structure among the university, faculties and departments, and the difficulties in self-repairing highly sophisticated equipment within STREC.

Besides the O&M of facilities and equipment, the continuity of research is also a key factor for sustainability. The organization called UNISERCH (in charge of assisting instructors in applying for research projects) and the research affairs offices of the university and at each faculty provide support services to individual instructors who wish to obtain research funds and to apply for projects.

Such support structure is standard for O&M system at universities with no big issues. However, as described below, there is room for further enhancement to improve the O&M situation.

2.5.1.2 Technical Capacity for O&M

Although the situation varies among laboratories, main users of laboratory equipment are students and/or technicians employed by the faculty, and in many cases the instructors themselves do not operate them. This does not pose a problems in most laboratories, where the use of the equipment that require high operational skills is limited to trained personnel, however

some laboratories have expressed concerns about the capabilities of their technicians. Some laboratory staff have indicated that the status of technicians is not well-established and that turnover is high, as potential reasons for the concerns raised.

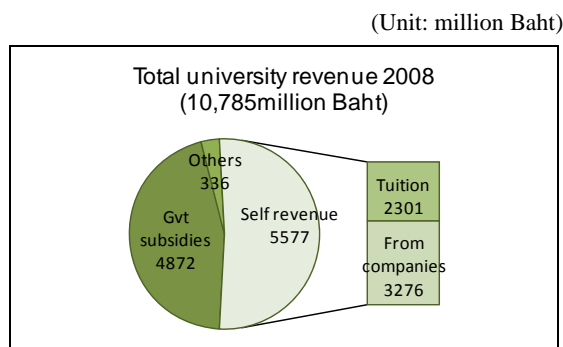
According to Japanese researchers who were providing technical guidance to the Food and Testing Research Laboratory of Faculty of Science at the time of the ex-post evaluation, the installation and operation of the equipment was properly conducted according to the manuals, however, the pre- and post- treatment of samples was not satisfactory at some laboratories. The technical guidance was being provided on a voluntary basis by a Japanese non-profit organization specialized in laboratory equipment and analysis, which has also donated some small laboratory tools such as flask stands to the laboratories.

No problem was noted in terms of technical capacity for O&M of information and network equipment: in both Faculties of Science and Engineering, the Computer Centers have employed qualified personnel (engineers and technicians) from outside and has constantly trained them as needed.

2.5.1.3 Financial Status

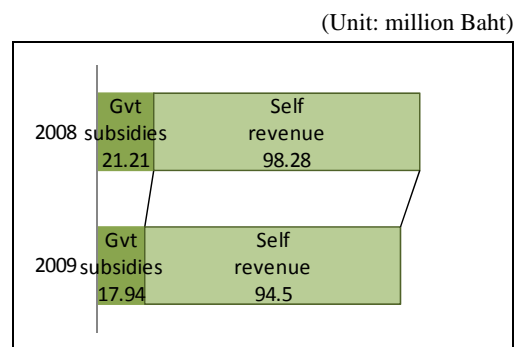
No particular problem was seen in the financial status of Chulalongkorn University. Figure 4 shows the university budget for year 2008. The own-revenue sources account for more than half of the university budget, and its share is increasing.

The allocation of the government budget portion is decided based on requests made from each department, and the allocation of the budget from the own-revenue source is decided based on actual performance of each faculty and department. The O&M budget for laboratory equipment is funded from either the university budget (own-revenue portion), commission revenues from academic services and research projects, donations or other sources. However, whether sufficient funds can be received varies depending on the department, the field of research, and also on personal connections of instructors with outside funding resources. Some laboratories have commented that their O&M budget is not sufficient³⁴.



Source: Chulalongkorn University

Figure 4: University budget

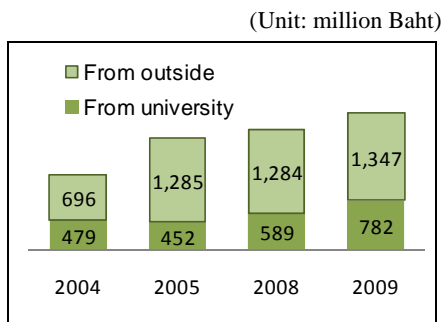


Source: Chulalongkorn University

Figure 5: O&M budget of Faculty of Engineering

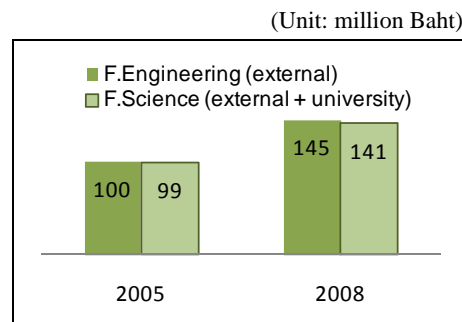
The amount of the research grants received is consistently increasing, both at the university level and at each of the Faculties of Science and Engineering (Figures 6 and 7. See also 2.3.2 (2) *Acquisition of Research Funds*).

³⁴ Among the twelve laboratories visited at the time of the on-site survey for the ex-post evaluation, four laboratories said there is no problem in the amount of the O&M budget for equipment, and other four laboratories did not provide an answer. The remaining four laboratories provided some figures on O&M cost: the annual O&M expense for equipment of their laboratories accounted for 0.75%-3% of the purchase price of the equipment under this project, which can be said to be insufficient.



Source: Chulalongkorn University

Figure 6: Research grants earned



Source: Chulalongkorn University

Figure 7: Research grants to Faculty of Science and Faculty of Engineering

2.5.2 Operation and Maintenance Status

At the time of the ex-post evaluation, the project facilities and equipment were maintained in generally good condition, although in a few cases some sensitive analytical instruments had been required to be sent abroad for repair. In seven out of 12 laboratories visited, some instructors expressed their concerns on the continuance of sufficient maintenance and repair and future replacement due to upgrades in the coming years. Some reasons provided for their concerns were the fast pace of obsolescence of advanced equipment, high cost for updating software, and some manufacturers not being able to provide maintenance services (even paid services) after the expiration of the guarantee period (normally five years). On the other hand, the laboratories that answered that there was no problem in O&M status had a common tendency that they all seemed to have close relations with companies, which again suggests the influence of personal connection of instructors with outside resources on O&M of equipment.

3. Conclusion, Lessons Learned and Recommendations

3.1 Conclusion

In light of the above, this project is evaluated to be highly satisfactory.

3.2 Lessons Learned

(1) Combination of equipment procurement and human resource development

A unique feature of this project is that it effectively combined human resource development (“soft” aspects) and facility development (“hard” aspects). Unlike some precedent similar projects, there was no case where unnecessary and expensive equipment were procured. This was possible due to planning and implementing both “soft” and “hard” components based on a specific research plan (Research Profiles), which should serve as a good reference for other projects. See the thematic evaluation report for more detailed lessons learned related to the combination of different components and their effects.

(2) Preparing the schedule taking into consideration characteristics of university organizations

In Thailand, instructors play a substantial role in managing universities. However, they are too busy with education and research activities to perform office work promptly. Even with assistance by project consultants in project management, there are many internal procedures in the university that must be conducted by the instructors themselves (e.g., those related to selection and dispatch of fellows for study abroad and equipment purchase). Therefore, it is important to list up all such necessary internal procedures in advance, and make a realistic and feasible schedule accordingly.

Also, in a project that assists several departments simultaneously (like this project), because the departments are run independent of each other the process of preparing the list of fellows to study abroad and of equipment tends to take time, and this also needs to be taken into consideration when preparing the schedule.

(3) Consideration of various methods for procurement of equipment

The procurement of laboratory equipment in accordance with specific research plans may require procurement of special-order equipment, which may not be suitable for procurement by ICB (international competitive bidding) method. Therefore, considering various procurement methods including direct purchase and international shopping from the planning stage, as was done in this project, could enhance efficiency of implementation.

(4) Retaining human resources who received technology transfer within the organization

In this project, all instructors who participated in the fellowship program for degrees have stayed in the university. This is attributed to several factors such as the government policy (i.e., penalties for early leavers), university policy (research cost assistance after return) and attractiveness of the university itself (i.e., high sense of belonging to the university due to self-pride of being an instructor of a top-ranked university or high expectation for the university's future).

