

SEMI-ANNUAL PROGRESS
AND
FINANCIAL REPORT NO. 11
YEAR 4, FOR THE PERIOD
APRIL 1 TO SEPTEMBER 30, 1996

Submitted to:
The ARA Consulting Group Inc.

December 1996

Prepared by:
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SEMI-ANNUAL PROGRESS

AND

FINANCIAL REPORT

Linkage Project Title: Institutional Linkage Project
Canadian Partners: Ryerson Polytechnic University (Canadian
Lead Partner)
Guelph University
University of Waterloo
Technical University of Nova Scotia
Thai Partners: Suranaree University of Technology
Project No.: 906/14868

Report No. 11

Covering the Period
April 1 to September 30, 1996

Submitted to ARA
December 1996

by

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PART 1**1.1 REPORT SUMMARY**

1. Project Start:	July 15, 1993	Finish:	March 31, 1998
CIDA Contribution:			\$ 995,484
Canadian Institutional Contribution:			\$ 601,605
Thai Institutional Contribution:			\$ 3,931,345
Other Sources of Funding:			\$ 432,535
Total Project Budget:			\$ 5,960,969

Project Description

This is a project of institutional linkage and technical cooperation to support the institutional development and capacity building of Suranaree University of Technology (SUT) through: (a) customized training programs in Canada; (b) technical assistance services in Thailand; and (c) joint academic and scholarly initiatives in both countries.

The project also involves the development and implementation of a number of innovation, joint academic initiatives including: (a) an English as a Second Language (ESL) Centre; (b) and international applied science and engineering undergraduate program; (c) a joint Ph.D. program; and (d) a co-op student exchange program.

The project incorporates a number of programs to strengthen university-industry linkages for both CUTC institutions and SUT including: (a) short upgrading programs for personnel from Thai enterprises; and (b) participation of Canadian and Thai industries and enterprises in a technical and commercial exposition supported by the Thai government at SUT in 1995.

2. Brief Summary of Project Management: Year 4

- This the first Semi-Annual Report for the period April 1 to September 30, 1996 introduced a new structure as requested by ARA.
- The Annual Report for period April 1, 1995 to March 31, 1996 was submitted to ARA based on a revised structure.
- Dr. Sam Mikhail returned as Project Manager. Mary Jane Curtis replaced Marsha McEachrane as Project Coordinator. Dr. Stalin Bector (Acting Project Director 1995) has reassumed his responsibilities as Program Manager.
- A Mini-PRC Meeting was held in Thailand at SUT from June 11-13, 1996, attended by Dr. Stalin Bector (*see Appendix I*)
- Following a report by Dr. Sam Mikhail to Dr. Vichai Tunsiri "Evaluation of the Status and Lesson Learned from the SUT/CUTC Project", the Internal Monitoring and Evaluation Sub-Committee visited Ryerson on June 24, 1996 (*see Appendix H*)
- SUT submitted their Quarterly Progress Report #8 for the period April 1, to July 31, 1996 (*see Appendix J*)
- Third Annual PRC Meeting held in Canada, hosted at the University of Waterloo, September 26, 27, 1996. (*see Appendix I*)
- Agreement was reached with ARA on a new reimbursement scheme based on a modified structure of deliverables and sub-deliverables
- A schedule of deliverables was submitted to ARA by Dr. Stalin: correspondence dated: Oct 21, Nov. 8, 20, 1996: (*see Appendix H*)

3. Progress and Achievements to Date

a) Accomplishments during the period under review

- **Program 1:** Institutional Capacity Building Program
Deliverable 1.31 and 1.32 were completed during this period. All activities and deliverables planned under Program 1 are now completed.
- **Program 2:** International Academic Programs
 - 2.1 International Applied Science and Engineering Undergraduate Programs
Four assignments by three professors related to curriculum development and delivery of the first year of the Mechanical Engineering IUP were completed during this period.

- 2.2 Collaborative Ph.D. Program
Three Thai/SUT faculty members are presently pursuing their Ph.D. programs at TUNS. Three other Ph.D. candidates are expected in 1997.
- 2.3 Co-op Work Placements
Four Canadian Student and two Thai students took part in work placement opportunities in Thailand and Canada during this period.
- **Program 3:** University-Industry Linkage Program
An Industrial Seminar and a Conference/Workshop took place at SUT during July, 1996. Six Canadian consultants participated in these activities. A Canadian consultant developed and planned co-op activities in collaboration with SUT.
- **Program 4:** Project Management
See Item 2, summary as above
- b) **Schedules:** Please see Minutes of the 3rd PRC Meeting (Appendix I)
- **Program 1:** Institutional Capacity Building
All activities in Program 1 are now completed
- **Program 2:** International Academic Programs
 - 2.1 5 IUP assignments (Electrical Engineering) are planned, 3 for Post Graduate program development and 2 for Food Technology program development will also take place in 1997.
 - 2.2 Three additional graduate students, Ph.D. candidates and four Post Doctoral assignments are scheduled for 1997.
 - 2.3 The remaining co-op work placements will be completed in 1997.
- **Program 3:** University-Industry Linkage Program
The final activities in this program (deliverable 3.21) will be completed in October 1996. Three additional industrial seminars are expected to be planed and delivered in 1997.

- **Program 4: Project Management**
The Fourth PRC meeting is scheduled for April 1997 at TUNS and the Fifth PRC meeting is scheduled for December 1997 at SUT.

c) Expenditures

For the period July 15, 1993 to March 31, 1998, CUTC budgeted \$995,484 to support the implementation of proposed activities. Funds expended to date total \$572,177. Of this consolidated total, CIDA funds budgeted for the period were \$240,387 and CIDA funds actually expended were \$220,564.

4. Progress Toward Achieving Project Objectives and Deliverables

- a) **Reached:** all activities and deliverables in Programs 1 and 3 are completed.
- b) **Scheduled:** see above

Can ARA Help?

No assistance from ARA is requested at this time.

PART 2

2.1 REPORT ON PROJECT MANAGEMENT

2.1.1 Project Managers

Canada: Dr. Sam Mikhail, Director, Ryerson International,
Ryerson Polytechnic University
Thailand: Dr. Sam-arng Srinilta, Vice Rector for Academic
Affairs, Suranaree University of Technology,
Thailand

2.1.2 Project Management Issues/Concerns/Problems and the Actual or Proposed Solutions

2.1.3 Sustainable Institutional Relationship

CUTC and SUT have developed strategies within the project to support sustainable linkages once CIDA funding ends. Examples of these are the Joint Ph.D program, the University-Industry Seminars and the International Applied Science and Engineering undergraduate program.

2.1.4 Mutual Benefits

The success of the IUP, as well as industrial linkage initiatives will support the establishment of sustainable linkages between SUT and CUTC on completion of the project.

The project remains committed to promoting women in development. A number of SUT personnel who have participated in study tours to Canada were women; and SUT is actively recruiting female high school students for the International Undergraduate Engineering Program. Also, a number of CUTC personnel who delivered and will be delivering consulting services to the project are women.

The environment is a key project area of focus that will be explored at the upcoming industrial seminar. It is proposed that the seminar's topic be in some area of environmental sustainability, and it is hoped that participation will not be limited only to the five project partner universities, and not only to Canadian and Thai participants.

2.2 REPORT ON PROJECT DELIVERABLES

Deliverable No: A 1.31

Deliverable Title: Customized Training in Canada for 4 SUT Support Personnel

Narrative

Two three-week training programs in Electron Microscopy were conducted at the University of Guelph:

Ms. Anik Janyooyen, Ms. Warawan Ratanachai, April 8-26:

Highlights of Lewis Melville, Microscope Lab Manager, Department of Botany, University of Guelph reports on April 25, 1996:

- completed 3-week program in practical methods for Light Microscopy, Scanning Electron Microscopy and Transmission Electronic Microscopy. Course included hand-on experience and discussion of the theory and practical applications.

Two Study Tours; one 4-week program and one 2-week program were conducted for two members of the Centre for International Programs at SUT to visit each of the four CUTC partner institutions in Canada.

Ms. Mantana Thammachoti, Centre for International Programs

September 3-28, 1996 (4 weeks):

- University of Guelph: September 3-6
- Ryerson Polytechnic University: September 9-13
- Technical University of Nova Scotia (TUNS): September 16-20
- University of Waterloo: September 23-27

Purpose: A overview of administrative, program and financial management systems for International activities and initiatives at the CUTC universities. Review of current and planned project activities over the next six-months. (See Appendix A) for individual CUTC reports on the activity schedule for the Study Tours)

Dr. Ruben Umaly, Director, Centre for International Programs, September 15-28, 1996 (2 weeks):

- TUNS: September 16-17
- Ryerson Polytechnic University: September 18-20
- University of Guelph: September 23-24
- University of Waterloo: September 25-27

Purpose of Dr. Umaly's Study Tour: To meet with each CUTC partner university to discuss current and proposed project activities and to explore new initiatives.

All planned activities in this project deliverable are now completed. A balance of \$11,607 remains in the budget.

* * * * *

Deliverable No: A 1.32
Deliverable Title: Provision of Technical Services by Canadian Consultants to Develop Institutional Support Services

Narrative

Two Consultants from the University of Waterloo completed their assignments at SUT in June 1996.

Mr. Roger Watt, June 1-15, 1996: Consultancy in Distributed Computing and Network Communications. Mr. Watt's report on immediate, short-term and long-term recommendations is appended (*see Appendix B*).

Mr. John Sellens, June 3-7, 1996: Consultancy in Computing Networks Operating Systems (UNIX). Dr. Weeapong Pairsuwan, Director, Centre for Computer Services, raised issues for consideration regarding the Web server speed and performance; computer servers (capacity), system backups, staff training, security/protection, system organization, and future directions. Mr. Sellen's report is appended (*See Appendix B*).

Anticipated Challenges

The Centre for Computer Services at SUT will need to assess the recommendations provided by the Canadian consultants in order to develop an effective working plan (short-term and long-term) for the upgrading of the computer services at SUT.

Progress Toward Completion

This activity has been completed.

* * * * *

Deliverable No: A 2.11

Deliverable Title: Academic Planning and Coordination

Narrative

Dr. Stalin Bector, CUTC Program Manager, conducted a Mini-PRC meeting in Thailand at SUT June 10-15, 1996. *(See Appendix C)* Program 1, 2 and 3 were reviewed and agenda set for the PRC Meeting in Canada on September 26 and 27, 1996, at the University of Waterloo. Dr. Feridun Hamdullahpur, Technical University of Nova Scotia, participated in the academic planning for the IUP Mechanical Engineering Students and attended Mini-PRC Meeting. Refer to Activity A. 2.21 for more information on Dr. Hamdullahpur's consultancy.

Anticipated Challenges

None

Progress Toward Completion

Two further planning and coordination assignments are scheduled for 1997. Also representatives from the four CUTC partner universities will deliver conference papers at the upcoming S.E. Asia Deans of Engineering meeting in February 1997 at SUT.

* * * * *

Deliverable No: A 2.12 (a)
Deliverable Title: Curriculum Implementation for IUP
(Mechanical Engineering Programs)

Narrative

One 14 week and four 7 week fast track courses were delivered between February and August 31, 1996:

*Professor Frank Juranka (14 weeks, February - April, 1996) Curriculum Development consultancy in *Fundamentals of Electrical Engineering;*

Professor D. MacKay: (7 weeks, June-July, 1996) Curriculum Development consultancy in ESL and Engineering Practice and Ethics;

*Professor G. Schneider: (two 7 week courses, July-August, 1996)
Curriculum Development consultancy in Introduction to Mechanical Engineering and Curriculum Development consultancy in Engineering Graphics.*

(Appendix D - Activity Reports)

Anticipated Challenges

Delays in admission to the IUP Program for eligible SUT Thai student to CUTC institutions including ESL proficiency. Length of time required to obtain medical clearance, visa or individual family circumstances.

Progress Toward Completion

Five 14 week assignments are scheduled for 1997 in Electrical Engineering in the area of: Circuits I, II, Digital Computing and Programing; Applied Science, Engineering Practise & Ethics and ESL. Two programs in Food Technology: One 14 week assignment in Undergraduate Lab Development and Planning a Graduate Program in Food Technology. Also, three 4 week assignments are scheduled by Canadian Consultants to help SUT plan and develop Engineering post graduate programs.

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Deliverable No: A 2.21

Deliverable Title: Selection of Thai Supervisors and Ph.D. Students by Canadian Faculty Members.

Narrative

Dr. Feridun Hamdullahpur, Technical University of Nova Scotia, Consultancy, June 8-15, 1996. Dr. Hamdullahpur discussed the planning, scheduling and implementation of project activities for: A 2.25, 2.27, 3.22.

Anticipated Challenges

Selection and completion of the post-doctoral programs at CUTC institutions

Progress Toward Completion

3 Post-Doctoral program placements (equivalent to four assignments) are scheduled in 1997. Also, another 3 Ph.D. candidates from SUT are expected to start their programs at TUNS and University of Guelph in 1997.

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Deliverable No: A 2.31

Deliverable Title: 16 Week Co-op Work Placements for SUT Thai Students in Canada

Narrative:

4 Thai Students are presently completing their co-op work terms at CUTC universities.

2 students at the University of Guelph in Food Science, from June to December 1996 and 2 students at TUNS from September 1996 to January 1997.

Progress Towards Completion

The remaining work placements will be completed in 1997.

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Deliverable No: A 2.32 (a)
Deliverable Title: 16 week Co-op Work Placements for Four Canadian Students in Thailand (1996)

Narrative:

Four Canadian students from the Technical University of Nova Scotia had 16-week work placements in Thailand from May to August 1996: (See Appendix E for reports)"

Mr. Ken T. Kelly, Urban Planning, "Asian Engineering Consultants Corporation, Bangkok;

Ms. Sarah Bruce, Mechanical Engineering "Laem Chabang International Golf and Country Club, Chonburi";

Mr. W. Jennings, Mechanical Engineering "Babcock Hansa, Bangkok;

Mr. Peter D. Lewis, Industrial Engineering "SWI Limited, Korat.

Progress Toward Completion

This sub-deliverable is now completed. One TUNS student is on a 16 week program in Thailand from September to December 1997. The activity will be considered a sub-deliverable of A 2.32, see budget for further detail. The remaining three co-op assignments (A 2.32 b) will be completed in 1997.

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Deliverable No: A 3.21

Deliverable Title: Technical Services by Canadian Consultant to
Develop Guidelines for University Industry
Collaboration

Narrative

Dr. Robert Eagle (TUNS) Consultancy October 1-17, 1996. Followed up on the framework and delivery of the Industrial Seminars at SUT in July, Activity A 3.22 Explored future potential of other joint-seminars and continuing education programs at SUT.

Progress Toward Completion

Activity completed in October 1996

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Deliverable No: A 3.22

Deliverable Title: Technical Services by Canadian Consultants to
Provide Industrial Seminars;

Narrative

Six Canadian consultants presented seminars at the Water Resource Management Conference at SUT from July 21 to 25, 1996. Conference papers are being prepared for publication. *(See Appendix F)*

Dr. T. Rodes, President/TUNS "University/Industry Technology Transfer";

Dr. W. Hart TUNS, "Watershed Planning and Management"

Dr. J. Underwood (Nova Scotia Power) "Water Use Development";

Ms. C. Moir (Nova Scotia Department of Environment) "Governmental Policy Review and Regulatory Framework";

Dr. D. Swayne (Guelph) "Computer Modelling of Environmental Systems".

Progress Toward Completion

This activity is now completed

* * * * *

Deliverable No: A 3.31
Deliverable Title: Technical Services by Canadian Consultant to
Develop and Supervise Co-op Activities

Narrative

Ms. Anne Marie Coolen, TUNS, consultancy May 22 to June 8, 1996.
Development of Co-op placement opportunities for Canadian and Thai
students. (*see Appendix G*)

Progress Toward Completion

Activity now completed

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Deliverable No: A4.21c) and A4.32 PRC Meeting
Deliverable Title: Canadian Management Team - Year 3

Narrative

Considerable planning went into the implementation of this activity. The Third PRC meeting was originally scheduled in April 1996 but because a number of key CUTC-SUT were not available in April, it was re-scheduled for September 26, 27, 1996 at the University of Waterloo.