3.3 Recommendations

3.3.1 Recommendations to Chulalongkorn University

(1) Utilization of unused equipment, execution of effective and sustainable O&M

It is recommended that the departments/ centers that have unused equipment start utilizing them according to the plan, as was informed at the time of laboratory visits that there were plans to use them in the near future.

Also, each faculty/ department is recommended to systematically prepare and implement an equipment O&M plan. In doing so, the O&M plans of STREC (ISO accredited), the Food and Testing Research Laboratory (on the way of ISO accreditation) and the one proposed by the consultants during the project implementation could be good references.

There are some equipment which will not be able to receive support services in a few years when the maintenance contracts expire. It is suggested that the University as well as each faculty/department identifies such expiration periods, and consider the necessity of future upgrades or replacement (including budgetary measures).

In order to enhance efficiency of use of expensive equipment and thus promote outputs of research, Chulalongkorn University is recommended to consider mutual inter-faculty or inter-department access to laboratory equipment. This direction would be in line with the promotion of Research Clusters currently undertaken by the University³⁵. In case where the main users of equipment are external technicians, provision of training and incentives necessary for enhancing their operation skills and for retaining human resources is also suggested.

(2) Promotion of technology transfer to industries

In order to fulfill the technology transfer to industries that is currently underway, Chulalongkorn University is encouraged to continue the promotion of the on-going university management plan (for contribution to society through promotion of R&D).

In doing so, there are some cases in which instructors informally collaborate with companies to avoid cumbersome procedures and incurring of costs accompanying the conclusion of formal agreements: the increase in formal agreements in a way that faculties and departments could

³⁵ It should be noted that specifications of some equipment have been tailored to specific research themes. Therefore, in order to identify equipment that could be shared with others, it is proposed to first prepare an inventory of equipment and share it with other faculties and departments. The evaluator has noted that Faculty of Science and STREC have already made such inventories. They could be useful for identifying the expiration date of support services and the period till replacement.

easily handle and that would benefit faculties and departments in terms of protection of intellectual property rights is encouraged.

As the continuation of research is essential for technology transfer to industries, it is expected that the University, faculties and departments continue to promote acquisition of research funds, conduct joint researches and exchanges of instructors with universities abroad using opportunities inside and outside the University.

Also, it is desired that the University, faculties and departments enhance effectiveness of technology transfer by participating in joint research with other universities in Thailand. As one of the instructors has pointed out, a key factor in past successful cases has been to identify the benefits of joint research for both Chulalongkorn and partner universities.

3.3.2 Recommendations for JICA

(1) Follow-up on O&M of equipment

It is proposed that JICA plan and implement technical assistance related to the use of research equipment in a way similar to ones recently carried out by Japanese instructors and researchers (NPO) on a voluntary basis for some laboratories. The target laboratories might be limited as the equipment is well-utilized by skilled personnel in most laboratories. However, conducting detailed study of the current status of equipment and training following the study would be possible options, by dispatch of a short-term experts or senior volunteers. Currently, the training offered by the above-mentioned NPO is open not only to staff of the concerned laboratory but to staff of other laboratories conducting similar types of work. Therefore, the technical assistance could also be extended to other institutions outside of the University, which would also contribute to the direct technology transfer to society.

(2) Project formulation to promote application of research outputs for the benefit of society

The technology transfer project to industries (“the second phase of this project”) that Chulalongkorn University is preparing is one means to achieve the overall goal of this project. Although details of that new project are not available, JICA could support such efforts of the University in ways such as short-term invitation of instructors to Japan, dispatch of Japanese researchers to Thailand which were proven effective in this project, as well as assistance in the development of a system of inter-disciplinary research (including inter-faculty and inter-department joint research and sharing of equipment), and assistance in the preparation of inventories of research equipment would also be beneficial.

Comparison of Original and Actual Scope

Item	Planned	Actual
(1) Outputs		
1) Fellowship program	Degree 47 instructors Non-degree 40 instructors	36 instructors 198 instructors
2) Japanese visiting scholars	263 instructors	562 instructors
3) In-house joint research fund	Establishment of the fund	Not established
4) S&T technology transfer	Lectures and seminars	Mostly as planned
5) Facility development	Education and research equipment, information network equipment and library development	Mostly as planned Additional outputs: Research Profiles
6) Consulting services	Software Development Support Services (SDSS): 69MM, Hardware Development Support Services (HDSS) and Overall Project Management Services (OPM): 396MM, Academic Fellowship Support Services (AFS): 90MM	SDSS: Cancelled, HDSS and OPM: 653MM, AFS: 240MM
(2) Project Period	August 1995 – March 2005	September 1995 – October 2006
(3) Project Cost		
Foreign currency	7,380 million Yen	6,444 million Yen
Local currency	1,288 million Yen (356 million Baht)	44 million Yen (1,380 million Baht)
Total	8,596 million Yen	6,879 million Yen
ODA loan portion	7,380 million Yen	6,444 million Yen
Exchange rate	1 Baht=3.62 Yen (as of May 1995)	1 Baht=3.14 Yen (as of October 2006)

PART II Thematic Evaluation Report

Thematic Evaluation Report

Assistance in Inter-University Cooperation Projects in the Technology Field by ODA Loan -- Opinions Expressed by Related Parties Concerning the Effects of the Thailand-Japan Technology Transfer Project

Evaluated Project : Thailand-Japan Technology Transfer Project

International Development Associates Ltd.

Takako Haraguchi

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1 Introduction

1.1 Background and Objective

This Report has been prepared to complement The Japanese ODA Loan Project Ex-post Evaluation Report (for fiscal year ending March 2009) related to the Thailand-Japan Technology Transfer Project (“TJTTP”).

The separately reported TJTTP Ex-post Evaluation (hereafter “the Main Project Evaluation”) was conducted within the normal JICA ODA loan project ex-post evaluation framework, based on information (including statistical data) mainly obtained from related organizations such as the executing agency (Chulalongkorn University) and its supervisory authority (Commission on Higher Education, Ministry of Education), and information from the results of the beneficiary questionnaire conducted by the evaluator, and concluded that the project was “highly satisfactory”.

Within the process of the Main Project Evaluation mentioned above, many relevant parties voiced their opinions and views towards the Project as well as hints for similar projects to be conducted in the future. However, since the Main Project Evaluation was made based mainly on factual findings from qualitative and quantitative information, such views expressed were not necessarily sufficiently presented in the Main Project Evaluation.

One characteristic of this Project is that, not only “hard aspects” such as improving facilities and equipment, but also “soft aspects” of human interaction such as through discussions related to project planning and execution, promoting study abroad of students and inviting teaching staff also played a large role towards meeting the objective of “improving the education and research levels at the Faculty of Science and the Faculty of Engineering.” Another characteristic is that the expected effects of the project is not limited to short term effects which can be numerically measured such as the number of academic degrees awarded or the number of research papers written, but more longer term and qualitative effects on capability development such as the change in the stance towards education and research activities are also expected. Some opinions and views expressed by relevant parties included expectations towards such longer term effects which were not necessarily visible now.

Therefore, this Report aims to draw lessons and hints for conducting future similar projects, by presenting in more detail the results of the beneficiary questionnaire and investigations etc. conducted towards related parties within the Main Project Evaluation process, as well as the views expressed by relevant parties on the effects of the project (especially in relation to the outcome and impact of the various components of the project).

1.2 The Evaluated Project and its Characteristics

The object project of this Report is the Thailand-Japan Technology Transfer Project (TJTTP). The objective of the Project was: “To upgrade science and technology education and research and development activities at the Faculty of Science and Faculty of Engineering of Chulalongkorn University, by improving the academic standard of teaching staff as well as enhancing educational and research facilities, thereby contributing to the industrial development of Thailand.” The main project components (output) conducted towards this objective were: (i) Fellowship Program (9 masters degrees, 36 doctors degrees, 198 non-degree or short term study visits), (ii) Japanese Visiting Scholars (562 visits by Japanese teaching staff), (iii) Science and Technology Transfer Program (through seminars etc), (iv) Facility Development (education & research equipment, IT network equipment, library books). For further details please see the Main Evaluation Report.

Even from before the TJTTP, ODA loan-financed projects related to assisting the development of higher education in the science and engineering field had been promoted. The target of such assistance varied widely from specific faculties within one university (such as in

TJTTP) to multiple universities and junior colleges (maximum approximately 300 schools¹).² Although the common underlying objective of these projects is to improve the level of education, in a project like TJTTP which is targeted to assist a university which is a top class university representing a country or region, improving the level of research is upheld as a key objective which is as important or even more important than the objective of improving the level of education. Generally, project components comprise a combination of (i) sending teaching staff, governmental organization staff or students to Japanese universities (for obtaining degrees or for short-term study), and (ii) enhancement of facilities (constructing school buildings and upgrading equipment facilities), and this is the same for TJTTP. However as mentioned above, in addition TJTTP is characterized by the fact that it has enhanced “soft” components including, but not limited to, fellowship programs.

1.3 Survey Framework

(1) Survey Implementation Structure

This Report has been prepared, based on the same survey which was conducted under the TJTTP Main Evaluation, by Takako Haraguchi of International Development Associates Ltd. The field survey was conducted in April and June-July of 2009 for total approximately 4 weeks, and domestic survey was conducted in April – May and August of 2009. A portion of the field survey was commissioned to IC Net Asia, Ltd., a Thailand local consulting firm.

(2) Survey Method

The planning and implementation of this Project as well as the post-completion management process of this Project was brought about by, and influenced by, various related parties from both Japan and Thailand. Such parties were organized as shown in Table 1 to structure the survey method. With the exception of a questionnaire issued to the executing agency and entity in charge of operation and maintenance (Chulalongkorn University), the survey method can be divided into three categories: (i) focus group discussions (FGD), (ii) write-in type questionnaires, and (iii) semi-structured interviews (SSI).

The number of persons who provided comments and opinions amounted to 212 persons from Thailand (of which 92 persons responded to questionnaires only), 24 persons from Japan (of which 16 persons responded to questionnaires only).

Survey Method (Summary)

- First, teaching staffs at Chulalongkorn University were divided into multiple groups based on their relation with and involvement in the project, and FGD were conducted. Within the FGD, each participant was asked to write their individual opinions on paper in order to grasp the variety of opinions, and then such opinions were consolidated into prototype opinions through discussions made among the participants taking into consideration the written opinions, and then voting (in order to rank the multiple opinions).
- Next, questionnaires were issued to teaching staff at both Chulalongkorn University and cooperating Japanese universities, and SSI was conducted at the same time. The questionnaires were used to understand general trends in the opinions, and individual

¹ The Education Facilities Expansion Project in the Republic of Korea.

² This is based on ex-post evaluation reports for the following 10 completed projects (year in parenthesis is the year of publication of the evaluation report): Bogor Agricultural University (IPB) Development Project in Indonesia (2002), Engineering and Science Education Project in the Philippines (2003), Strengthening Vocational and Technical Manpower Production Program in Thailand (2004), Mulawarman University Development Project in Indonesia (2004), Education Facilities Expansion Project in the Republic of Korea (2004), Higher Education Loan Fund Project (HELP) in Malaysia (2005), The Bogor Agricultural University (IPB) Development Project (2) in Indonesia (2005), Development Project of the Institute of Technology in Bandung(2) in Indonesia (2005), Syiah Kuala University Development Project in Indonesia (2006), and Professional Human Resources Development Project (2) in Indonesia (2007).

opinions were collected through the SSI. Upon creating the questionnaire, information obtained during the FGD and SSI process were referenced.

- Individual opinions from various parties other than teaching staff were collected through the SSI.

Table 1 : Method of Beneficiary Survey made towards TJTTP related parties

※CU: Chulalongkorn University

	Related Parties	Country	Primary Classification	Role within the Project	Survey Method within the ex-post evaluation ^{*1}
1	CU Project Implementation Section	Thailand	Executing Party	Project implementation and monitoring	<ul style="list-style-type: none"> • Question List • Semi-structured interviews (SSI) 4 persons
2	CU Management Execution Section	Thailand	Operator/ Maintenance	Project benefit operation and maintenance.	<ul style="list-style-type: none"> • Question List • SSI 9 人
3	CU Teaching Staff at Faculties of Science and Engineering (staff sent abroad for study)	Thailand	Direct Beneficiary	Visited Japan in fellowship programs to obtain degrees or for short-term stay, and participated in joint research and used provided equipment.	<ul style="list-style-type: none"> • Focus group discussions (FGD) 26 persons • Questionnaire 92 persons • SSI 15 persons
4	CU Teaching Staff at Faculties of Science and Engineering (staff not sent abroad)	Thailand	Direct Beneficiary	Received technology transfer within Thailand, used provided equipment.	<ul style="list-style-type: none"> • FGD 15 persons • SSI 2 persons
5	CU Students in Faculties of Science and Engineering	Thailand	Direct Beneficiary	Receiving instructions from teaching staff who received technology transfer, used provided equipment.	<ul style="list-style-type: none"> • FGD 15 persons
6	CU Graduates of Faculties of Science and Engineering.	Thailand	Direct Beneficiary	Same as above	<ul style="list-style-type: none"> • SSI 9 persons
7	Current Employers of Graduates of CU	Thailand	Indirect Beneficiary	Employed graduates of the target faculties.	<ul style="list-style-type: none"> • SSI 1 person^{*2}
8	Client firms of CU academic services.	Thailand	Indirect Beneficiary	Utilized services using the equipment provided	<ul style="list-style-type: none"> • SSI 3 persons
9	Ministry of Education, Higher Education Bureau	Thailand	Policy Maker	The supervising authority of CU	<ul style="list-style-type: none"> • SSI 1 person
10	CU Teaching staff in other faculties.	Thailand	Third Party	(provided third party opinions regarding the project)	<ul style="list-style-type: none"> • FGD 5 persons
11	Teaching staff and researchers at other university faculties of science and engineering.	Thailand	Third Party	provided third party opinions regarding the project) provided third party opinions regarding the project)	<ul style="list-style-type: none"> • SSI 5 persons
12	Cooperating Universities in Japan	Japan	Cooperator	Received students in fellowship programs, sent instructors from Japan	<ul style="list-style-type: none"> • Questionnaire 16 persons • SSI 2 persons
13	Business Consultant	Japan	Executing Party	Implemented the project	<ul style="list-style-type: none"> • SSI 2 人
14	Other Japanese researchers	Japan	Cooperator/ Third party	Cooperated with project operation and maintenance/ (provided third party opinions regarding the project)	<ul style="list-style-type: none"> • SSI 6 人

Source : Prepared by author of this report

Notes: 1) Upon stating the number of persons who were surveyed in the “Survey method within the ex-post evaluation”, if a person was involved in surveys for more than one category (for example, a person who is a member of the project implementation section is also a teaching staff at CU faculty of science or faculty of engineering, etc.), such person was counted only in one category depending on the content of the information provided by such person. However, with respect to the category “(6) CU Graduates of Faculties of Science and Engineering”, of the 9 persons stated, 3 of them were double counted in other categories.

- 2) In category “(7) Current Employers of Graduates of CU”, only one firm is counted with whom we were able to speak to the person in charge of human resources, however, actually 4 firms provided feedback (who were counted under the category “(6) CU Graduates of Faculties of Science and Engineering”).

(3) Feedback Seminar

At the time of completion of the 2nd field survey on July 15, 2009, a feedback seminar on the evaluation results was held at Chulalongkorn University. A total of 37 persons comprising the above mentioned project related parties and JICA Thailand Office participated in the seminar, and the provisional evaluation results were discussed.

2 Survey Results

The results of each survey are reported below. As a common trend seen among all survey results, the assessment of the Project by related parties were generally high, and in particular the direct outcome of the improvement of the level of education and research (by technology transfer from Japan) at Chulalongkorn University was strongly recognized. However, at the impact level, the recognition of contribution (through technology transfer) from Chulalongkorn University to the industrial sector was limited. Also, some pointed out issues such as the slow speed of delivery of procured equipment, and difficulty of maintenance etc., in parallel to positive opinions that such equipment improved the quality of research and education.