(see Appendix I for Agenda and Minutes, Activity A 4.32)

Five members of SUT attended: Dr. Sam-arnng Srinilta, Dr. Prasart Suebkha, Dr. Thawit Chisomboon, *Dr. Ruben Umaly, *Ms. Thammachoti Mantana (*end of Study Tour see Activity A 1.31, provided an opportunity for 2 staff members of the Centre for International Programs, SUT, to attend PRC meeting). Eight members of the CUTC partner universities participated in the discussions. As well Mr. Roger Griffin, ARA, attended the meeting. Dr. Doug Goff, University of Guelph, attended for part of the discussion regarding a 14-week consultancy at SUT in Food Technology planned for September 1997, Activity A 2.12. The Fourth PRC meeting is scheduled at TUNS, Halifax, April 3, 4, 1997.

This six-month period marked a high degree of project activity which required planning, co-ordination and implementation. Project communication is a critical factor in effective management of the project.

Activity Planned During Next Quarter

CUTC continues to coordinate and communicate among its Canadian and Thai partners in preparation for the period January to June, 1997: CUTC's participation in the S.E. Asia Dean's of Engineering meeting, 3 consultancies in Postgraduate program development planning, and 1-14 week Canadian consultancy in Thailand; and the Fourth Project Review Committee Meeting, scheduled to take place at TUNS, Nova Scotia, April 3,4, 1997. Eight Canadian consultancies (6-14 week assignments and 3-7 week assignments A 2.12) are planned between June and December 1997.

Anticipated Challenges

None

Progress Toward Completion

Management of the first 6 months of Year Four are now complete. Next Semi-Annual report is scheduled for the period: October 1, 1996 to March 31, 1997, Year Four.

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Deliverable No: A4.33
Deliverable Title: Project Management

Narrative

Project Management team was re-defined in February 1996. Dr. Sam Mikhail resumes his role as Canadian Manager of the CUTC-SUT project. Dr. Stalin Boctor assumes Program Manager. Mary Jane Curtis has been appointed Project Co-ordinator, replacing Marsha McEachrane and Jennifer Sherwood.

Dr. Claude Lajeunesse, President and Vice Chancellor, Ryerson Polytechnic University has been invited to SUT at the end of July, 1997 to participated in SUT's Celebration activities, and deliver a seminar on Internationalization of Higher Education.

Anticipated Challenges

None

Progress Toward Completion

This activity is ongoing for the life of the project. Project ends March 31, 1998.

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Deliverable No: A4.41

Deliverable Title: Communications/ Support Services

Narrative

This activity continues for the life of the project, and consists of the production and distribution of quarterly reports, and ongoing project communication between partners. At the Third PRC Meeting, it was agreed that a percentage of the Communication budget be shared amongst the CUTC partners. Each partner university agreed to submit their estimated communication expenses from 1993-98.

Activity Planned During Next Quarter

Continuous activity is planned.

Anticipated Challenges

None.

Progress Toward Completion

This activity will be completed by March 31, 1998

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2.3 FINANCIAL REPORTS

THAI CANADIAN HRD PROJECT
Linkage - CUTC & SUT
Project #L3004-91063
CIDA #906-14868

CIDA FUNDED EXPENDITURES
Contract Summary
As at September 30, 1996

	1993/94 Actual	1994/95 Actual	1995/96 Actual	1996/97 Actual/Budget	1997/99 Budget	Total Actual/Budget	Contract Value	Variance
Program 1								
Fees	22,190	27,540	23,532	45,380		118,642	126,362	7,720
Travel	34,921	24,815	42,580	19,300		121,616	131,516	9,900
Other	0					0	0	0
Subtotal	57,111	52,355	66,112	64,680	0	240,258	257,878	17,620
Program 2								
Fees		3,600	5,400	76,560	59,200	144,760	146,200	1,440
Travel		3,662	11,187	68,208	108,390	191,447	193,299	1,852
Other		0		3,200	1,600	4,800	3,200	(1,600)
Subtotal	0	7,262	16,587	147,968	169,190	341,007	342,699	1,692
Program 3								
Fees		0	2,700	12,600		15,300	15,300	0
Travel		0	4,534	31,575		36,109	30,084	(6,025)
Other		0				0	0	0
Subtotal	0	0	7,234	44,175	0	51,409	45,384	(6,025)
Program 4								
Fees	34,320	35,759	37,561	35,673	43,409	186,722	187,259	537
Travel	2,488	11,895	19,597	50,581	52,523	137,084	139,732	2,648
Other	746	1,672	914	6,145	9,495	18,972	22,323	3,351
Subtotal	37,554	49,326	58,072	92,399	105,427	342,778	349,314	6,536
Total	94,665	108,943	148,005	349,222	274,617	975,452	995,275	19,823
Other							209	209
Total	94,665	108,943	148,005	349,222	274,617	975,452	995,484	20,032

Deliverable	Current Half Year			Project to Date			Estimated Expenditures to Completion	Delivery Completed
	Actual Apr- Sept/96	Budget Exp. Apr- Sept/96	Variance	Actual Exp. to Sept 30/96	Budget Exp. to Sept 30/96	Variance		
1. Institutional Capacity Building Program								
A1.11a) Training Academic Administrators (4)	0	0	0	36,789	36,789	0	0	Mar/95
A1.11b) Training Academic Administrators (1)	0	0	0	5,276	5,276	0	0	May/95
A1.21 Training Faculty Members	0	0	0	50,524	50,524	0	0	May/95
A1.31 Training Support Personnel	25,193	36,800	11,607	81,557	93,164	11,607	0	Oct/96
A1.32 Institutional Support Services	7,987	14,000	6,013	8,936	14,949	6,013	0	Oct/96
A1.41 Evaluate ESL Needs	0	0	0	9,095	9,095	0	0	Dec/93
A1.42 Study Tour ESL	0	0	0	16,581	16,581	0	0	Feb/94
A1.5 CUTC Additional Mgt Activities	31,500	31,500	0	31,500	31,500	31,500	0	Apr/96
Program 1 Sub-total	64,680	82,300	17,620	240,258	257,878	49,120	0	
2. International Academic Program								
A2.11a) Academic Program Planning	5,760	19,100	13,340	24,172	37,512	13,340	0	Oct/96
A2.11b) Academic Program Planning	0	0	0	0	0	0	16,350	
A2.11c) Academic Program Planning	0	0	0	0	0	0	22,040	
A2.12a) Curriculum Implementation	21,840	25,600	3,760	21,840	25,600	3,760	0	Oct/96
A2.12b) Curriculum Implementation	0	0	0	0	0	0	19,200	
A2.12c) Curriculum Implementation	0	0	0	0	0	0	32,000	
A2.12d) Curriculum Implementation	0	0	0	0	0	0	12,800	
A2.21 Selection Supervisors/PHD	5,798	5,200	(598)	11,235	10,637	(598)	4,602	
A2.23 Ph.D Research	0	0	0	0	0	0	10,400	
A2.25 Post Doct. Research Fellowships	16,700	0	(16,700)	16,700	0	(16,700)	28,000	
A2.26 Thai Advisors visit to Canada	0	0	0	0	0	0	13,000	
A2.27 Collaboration Co-supervisors	0	1,890	1,890	0	1,890	1,890	0	
A2.31a) Work Placements - Canada	8,000	8,000	0	8,000	8,000	0	8,000	
A2.31b) Work Placements - Canada	0	0	0	0	0	0	16,000	
A2.32a) Work Placements - Thailand	16,000	16,000	0	16,000	16,000	0	0	Oct/96
A2.32b) Work Placements - Thailand	0	0	0	0	0	0	16,000	
Program 2 Sub-total	74,098	75,790	1,692	97,947	99,639	1,692	198,392	
3. University-Industry Linkage Program								
A3.11 Training Co-op Program	0	0	0	7,234	7,234	0	0	May/95
A3.21 Industrial Training Framework	3,775	3,400	(375)	3,775	3,400	(375)	0	Oct/96
A3.22 Training Seminars by Canadian Consult.	33,225	31,350	(1,875)	33,225	31,350	(1,875)	0	Oct/96
A3.23 Additional Ind. Seminars in Thailand	0	0	0	0	0	0	19,600	
A3.31 Monitor Co-op Students	3,775	0	(3,775)	3,775	0	(3,775)	0	Oct/96
Program 3 Sub-total	40,775	34,750	(6,025)	48,009	41,984	(6,025)	19,600	
4. Project Management								
A4.21a) Canadian Management Team -yr 1	0	0	0	34,320	34,320	0	0	Mar/95
A4.21b) Canadian Management Team -yr 2	0	0	0	35,759	35,759	0	0	Mar/95
A4.21c) Canadian Management Team -yr 3	0	0	0	32,881	32,881	0	0	Mar/96
A4.21d) Canadian Management Team -yr 4	17,568	18,105	537	17,568	18,105	537	18,641	
A4.21e) Canadian Management Team -yr 5	0	0	0	0	0	0	36,209	
A4.31 Project Review Committee - Thai	0	0	0	22,298	22,298	0	0	Dec /95
A4.311 Project Review Committee - Thai	0	0	0	0	0	0	25,560	
A4.32 Project Review Committee- Can	14,266	14,100	(166)	14,266	14,100	(166)	13,934	
A4.33a) Project Management	7,780	10,594	2,814	24,144	26,957	2,813	0	Oct/96
A4.33b) Project Management	0	0	0	0	0	0	26,412	
A4.33c) Project Management	0	0	0	0	0	0	25,000	
A4.41 Communication/Support	1,397	4,748	3,351	4,727	8,079	3,352	17,595	
Program 4 Sub-total	41,011	47,547	6,536	185,963	192,499	6,536	163,351	
Total	220,564	240,387	19,823	572,177	592,000	51,323	381,343	
Activities to be determined at 4th PRC							41,964	
Total							423,307	

Appendix A

Reports Activity A 1.31

University of Guelph
College of Biological Science
Electron Microscope Facility

MAY 15 1992

To: J.C.M. Shute
Centre for International Programs
University of Guelph.

RE: Activity Report.
Electron Microscopy Training Course for Thai technicians
Anik Janyooyen and Warawan Ratanachai.

Anik Janyooyen and Warawan Ratanachai successfully completed a three week program in practical methods for Light Microscopy (LM), Scanning Electron Microscopy (SEM), and Transmission Electron Microscopy (TEM).

The course included hands-on experience and discussion of the theory and practical applications of LM, SEM, and TEM. Notes were supplied for all topics, and safety issues were discussed. The following techniques were included in the program:

Light Microscopy:

A general review of light microscope technique, with practical demonstrations of hand sectioning and sectioning of resin-embedded material, staining, and the use of fluorescence microscopy, interference contrast microscopy, and conventional light microscopy as it relates to electron microscopy.

Scanning Electron Microscopy:

Specimen preparation for SEM, and operation of the SEM and associated equipment, using materials selected by the participant.

This included sampling, fixation, dehydration, critical-point drying, mounting specimens on stubs, and sputter coating with gold/palladium. A demonstration of the JEOL 35-C Scanning Electron Microscope was followed by individual training on the operation and maintenance of the SEM, paying particular attention to general principles and applications.

Transmission Electron Microscopy:

Specimen preparation for TEM, and operation of the TEM and associated equipment, using materials selected by the participant.

This included sampling, fixation, dehydration, embedding in Spurr's resin, sectioning, and staining for TEM. Training in the making of glass knives for sectioning, coating grids with formvar substrate, preparing stains, and the use of various microtomes was followed by a demonstration of the JEOL 100CX transmission electron microscope. Individual training on operation of the 100CX was supplemented with a discussion and demonstration of general operating principles and maintenance of the TEM.

Scanning Laser Confocal Microscopy:

A demonstration of scanning laser confocal microscopy, including techniques and applications was conducted by Dr. Melissa Farquhar.

Energy Dispersive Microanalysis on the SEM (Hitachi):

Sandy Smith MSc. provided a demonstration on the effects of different accelerating voltages on the accuracy of elemental analysis using SEM.

Using the Library and other available resources:

A review on the use of scientific journals and textbooks as an information source was conducted, including a tour of the relevant areas of the University of Guelph library.

Darkroom and Photography:

Participants received practical experience in black and white photographic techniques associated with electron microscopy, including the processing of films and prints.

Lewis Melville,
Microscope Lab Manager
Dept. of Botany
University of Guelph

April 25, 1996.

Comments:

Both Anik and Warawan had reasonable proficiency in English, and their previous experience with Scanning Electron Microscopy was very helpful in the SEM component of the workshop. They demonstrated a willingness to learn, an aptitude for the work, and were capable of working independently.

Recommendations:

Three weeks is only enough time to familiarize someone with the general applications of electron microscopy and the associated techniques and instrumentation. For a more complete training course I recommend a longer term of study, incorporating a specific project of interest to the participant, as this allows more time to properly complete and analyze an experiment, more practical experience using the equipment, and more time to become comfortable in an English-only working environment.

The usual duration of the graduate or undergraduate project courses with similar content is 3-4 months. If possible, perhaps future international training programs on electron microscopy could be integrated into either the Plant Microtechniques Course (17-443), or the existing Graduate course in Advanced Ultrastructure.

Transmission Electron Microscopy is largely used to evaluate cell ultrastructure on biological specimens. A working knowledge of cell biology is necessary to properly understand technical aspects of specimen preparation and TEM applications. Previous experience in cell biology, or participation in a concurrent course in cell ultrastructure, would help optimize this type of training program.

JUN 19 1996

REPORT

ATTENDED SEMINAR ELECTRON MICROSCOPY ANALYSIS

UNIVERSITY OF GUELPH, CANADA

8-26 APRIL 1996

ANIK JANYUYEN
WARAWAN RATANACHAI

The first week

- 08-04-96 09:30 A.M. Prof. Jim Shute's wife, she came to take us to see Ms. Isabel Landers who will introduce us to Prof. Jim Shute. She is the one took us to tour the University and surrounding area.
- 10:30 A.M. We had a nice chat with Prof. Jim Shute who is Director Center of International Program. We talked about how to get here, where we are going to stay, what is the weather going to effect us and how we are going to survive during these three weeks. As a matter of fact we have taken above subject before.
- 11:00 A.M. We met our instructor everyday during these three weeks period. Mr. Lewis Melville was introduced to us by Prof. Jim Shute regard the purpose of these program which we want to learn and bring back the knowledge to our institution for everybody.
- 11:30 A.M. Mr. Lewis Melville took us to show the classroom for tomorrow and we got to know Prof. Larry Peterson who is Chairman Department of Botany as well as colleagues such as, Ms. Marisa Farguhar, Ms. Ukari Utake, Mr. Ron Deckert and another.
- 12:00 noon We had lunch with Prof. Jim Shute and instructor Lewis at the fifth floor of the University Center building. usually, Prof. Jim Shute brought his lunch from home, because it was economically as well as safe and cleaner. He suggested us to do the same so we did.
- 01:00 P.M. Ms. Isabel Landers took us to with draw to the U of G subsidize money for us. On our way to the bank she demonstrated the building, the park and the U of G map thoroughly well, these public area also installed the emergency switch call in case anybody need help. We just had a short walk that day because, the weather was very cold.
- 03:30 P.M. We returned to U.C. and got back to our residency for the day.
- 09-04-1996 08:10 A.M. We started our journey to Botany department and somehow we got lost ,we did not know where we are going. We started to ask people past by, somebody told us go to the left, other told us go to the right. We never got to where we want to go ,the further we go the more confuse we get. Finally, we called Ms. Lewis Melville ,told him where we were as soon

as he know from us he said, stay here you are I will be there within one minute. These journey took us three hours and we had to sit-down and learn our map again

11:40 A.M. We started with schedule of the seminar. We got to know classroom, the instrument, solution AB, glutaraldehyde, the various chemical and how to use them carefully to make sure nobody get hurt. In the classroom we also have the chemical dictionary. Just in case we want to know references.

PS How to prepare the solution A.B. pH 6.8 at follow; the mid-point, if we don't know the normal point of the sample we use pH 6.8. If we know the normal point we use that given point for pH the solution AB. If we have to know the nature point of the sample we have to do as follow;

- 1 Used the past research.
- 2 Assume pH point.
- 3 We check from the root, we check the surrounding area; some tree grow up in the high pH, other tree grow up in the lower pH phenomena.
- 4 If we can check other thing for instance, temperature, pH, pressure and salt...etc.

The above method will give us the better sample.

12:00 noon We had lunch downstairs in U.C. with Mr. Lewis Melville . He also brought his lunch from home. And he told us the same advantages what we heard from Prof. Jim Shute.

01:00 P.M. We learned how to coat the sample, over here they like to code with gold/palladium. We learned how to section by hand with razor blade, how to section in the water by telescope. We learned how to use various telescopes. We learned how to handle the sample and how to solved the problem for instance;

- 1 We look from the classroom reference book.
- 2 We go to the library
- 3 We use the e-mail exchange information from among our colleges.
- 4 We use chemical Encyclopedia.