Furthermore, recognition of the effects varied among the project components as described in detail below.

- The level of satisfaction of teaching staff who participated in the fellowship programs was especially high. Technology transfer effects were also strongly recognized.
- There is strong recognition that improvement of level of education is closely tied to enhancement of equipment facilities.
- At the research level, various parties recognized that improvement was made; however, promotion of research in cooperation with Japan was recognized stronger where there was human exchange with Japanese researchers. In such case, the level of recognition was not affected by the length of stay in Japan, and such effect was recognized even in cases of short-term interaction.

2.1 Focus Group Discussions

(1) Summary

As shown in Table 2, five FGDs were conducted: 4 with teaching staff at Chulalongkorn University, and 1 with students at Chulalongkorn University. Local consultants acted as facilitator of the discussions, and each FGD took approximately 2 hours.

The following three methods were used for the discussions. These methods are characterized by the fact that they do not induce the participants towards a certain direction, allowing participants to freely express both positive and negative opinions, and that they allow extraction of majority opinions from the various opinions expressed. The 4th FGD which was conducted among teaching staff from other faculties comprised only a small number of participants, and therefore only plenary discussions were conducted.

Discussion Method utilized in FGD:

- Brain-storming: Each respondent was asked to write responses to the main question “How did this Project change Chulalongkorn University’s (or your) education/ research activities?” on cards.
- Group and plenary discussions: The cards (opinions of the participants) were organized, captioned and summarized.
- Ranking Poll: Respondents were asked to vote on the most significant “changes”

perceived (multiple voting allowed).

Table 2 : Summary of Focus Group Discussions

No.	Participants	No. of Participants	Discussion Date
FGD1	Teaching staff at Faculty of Science and Faculty of Education at Chulalongkorn University, who participated in the Fellowship Program (Degree Program) of this Project.	10 persons (Fac. Sci. 7, Fac. Eng. 3)	April 28, 2009
FGD2	Teaching staff at Faculty of Science and Faculty of Education at Chulalongkorn University, who participated in the Fellowship Program (short-term study) of this Project.	16 persons (Fac. Sci. 11, Fac. Eng. 5)	April 28, 2009
FGD3	Teaching staff at Faculty of Science and Faculty of Education at Chulalongkorn University, who did not participate in the fellowship program of this Project.	15 persons (Fac. Sci. 9, Fac. Eng. 6)	April 29, 2009
FGD4	Teaching staff of other faculties at Chulalongkorn University (faculty of dentistry, faculty of commerce, etc.)	5 persons	April 29, 2009
FGD5	Graduate school students at the Faculty of Science and Faculty of Engineering at Chulalongkorn University	15 persons (Fac. Sci. 8, Fac. Eng. 7)	June 23, 2009

(2) Results of FGD towards teaching staff

First, an overview is provided of the 3 FGDs conducted inviting teaching staff of the Faculty of Science and Faculty of Engineering, the faculties targeted for this project.

As a common result, in all three FGDs, both positive and negative opinions were received. The main common opinions received are as follows.

Some Positive Changes from this Project:

- Advancement of research activities (through equipment and obtaining PhD degrees etc.): Increased number of teaching staff with PhD degrees, deepened research and obtained new knowledge, developed new areas of research, enhanced ability to establish new research themes, increased interest in research, increased opportunities to participate in research projects, increased number of research findings, etc.
- Cooperation with Japanese universities: Established long-term relationship with Japanese researchers, promoted mutual understanding, learned Japanese style research method and method of administering experiment laboratories, established basic infrastructure for international cooperation, connections with students from other countries, established contacts with Japanese firms, increased number of students wishing to study in Japan.

Some Negative Changes (or issues) from this Project:

- Process of procuring equipment took time: Delay in procurement process, lack of information regarding procurement process, etc.
- Issues related to equipment maintenance and use: shortage of budget to maintain and operate the equipment (cost of maintaining and using the equipment became high), absence of a maintenance plan, etc.

With respect to differences among groups, within the 3 FGDs, there was a difference in ranking of opinions (on what is the most important point) as described below. From this, the possibility arises that the longer the period of stay in Japan the higher the satisfaction level towards this Project. On this point, as further described below, this trend is seen consistently in results from other survey methods such as questionnaires etc.

- “The most important point” which was raised by participants in the degree programs (FGD1) were all positive ones, however participants in short-term stay programs

(FGD2) and teaching staff who were not sent to Japan (FGD3) raised issues related to the equipment in addition to positive points (the highest ranked point was negative point related to the equipment).

- Participants in degree programs (FGD1) put more emphasis on advancement of education compared to other FGD participants.
- Participants in degree programs (FGD1) placed more importance on changes to way of thinking and changes in behavior.
- Participants in fellowship programs (FGD1 and FGD2) placed emphasis on cooperation with Japanese universities.
- Participants in short-term stay programs (FGD2) and teaching staff not sent to Japan (FGD3) pointed out many issues related to the equipment.

Another opinion worth being mentioned is that “Currently it is the stage where technology is being transferred from Japan to the university. Next step is for us to transfer such technology to the Thai industry”. This opinion supports the status that “transfer of technology to the industrial world is expected in the future” which is also one of the conclusions in the Main Evaluation.

Table 3 : The Most Important Changes brought about to Chulalongkorn University’s Education and Research Activities by this Project (Results of voting on majority opinions put forward in FGD with teaching staff at target faculties)

No.	Ranking	Content of opinions regarding perceived “changes” (number in brackets are number of votes)	
FGD1 (Degree course participants) Total 50 votes	1	(+ level of research improved (due to equipment) (13)	
	2	(+ improved level of education (11)	
	3	(+ established ties with Japanese universities (9)	
	4	(+ changed way of thinking and behavior (9)	
	5	(+ level of research improved (due to obtaining PhD degree) (8)	
FGD2 (Short-term stay course participants) Total 80 votes	1	(- process of equipment procurement lacked flexibility, took time (29)	
	2	(+ established ties with Japanese universities (23)	
	3	(+ assisted the conversion to a research university (13)	
	4	(+ increased international research papers (5)	
	5	(+ increased achievements of graduates and education	
FGD3 (participants who did not study in Japan) Total 75 votes		Faculty of Engineering (30 votes)	Faculty of Science (45 votes)
	1	(+ quality of research improved (7)	(+) analytical equipment increased (14)
	2	(+ number of research staff increased (4)	(-) costs related to equipment increased (6)
	3	(-) required improvement of maintenance and use of the equipment / procurement process took time (3)	(-) the merit of some equipment was not clear (6)
	4	(+) achievements from research increased (1)	(+) established cooperative relationship with Japan (5)
5	(+) the quality of the faculties improved (0)	(+) the quality of teaching staff improved (through obtaining PhD degrees) (4)	

Note: Each participant was given 5 votes, and was allowed to freely allocate them to one or multiple “changes”.

The FGD with teaching staff at Chulalongkorn University other than in the faculty of science and faculty of engineering (FGD4) took a more informal style of free discussions because there were only a few participants. The main question discussed was “Do you know anything about TJTTP?”, and most of the 5 participants (from faculties of dentistry, fishery, and commerce) had not heard of the project, however they knew about the new building constructed (at the faculty of science) and that equipment were purchased and the number of research papers and research

projects increased at the target faculties, and that there was an increase in external financing.

(3) Results of the FGD with graduate school students

The results of the FGD conducted with graduate school students at the Faculty of Science and Faculty of Engineering were similar to the FGD results with teaching staff. Positive feedback included the improvement in the capability of teaching staff (satisfaction with quality) and negative feedback related to problems with equipment facilities (delay in procurement, lack of access to the equipment, shortage of budget for maintenance and operation costs). Dissatisfaction related to equipment seemed to be stronger than with teaching staff. This was attributed to the fact that in many experimental laboratories the main users of the equipment facilities are the graduate school students, together with technicians employed by the faculties, and thus it can be inferred that the graduate school students have more interest in the equipment facilities.

**Table 4 : The Most Important Changes brought about to Chulalongkorn University’s Education and Research Activities by this Project
(Results of voting on majority opinions put forward in FGD with graduate school students of the target faculties)**

No.	Ranking	Comments/Views Received Regarding “Changes” (numbers in brackets are number of votes)	
FGD5 (graduate students) 75 votes		Faculty of Engineering (35 votes)	Faculty of Science (40 votes)
	1	(-) insufficient budget to maintain and operate the equipment (13)	(-) Use of some equipment are restricted, or are broken ore have been sent out for long-term repair, and shortage of equipment has caused work delays. (16)
	2	(-) some equipment have already become old (7)	(-) There are some information sources (journals) which cannot be accessed (8)
	3	(+) there are many equipment of industrial world standard, and are useful for research (6)	(+) Teaching staff with abundant knowledge provides knowledge and instructions (7)
	4	(+) teaching staff have abundant knowledge (5)	(+) Various and new type equipment were introduced which enhanced the effects of experiments. (5)
5	(+) strengthened cooperation with other universities and organizations (4)	(-) There are many research aid funds, however the amounts are too small, and it takes time to receive payments (4)	

Note: Each participant was given 5 votes, and was allowed to freely allocate them to one more multiple “changes”.

2.2 Questionnaire

(1) Summary

As shown in Table 5, two types of questionnaire surveys were conducted towards teaching staff at the Faculty of Science and Faculty of Engineering at Chulalongkorn University, and towards cooperating universities in Japan.

Table 5 : Summary of Questionnaire Surveys

Type of Survey	Respondent Classification	Parent Population	Number of Respondents
Teaching staff at the faculties of science and engineering at Chulalongkorn University	Teaching staff who participated in the fellowship program (degree course) and who obtained PhD degrees.	36 persons	36 persons*
	Teaching staff who participated in the fellowship program (short-term).	146 persons	51 persons (Faculty of Science 27, Faculty of Engineering 24)
	Other teaching staff who were involved in this project.	-	5 persons (Faculty of Science 2, Faculty of Engineering 3)
Cooperating Japanese universities	Supervising instructors of teaching staff of Chulalongkorn University who studied abroad in degree courses.	46 persons	16 persons (10universities)

Note: Of the 36 respondents from degree courses, 18 had also participated in short-term stay programs. These participants are not counted in the 51 persons categorized under “participants in fellowship programs (short-term)”.

(2) Results of the Questionnaire conducted towards teaching staff at Faculty of Science and Faculty of Engineering at Chulalongkorn University

As stated in the Main Evaluation Report section “2.3.5 Satisfaction of Beneficiaries”, of the 92 respondents 82% expressed their satisfaction towards the project implementation process and its effects, and particularly high satisfaction was indicated regarding cooperation with Japan and the improvement of level of research.

In this report, the satisfaction levels of the following aspects will be observed³: (i) whether or not participants participated in long-term fellowship programs (degree course), (ii) whether or not participants received lectures and instruction from Japanese visiting scholars, and (iii) whether or not participants used equipment facilities procured under this Project. The high satisfaction levels towards this Project seen among staff who have studied abroad as was stated in section “2.1.(2) Results of FGD towards teaching staff” was particularly distinct with respect to effects of the project in terms of project implementation process and transferring of new technologies.

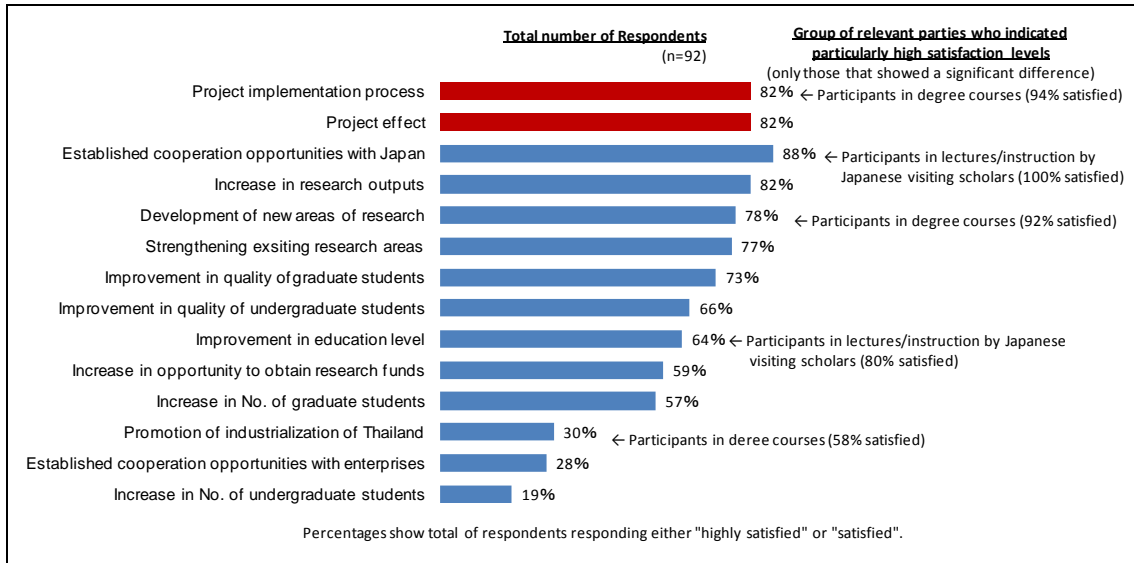
First, (i) With respect to participants in the long-term fellowship programs (degree course), satisfaction levels towards the project implementation process, development of new research areas, promotion of industrialization of Thailand was higher compared to satisfaction levels of staff who did not study abroad. The satisfaction expressed towards development of new research areas is assumed to be pointing to achievements in education and research at Japanese university graduate schools⁴. With respect to promotion of industrialization, as stated in the Main Evaluation Report, it cannot be said that such industrialization has been sufficiently achieved at this time; however, the level of satisfaction on this aspect is relatively higher among teaching staff that had stayed in Japan for longer periods.

³ The relationship between each of the respondent categories and other components is as follows: (i) out of 36 participants in the fellowship program (degree), 16 persons participated in the fellowship program (short-term), 14 persons attended lectures and instructions by Japanese visiting scholars, and 10 persons used equipment procured under this Project; (ii) out of 44 participants in lectures and instructions by Japanese visiting scholars, 10 persons participated in the fellowship program (degree), 37 persons participated in the fellowship program (short-term), and 37 persons used the equipment; (iii) out of 46 users of the equipment, 14 persons participated in the fellowship program (degree), 39 persons participated in the fellowship program (short-term) and 37 persons used the equipment. The category “participants in the fellowship program (short-term)” was not prepared as most of the respondents falls under this category.

⁴ For example, in the free comments section of the questionnaire, there was an opinion that “Through studying abroad in Japan, I was able to receive instructions to support industrial development in Thailand”.

Next, ② Participants who had received lectures or instruction from teaching staff invited from Japan expressed particularly high satisfaction levels for establishment of cooperative relationship with Japan and obtaining research funds. Most of the respondents to the questionnaires had been sent to Japanese universities and is believed to have effected the results, but in addition effects of invited Japanese teaching staff can be seen.

③ The users of equipment facilities (educational and research equipment) procured under this project indicated high satisfaction towards improvement of education. This result is consistent from the opinions indicated in the FGD pointing to the effect that increase in experimental equipment has on education activities.



Note: Significant difference was 5% of significance level.

Figure 1 : Level of Satisfaction towards this Project of Teaching Staff at Chulalongkorn University

Many opinions were obtained in the free comments section of the questionnaires. In that section respondents commented on the variety of aspects where they felt they the components were useful in their education and research activities, but as with the FGDs, they also pointed out the slowness of the equipment facilities procurement process and the complications experienced with procurement procedures. With respect to effects in relation to equipment facilities, there were positive evaluations such as “it was not possible to obtain this much equipment facilities outside of this Project”, “I was able to publicize many research papers on international journals using the new equipment facilities”, “we were able to establish new courses using the newly installed equipment⁵”, and “we were able to obtain Thai research funds with the new facilities”. On the other hand, there were other opinions such as “it is only one of many other existing scholarships and projects”, “as it became difficult to continue study in Japan, I left the Japanese university and obtained a PhD degree in the United States”, “Because I changed my research theme, cooperation with Japan was no longer meaningful”. Also, as a recommendation for the future, many respondents stated cooperation for maintenance of equipment facilities and assistance for continued human interaction. Below is a quote from a comment received, which well summarizes the comments of many teaching staff.