5 We learn how to use the instrument and how to take care of them

6 Try period tail.

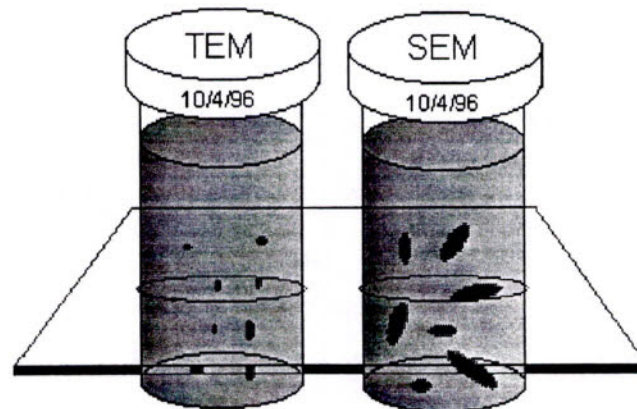
04:30 P.M. We returned home.

10:04:1996 07:45 A.M. We started from residence to the Botany department.

08:30 A.M. Mr. Lewis Melville showed up the first person.

We learned how to fix TEM, SEM sample break it down to be two bottles for the difference size such as $SEM=3mm^3$, $TEM=1mm^3$. We have to be very careful to fill the chemical fluid, make sure there is no spread over the area, or the edge of the tube inside and outside.

Record the name of the sample and keep the sample processing time for 2-4 hours at least



11:00 A.M. We examined the picture by telescope.

12:00 noon Lunch time.

02:00 P.M. We went to Biotech Food Since Lab, Ms. Sandy Smith who is the instructor the method how to analyze EDX by the Hitachi instrument. MS. Sandy Smith hand over the instrument sample to us. She also taught us how to use the instrument.

04:00 P.M. We recorded our sample again.

04:30 P.M. We went out to shopping, we took the bus to supermarket, we reviewed our map to gain the experience.

11-04-1996 08:30 A.M. We continued what we left over yesterday, we washed our sample by alcohol for 30 minutes or more after we already washed the buffer yesterday and keep it over night.

The percentage of the alcohol at follow;

50%,70%,80%,90%,95%,100%,100%,100%

Embrace of the Osmium TEM sample for 15 minutes 2 times.

SEM sample we can reduce the water by alcohol method the more time we have the better sample will be, or depend up on the size of the sample.

Osmium can stabilize the fat. If we want to reduce the dangerous of the Osmium, we can use the fat method-vegetable oil, milk...etc.

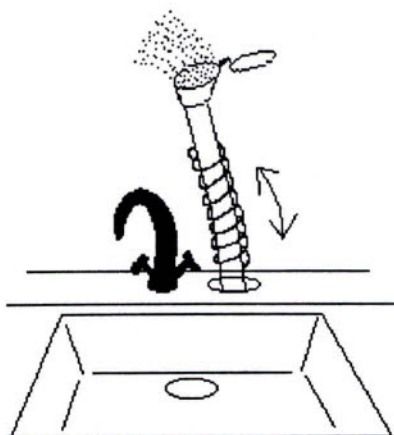
Alcohol 100% in the container plus dessicant would be able to keep the alcohol 100% at all time.

The used pipette with the Osmium we must throw away.(We carefully use the Osmium a little bit at a time because it's very expensive.)

01:00 P.M. We learned how to make the glass knife, easy to use, we use it for thin cut, it has the wide cut area, after used we throw away.

Diamond knife good for the thick cut, hard for maneuver, hard for the thin cut ,narrow cutting area, always clean it after used.

If the chemical fluid spread to the eyes, use the water wash away immediately.



04:00 P.M. Mr. Lewis Melville took us to tour the library, we went to journey section, research section, reference book section and also show us how to use the copy machine.

04:55 P.M. We went home.

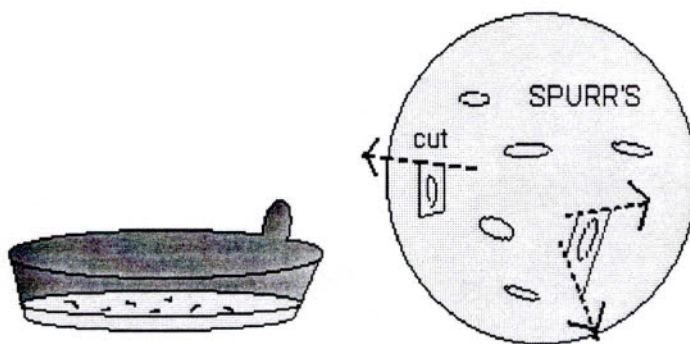
12-04-1966

08:30 A.M. We had a little water festival in the morning with the Prof. Larry Peterson and Mr. Lewis Melville we talked about the traditional custom to show the respect by Thai sprinkle the water on to the hand of the elderly person.

09:00 A.M. We learned how to pick up the best TEM sample and glued the sample by epoxy.

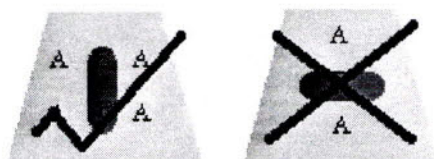
We must put the para glove when we handle the chemical every time.

We cut the plastic according to the drawing tetrahedral. We must be careful to cut it. It was easy to break up. After it altogether we brought them in to the stove and set up 60c for 10 minutes.



How to trim the sample, take the sample put on the path form.

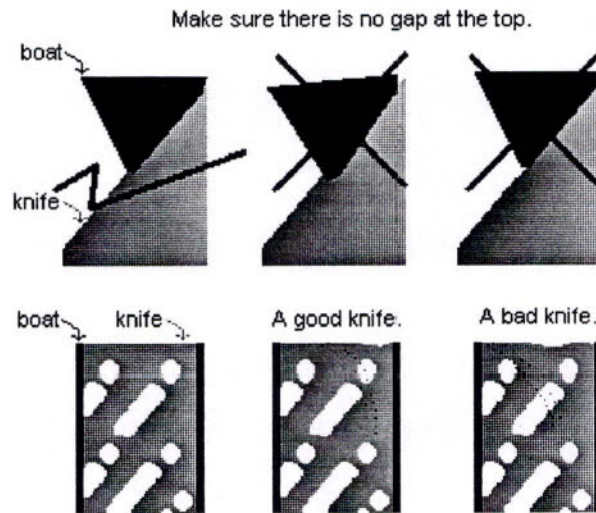
Use the recycle razor blade 0.004 to trim the sample according to picture below.



Anytime when we prepare the sample we must pick up the right amount.

The experience one way be use only one sample.

01:00 P.M. Learned how to make the glass knife, took a piece of square glass cut it to be rectangular, slowly break it down to be two pieces, attach the knife with the boat make true the edge evenly. We can save some money by using the metal tape instate of enamel or may be we can order the boat from Thailand, it is cheaper.

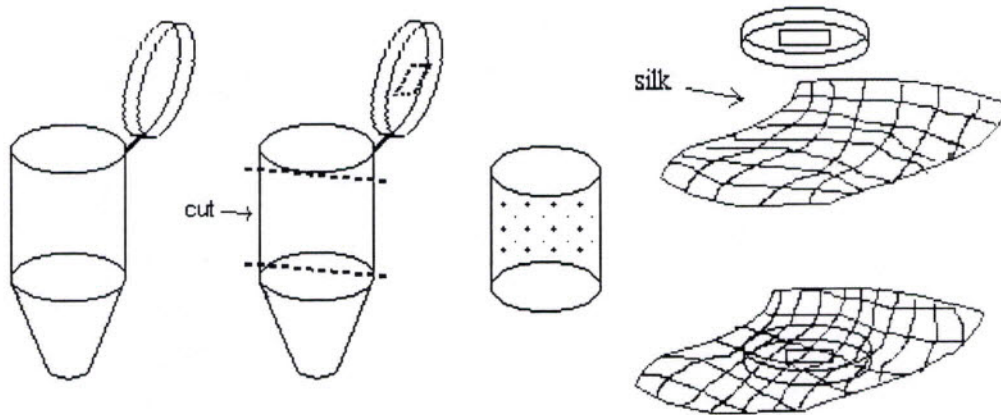


04:20 P.M. We made the hair stick to select the sample.

07:00 P.M. Ms. Khwuanjay and Mr. Bryan Salter took us to see Ms. Jan Craig's house. We liked it very much, we wanted to move in immediately even through it is far a way from the Botany department.

The second week.

15-04-1996 08:30 A.M. Section SEM sample and put them into microporous, then, moved them over into CPD machine.



We must be careful the shape of the sample it is easy to change the shape when we move from one place to the other;

1. Tendering touch.
2. Keep the sample in the liquid.
3. We could use pipette to move one place to the other.
4. If we want to keep the sample in the long period, we must seal the cover.

The way we created CPD ,we did not have to use ethanol 100%, we must release the LCO₂ as fast as possible. If the sample had bigger size, it would take longer time.

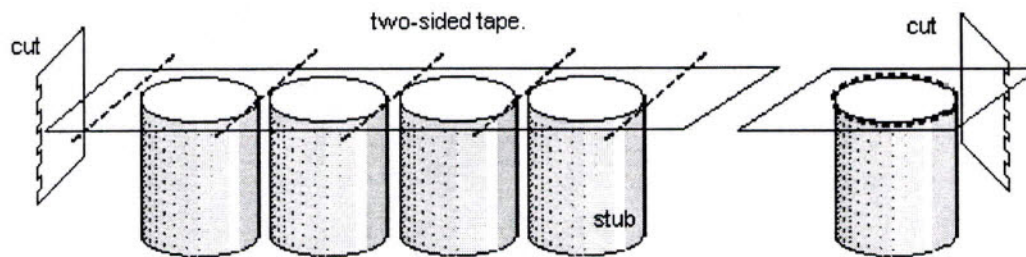
We must keep the distance when we change the pressure.

take out the sample and keep it well by seal the cover.

01:00 P.M. Recorded propylene oxide.

Prepared the instrument for TEM sample, we eliminated the alcohol by propylene method.

We reused the old stub by clean them up, marked the name and set up the record on the back side only.

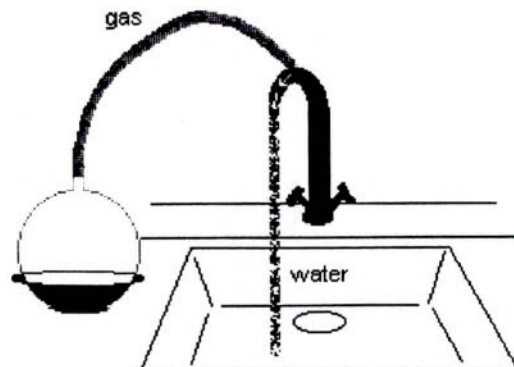


02:00 P.M. We attended the student seminar section at the Botany.

16-04-1996

08:30 A.M. We made the Epon and Spurr's

1. We used longer time for the bigger.
2. We made vacuum the sample in Spurr's.
3. If the liquid was change from the original, we must to freeze by heat then, throw away.
4. The easy way to built the empty area which using the running water method as the picture down below.

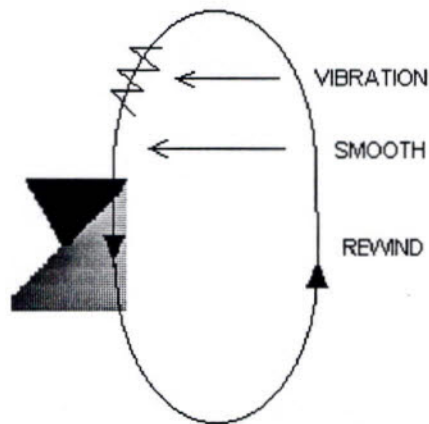


The method to adjust the glass knife for the thin section, we set the corner for 4-6 degree, adjust the corner of the knife parallel with the sample

corner. We fit the water into the boat slowly turn it up for the best reflection.

Coloured section for easy to identify. Then we narrowed down the area, at on chloroform to changed group the sample, grid took the sample from the liquid and covered it away from the open air, we rechecked the sample on the grid to make sure to have them on. Then stained the grid.

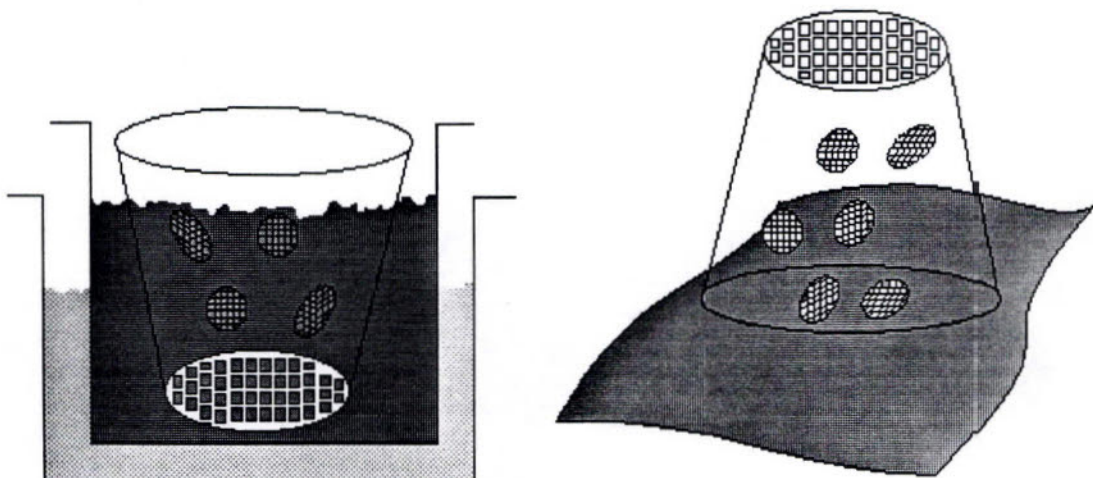
Section for the sample, must using the automatic method in order to get the thin sample no problem line, using the hand turn the knife until the knife cut the first section then, adjust the machine in to automatic mode.



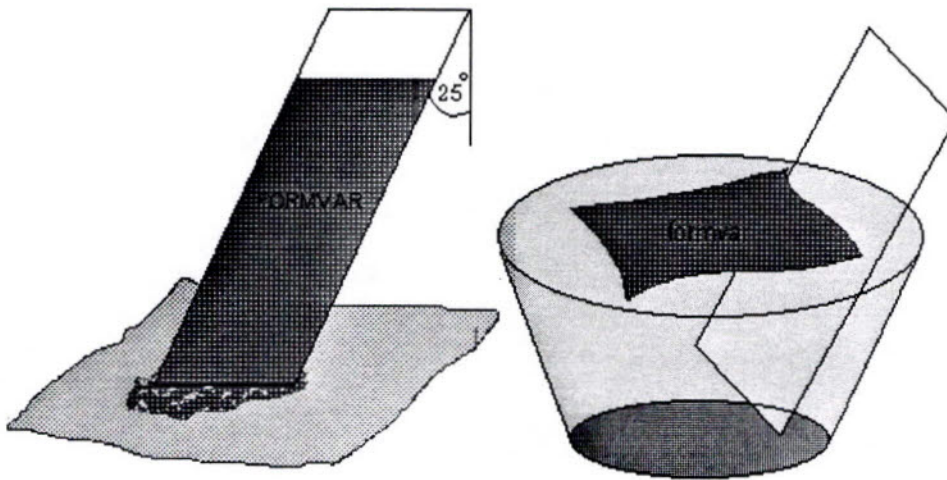
17-04-1996 08:30 A.M. Examined the sample by fluorescence microscopy and took the picture. The sample stub if not made secure type enough it will be create distribution, some time LkV better HkV.

We can use the epoxy or resin to glue the stub bit is not contaminated by filament, With the exception we must make them to be electrify and dry.

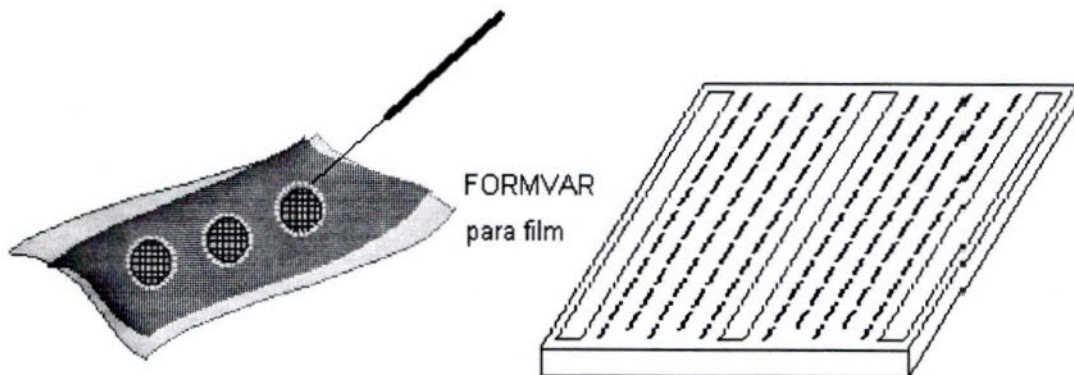
18:04:1996 08:30 A.M. We cleaned it up the grid by acetone before we put the formvar together.