“If there is a second phase of this project, issues related to documentation preparation and procedural aspects should be addressed. In particular, consultants frequently requested large

⁵ Example: Master Program on Pulp and Paper Technology etc.

volumes of paperwork towards teaching staff at Chulalongkorn University, and this should be changed. (*partially omitted*) It should not be the case that continued research activities are adversely affected by this Project due to project budgeted funds being used only for purchase of new equipment facilities. Our research group further requires repair of existing equipment, sending teaching staff and students to Japan, support for participation fees for international conventions, in order to further develop the achievements made to date.”

(3) Results of the Questionnaire towards Japanese cooperating universities

The results of the questionnaire towards supervising staff at the cooperating universities in Japan (i.e. the supervising instructors of staff studying abroad in degree courses at Japanese universities) can be found in “Section 2.4.2”: Creation of Collaborative Relationship with Japanese Researchers” in the Main Evaluation Report. As some supervising professors had retired or otherwise very busy, the number of responses received were limited (16 responses to questionnaires, and 2 cases of feedback from similar questions made in SSI process). However, as mentioned in the Main Evaluation Report, more than half of the cases showed results such as joint research continuing as a result of the cooperation with this project, or establishing of new human exchange. Details of the human exchanges and other merits are described below. There are some positive feedback, but some have pointed out that follow up after the project implantation is not sufficient.

**Table 6 : Opinions of supervising staff at Japanese cooperating universities
(Some excerpts from responses to the questionnaires)**

Contents of continuing interaction and communication	<ul style="list-style-type: none"> • Visiting research laboratories • Conducting joint research • Annual reporting of progress made through joint research • Intercommunication among research lab students (joint seminars) • Receiving post-doctorates • Receiving internship students • Receiving new students to study abroad. • Receiving revisits to Japan at visitor’s own expense. • Launching new projects. • Japanese instructors visiting and teaching in Thailand.
Merits for Japan	<ul style="list-style-type: none"> • It contributed to the advancement of research. • It provided direction towards international cooperation. Was able to learn the way of cooperation. • Was able to obtain high quality students. • Obtained much information regarding universities in Thailand. Was able to acquaint Thai researchers. • Was able to understand the organization of Thailand universities and their state of research. • Was able to have contact with Thai culture. • The personalities and eager research attitude of the students from abroad affected and stimulated other students. • Broadened the international views of other students.
Other Comments	<ul style="list-style-type: none"> • We received high quality students. • The follow-up care to students such as Japanese language training was thorough, and was helpful in day-to-day research activities. • Although it was not easy up to providing degrees, however ultimately there was merit also for the supervising side. • Response from Thailand side was slow. • Interaction after the student’s return to home country became scarce on the receiving side, and regret that we were not able to provide after care. It would be good to have a follow-up system. • It would have been better to appeal this project more internally within the university.

2.3 Semi-structured Interviews

(1) Summary

SSIs were conducted with all of the project related parties listed in Table 1 except for Chulalongkorn University students. The SSIs were mostly individual interviews; however group interviews were conducted with the CU Management Section and with graduates of

Chulalongkorn University. In total 59 persons were interviewed. Each interview lasted for approximately 30 minutes to 1 hour, and were conducted based on pre-provided list of questions, however, some questions were added or skipped as deemed necessary.

(2) Main Results

Of the information obtained in the SSIs, those related to facts have already been reported in the Main Evaluation Report. Here in the Table below, some opinions received from related parties are shown in excerpt or summary form (and a more detailed version is provided in the Table in the Appendix to this report). As with the results of the survey using other methods, the overall evaluation of this Project is high (particularly at the direct outcome level). Also, various opinions were obtained regarding the Project, including the importance of human exchange through short-term fellowship programs etc.

Some examples of differing opinions are, (i) the necessity for on-going external assistance after project completion (some were of the view that this was not necessary as they could continue development by themselves, were others viewed that it would be difficult to continue research without such external support), (ii) whether to allow sharing of experiment equipment facilities with other faculties and entities (some was for sharing to extract maximum utilization of high cost equipment, where others viewed that sharing would be difficult because the required specifications differed depending on the research theme even with the same equipment.) Furthermore, at more basic level, (iii) the issue of which is the main objective, education or research? (some pointed out that although this project emphasizes development of research, it should likewise take on the responsibility as a human development organization by focusing more on educational aspects, and another opinion was that the beneficiaries are limited when taking the approach of aiming to enhance the frontier level by developing core universities as in this Project, so it is better to assist a wider number of entities. Such opinions were received mainly from outside parties.)

Table 7 : Opinions received regarding this Project during the Semi-structured Interviews (SSIs) (excerpt / summary)

CU Project Implementation Section	<p>< Assessment of this Project ></p> <ul style="list-style-type: none"> • This Project served as a good contact point for promoting joint research between Thailand and Japan. <p>< Recommendations for the future ></p> <ul style="list-style-type: none"> • The short-term fellowship program is an interesting program which allows for participants to obtain know-how regarding equipment during the stay, and then can publicize research paper after returning home. It is a necessary program going forward. • It is important to choose one's research theme from the standpoint of technology transfer (obtaining new knowledge). • Similar projects should be those which also benefit the Japan side (such as research achievements etc). • Regarding the term of short-term stay, 2 months may be sufficient for establishing personal ties in Japan, however for research purposes minimum 3 months is really necessary.
CU Management Section	<p>< Assessment of this Project ></p> <ul style="list-style-type: none"> • It is apparent that research activities at Chulalongkorn University had improved through this Project. • Although it is said that transfer of technology to the industrial world is not seen, however, as a research university CU puts emphasis on basic research, and therefore it will take longer time for achievements to be applied. <p>< Direction going forward ></p> <ul style="list-style-type: none"> • Promote organization of academic research clusters, and provide research achievements which adhere to the needs of society.
CU Teaching Staff at Faculties of	<p>< Assessment of this Project ></p> <ul style="list-style-type: none"> • A significant effect was exchange of human resources. • Fellowship program was a big opportunity for continuing research.

Science and Engineering	<ul style="list-style-type: none"> • Research at Chulalongkorn University advanced significantly due to this Project, and afterwards the pace has slowed down however is continuing development. • The equipment facilities procurement process was extremely slow. <p><Recommendations for the future></p> <ul style="list-style-type: none"> • Chulalongkorn University is currently in the stage of reform and therefore would like to be a part of such reform (therefore, do not intend to leave the current position). <p><Others></p> <ul style="list-style-type: none"> • The burden of teaching courses and instructing students is large (participant in short-term fellowship program).
Current employers of graduates of CU	<p><Assessment by Graduates></p> <ul style="list-style-type: none"> • The current performance of the graduates is highly assessed ranging around an average of 9 to 10, on a scale of 10.
Client firms of CU academic services	<p><Assessment of CU as a service provider></p> <ul style="list-style-type: none"> • The quality of the researchers is high. • We are satisfied with the service provided by the Science and Technology Research Equipment Center. • The level of satisfaction towards the service is 50/50. The facilities are sometimes still insufficient, and there are some equipment facilities where use is restricted. The equipment and needs do not fully correspond. • CU is still not at the stage of providing R& D to enterprises.
Ministry of Education, Commission on Higher Education	<p><Function of CU></p> <ul style="list-style-type: none"> • Although it is a research university, education activities are also important.
Teaching staff and researchers at other university faculties of science and engineering	<p><Recommendations for the future></p> <ul style="list-style-type: none"> • Transfer of technology from university to enterprises is still difficult. There is a shortage of needs in the industrial world. • The university should function solely as a human resource education organization. • High quality human resources at CU is limited, and other universities also have high quality human resources, so it is strange to view CU as representing the one and only best university
Cooperating Universities in Japan	<p><Assessment of this Project></p> <ul style="list-style-type: none"> • Up to now basic skills and development capabilities have been nurtured. The level of Thailand has become high compared to surrounding countries. • It is not a project which produces immediate results. The real fruits will come out when people begin to forget about this project. • After project completion, we saw improvement in education facilities. Experiment items are also well thought out. <p><Recommendations for the future></p> <ul style="list-style-type: none"> • Thailand is still at a stage where a leading university needs to lead to upgrade the whole. Therefore, it is better to first develop a leading organization. • In order to respond to the needs of the industry, it is important to produce continual output.
Project Consultants	<p><Project Implementation Process></p> <ul style="list-style-type: none"> • The reason why the target of this Project was limited to just one university CU alone was that, at the time of planning, there were no other universities which had the potential capability to conduct joint research with Japanese universities. • Reflecting on lessons learned from similar projects from the past, in addition to procuring equipment which are wanted by researchers, Research Profiles which include experiment protocols were created, and selected conditioned on integration with soft aspects. <p><Assessment of this Project></p> <ul style="list-style-type: none"> • As a loan has been made, there are merits such as the scale is large, administration is sound, and the counterparty is eager. • There is a large gap in the technology level between the technicians and teaching staff.
Other Japanese	<p><Assessment of this Project></p>