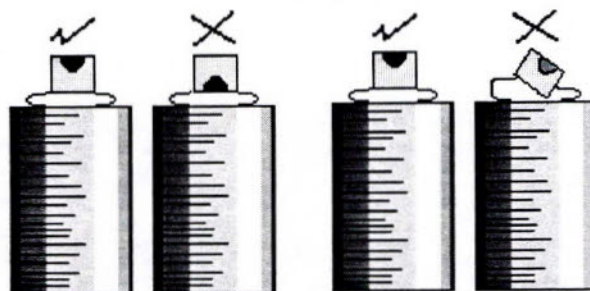
We took the formvar from the mixing beaker of Ethylenedichloride and chloroform mixed them together then, took the clean slide put one the formvar and life it up and set on 25° from the top. We dried it up, took the plain cut the edge of the formvar to free form the slide by dipping into the water as soon as the formvar on the surface we took it off the water with para film and dried it up we took the sliming side of the grid turned over on the formvar.



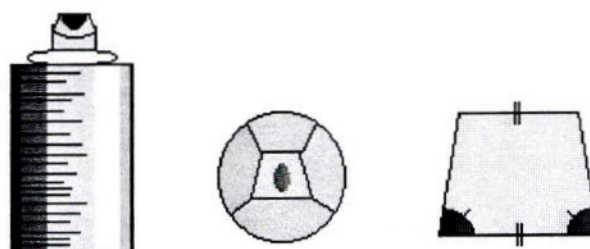
Took the meddle cut off the formvar and the grid and the formvar would attach together and then kept in the box.



The method how to put the Spurr's on the stub please see the picture below.



How to trim before sectioning, please see the picture below



19-04-1996 08:30 A.M. We cut a piece of wood to see inside, and we discovered that the wood had a large of resin, we put it into the alcohol, acetone into the Ultrasonic machine.

We tested the operation of the Ultramicrotome to see how we can maneuver them.

We embed the grid anytime when we embed it, we must put the grove on. Any instrument have radiation we could not reuse them. This experiment time all it take only 25 minutes. Please see the picture below.

The third week.

22-04-1996 08:30 A.M. We learned how to use TEM machine.

-The cold can keep the filament has the longer life time.

-The chill water can mix the chlorine on or we can use the anti bacteria chemical.

TEM 100 kV changing filament day by day.

SEM 40 Kv if inside it empty air, and on foreign material we can use them the longer time.

-e if the instrument's not 100% air free and not clean enough. Then, we will get the bad result.

-Electromagnetic field use to change the size of the focus beam.

-Stigmator can control the magnetic field.

-The easy way to compare, $I = e$.If use more I ;

1. We get more power of light clear picture

- 2 has shorter life

(We must consider the cost factor also)

-The usefulness of the vacuum system;

1. Indicate the performance of the machine.

2. Protect the contamination of the film by keep the film in the system 24 hours.

- 3 Protect the dust.

4. Protect the moisture.

If we use the film with out vacuum the result will be;

1. filament has no longer life.

- 2, No looking good.

. Turn on the TEM system to check;

1. The voltage.

2. I (current)

3. e, magnetic field.

4. condenser, spotsize.

5. Alignment, set spotsize the center (use wobbler)

6. Set the eyes of the focus.

7. Set photo system.

8. Set the focus of the camera.

9. Magnification.

10. Take the picture.

When we use the TEM system, we must be careful the following;

1. High vacuum.

2. I, V

3. X-ray

4. N2

Examine the sample by TEM system be careful when we lay the tray on, keep the eyes and ears open, turn the bar to C and put in, check vacuum again, low magnification change aperture to increase the contrast high magnification.

If we didn't fix up well the nucleus might be broken, according to the picture we saw.

Turn the system off;

1. turn off the condenser
2. Turn aperture off
3. Turn e off
4. Take off the sample.
5. Turn off the switch.

Just do the opposite way when we turn on.

23-04-1996 08:30 A.M. We learned how to change the TEM, SEM films. We must have at least 4 boxes of TEM film.

Today we have the problem of water we called for the day. Then, we went to the library.

24-04-1996 08:30 A.M. Learned how to operate the TEM, SEM system.

12:30 noon We visited Physics Building, Mr. Apichart Linhananta take us to tour the entire area.

02:00 P.M. Learned how to take the picture by TEM system.

03:00 P.M. Embed grid again.

04:00 P.M. Learned how to develop film.

25-04-1996 08:30 A.M. Developed film.

09:00 A.M. Stained the sample again.

10:15 A.M. We went to the celebrate party.

11:00 A.M. Solo SEM system.

12:00 noon We brought the gift to Prof. Larry Peterson ,Mr. Lewis Melville Mr. Ron Deckert and Ms. Ukari Utake, every body seem to like it.

01:30 P.M. Solo TEM system, in order to check the sample we made before.

03:30 P.M. Learned how to develop picture in the dark room.

Increase or decrease the contrast to tune up the colours.

Before we put the chemical fluid away we must test the quality.

The formula to test fixer.

H₂O 80F +190 g. Potassium iodide and put them together = 1L.

05:00 P.M. Visit Animal Lab.

26-04-1996 09:00 A.M. Oral conversation with our instructor to what we learned during this past 3 weeks.

10:00 AM. We had a western style farewell party. Prof. Larry Peterson , Mr. Lewis Melville, Ms. Ukari Utake and our guest or together 10 person.

10:30 A.M. We continued our oral conversation again.

12:00 noon We had our last meal at U.C.

01:30 P.M. We had examination.

04:55 P.M. We got back home.

Everyday we have our friendly program. for instance; take about Thailand for example Thai food, Thai fruit. Then, our westerner guest have a chance to test Thai food sometime. And Ms. Ukari Utake taught us Japanese one sentence a day and we do like wise; wan nee foun tok, wan nee ar koud yen, wan nee he ma tok, wan nee wan jun,...,wan nee wan suik, la korn laew pop kun mai.

The journey thought;

hospitality they handed over to us are so wonderful, we had somebody to pick us up from the airport, gave us the ID and the cheque.

When we stepped out side there was a limousine was waiting for us. Take only 45 minutes to the Hotel. The had been register, we just told our name and took the key. We got the special rate. At 10:20 P.M. we called to report our self to Prof. Jim Shute and to made the appointment for Monday morning after that we went to take a bath and went to sleep.

We had a formal meeting with Prof. Jim Shute in the morning, his room was set up nice and neat, decorate with all kinds of international the student souvenir, who come to attained the University of Guelph like us. Prof. Jim Shute introduce us to Mr. Lewis Melville and let him know the purpose we come. Prof. Jim Shute, he was conservation, he brought lunch from home because it was healthier and economical. He was nice and neat person. It same to be that the Canadian were very orderly, every houses were nice and clean. The city was so well plan. Everybody same to be known what they want, know how plan the future in order to get the better result. The Guelph was a little tiny town life over here was simple most of the people came from England, France originally. Everybody seem to know

each other. Even though the garbage collector has greeted by person who passes by.

The day we get lost we should turn back to where we were immediately instead of make further mistake, the map didn't help, asking people around couldn't help because we were not familiar with the area. The only like person we should ask is our teacher who knew the campus very well. We learned how to use the public phone, bus fare, bus stop,...etc. As soon as our Thai friends know we got lost, they took us to get familiar with the bus system.

We learned a large of thing from Mr. Lewis Melville 25 minute from now will be noon, we are very tired he still keep teaching and we stay over time most of the time. Which was we like and we very thank you.

The schedule we have was well arrange, not going to interfere, overlap each other. Everybody each enthusiasm. We were enjoy our learning.

The library was very big. It had all kinds of book to look for. It had all kind of communication facilities for instance; computer, microfilm and other. The student need not to be additional books.

Most people over here were conservation they were not over spending easily. They didn't mine to by the used items, any house hold items could reuse. they reused. They didn't throw away thing. People here seem to be very up grade them self especially the education.

During we lived with Ms. Jan Craig's family, the house was very warm. Ms. Jan Craig and her daughter came to sent us at the door everyday, and always told us when she come back home. This was very nice thing to do, and we liked to follow her food step. But sometime we did not know before hand, sometime we forgot to call home to tell her. When we got back home we discovered that she was waiting for us.

Our Thai friends look after us very well. Mr. Lewis Melville said he cannot compare with them. When we didn't know something our Thai friends told us, they took us to shopping, supermarket and including side

seeing, we could say that our Thai friends are everything for us. Which was we say thank you very much everybody.

We liked to talk about the house one more time, during this 2 weeks live there, it was a storehouse, have 4 bedrooms, the attic room, stores one and a half bathroom the basement, including all kinds facilities. Ms. Jan Craig allowed us to use any room we wanted, we sit in the family room, we sit in the former sitting room, we enjoyed the back yard. Each of us had our own bedroom. We enjoyed cooking, laundry, we liked to do self by ourselves. Ms. Jan Craig allowed us to make like home. She gave us the only 1 house key. She gave us all the freedom we wanted. We were very happy and thank you.

What we got from the trip;

1. Books from Prof. Larry Peterson and Mr. Lewis Melville
2. Books from Dr. Apicharth Linhananta.
3. Time sharing records.
4. The list of the interesting books
5. The experiment sample, the sample instrument.
6. Maple leaf and the picture.
7. I become more competition person.

Study Tour - Dr. Ruben Umaly
Thai-Canadian HRD Program CUTC-SUT project
September 15-28, 1996

****Project covers ground transportation to/from program, hotel, airport/bus, to be prepaid and arranged through the participating partner universities co-ordinated with Ryerson International.**

Date	Transportation	Hotel	University- Program
September 15 arrival: Halifax Air Canada # 8855 4:15 p.m.	TUNS to arrange transportation to/from airport to accommodation and transfers to/from accommodation to university	Halliburton House Inn 5184 Morris Street Halifax, Nova Scotia B3J 1B3 (2 blocks from TUNS) tel: 902-420-0658 fax: 902-423-2324 a country inn; serves continental breakfast Sept 15, 16 cost: \$70/night + taxes	Technical University of Nova Scotia: Program: Sept 16-17 Mr. Robert Eagle
September 17 Halifax to Toronto	Air Canada #639 dep: 7:15 p.m. Arr: 8:25 p.m. Toronto Dr. Bector will meet at Toronto airport	Delta Chelsea Inn 33 Gerrard St W. Toronto, Ontario M5G 1Z4 tel: 416-595-1975 fax: 416-585-4366 confirmation #: 46950 Sept 17, 18, 19, 20, 21 cost: \$89 + taxes	Ryerson Polytechnic University: September 18-20 arranged by Dr. Stalin Bector, Dr. Sam Mikhail and M.J. Curtis
September 20 ²² departure Toronto to Guelph	Greyhound Bus: Bay and Dundas terminal Dr. Bector to arrange (\$15.78 one-way) dep: 2 p.m. arr: 3:15 or dep: 3:30 arr: 4:45	College Inn and Conference Centre 716 Gordon Street Guelph, Ontario N1G 1Y6 Tel: (519) 836-1240 Fax: (519) 763-5225 Reservation # 3537 Sept. 20, 21 , 22, 23 Rate: \$71/night + taxes	University of Guelph Dr. Jim Shute Program Dates: September 23-24
September 24 departure for Waterloo	Marg White, U. Guelph to drive to Waterloo at 3:15 p.m.	Waterloo Motor Inn 475 King St. N. (Highway 86 and King St) Waterloo, Ontario tel: 1-800-361-4708 fax: 519-884-0321 confirmation: 04E0C September 24, 25, 26, 27 rate: \$79/night + taxes	University of Waterloo Dr. Gerry Schneider Program: Sept. 25 PRC: Sept 26-27
September 28 departure for Thailand	Cathay Pacific #829 departure from Toronto Airport: 11:55 p.m. * Cullitons from Waterloo Inn to Airport 2 cars	Transportation from Waterloo September 28 to Toronto Airport TBA	*Cullitons ppd Limo service - 2 sedans (5-SUT)

SEP. 27
CUBESCA N/A
ESSEX FC N/A

Study Tour - Ms. Mantana Thammachoti
Thai-Canadian HRD Program CUTC-SUT project

September 3-28, 1996

****Project covers ground transportation to/from program, hotel, airport/bus, to be prepaid and arranged through the participating partner universities co-ordinated with Ryerson International.**

Date	Transportation	Hotel	University- Program
September 2 arrival: Toronto Cathay Pacific #828 9:10 p.m.	Toronto Airport: <i>Go to ground transportation depot to meet Red Car - watch for sign with your name</i>	home stay: U of Guelph faculty Lynne Mitchell & Jun Pintana 163 Ironwood Guelph, Ontario Tel: 519-763-8934 Fax: 519-767-0756 accommodation and 3 meals daily \$420 (6 x 70/day)	University of Guelph Program Dates: September 3-6 - transportation to be provided by your hosts to/from university Program: Dr. Jim Shute
September 8	Greyhound Bus to Toronto (to be arranged/prepaid by U of Guelph - see Mrs. Lander) dep Guelph 7:10 pm arr Toronto 8:25 pm M.J. Curtis to meet	apartment/hotel: Bay Bloor Executive Suites; 1101 Bay Street Toronto, Ontario tel: 1-800-255-2811 fax: 416-968-7385 reservation: 67608 Sept 8, 9 10, 11, 12, 13 studio: \$73/night + taxes	Ryerson Polytechnic University September 9-13 arranged by Dr. Stalin Boctor, Dr. Sam Mikhail and M.J. Curtis
September 14: departure: Toronto to Halifax <i>dep: 3:45 pm for Toronto Airport - Vira</i>	Air Canada #142 departure 5:05 p.m. /Toronto Arrival: Halifax 7:56 p.m. TUNS to arrange transportation to/from accommodation and to from accommodation to University	Halliburton House Inn 5184 Morris Street Halifax, Nova Scotia B3J 1B3 tel: 902-429-0658 fax: 902-423-2324 (2 blocks from TUNS) a country inn; serves continental breakfast Sept 14-20 ✓ room: \$70/night + taxes	TUNS: Robert Eagle September 16-20
September 21 ²² departure Halifax, 5 pm on route via Toronto to Waterloo	Air Canada #627 departure Halifax: 5:00 p.m. Arrival Toronto: 6:10 p.m. departure for Waterloo - Cullitons limo Service from Toronto to Waterloo arranged	Waterloo Motor Inn 475 King St. N (Highway 86 and King St) Waterloo, Ontario tel: 1-800-361-4708 fax: 519-884-0321 confirmation: 04E0E September 21-27 \$79/night + tax transportation Toronto-Waterloo	University of Waterloo Dr. Gerry Schneider Program: Sept. 23-25 PRC: Sept 26-27
September 28 departure for Thailand	Cathay Pacific #829 departure from Toronto Airport: 11:55 p.m.	Transportation from Waterloo September 28 to Toronto Airport TBA	Culliton Limo Service/prep Waterloo to Toronto airport for 5 persons/ SUT - 2 sedans

September 9-13

Sun, Sept. 8	8:25 arrival - Bay/Dundas Bus Terminal (MJ Curtis to meet)
Mon, Sept 9	9:30-10:00 Introduction to Ryerson and RI Dr. Sam Mikhail, Director
	10:15-11:45 Project Administration Campus Orientation, M.J. Curtis
	Lunch Hosted, RI (by invitation)
	p.m. open/free
Tues, Sept 10	9:30-11:30 Project Finance, Oracle Computer Systems 10th Floor, Jorgenson Hall, Mr. Richard Leung
	lunch open/free
	2:00- 4 p.m. Dr. Stalin Bector, Electrical Engineering T-200B, 87 Gerrard St. East
	Evening CN Tower (Vira Kozlowsky to accompany)
Wed Sept 11	9:00-noon Office of Development, Alumni and Community Relations, Mr. Ian Marlatt 2nd Floor, Jorgenson Hall
	p.m. Open/free <i>WED LUNCH/MARSHA</i> <i>ART GALLERY - MS. IRENE/TONY JURANKA</i>
Thurs, Sept 12	9-8 p.m. Niagara-on-the-Lake, Niagara Falls Pick up at 9 a.m., M.J. Curtis V. Kozlowsky
Fri, Sept 13	9:00-noon International Student Services and Admissions Margaret Phillips, 3rd Floor, Jorgenson Hall
	Lunch open/free
	2:00-4 p.m. Kim Cheah, ARA Associates 121 Bloor Street East, Suite 405
Sat, Sept 14	3:15 p.m. pick up at 1101 Bay Street, Bay/Bloor Exec. Suites (Vira Kozlowsky to drive to Toronto airport) Departure for Halifax: Air Canada #142, 5:05 pm