researchers	<ul style="list-style-type: none"> • The selection of equipment facilities was appropriate. However, there is a shortage of supplementary equipment used to move the large equipment. • The maintenance status of the equipment is appropriate. However, there seems to be lack of information to fully use such equipment. <p><Recommendations for the future></p> <ul style="list-style-type: none"> • Sharing of equipment is questionable. The skills required to use the advanced equipment will not improve, and some need to be customized for individual researchers. It may be more realistic to jointly use basic equipment. • The first role of a university should be to send high quality human resources to the industrial world. • Even if new technology is developed, it is not meaningful unless facility investments for manufacturing are made and sales channels are acquired.
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3 Conclusion and Lessons Learned

The opinions received from related parties which are introduced in this report vary widely, but each of them are evidence of the results of the Main Evaluation results, and the consistency among the information received through the multiple survey methods used was confirmed.

Each opinion received is highly suggestive, but when consolidated, the following lessons can be learned.

- (1) The target will differ depending on which aspect, education or research, is more emphasized.

In the above mentioned survey, a few participants pointed out that developing human resources should be prioritized over research activities, or that social contribution is larger by sending university graduates to R&D departments at enterprises rather than for university researchers to directly produce research achievements. When taking into consideration various needs and the role of higher education organizations, the role and direction of higher education assistance can be divided into (i) assistance provided to top class universities emphasizing research aspects, and (ii) assistance towards a wide range of universities and other higher education organizations emphasizing education aspects. This Project takes the former approach.

This type of assistance towards top class universities, as with this Project, is backed by the strategy to upgrade higher education as a whole by upgrading the core organization. Although there are needs to develop human resources more broadly and at more basic levels, for this type of core target assistance it is important to confirm at the appraisal stage whether the pre-conditions are met such as (i) whether the targets of the assistance (in this case the teaching staff at Chulalongkorn University) already have the capability to participate in the project (if the capability is not sufficient, there is a risk that the high-value equipment will not be utilized), (ii) Government policies and measures justify support to be provided to a specific organization (to achieve international competitiveness, upgrading the level of a top class university in order to upgrade the whole etc.), and (iii) the target university to be assisted has a clear vision to contribute to society its research achievements (without such vision there is no impact to society).

- (2) A long-term perspective is needed to produce results in capacity development in the research.

There is a common recognition that through this Project the research environment was improved, the attitude and way of thinking upon engaging in research was learned, cooperative relationships with internal and external parties were established, experience was gained to publicize research papers in international forums, and the foundation was established for continual capacity development.

It is mutually agreed by all related parties that in order for the higher level objective of contribution to the industrial world and society to be achieved, these achievements need to be continued for a long period. Opinions on whether follow up assistance (including for equipment maintenance and further human exchange) is necessary is divided, there are cases where the teaching staff have on his/her own developed personal connections and obtained financing (and thus has been able to continue research without additional assistance), but some have pointed out that there are other cases where further assistance is necessary post completion of the Project.

Therefore, in establishing higher level objectives for similar projects, it is important to ascertain whether such objective can be achieved within 2-3 years after project completion (increase in research papers, improvement in academic services etc.) or will require a longer period of time (contribution to the industrial world with new technologies and know-how, such as through product commercialization of the achievements of research and development), and to consider the achievement deadline and achievement path (including the condition of whether follow up assistance would be necessary after completion of the project).

In addition, when assessing long-term (such as 10 years) impact to society, the equipment initially procured in the project may no longer exist (high level equipment can especially become obsolete rather quickly). Also, it can be expected that it will be difficult to distinctly recognize the difference in effect with that of other similar projects. Therefore, the contribution of this project should be that it provided a catalyst to enable continued research.

(3) It is important to understand the characteristics of multiple components (both soft and hard aspects), and combine them in line with the objectives.

High satisfaction on the effects were expressed from many participants in relation to fellowship programs (both doctor degree and short-term programs), Japanese visiting scholars, and installing equipment facilities. The characteristics of each are described below.

Effectiveness of doctor degree courses was commonly recognized by both participants and non-participants in the courses. Teaching staff who obtained PhD degrees in this project have generally expressed high satisfaction towards the project, and other teaching staffs have also positively perceived the improvement in capabilities. Of course, some pointed out that if the objective is just to obtain a degree, then such objective could be sufficiently accomplished under other scholarship programs. Others opined as further described below that if the objective is to establish relationships then that could be accomplished under the short-term stay programs. Therefore, it is advised that this component should be added taking into consideration the merits (such as stated above, learning the way of approaching research, bringing about comprehensive research achievements, developing new areas of research, establishing deep and strong relationships, opportunities to publicize findings at international conventions, contributing research achievements to Japanese universities, etc.) of conducting research activities during a long time-span in Japan.

With respect to Short-term fellowship programs, many participants gave opinions that they found it useful in establishing cooperative relationships with Japanese universities. As with the doctor degree courses, the levels of satisfaction among participants in the short-term fellowship programs are generally high. On the other hand, the project implementation section viewed that if the objective is not just establishment of personal connections but also to achieve results in research, then the current average length of study abroad of approximately 2 months is not sufficient, and that at least 3 months is necessary (the length of stay was shortened from the initial plan of 5 months due to the request of the teaching staff). Also, contrary to other components, the objective (effect) of improving education levels was not indicated under the short-term study programs, and there were some negative opinions such as it was necessary to shorten the stay period due to education activity obligations, or it was a burden on research activities. Therefore, there seems to be a need to confirm that the length of studying abroad is consistent with the objective of such stay. For example, adjustments such as the following should be considered from the time of project appraisal: if the objective is to create

opportunities for joint research then it would be effective to plan many fellowship programs of approximately 2 months, or if the objective of studying abroad is to transfer new knowledge and technologies then the term of stay should be 5 months. In order to do so, it is also considered necessary to confirm the schedule of teaching staff (confirm how long of a period the staff can be away from Japan due to classes etc) and research needs as well as whether sending the same staff multiple times can bring about research achievements.

In relation to invitation of Japanese visiting scholars, although responses were fewer compared to fellowship programs and equipment facilities, determining from the questionnaires responses it became evident that the cooperative interaction with Japan and improvement of education levels were highly assessed. Regarding improvement in education levels, as with improvement of equipment facilities, it is noteworthy that students can directly benefit from such component. Therefore, by combining the component with sending teaching staff to Japan (such as where Japanese instructors who received fellowship-program participants from the counterparty institution is then next sent to visit that counterparty institution), it is expected to heighten the project effect from both education and research perspectives by strengthening cooperative relationships, the students in the counterparty country can receive direct instruction from Japanese teaching staff, and technology transfer would progress even under mutual short-term stay.

In relation to installation of equipment facilities, the impact of readily visible output from education and research equipment is strongly recognized from both good and bad standpoints. First, as for positive effects, experiment laboratories were established, equipments increased enabling increasing the number of students, and many teaching staff also pointed out that they were able to obtain new research funds. In particular, it can be said that one of the merits of loan projects is that it enables purchase of expensive and wide range of equipment facilities which cannot be purchased under other projects.

On the other hand, especially when the period of stay in Japan is short term, the dissatisfaction towards equipment procurement process and contents of the equipment are large (dissatisfaction related to equipment facilities procurement were less from doctor degree course participants). From this it can be assumed that for beneficiaries who do not participate in long-term fellowship programs, the importance of procurement of equipment facilities is high, and the greater the importance of obtaining the appropriate specifications of equipment and timing of installation. Therefore, upon making detailed plans for the project, it is required that a realistic and effective process for selecting and purchasing equipment facilities which match the research theme and needs of participants not studying abroad is designed, and such plans are promptly implemented.

Appendix: Opinions received regarding this Project during the Semi-structured Interviews (SSIs)

CU Project Implementation Section	<p><Project Implementation Process ></p> <ul style="list-style-type: none"> • We learned the procedure for purchasing equipment facilities and that it takes time to install such equipment. The process should be more efficient next time. • The key factors for success of this project are the capability of the project director and the understanding of the university principal. • Although in the initial stages we often clashed with the consultant many times, as a result we were able to closely cooperate and co-work. <p><Assessment of this Project ></p> <ul style="list-style-type: none"> • This Project served as a good contact point for promoting joint research between Thailand and Japan. <p><Recommendations for the future ></p> <ul style="list-style-type: none"> • The degree program has now already ended its role. • The short-term fellowship program is an interesting program which allows for participants to obtain know-how regarding equipment during the stay, and then can publicize research paper after returning home. It is a necessary program going forward. • It is important to choose one's research theme from the standpoint of technology transfer (obtaining new knowledge). • Similar projects should be those which also benefit the Japan side (such as research achievements etc). • Project directors should be outstanding in both administration and research. • The system of "Thesis Doctors" (i.e. doctor degrees that are obtained by submitting a thesis only) enables obtaining the knowledge, skills and experience (in applied research) necessary for technology transfer. Thailand also needs such a system where researchers can obtain practical experience. • Regarding the term of short-term stay, 2 months may be sufficient for establishing personal ties in Japan, however for research purposes minimum 3 months is really necessary.
CU Management Execution Section	<p><Assessment of this Project ></p> <ul style="list-style-type: none"> • It is apparent that research activities at Chulalongkorn University had improved through this Project. • Although it is said that transfer of technology to the industrial world is not seen, however, as a research university CU puts emphasis on basic research, and therefore it will take longer time for achievements to be applied. <p><Operation and maintenance aspects ></p> <ul style="list-style-type: none"> • There are already certain equipment facilities which require upgrading (servers etc.) • Shortage of maintenance and operation budget from the government and university. <p><Direction going forward ></p> <ul style="list-style-type: none"> • Promote organization of academic research clusters, and provide research achievements which adhere to the needs of society.
CU Teaching Staff at Faculties of Science and Engineering	<p><Assessment of this Project ></p> <ul style="list-style-type: none"> • A significant effect was exchange of human resources. • Fellowship program was a big opportunity for continuing research. • Research at Chulalongkorn University advanced significantly due to this Project, and afterwards the pace has slowed down however is continuing development. • The equipment facilities procurement process was extremely slow. <p><Recommendations for the future ></p> <ul style="list-style-type: none"> • The allocation of equipment maintenance and operation budget should be changed to achievement basis. • Chulalongkorn University is currently in the stage of reform and therefore would like to be a part of such reform (therefore, do not intend to leave the current position). <p><Others ></p> <ul style="list-style-type: none"> • The burden of teaching courses and instructing students is large (participant in short-term fellowship program).
Graduates of CU	<p><Assessment of this Project ></p>

Faculties of Science and Engineering	<ul style="list-style-type: none"> • Have not heard about this project. • Did not recognize any large changes to the research laboratories while in school. • As a student, equipment facilities were in the process of being purchased. Did not use the equipment as a student, but is using the equipment after graduation. • CU has a good education environment. Good quality of staff. However, when a student, the equipment facilities were old. • Do not remember the name of the supervising teacher. Did not have interaction with them (a few undergraduate students).
Current Employers of graduates of CU	<p>< Assessment of Graduates ></p> <ul style="list-style-type: none"> • We are expecting high quality from CU graduates. The current performance of the graduates is highly assessed ranging around an average of 9 to 10, on a scale of 10.
Client firms of CU academic services.	<p>< Assessment of CU as a service provider ></p> <ul style="list-style-type: none"> • The quality of the researchers is high. • We are satisfied with the service provided by the Science and Technology Research Equipment Center. • The level of satisfaction towards the service is 50/50. The facilities are sometimes still insufficient, and there are some equipment facilities where use is restricted. The equipment and needs do not fully correspond. • Compared to other universities, CU's infrastructure is superior, and the quality of researchers is at a comparable level. • CU is still not at the stage of providing R& D to enterprises.
Ministry of Education, Commission on Higher Education	<p>< Function of CU ></p> <ul style="list-style-type: none"> • Although it is a research university, education activities are also important.
Teaching staff and researchers at other university faculties of science and engineering.	<p>< Recommendations for the future ></p> <ul style="list-style-type: none"> • Transfer of technology from university to enterprises is still difficult. There is a shortage of needs in the industrial world. • It is good to have the government standing between the industry and academic worlds. This is because even though the industry wishes to have something which is readily useable, most advanced technologies do not make money right away. • Contribution to enterprises is best made through students. • The university should function solely as a human resource education organization. • High quality human resources at CU is limited, and other universities also have high quality human resources, so it is strange to view CU as representing the one and only best university
Cooperating Universities in Japan	<p>< Project Implementation Process ></p> <ul style="list-style-type: none"> • It took time to nurture mutual understanding with Thailand. <p>< Assessment of this Project ></p> <ul style="list-style-type: none"> • Up to now basic skills and development capabilities have been nurtured. The level of Thailand has become high compared to surrounding countries. • It is not a project which produces immediate results. The real fruits will come out when people begin to forget about this project. • Key factors for project success depend on individual capabilities and on the research area. • After project completion, we saw improvement in education facilities. Experiment items are also well thought out. • It is a problem that there are some researchers who devote too much to providing services to enterprises which have resulted in not being able to write research papers. <p>< Recommendations for the future ></p> <ul style="list-style-type: none"> • Thailand is still at a stage where a leading university needs to lead to upgrade the whole. Therefore, it is better to first develop a leading organization. • It may be good to choose high quality students and have them obtain a PhD degree in Japan, and educate them as researchers for the next generation. • High level equipment facilities should be chosen by first identifying where such equipment is situated. • It is necessary to educate persons who can advise on know-how for maintaining and operating equipment facilities.

	<ul style="list-style-type: none"> · In order to respond to the needs of the industry, it is important to produce continual output.
Project Consultants	<p><Project Implementation Process></p> <ul style="list-style-type: none"> · The reason why the target of this Project was limited to just one university CU alone was that, at the time of planning, there were no other universities which had the potential capability to conduct joint research with Japanese universities. · Reflecting on lessons learned from similar projects from the past, in addition to procuring equipment which are wanted by researchers, Research Profiles which include experiment protocols were created, and selected conditioned on integration with soft aspects. · Research Profiles have the history of research, and is useful in explaining to third parties. <p><Assessment of this Project></p> <ul style="list-style-type: none"> · As a loan has been made, there are merits such as the scale is large, administration is sound, and the counterparty is eager. · There is a large gap in the technology level between the technicians and teaching staff.
Other Japanese researchers	<p><Assessment of this Project></p> <ul style="list-style-type: none"> · The selection of equipment facilities was appropriate. However, there is a shortage of supplementary equipment used to move the large equipment. · The maintenance status of the equipment is appropriate. However, there seems to be lack of information to fully use such equipment. <p><Recommendations for the future></p> <ul style="list-style-type: none"> · It is necessary to educate operators and technicians. · Sharing of equipment is questionable. The skills required to use the advanced equipment will not improve, and some need to be customized for individual researchers. It may be more realistic to jointly use basic equipment. · The first role of a university should be to send high quality human resources to the industrial world. · Even if new technology is developed, it is not meaningful unless facility investments for manufacturing are made and sales channels are acquired.