**Dr. Ruben Umaly, Director-International Affairs
Suranaree University of Technology, Thailand
Program Schedule at
Ryerson Polytechnic University
September 17 to 20, 1996**

Wed, Sept 18	9-12	Ryerson International Dr. Sam Mikhail, Director
	<i>Lunch</i>	<i>hosted by RI, Dr. Sam Mikhail</i>
	2:30	ARA Associates, Roger Griffin, Archie MacKinnon, Kim Cheah
Thurs, Sept 19	9-12:00	Department of Electrical Engineering Dr. Stalin Boctor
	12:10-12:30	Dr. Claude Lajeunesse, President Visit in October 1997 (Dr. Sam Mikhail and Dr. Stalin Boctor)
	2:00-3:15	Centre for Advanced Technology Education, Dr. Al Oatridge, Director 4th Floor, 87 Gerrard St. E.
	3:30-4:00	Continuing Education, M. Booth, Dean, Jorgenson Hall A-106
Frid, Sept 20	9:30-11:30	Rogers Communication Centre Room V 202, Dr. Michael Murphy
	<i>Lunch</i>	Dr. Stalin Boctor
	TBA	Early Childhood Education, S 349-N Professor June Pollard, Director
Sun, Sept 22	11:30 am	Bus to Guelph (Bay/Dundas Terminal) (bus stops near College Inn, 716 Gordon Street, Sept 22-24 (519) 836-1240, Confirm #3537)

FINAL REPORT ON ACTIVITY A1.31

Provision of Customized Training in Canada for SUT Support Personnel

- Ms. Mantana Thammachoti

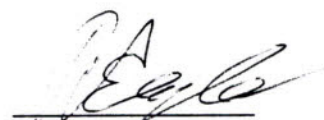
- Dr. Rubin Umaly

Both Ms. Mantana and Dr. Umaly have completed their study at TUNS and the training associated with it. The schedules for their visit are attached. Both visits were interesting and useful with many new ideas and opportunities being discussed.

Ms. Mantana arrived on September 14, 1996 at the height of a hurricane. Her visit was busy with her meeting a large number of people at TUNS, Saint Mary's University and Dalhousie University. She thus obtained an impression of how three small institutions undertake their international programs. Ms. Mantana was also able to see the continuing education departments of both Dalhousie and TUNS. This was of particular interest to her, as it is the area of her post graduate work at the University of Saskatchewan. The SUT Centre of International Affairs hopes to undertake a number of programs in this area.

Dr. Umaly's visit was somewhat shorter but non-the-less successful. Detailed discussions were held on continuing education, the SUT industry seminars, SUT/TUNS graduate students, and potential projects in Vietnam and the Mekong River Sub-region. Dr. Umaly met with the industrial liaison officer at Saint Mary's University as well.

Respectfully submitted,



Robert Eagle
Director, Research Services

RE/jly

cc: Dr. W. Caley
Enclosures

September 19

9:30-10:30

Meeting with Dr. Ronald Gilkie, Dean of Students and the International student advisor in the Dean's office Room A212

11:00 -3:00

Visit Saint Mary's University - Ms. H. Taylor,
Alana Robb, International Student Advisor and Neill Evans, International Marketing Officer

4:00-6:00

International Students Welcome Reception in Common Room

September 20

Dr. Dave MacKay (all day) 454-4917

September 22

flight to Toronto (same as the Saturday flight #627 departs at 5:00 pm)



Dalhousie University



**Lester Pearson
International
Institute**

1321 Edward Street
Halifax, Nova Scotia
Canada B3H 3H5

**Visit of Ms. Mantana Thammachoti, Program Officer,
Centre for International Affairs
Suranaree University of Technology (SUT), Thailand
to the Lester Pearson International Institute (LPI),
Dalhousie University
Wednesday, September 18, 1996**

ITINERARY

<u>TIME</u>	<u>NAME & LOCATION</u>
10:15 a.m.	Greeted by Pat Rodée , Associate Director/Projects & Administration, LPI Location: LPI Reading Room, 1321 Edward Street
10:25 a.m.	Depart LPI for Henson College, accompanied by Bernadette Mount , Special Events Coordinator/Secretary, LPI
✓ 10:30 a.m.	Meeting with Lloyd Fraser , Associate Professor, Continuing Education, Henson College of Public Affairs and Continuing Education Location: Henson College
✓ 11:30 a.m.	Meeting with Lynn Burgess , Projects Assistant, LPI Location: LPI Reading Room
12:30 p.m.	Luncheon meeting with Pat Rodée Location: Dalhousie University Club
2:00 p.m.	University tour with Bernadette Mount Depart from LPI
✓ 2:30 p.m.	Meeting with Gary Newkirk , Program Director, Island, Sustainability, Livelihood & Equity (ISLE) Program and Project Director, Coastal Resources Research Network (CoRR) Location: LPI Reading Room
3:30 p.m.	Depart LPI for Haliburton House Inn

STUDY TOUR
Dr. Ruben Umaly

September 16 and September 17, 1996

September 15

4:15 pm Robert Eagle to pick up Dr Umaly at the Halifax International Airport.
Arrival at the hotel at approximately 5:45 pm.

September 16

9:00am Welcome by Dr. Adam Bell - Dean of Engineering
Room A102

9:30/11:30 Discussions with Robert Eagle - Director, Research Services,
on Research Services and IP functioning at TUNS
Room A210

12:00/1:30pm Lunch

2:00/4:00pm Discussions with Dr. F. Hamdullahpur, Dean of Graduate Studies and
Research - how office works and general project discussion
- with R. Eagle, Dr. B. Caley, and Dr. B. Hart
Financial Services Board room

4:30/7:00pm Reception at University House

September 17

9:00/11:00 Continuing Education Program overview with Ms. Carol Connor, Director

11:00/12:00 Discussions with Robert Eagle on joint projects; Mekong, Vietnam and
Thai Seminars, Room A210

12:00/1:30pm Lunch

2:00/3:30 Saint Mary's University - Denis Leclaire & Robert Eagle

5:15pm Leave for airport (flight #639, departures at 7:15pm)



CENTRE FOR INTERNATIONAL PROGRAMS

REPORT ON STUDY TOURS
of
DR. RUBEN UMALY and MS. MANTANA
UNIVERSITY OF GUELPH
SEPTEMBER 1996

1. **Mantana Thammachoti** spent the period September 3 to 6 in the Centre for International Programs studying the systems and procedures used by the Centre for International Programs in facilitating student mobility, maintaining databases and inventories, utilizing electronic communication, disseminating information, developing partnerships with overseas universities and serving the international mandate of the University of Guelph.
2. **Dr. Ruben Umalý** spent the period September 23 and 24 in the Centre for International Programs examining the policy framework, systems applications and networking procedures of the Centre for International Programs, including campus-wide collaborative mechanisms, information dissemination, Centre management, cost-recovery possibilities and other features of the Centre in the context of university internationalization.

I attach a copy of Dr. Umalý's schedule.

A handwritten signature in black ink, appearing to read "J.C.M. Shute".

J.C.M. Shute,
Director.

University of Waterloo



Mary Jane Curtis
Supervisor, Administration
Ryerson International
Ryerson Polytechnic University
350 Victoria Street
Toronto, Ontario,
M5B 2K3

Office of the Associate Dean
Undergraduate Studies
Faculty of Engineering

Waterloo, Ontario, Canada
N2L 3G1

519/888-4761
Telex 069-55259
Fax 519/725-9970

Date: October 8, 1996

Subject: Study Tour of Ms. Mantana and Dr. Umaly, University of Waterloo

Report on the Study Tour

Ms. Mantana was picked up to begin her study tour at the University of Waterloo at 9:15 a.m. on Monday, September 23, 1996. She was on study tour for the Monday, Tuesday, and Wednesday of that week. Dr. Umaly was picked up for his study tour at 9:15 a.m. on Wednesday, September 25, 1996 for a one-day tour. Both Ms. Mantana and Dr. Umaly attended the PRC Meeting on Thursday and Friday of that week. The itineraries for both Ms. Mantana and Dr. Umaly are attached.

On Monday and Tuesday of that week, Ms. Mantana met with myself, representatives from the Department of Cooperative Education and Career services, our Director of Exchange Programs (for Engineering), our University Student Advisor for International Students, and Elizabeth Adrian from Career Services. Numerous printed materials were provided to her from my office as well as from the other representatives she met.

The Wednesday program, for which Dr. Umaly was also present, was concentrated more exclusively on our International Programs operation and registrarial and contracts operations with respect to international activities. This seemed appropriate since both Ms. Mantana and Dr. Umaly are from the Centre for International Affairs (CIA) of SUT. Additional printed materials were provided to them on that Wednesday.

While I was not present at all meetings with the representatives that Ms. Mantana and Dr. Umaly met, I sensed that they were quite happy with the information they received during their tours. They certainly conveyed this impression to me. Knowing the representatives that they met, I am not surprised since these representatives are quite competent in their disciplines. Both Ms. Mantana and Dr. Umaly received a complete description of how we conduct our international programs operations, and this is in accordance with the study tour objectives.

I trust that this will be satisfactory.

Sincerely yours,

A handwritten signature in cursive script, reading "G.E. Schneider".

G.E. Schneider
Associate Dean of Engineering
Undergraduate Studies
GES:c:\gerrys\suranaree\ciatour



CENTRE FOR INTERNATIONAL PROGRAMS

Visit to the University of Guelph

September 23, 24, 1996

*Dr. Ruben Umaly
Director, International Office
Suranaree University of Technology, Thailand*

Itinerary

Monday, September 23

- | | |
|----------------------|---|
| <i>09:00 - 10:00</i> | <i>Professor James Shute, Director
Centre for International Programs</i> |
| <i>10:00 - 11:00</i> | <i>CIP Staff Meeting - Room 431, University Centre</i> |
| <i>11:15 - 11:30</i> | <i>Professor Constance Rooke
Associate Vice President Academic</i> |
| <i>12:00 - 13:15</i> | <i>Lunch at the University Club, Level 5, U.C.
accompanied by
Professor James Shute, Dr. Doug Goff, Department of Food
Science, and Ms. Lynne Mitchell, Study Abroad Manager, CIP</i> |
| <i>13:30 - 14:00</i> | <i>Mrs. Isobel Lander, Executive Secretary, CIP</i> |
| <i>14:00 - 18:30</i> | <i>Free Time</i> |
| <i>*18:30</i> | <i>Dinner at the home of Professor Truman Phillips &
Daphne Phillips</i> |

**Professor T.P. Phillips, Acting Chair, Department of Agricultural Economics & Business,
will meet Dr. Umaly at the Front Desk, College Inn, at 18:30.*

Itinerary for Ms. Mantana Thammachoti

	Monday Sept. 23, 1996	Tuesday Sept. 24, 1996	Wednesday Sept. 25, 1996	Thursday Sept. 26, 1996	Friday Sept. 27, 1996
8:00am					
8:30am					
9:00am	Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider
9:30am	G.E. Schneider	G.E. Schneider		PRC Meeting	PRC Meeting
10:00am			P. O'Neill, International Programs		
10:30am	To be determined	H. Ratz, Director of Exchange Programs			
11:00am					
11:30am					
12:00pm	Lunch, J. Westlake, Cooperative Education and Career Services, G.E. Schneider,	Lunch with H. Ratz	Lunch, P. O'Neill		
12:30pm					
1:00pm					
1:30pm	J. Westlake, Cooperative Educationa and Career Services	Darlene Ryan, Counselling Services, International Sdtudent Advisor			
2:00pm			Registrar's Office, Ken Lavigne (x2262)		
2:30pm		Elizabeth Adrian, Career Services			
3:00pm	Study		Contracts, Judy Brown (x2022), or Sue Nelson (x2021)		
3:30pm		Study			
4:00pm			Pick-up at NH		
4:30pm	Return to hotel, G.E. Schneider	Return to hotel, G.E. Schneider	Return to hotel.	Reception Return to Hotel, G.E. Schneider plus ...	Return to hotel, G.E. Schneider plus ...
P.M.				Dinner Bhima's Warung, pickup at 8:00	Dinner at the Duke's, pickup at 8:00

Itinerary for Ms. Mantana Thammachoti

	Monday Sept. 23, 1996	Tuesday Sept. 24, 1996	Wednesday Sept. 25, 1996	Thursday Sept. 26, 1996	Friday Sept. 27, 1996
8:00am					
8:30am					
9:00am	Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider
9:30am	G.E. Schneider	G.E. Schneider		PRC Meeting	PRC Meeting
10:00am			P. O'Neill, International Programs		
10:30am	To be determined	H. Ratz, Director of Exchange Programs			
11:00am					
11:30am					
12:00pm					
12:30pm	Lunch, J. Westlake, Cooperative Education and Career Services, G.E. Schneider,	Lunch with H. Ratz	Lunch, P. O'Neill		
1:00pm					
1:30pm					
2:00pm	J. Westlake, Cooperative Educationa and Career Services	Darlene Ryan, Counselling Services, International Sdtudent Advisor	Registrar's Office, Ken Lavigne (x2262)		
2:30pm					
3:00pm			Contracts, Judy Brown (x2022), or Sue Nelson (x2021)		
3:30pm	Study	Study			
4:00pm			Pick-up at NH		
4:30pm	Return to hotel, G.E. Schneider	Return to hotel, G.E. Schneider	Return to hotel.	Reception Return to Hotel, G.E. Schneider plus ...	Return to hotel, G.E. Schneider plus ...
P.M.				Dinner Bhima's Warung, pickup at 8:00	Dinner at the Duke's, pickup at 8:00

Itinerary for Dr. Rubin Umaly

	Monday Sept. 23, 1996	Tuesday Sept. 24, 1996	Wednesday Sept. 25, 1996	Thursday Sept. 26, 1996	Friday Sept. 27, 1996		
8:00am							
8:30am							
9:00am			Pickup, G.E. Schneider	Pickup, G.E. Schneider	Pickup, G.E. Schneider		
9:30am			P. O'Neill, International Programs	PRC Meeting	PRC Meeting		
10:00am							
10:30am							
11:00am							
11:30am							
12:00pm			Lunch, P. O'Neill				
12:30pm							
1:00pm							
1:30pm			Registrar's Office, Ken Lavigne (x2262)				
2:00pm							
2:30pm			Contracts, Judy Brown (x2022), or Sue Nelson (x2021)				
3:00pm							
3:30pm							
4:00pm			Pick-up at NH				
4:30pm			Return to hotel.	Reception Return to Hotel, G.E. Schneider plus ...	Return to hotel, G.E. Schneider plus ...		
P.M.				Dinner Bhima's Warung, pickup at 8:00	Dinner at the Duke's, pickup at 8:00		

STUDY TOUR
Ms. Mantana Thammachoti

September 14 and September 21, 1996

September 14

8:00 pm

Robert Eagle to pick up Ms. Thammachoti at the Halifax International Airport. Arrival at the hotel at approximately 9:45 pm.

September 15

10:00/3:00

Robert Eagle to pick up Ms. Thammachoti for a tour of Peggy's Cove

September 16

9:00am

Welcome by Dr. Adam Bell - Dean of Engineering
Room A102

9:30/11:30

Discussions with Robert Eagle - Director, Research Services, on Research Services and IP functioning at TUNS
Room A210

12:00/1:30pm

Lunch

2:00/4:00pm

Discussions with Dr. F. Hamdullahpur, Dean of Graduate Studies and Research - how office works and general project discussion
- with R. Eagle, Dr. B. Caley, and Dr. B. Hart
Financial Services Board room

4:30/7:00pm

Reception at University House

September 17

9:00/11:00

Continuing Education Program overview with Ms. Carol Connor, Director

11:00/12:00

Discussions with Robert Eagle on joint projects; Mekong, Vietnam and Thai Seminars, Room A210

12:00/1:30pm

Lunch

2:00/4:00

Ruth Murray, CIFT and Darcy Bears, Financial Services to discuss accounting practices in Financial Services Board room

September 18

10:00/3:30

Pearson Institute, Dalhousie to see all aspects of their operation (student advice, financial, and policy review) see attached
- R. Eagle to provide transportation to the university/return by taxi

2:30/3:30

Dalhousie International Student Advisor - Lynn Shakry

September 19

9:30-10:30

Meeting with Dr. Ronald Gilkie, Dean of Students and the International student advisor in the Dean's office Room A212

11:00 -3:00

Visit Saint Mary's University - Ms. H. Taylor,
Alana Robb, International Student Advisor and Neill Evans, International Marketing Officer

4:00-6:00

International Students Welcome Reception in Common Room

September 20

Dr. Dave MacKay (all day) 454-4917

September 22

flight to Toronto (same as the Saturday flight #627 departs at 5:00 pm)

Appendix B
Reports Activity A 1.32

Activity A 1.32

Report: Roger Watt

Date: Friday June 14, 1996

From: Roger Watt
Associate Director, Distributed Computing
University of Waterloo

To: Dr. Weerapong Pairsuan
Director, Centre for Computer Services
Suranaree University of Technology

Subject: Recommendations

Questions about issues in this report should be sent by email to
rwatt@uwaterloo.ca

PART ONE IMMEDIATE-TERM CONSIDERATIONS

1.1 Administration of the IP Address Space

A strict administrative record-keeping "standard operating procedure" must be imposed on the IP address space, using SUT's Domain Name System database as the official record of the network. There are currently only a few dozen computers registered in the DNS database. There are no DNS records for the additional machines that have been assigned (or are using, without CCS authority?) an IP address, and this condition will lead to disaster.

The standard operating procedure should be that a device must not be connected to a cabling system until that device has been assigned a "host" name and an IP address by CCS personnel, and the name and address have been entered into the DNS database, and that they are now visible via mechanisms such as the "nslookup" command. For a device with multiple IP interfaces, such as a router, every IP address assigned to the device should be registered in the DNS. Also, every IP subnet should be assigned a name and be registered in the DNS database.

A naming scheme should be devised for the network-equipment IP devices (routers, network-management modules in the Ethernet/UTP repeaters), plus the network and its subnets. The name of each device and each subnet should reflect what it is and where it is or what it services (for example, by using building and floor codes). For example,

```
203.158.4.16   = net-campus.sut.ac.th
203.158.4.19   = router-W.sut.ac.th
               (same for its other interfaces)
203.158.5.32   = net-W-1a.sut.ac.th
203.158.5.64   = net-W-1b.sut.ac.th
...
```

The DNS "HINFO" and "TXT" record types can be used to publish additional information about the DNS entry. HINFO's purpose is to record information about hardware and software. TXT's purpose is to record arbitrary comments; multiple TXT records per device could be used to record date-last-modified and who-to-contact information.

Also, the IP-topology map for the campus must up to date at all times.

1.2 Planning For and Making Changes

Any change to the IP network requires a change to the corresponding DNS entry or entries (such as the name or address of a device). Any such change must be planned far enough in advance of the default TTL (time to live) value such that the TTL value for the device can be set to a lower value (from days to hours, and then from hours to minutes) before the change, so that the rest of the world will detect the change in a timely fashion.

Also, making a change must involve updating the map as well as the DNS.

1.3 Network Connectivity and Utilization Monitoring

A program that provides real-time information about the current state of the network is required. It must have more features than the PC-based "WS-watch" currently in use. The program must have an "auto discovery" mode that uses SNMP to determine the topology of the network, rather than depending on information provided by a human. The program must also show current traffic levels on the links between the devices that it has discovered, and provide a mechanism for logging such data to an external file for post-processing analysis and reporting.

There are two approaches to such a program. The "complexity" approach involves a large "industrial strength" network monitoring program such as Cabletron's "Spectrum", HP's "OpenView", or Bay's "Optivity" (which I understand SUT has but is not currently using). Such programs provide a vast range of features, but they do so at the considerable expense of requiring CCS Unix-support staff to learn, install, configure, and use. The "simplicity" approach involves a program such as "InterMapper" from Dartmouth College in the US. InterMapper runs on an Apple Macintosh. We use it at the University of Waterloo to monitor the campus network, and I recommend it most highly; it is available from <http://www.dartmouth.edu>, and installs over the Internet. It is currently free, but will soon cost several hundred US dollars (for an academic institution). It is almost immediately "obvious" as to how to use it. There is also a PC program called "SHMPC" that is somewhat similar, but it does not have all of the same features as InterMapper, but it is much less complex than Optivity. (URL <http://crc.castlerock.com>)

1.4 Network Utilization Data Collection and Reporting

Some basic information about the loading of the critical components of the IP network must be maintained so that projections can be made that will identify "future requirements" long before they become "current problems". There are three traffic loads that must be measured ... response across the external connection, traffic through the backbone router ports, and traffic within each cabling system.

Response across the external connection can be measured by a PERL program that issues a "ping" command to transmit ten 1024-byte packets and then record the transit times (min, average, max) and percent packet loss. This task can be run by "cron" from one of the backbone-connected Unix systems, automated by a control program that collects the data at intervals throughout the day, reduces the interval records to a single daily-averages record at the end of the day, reduces the daily-averages records to a single monthly-averages record at the end of the month, keeps the most recent 24 monthly-averages records, and performs linear and exponential projections for the next 12 months. I have copied software to do this from UWaterloo and modified for SUT, as a model for the "interval, day, month" process, in research:/user/roger/software/linkspeed. It is currently running under control of a crontab entry.

FILE FOR SEMI-ANNUAL REPORT
Activity A1.32
JUN 1-15/96

Traffic though the backbone router ports can be collected, reduced, and reported using the same 'interval, day, month, projection' methodology, again from a backbone-connected Unix machine. In this case, the interval program will need to invoke a program that can issue SNMP 'GET' requests to each of the routers. I have copied software to do this from Waterloo and modified it for SUT, in `research:/user/roger/software/routerwalk`. However, it requires 'snmpwalk' software from Carnegie-Mellon University (available via FTP from `cmu.edu`) that does the SNMP communication.

Collecting data on the traffic within the cabling system that services an IP subnet requires the continuous presence of an 'agent' device that supports the SNMP 'RMON' MIB. Such devices are expensive (several thousand dollars US, each). However, the network-management module of the Bay Networks 'SynOptics 2813SA' Ethernet/UTP hub contains a Data Collection Module (DCM) that implements all nine groups of the RMON specification.

The daily and monthly reports from all three types of collection should be published in a 'campus networks' section of the SUT webspace so that all interested parties within the university can stay abreast of the 'health' of the network.

1.5 Labelling of all Cabling Runs

Every fibre and UTP connection should have a label on the cabling that identifies the device it connects to and the device at the other end of the connection. Otherwise, if two connections are unplugged at the same time (for maintenance work), it is too easy to make a mistake and plug the wrong cable into the wrong port when reconnecting them.

PART TWO SHORT-TERM CONSIDERATIONS

2.1 Dynamic IP Configuration of Computing Systems

Every IP-connected computing system that COULD be configured to obtain its IP-configuration information (hostname, IP address, subnet mask, address of default route, etc) from a central network server SHOULD be configured to do so, rather than hardcoding that information in the computing system, so that making a change does not require that a person go to the machine.

Today, the means for doing this is a central 'bootp' server. This requires a CCS Unix-support person to install and maintain the 'bootp' server, and enter and maintain the data for each computing system, but the resulting simplicity will provide long-term payoff.

The industry is currently in the process of developing a much more functional mechanism, based on the 'Dynamic Host Configuration Protocol' (DHCP). Some Unix-based DHCP server software exists, and vendors (such as Microsoft) are in the process of developing industrial-strength DHCP servers. Today's DHCP servers do not yet integrate adequately with the DNS, and I would advise a 'wait and watch' approach for perhaps the next six to nine months before any acquisition. However, something should be done before the environment gets much bigger.

2.2 Connection to the Student Residences

The current 28.8Kbps modem link to the computers in the Student Residences is not sufficient to support any significant use. If a fibre link to the Ethernet cabling system within the Residences is not justifiable, then

perhaps it will be possible to consider a spread-spectrum radio (SSR) link. This involves a matched pair of 'remote Ethernet bridge' devices that communicate over a line-of-sight low-power low-frequency radio link, with a mast and antenna on the building at each end of the link. Several vendors make such equipment in CA and US. The product with which I am familiar is the ARLAN 640, made in Canada, which operates at 2Mbps, and costs CA\$7000 for the pair. (Sorapat has the URL for further information.)

2.3 External Connection

The external 64Kbps connections from SUT to Bangkok and beyond via satellite introduces packet-latency delays that make effective real-time interaction unworkable, and I strongly recommend you replace them with a single higher-speed land-based line to Bangkok as soon as funds permit.

>From examining the documentation for release 8 of the Wellfleet router software, I found Wellfleet's solution to the 'alternate default routes' problem. It requires a two-step 'traffic filter' on the router that has the two satellite links. The router must examine every packet that arrives from the FDDI ring, first to ensure that traffic destined for local interfaces is delivered there, and second to decide which of the remaining (ie, off-campus) traffic is to try which of the two satellite links as its first choice. In testing, we discovered two problems that I believe are 'bugs' in Wellfleet's code.

The version of software currently running in the routers is almost two years old, and should be upgraded to Wellfleet's current version as soon as possible. Bay Networks has most certainly found and fixed numerous bugs in the last two years; the problem we encountered may be among them. The Bay Networks representative in Bangkok is pursuing the matter with central technical-support personnel at this time.

2.4 Cabling-System Security in Student Areas

A number of vendors make a version of Ethernet/UTP repeater (hub) in which a port can be configured to talk only to a specific Ethernet address, and also not to send an Ethernet frame out a port other than the one to which the destination device is connected without first destroying the data portion of that frame. This creates an environment in which it is possible for students to attempt to install 'sniffer' software on a connected PC, or to disconnect the PC and connect a machine of their own. not

At Waterloo, we no longer install hubs without these features. We have tried several vendors' products and are currently using hubs from ATI for this purpose, because SynOptics did not have them at the time we needed them. I do not know if SynOptics now has such hubs.

2.5 Campus Newsgroups

The 'network newsgroups' features now common in web-browser software such as Netscape provide an excellent opportunity to establish a central NNTP network-newsgroups server for use within SUT (it is not necessary initially to obtain an external newsgroup to do this; that can come later). For example, a set of 'th.ac.ut.' newsgroups would provide a mechanism for SUT students, faculty, and staff to voice concerns and discuss issues in a campus-wide open electronic forum.

Doing this will require obtaining and installing news-server software on one of the central Unix machines. The software currently in use at most places for this is called 'INN' (Internet Network News). I did not have

time to track down a reference, but will do so when I return to UWaterloo.

PART THREE LONGER-TERM CONSIDERATIONS

3.1 Transmission Layer

The design of the transmission system that supports SUT's two-level campus IP network is excellent.

The level-one IP network is serviced by an FDDI-transmission fibre cabling system between buildings that contains the 'building point-of-presence' IP routers plus the critical network-server computing systems. Each level-two IP network is serviced by an Ethernet-transmission Category 5 UTP cabling system that connects office/lab computers back to the workgroup's 'floor point-of-presence' wiring centre containing an Ethernet/UTP repeater that is connected by fibre back to the building's router.

The use of fibre and Category 5 UTP in this tiered and modular design enables future expansion as necessary. As the distributed-computing environment grows, a workgroup can acquire its own server(s) so that it is no longer dependent on central servers, and if transmission-loading conditions within the workgroup become too severe for shared 10Mbps Ethernet, the workgroup's Ethernet/UTP repeater can be replaced by a 10Mbps/100Mbps Ethernet switch. If transmission-loading conditions between a workgroup and the building router become too severe for 10Mbps Ethernet, that link can be upgraded to 100Mbps Ethernet. Similarly, if and when warranted, the Ethernet/FastEthernet transmission systems and the core FDDI transmission system can be upgraded to ATM (or, hopefully by then, Gigabit Ethernet will be a commercial reality and the complexities of ATM can be avoided).

I did not have time to determine whether Bay Networks has a FastEthernet interface for the models of Wellfleet routers that SUT is currently using.

3.2 Network Layer

The complexities of multiple aggregated Class-C network numbers and the related problems that the Internet is encountering with the growing size of routing tables could eventually lead to disaster for SUT. To date, the only possible solution to this appears to be the emerging field of 'Network Address Translation' devices that would permit SUT to exist behind such a device in a private Class-B (or even Class-A) address space as set forth in RFC1597, 'Address Assignment for Private Networks'. Until such devices become a commercial 'commodity', it will be some time before this becomes a move that SUT can consider.

3.3 A 'Proxy Caching' Web Server for the Campus

Some web-server software provides the ability to perform 'proxy' and 'caching' services for the web-browser clients. In this manner, the client's request to retrieve a document is sent to the proxy/caching server rather than the destination server. If the proxy/caching server does not currently have that document in its cache, it fetches it from the destination server, stores it in the cache, and then delivers it to the requesting client. Under certain circumstances, this can save considerably on the off-campus traffic consumption caused by web-space browsers.

NCSA's server, which SUT is currently using, does not provide this. However, both Netscape and Microsoft have commercial-strength server software that does this.

PART FOUR PROFESSIONAL DEVELOPMENT

There are a number of reference-materials sources that will be of significant benefit to the CCS staff involved in support of the campus network. (Some of these may already be in use.)

- books, such as:
O'Reilly Associates has many great books (<http://www.ora.com>)
- trade magazines, such as:
Network Computing (<http://www.cmp.com>)
Communications Week (<http://www.cmp.com>)
- network newsgroups, such as:
comp.dcom.sys.wellfleet
comp.dcom.net-management
comp.security.firewalls

The network newsgroups are invaluable ... they provide the ability to post a question or a request for advice that will be seen and responded to by experienced people throughout the world in less than 24 hours, and to learn from questions/responses on related topics. Unfortunately, one also gets responses from people who do not know what they are talking about, so it is always wise to wait and see if someone's response is rapidly criticized by other readers of the newsgroup, before taking action. I used this ability, from UW, several times this week in pursuit of the Wellfleet traffic-filter routing problem. CCS should attempt to obtain permission from the Internet Service Provider in Bangkok for CCS staff to use its NNTP newsfeeding machine (if it has one) as a remote newsreading/newsposting server, until such time as it is appropriate to obtain an actual newfeed for SUT and begin importing some of the newsgroup structures.

-- conferences sponsored by 'user group' associations and by vendors

-- (?) working groups of support staffs from the universities throughout Thailand, who meet regularly to discuss common problems and solutions

In closing, I wish to thank you VERY MUCH for inviting me to SUT for these past two weeks. It has been a fascinating experience, and I have enjoyed working with Sorapat and Prapat and Krit; you have every reason to be proud of them.

Please, whenever there are questions or issues on which you would like comment from me, whether in the immediate future or beyond, I would welcome email from you and/or your staff.

Sincerely,

University of Waterloo

Activity A 1.32 Report: John Sellens



Waterloo, Ontario, Canada
N2L 3G1

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IST/Data Processing
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September 10, 1996

Dr. Weerapong Pairsuwan
Director, Center for Computer Services
Suranaree University of Technology
Nakhon Ratchasima 30000
Thailand

Dear Dr. Pairsuwan:

Enclosed please find the final copy of my report on my visit to the Center for Computer Services at Suranaree University of Technology. This final copy is, of course, based on the draft version that I left with you in June.

I am sorry to have been so long in completing this report – I have been very busy with other responsibilities and, unfortunately, I allowed the completion of this report to drag on.

I would like to thank you and the CCS staff for your hospitality and support during my visit. I very much enjoyed the trip, and hope that my visit and this report will have been useful to CCS. I will, of course, be glad to provide additional information or clarification on any areas of this report.

If I can be of further assistance to you, or if, by chance, another visit to SUT would be useful to you, please let me know.

Thank you again for the opportunity to visit CCS and SUT, and to offer you my assistance and recommendations.

Sincerely,

John Sellens

cc: Gerry Schneider, University of Waterloo
→ Mary Jane Curtis, Ryerson International

Notes on UNIX Systems and Network Integration at Suranaree University of Technology

John Sellens
University of Waterloo
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September 10, 1996

1 Introduction

This report is a summary of my visit to the Center for Computer Services at Suranaree University of Technology, Nakhon Ratchasima, Thailand, June 3 to 7, 1996.

My report contains a list of issues that were to be addressed during my stay, other issues that I thought would merit some investigation or consideration, some background information, and some recommendations of what CCS at SUT could do in order to make the best use of its resources to provide an appropriate UNIX infrastructure. As well, I have included a list of references that I hope will be of use to CCS staff.

Much of the software and resources that I will recommend are only available (so far as I know) in English, which may, unfortunately, limit their usefulness to some members of the SUT staff.

I very much enjoyed my time at SUT. Prapat Pusopa and Sorapat Dhaparangsri of CCS were both very helpful to me while I was there, and, I believe, helped to make my visit much more productive than it might otherwise have been. Unfortunately, as I had little time for advance planning, and my time at SUT was limited, I was unable to accomplish quite as much as I had hoped I might, and was unable to address all the issues that came up, but I hope that my visit was useful to CCS. Should the opportunity for a return visit ever arise, I would be very interested in visiting CCS and SUT again.

2 Issues

Dr. Weerapong Pairsuwan mentioned the following issues as things that CCS would like assistance with, or at least this is my understanding of what CCS's interests are, based on the discussion with him and with Prapat.

- Web server speed and performance
- Performance tuning in general, especially on the Sun servers
- Directions for future expansion e.g. single large machine vs. multiple smaller machines, vendor selection (Sun, DEC, other)
- Issues related to the DEC Alpha server used in the academic areas
- Student mail servers, and issues related to account creation and maintenance

Other issues that came to mind during our discussions and tour of the CCS facilities, and as the week progressed, are as follows:

- System backups – I understood that there were no backups of the central UNIX servers
- System staff training and knowledge resources – how should CCS staff gain more knowledge about UNIX programming and system administration?
- Software consistency across multiple platforms – how can CCS ensure that its multiple systems are appropriately and consistently maintained and configured?
- Integration of Windows PC systems with the UNIX servers – how can all the systems work together, sharing all resources?
- Protection of the administrative network(s) – would it be appropriate to install some sort of network firewall system to protect the administrative systems? Would it be appropriate to protect the campus networks from outside intruders?
- Other security issues and intrusion detection – things like cops, tripwire, passwd file scanning and problem reporting.
- General system organization – are generic mail aliases in use? / .forward files?
- DNS name service – is it appropriately configured for redundancy and reliability?

- During our time at SUT, we noticed that the satellite links to Bangkok introduce substantial delays (up to 7 seconds) in internet traffic, and make it difficult to use services and information outside SUT. If off-campus internet access is important to SUT, you may wish to investigate networking options with higher capacity and shorter round-trip times.

3 Backups

Backups were not (at least up until the time of my visit) being done on the CCS UNIX machines. If a disk failed, or files were accidentally (or maliciously) removed, important data could be lost, and there could be substantial disruption to the systems. Backups are vital for “production” machines.

I created a simple shell script (on ccs in `~john/backups`) which should make it possible to do rudimentary backups of ccs, and could be used as a model for backing up the other CCS UNIX systems.

The Amanda backup software, from the University of Maryland, will likely be a good backup system for CCS. If and when volume justifies it and the budget allows, CCS may wish to consider a commercial product such as Networker from Legato (<http://www.legato.com>). We use Networker at Waterloo with large central tape jukeboxes – we currently have 3 on campus – backing up significant amounts of data from machines across campus.

Amanda is available from <ftp://ftp.cs.umd.edu/pub/amanda> and there are apparently Amanda-related mailing lists available – mail to amanda-lists@cs.umd.edu for information on how to subscribe. There are postscript copies of papers describing Amanda in that FTP directory.

The current “alpha” release of Amanda supports backups using *gnutar*, which I think is necessary to backup CCS’ Linux machines.

I set up an initial installation of Amanda on ccs, research, and popeye1, using the “backup” userid, with the software installed under `/usr/local/amanda`. The “backup” userid must be in group “operator” on SunOS, “sys” on Solaris, and “disk” on Linux, in order to be able to read the raw disks and update the `/etc/dumpdates` file. I added the appropriate configuration entries to the `/etc/inetd.conf` and `/etc/services` files, but did not set up the necessary cron jobs to cause Amanda to run backups automatically. Unfortunately, certain backups consistently fail for as yet unknown reasons, apparently due to problems with the *taper* program.

I had hoped to investigate this problem on my return to Waterloo, but other commitments have prevented me from being able to find the time to do so.

I was unable to determine how the Netware servers are being backed up, or if they are being backed up at all. If Netware servers are being used to store important data, backups are just as important for those servers as for the UNIX servers.

A significant amount of computing at SUT is done on standalone PCs, and I suspect that there are virtually no backups being done of the data on these PCs. I would recommend that CCS investigate the use of more central PC file servers, either Netware, Windows NT, or UNIX machines with Samba, in order to ensure that all PC users have a backed-up file server on which to store their files.

4 Web Server Speed and Performance

The SUT/CCS web server `www.sut.ac.th` was running (I believe) version 1.4.2 of the NCSA HTTP server. The highest performance (and least buggy) HTTP server right now is the Apache server, available from `http://www.apache.org`. This server is based on the NCSA server and claims to be a “drop-in” replacement for it. One nice feature that the Apache server has is the ability to leave the connection to the server open, and retrieve multiple documents or images without having to create a connection for each one – this will result in higher performance.

If performance is a concern, I would recommend that CCS obtain and investigate the Apache Web server with the goal of replacing the current NCSA server.

The `httpd` HTTP server was being run from `/etc/inetd.conf`, and so was started separately for each HTTP connection. I would recommend that it be run as a standalone daemon, which will mean lower overhead and slightly faster response.

5 DNS Name Service

We have noticed that many machines (primarily PCs) are not registered in the DNS name server database, even though they are using IP addresses. I believe that Roger Watt has addressed this along with some other DNS issues.

On the morning of Thursday May 6, the network connection in Bangkok was not working, and there were problems resolving host names at SUT e.g. `ccs` could not resolve the name `ccs.sut.ac.th`. CCS should carefully review the DNS setup at SUT with an eye to being self-sufficient on campus, at least for the `sut.ac.th` domain, and to having redundant nameservers (i.e. a primary and at least one secondary).

There were inconsistencies between the hostnames of machines and the names recorded in the DNS database. For example, the machine known primarily as by the domain name `www.sut.ac.th` thought that its name was “sura”, and there was confusion on the research machine about whether its name was “research” or “garfield”.

I would recommend that CCS obtain a copy (if you do not already have one) of the book “DNS and Bind”, by Paul Albitz and Cricket Liu, published by O’Reilly and Associates.

6 Performance Tuning

Since the major UNIX servers in CCS are running SunOS and Solaris, I would recommend that CCS purchase a copy of the book “Sun Performance and Tuning”, by Adrian Cockcroft, published by SunSoft Press through Prentice Hall, ISBN 0-13-149642-5. This book covers every possible performance and tuning question on Sun systems, and provides a lot of information on detecting and correcting problems.

Adrian Cockcroft also writes a monthly column on performance issues in “SunWorld Online”, a net magazine, available at

<http://www.sun.com/sunworldonline>

“SunWorld Online” also includes many other Sun-related articles.

7 Research Configuration Problems

It was brought to my attention that there were some configuration problems on the research machine. The most obvious problem was that there was confusion over the name of the machine – the machine itself believed that its name was “garfield”, but it was registered in the DNS database as “research” and “garfield” was not listed as a DNS alias. The machine also seemed to be configured to use NIS+, but as it is a standalone machine, NIS+ just adds extra complexity and confusion – there seemed to be inconsistencies between the `/etc/passwd` file and the information in the NIS+ database. I noticed a few anomalies on the research machine (e.g. couldn’t find the `vi` command – since fixed), and with the confusion over NIS+ and naming, you may wish to re-install the operating system and rationalize the configuration at that point. You may wish to consider a “from scratch” installation in order to start fresh.

I would recommend that you purchase at least one copy of Sun's C compiler. The GNU C compiler (*gcc*) is very good, but there are a number of situations and software packages that require the Sun compiler in order to perform properly.

In order to optimize the performance of the research machine, I would recommend that you follow some of the tuning and monitoring suggestions in "Sun Performance and Tuning". In particular, you should ensure that there is an appropriate amount of memory in order to run the larger jobs.

8 Future Directions and System Planning

I was asked to provide some opinions on suitable ways to plan to expand the UNIX systems and services offered by CCS at SUT. As I understand it, there are currently only a small number of UNIX machines at SUT and within CCS. I believe that CCS has 3 Sun Sparc 10 and 20 systems, and 2 or 3 Linux machines. In addition, I understand that the Library is using a large HP system, and there is a DEC Alpha in an academic area.

At the University of Waterloo, we currently have over 550 UNIX machines on campus, all provided with software distributed from a central server. We have spent a lot of time developing our software installation and distribution systems which enable us to deal with so many machines. As CCS is just getting started in UNIX services, I do not think that it will be practical for CCS to develop any sort of large scale software support mechanism in the near future. There is some software available on the Net to do some of the necessary software distribution and configuration, but I believe that it is still likely to be a difficult task for CCS at this time.

My recommendation is that it will be more appropriate for SUT to try to have fewer, larger UNIX systems than to have more, smaller machines. I would also recommend that SUT try to standardize on systems from one vendor, as multi-vendor system administration is much more complicated. Sun's current UltraSparc offerings are quite competitive, and offer a good range of capacities.

Examples of how this can be applied are as follows:

- Provide database services from one large, centralized database server, rather than multiple replicated servers.
- Have one student mail and UNIX server.

There are problems with this approach, however:

- Single point of failure. With only one database server, a hardware or software failure would mean that no database information would be available. With replicated databases, the information would still be available, but it may not be possible to modify the information in the database until all servers are up and running. The potential impact of this kind of problem can be reduced by implementing some amount of redundancy and fault-tolerance in the database server itself. The most common example of this is disk striping and mirroring using RAID.
- Capacity limits and expansion. With a single server, you will likely eventually hit the capacity limit of that server and will be unable to increase capacity without buying a substantially larger server (unless, of course, you buy a very large server to start with). If, on the other hand, you started with multiple servers, you would have already solved the (potentially substantial) problems associated with multiple servers, and adding another one should not be much of a problem.
- Purchase cost. Large UNIX machines tend to be more expensive per unit of computing power than smaller machines. By buying larger machines you would increase your acquisition costs, but decrease your human costs – the time to set up and maintain the machines. With multiple smaller machines, you save on the purchase price, but pay more to configure and administer the systems. At Universities in Canada, it is almost always worthwhile to spend more on the machines in order to save people time – in Canada the cost of a person's time tends to be much larger than the increased cost of a machine, especially at educational prices.

There are some situations and services in which it is appropriate to have separate machines:

- It is a good idea to separate student computing from administrative computing. This lessens the risk that students will gain unauthorized access to confidential information.
- It is a good idea to separate public services from private services – for example, the administrative web server should be a separate machine from the administrative database server.

9 Tracking System Changes

One very important aspect of UNIX (or any other system) system administration is keeping an appropriate record of the changes that have been made. There are several ways to do this, and I would recommend using a combination of all of them.

- Use a revision control system. A revision control system allows you to keep track of all the changes to a file or files, and allows you to view the differences between different versions of a file. There are two main revision control systems in use on UNIX systems: SCCS (Source Code Control System) which comes with a number of UNIX systems, and RCS (Revision Control System) which is freely available software, and would usually have to be installed locally. At Waterloo, we make extensive use of RCS, recording changes to system configuration files, source code, and recording the changes that we have made to localize software that we have installed from the Net. RCS is available from the directory `ftp://prep.ai.mit.edu/pub/gnu` – I have temporarily installed RCS in `~john/rccs`.
- A log book and paper copies of important information are also important system administration tools. A log book is very handy because you can carry it around easily, to meetings or to other buildings, and it's always available, even when the machines are down. Paper copies of important information can be vital when repairing a system that is not running. Examples of things that should be available offline are copies of *df* output, the `/etc/fstab` and `/etc/vfstab` files, disk partition information from the *format* command, etc.
- Mailing lists are very useful for keeping people up to date on important changes. The most common type of mailing list is a system alias including all members of the system support group. This makes it easy to let everyone know about important changes or problems, as they occur. You may wish to have a mailing list for the users of a system, but such mailing lists can easily get too large to be useful.
- Local USENET newsgroups are very useful for recording changes. They are similar to mailing lists, but are less immediate and reach a (potentially) wider audience. This will be more difficult to implement at SUT since there is not currently a news system running on campus. A less convenient alternative that you may wish to consider would be to record changes and notices in a web page (or pages) and make the information available that way.

10 Training and Assistance for System Administrators

UNIX system administration can be a task requiring large amounts of knowledge and experience, and it is important for a beginning system administrator (or an experienced one) to have appropriate training and resources available to them if they are to be able to do an effective job.

Many of the References and Resources listed below will be helpful in providing training and assistance for the CCS UNIX system administration staff. Sun offers various Sun-specific training courses, and if Sun offers some of these courses in Bangkok, it might be worthwhile for CCS

staff to attend. USENIX is one of the best opportunities for system administration training and publications – I have included information about USENIX below.

The USENET newsgroups are a wonderful resource for system administrators – it's possible to get an answer to almost any question, and often within just a few hours. And reading a few newsgroups is a wonderful way to learn more about systems, through reading about other people's experiences. CCS should determine whether it's possible to read news from a server in Bangkok – this will be much easier than trying to arrange and maintain a local news server at SUT (in the short term at least).

11 PC Networking and Integration

I believe that it is important for PC and UNIX systems to be integrated with each other. At Waterloo, we are addressing this issue in the following ways:

- All PC networking will be based on the Microsoft protocols for file and print sharing, using TCP/IP as the transport protocol. We believe that NetBEUI is unsuited to networks larger than a few machines.
- We are using the freely available Samba software to allow our UNIX machines to talk Microsoft protocols, and so participate in file and print service. At SUT, this would allow the use of PC printers from UNIX machines, and would allow file service between PCs and UNIX machines.
- When a PC-based file server is appropriate, we are standardizing on Windows NT servers. The NT servers can be TCP/IP based, support *lpr*-based print service, and work with no additional software required on the PCs. I would recommend that CCS investigate the Samba software to aid in integrating its PC and UNIX systems. I have included a reference to Samba below. I put together a small experiment with Samba while I was at SUT.

I would recommend that CCS develop a plan for better integrating PC and UNIX services and systems.

12 Useful Software and Tools

There are many freely available tools and software packages that are useful for UNIX and network administration. I will mention a few here, and I would be happy to provide you with references or pointers to these programs.

- Perl is a very useful language that is a cross between C, *awk*, *sed*, and the shells, provides easy prototyping and is very powerful. Many system administration tools are written in Perl
- TCP wrapper is a program that helps control and log access to network services. It is useful for implementing certain security rules, and may be useful on those machines that you wish to control a little more tightly.
- *rdist* is a command that is used to ensure that files are consistent across sets of machines. It can be used to distribute software packages to different machines, or to ensure that configuration files (*/etc/resolv.conf* for example) are consistent across multiple machines. *rdist* is included with most UNIX systems. There is a newer version available with more features, but the stock *rdist* is likely sufficient for CCS's immediate needs.
- The CMU bootp server software with DHCP modifications will allow SUT to automatically configure PC networking parameters. I believe that Roger Watt has discussed this in more detail.
- The CMU SNMP tools are very useful for network monitoring, and I believe that Roger has also covered the use of tools like this.

13 Security

I was unable to address any significant security-related issues while I was at SUT. I would like to recommend the book "Practical UNIX & Internet Security", by Simson Garfinkel and Gene Spafford, as a useful resource. It is available from O'Reilly and Associates.

14 Postscript Printing

Many documents from the internet come only in Postscript form, and it will be useful for CCS staff to be able to print Postscript documents. I was unable to identify an accessible Postscript capable printer at CCS. There are 2 basic approaches that you can take:

- Buy a new Postscript printer, or upgrade an existing printer to add Postscript. In particular, it may be possible to add Postscript to the HP5si printer that you already have in the main office area (thereby converting it to an HP5si MX).

- Install the ghostscript software (available from the GNU software archive) which is an interpreter for the Postscript language and can, among other things, convert Postscript to HP's PCL.

The first option (a Postscript capable printer) will be the most reliable and convenient.

15 References and Resources

I believe that you may find following references useful.

- The "UNIX System Administration Handbook" by Nemeth et al is widely respected as a very good resource for UNIX system administrators. It is published by Prentice Hall with ISBN 0-13-151051-7.
- O'Reilly and Associates publishes a large number of books related to UNIX systems, and most of them are quite good. The O'Reilly books tend to be practical guides that can be put to use immediately. The O'Reilly catalog is available at <http://www.ora.com>.
- The USENET newsgroups `comp.unix.admin`, `comp.unix.sun`, `comp.unix.solaris` are very useful resources for Sun system administrators.
- The USENIX Association home page <http://www.usenix.org> contains a lot of information about conferences, publications, and references to papers. You may wish to join USENIX, which will provide you with a subscription to the bi-monthly newsletter "login:" which contains a lot of information and tips for UNIX system administrators.
- USENIX also holds a number of conferences during the year, the most useful of which would likely be the LISA System Administration conference. The 1996 conference will be held in Chicago, USA in September, and will include a number of tutorials that CCS staff may find very useful. If CCS is unable to send someone to the conference, it would probably be worthwhile to obtain a copy of the conference proceedings, which will likely contain a number of papers that will be of use to CCS staff. More information about the conferences is available through <http://www.usenix.org>.
- The "UNIX Guru Universe" web site, containing links to lots of things that are useful to the UNIX system administrator, is at

<http://www.polaris.net/ugu>

- The GNU software archive at `ftp://prep.ai.mit.edu/pub/gnu` includes software like `gcc`, `RCS`, and so on. The GNU project creates a large amount of software for UNIX systems, most of it quite good. Some of it is replacements for stock UNIX software, and some is useful additions. One of the most well-known is the GNU emacs editor, which can be very highly customized into an complete working environment – it may, however, be best left to the “experts”.
- I made a presentation at the 26th Ontario Universities Computing Conference in late May, identifying some of the things that we are doing at Waterloo to make our administrative networks more secure. My presentation is available at

`http://www.adm.uwaterloo.ca/~jmsellen/Papers/towards`

in various formats.

- SunWorld Online magazine, from

`http://www.sun.com/sunworldonline`

is a monthly online magazine that contains a lot of information that is useful to a Sun system administrator.

- The book “Sun Performance and Tuning”, mentioned above.
- The Samba software for providing PC-style networking on UNIX hosts is available at

`ftp://nimbus.anu.edu.au/pub/tridge/samba`

and a web page is available at

`http://lake.canberra.edu.au/pub/samba/samba.html`

and includes documentation and information about Samba. This software is very good, and we find it very useful in integrating our systems.

Appendix C
Reports Activity A 2.11

Report on the SUT/CUTC Project Activities Mini-PRC Meeting June 11-13, 1996

*Participants: Representing SUT: Dr. Sam-arng Srinilta
Dr. Prasart Suebka
Dr. Ruben Umaly
Representing CUTC: Dr. Stalin Boctor (RPU)
Dr. Feridun Hamdullahpur (TUNS)*

I. Review of On-going Project Activities

Program 1: Development of Institutional Capacity

A1.31: Provision of Customized Training in Canada for SUT Academic Support Personnel

The training of two equipment centre technologist in electron microscopy at the University of Guelph was satisfactorily and successfully completed in April 96. The visit by the Director and the Program Officer of C.I.A. in September 96, to the CUTC partner universities, will complete the activities in this project deliverable.

A1.32: Provision of Technical Services to SUT by two Canadian Consultants to Develop SUT's Institutional Services in MIS and Computer Networks

Two consultants from the computer centre at the University of Waterloo are presently engaged in this activity at SUT. Their tasks will be completed by June 14, 1996. This project deliverable will thus be completed.

Program 1 will therefore be fully implemented by September 30, 1996. Any unspent funds in this program will be added to program 3 (see below).

Program 2: International Academic Program

A2.11, A2.12: Curriculum Implementation of the IUP

Status of the first batch of students: Of the eleven students who enrolled in the IUP mechanical engineering program in June 95, only four are academically "clear" with no course failures, and most likely to be considered for admission as second year students. Three options were explored.

Option 1: Four of the seven remaining students (two with GPA over 3.0, and two with GPA of about 2.5) will be eligible to apply for admission to second year mechanical engineering at the University of Waterloo or to first year of the three year part of mechanical engineering program at TUNS, provided that their TOEFL scores are acceptable (600 and 550 respectively). Academic transcripts for these students will be provided to Dr. Hamdullahpur and to Dr. Schneider for consideration. A

meeting with these students was held and their options was discussed. Arrangements will be made to run a trial TOEFL exam by their english instructor, Dr. David MacKay before the actual TOEFL exam is written.

The University of Waterloo, being the sponsoring university of the mechanical engineering program, and having a second year entrance possibility in January 97, will be consulted about this option when Dr. Schneider is at SUT in July 96.

Option 2: Those students who may not be admitted to CUTC universities due to academic language deficiencies, but are otherwise eligible for promotion to try second year of mechanical engineering at SUT may opt to transfer to the regular mechanical engineering program at SUT, or

Option 3: Discussions will take place between SUT and other Thai universities which offer International Undergraduate program in mechanical engineering to examine the transfer eligibility of those students. Options 2 and 3 above will be presented to SUT's senate for approval.

As planned, four teaching assignments by Canadian professors will be completed by September 96, consisting of: Prof. F. Juranka (1), Dr. D. MacKay (1), Dr. G. Schneider (2). Dr. Boctor's present visit is part of the activities under A2.11.

A2.21, A2.22: Selection of Thai Supervisors and Ph.D. Students

Two Thai Ph.D. students are presently enrolled in postgraduate programs at TUNS. One (industrial engineering) started in October 95, and one (electrical engineering) will start in July 96. Dr. Hamdullahpur met the electrical engineering student and provided him with final letters to facilitate his visa requirements. He will arrive with his family in Canada on July 4, 96. His wife is also expecting to be admitted in the near future to Mt. St. Vincent University in Halifax to do her masters in nutrition.

Three other prospective Ph.D. students were available for a meeting with Dr. Hamdullahpur and Dr. Boctor on Wednesday, June 12, 96. One candidate in civil/transportation engineering, and one candidate in computer science expressed strong interest to apply to and enrol in Ph.D. programs at TUNS by September 96 or at most by January 97. Some family commitments and personal considerations were discussed. Those two students will probably stay at TUNS for the duration of their Ph.D. programs and their wives are also expecting to do their Ph.D. degrees in Canada. The third candidate in chemical engineering is expected to start her Ph.D. program at TUNS by September 96. She will be co-supervised by professors at TUNS and SUT and will return to SUT to continue her Ph.D. research. Her flexible residency requirements and co-supervision in Canada and Thailand will be facilitated through the program (A2.23). A fourth Ph.D. candidate in food science is expected to apply to and enroll at Guelph University before December 96. Dr. Hamdullahpur's present visit is part of the activities under A2.21 and A4.33.

A2.25: Postdoctoral Research Fellowships

Flexible arrangements of this activity will allow for possible one-year fellowship duration instead of four months. One candidate, in environmental engineering is expected to apply for and start his research project at TUNS in September 96, and possibly stay for one-year, accompanying his wife (Ph.D. candidate in chemical engineering).

The other one (or two) candidates for the postdoctoral research fellowships are expected to apply, describing their proposed research programs by June 96, for consideration and placements at the CUTC partner universities.

Further consideration of this activity will be discussed during the upcoming PRC meeting in September 96.

A2.26, A2.27 (see below)

A2.3 Co-op Student Exchange Program

Currently, four Canadian students from TUNS are spending one term co-op placements in Thailand. They were placed in Thai industrial corporations through the assistance of SUT, and the support of the project. One of the four students may spend one additional co-op term in Thailand, continuing through Fall 96 as requested by his employer. Three-four similar placements of Canadian students are planned for May 97.

At present two Thai students, in food science, are placed at Guelph University. Their placements will be extended to six months instead of four. Each will therefore be considered as equivalent to 1.5 placement position and will be supported accordingly. Two similar placements are planned at Guelph University next June 97. Further, two Thai engineering students (mechanical and electrical) will be placed at TUNS during the Fall 96 for one co-op term each.

Thus, all eight co-op placements for the Canadian and the Thai students, supported by the project will be completed, satisfying the deliverables of this project activity.

The financial support provided by the project is to be considered as seed funding. The continuation of this co-op placement activity is expected beyond the termination of the project, i.e., after March 98. The Thai and Canadian organizations involved in such placements are then expected to contribute the full costs associated with these co-op placements.

Program 3: University-Industry Linkage Program

A3.21: Technical Services to Develop Guidelines and Framework for Joint Industrial Training Seminars in Thailand

This assignment is expected to take place during the first two weeks of October 96 by Mr. R. Eagle from TUNS. Plans will be discussed at that time to consider the implementation of another industrial workshop/seminar during July 97. Topics related to agroindustry and industrial safety and health, were proposed, among others.

A3.22: Technical Service by Five Canadian Consultant to Provide Training Seminars in Thailand

Plans and preparations for two seminars, involving five Canadian consultants are presently well advanced. These two seminars will take place in July 96, involving:

- seminar on university-industry technology transfer and collaboration
- workshop on water resource management and waste water treatment

A3.31: Technical Service by Canadian Consultant to Monitor/Supervise Co-op Students

This project activity was just concluded this month through the visit of Ann-Mary Colin from TUNS. She visited the co-op students on site, discussed their placements with them and their employers and considered future placement plans as already reported above.

Thus all activities under Program 3 will be fully completed by October 96, satisfying all of the approved project deliverables in this area.

Program 4: Project Management

A4.32: PRC Meetings in Canada

Plans were confirmed regarding the third PRC meeting, which will take place at the University of Waterloo on September 26 and 27, 1996. It is expected that the fourth PRC meeting will also take place in Canada, in late March or early April 97 at TUNS.

The above review clearly indicates that all of the project deliverables under Programs 1 and 3 are either fully achieved or well underway for completion by the Fall of 1996. The following presents the plans discussed at this Mini-PRC meeting for the implementation of Program 2 activities. Further, the possibilities for extending Program 3 industrial seminar activities are also examined.

II. Plans for Future Implementation of Approved Project Activities

Program 2: International Academic Programs

A2.11, A2.12: Curriculum Implementation of the IUP

Based on the discussions conducted during the Mini-PRC, it is clear that SUT is fully committed to the continued implementation of the IUP. Dr. Tawit, from mechanical engineering, has been recently appointed as Director of the IUP. During the admissions cycle that has just been completed for the second batch of IUP students, 14 out of 54 applicants were admitted in the intensive ESL program. SUT has approved the implementation of the electrical engineering program, starting in September 96. The target of the promotional activities this year was focused on Thailand, with visits to over 20 high schools, and various advertisements. SUT will put stronger emphasis next year on targeting Malaysian, Indonesian, Taiwanese and South Korean students, among other countries in Southeast Asia. Admissions promotional material are urgently requested from the partner CUTC universities, in order to use these material during the upcoming IUP promotional activities.

Since the increase in student enrollment is not as fast as originally anticipated, SUT has decided to change the mode of the IUP delivery until appreciable expansion materializes. The academic program offered at SUT will concentrate on only the first-year of the IUP program, with support from the CUTC partner universities. The particular program offered during any given year will depend on the interest area expressed by the majority of applicants. The delivery of two or more IUP programs will depend on the number of students enrolled. After the students successfully complete year 1 at SUT, they will be offered second year admissions to the CUTC universities, provided they satisfy the agreed upon admission requirements (TOEFL > 550, CGPA > 2.7). The two other options discussed earlier will be available to the remaining students.

It was unanimously agreed that this mode of delivery offers the best chance for the continuation of the IUP in the near future. It is still expected that as SUT's reputation grows, and more students are recruited from other Southeast Asian countries, the full implementation of the IUP will take place on a sound academic and economic basis. The future continuation and sustainability of the IUP beyond the life of the project is now much more certain than was felt earlier.

Since the remaining IUP students in the first batch will be accommodated as discussed earlier, the proposed assignments for the second year mechanical engineering will be cancelled. The electrical engineering program of the IUP, which will be implemented in September 96 will probably have an enrollment of 12-14 students. After the successful completion of year I at SUT, about 4-6 students will be transferred to RPU in September 97, as discussed earlier. The 14 students enrolled in the second batch were visited by Dr. Hamdullahpur and Dr. Boctor on June 12, 96. Their transferability to the CUTC universities and the other options were also discussed with them.

Four assignments for CUTC professors to implement the electrical engineering program are planned for 1996/97, as follows:

1. Fundamentals electrical engineering and lab I, January 97
2. Electric circuits II and lab II, May 97
3. Applied science for electrical engineering, May 97
4. Engineering practice, ethics and technical communication and ESL III, May 97

In addition, two assignments for Dr. Goff and Dr. DeMann, from the University of Guelph's food science program were approved to help SUT develop and implement its undergraduate and graduate program in food technology. These assignments are expected to take place during the Fall of 97, i.e., September 97.

It was suggested and approved that four of the remaining six assignments be implemented during May-June 97, for 4-6 weeks duration, to help SUT in the formulation, planning and development of graduate program in engineering and applied science. These activities are expected to concentrate on chemical, mechanical, civil and electrical engineering, according to SUT's new five-year plan.

It was unanimously agreed that the planned academic assignments for the upcoming academic year provide positive proof of the successful Thai-Canadian collaboration in the area of international academic program's development. The newly approved assignments provide a new avenue for the sustainability of future collaboration in the area of postgraduate programming and research, beyond the life of the present project.

A2.21, A2.22, A2.23: Ph.D. Programs

As discussed earlier, it is expected that six Ph.D. candidates who are presently staff members at SUT (and their spouses), will be enrolled in Ph.D. programs at TUNS and the University of Guelph by January 97. The jointly supervised Ph.D. candidate in chemical engineering will require the full implementation of activity A2.23, as originally anticipated. Thus, the successful implementation of the Ph.D. programs will be fully achieved.

A2.25: Postdoctoral Research Fellowships

With the restructuring of this activity to provide the flexibility for one-year long assignments, together with one-term assignments, it is expected that at least 3 faculty members from SUT will take part in this activity, starting in September 96, and possibly continuing during 1997.

A2.26: Ph.D. Thai Advisors Visit

Two faculty members, one in electrical engineering (high voltage) and one in mechanical engineering

(energy, manufacturing) will visit relevant research facilities at the CUTC partner universities, starting September 7, 96. SUT will recommend and advise CUTC about the two visitors.

A2.26, A2.27: Collaboration and Co-supervision in Canada

It was felt that some of these remaining activities may not take place during the remaining project period. The upcoming PRC meeting will examine the possibility of using the remaining funds available in these activities to support:

- (a) additional postdoctoral fellowships (A2.25)
- (b) additional industrial seminar activities (A3.22)

Program 3: University-Industry Linkage program

A3.22: Technical Service by Canadian Consultants to provide Training Seminars in Thailand

It is expected that:

1. RPU President will provide a seminar in the area of University-Industry Linkage during the 1997 SUT's anniversary celebrations.
2. A workshop on either agroindustry or industrial safety and health, or other relevant topics be planned and delivered during July 97.

As discussed earlier, any remaining funds from Program 1 and activity A2.27 can be reallocated to support these additional Program 3 activities.

Submitted by:



Dr. S.A. Bactor

for Dr. F. Hamdullahpur

cc: SUT
University of Guelph
University of Waterloo
RPU
TUNS

Appendix D
Reports Activity A 2.12 (a)

REPORT TO CUTC/SUT

by
G. David M. MacKay

July 30, 1996

INTRODUCTION:

The author taught two courses at Suranaree University of Technology [SUT, International Undergraduate Program (IUP)] in the summer semester [1996] under contract to Ryerson International. This document is intended both to satisfy RI as a report on the completion of the contract, and also to provide SUT and its Canadian partners with useful commentary on the courses delivered, and on some associated matters.

The CONTRACT:

I found the terms of the contract satisfactory. To this date SUT and RI have fulfilled the terms to my satisfaction. I trust officials at those institutions will not say otherwise about my effort.

GENERAL COMMENTS:

1. The Term.

The term should not be split if it is possible to avoid. Delivering a course in six and a half weeks rather than the usual thirteen halves the time available for the students to absorb and reflect on the material. In courses such as ESL300 and CST100, the element of reflection is especially important. In addition the time for collection of information and for the revision process in writing is unhappily compressed.

With that caveat, I was pleased with the progress the students made during the term. I am satisfied they can all operate satisfactorily in a Canadian university environment. These students have obviously received very good preparation by the English Department at SUT. With one exception, they would very probably not do well on a TOEFL test. That is not surprising; they were not being prepared for that test. Requiring these students to obtain a TOEFL in the range of 580 would be a misuse of their time. They are much better able to communicate effectively in an english environment than many students I have known who did achieve 580+ on the TOEFL. Those students trained to "pass the TOEFL", not to communicate in an english speaking environment.

2. Internet Access

The IUP students should have ready access to the internet. It will be a requirement in a North American university. The wealth of information available on virtually every topic in technology can make a course such as ESL more interesting, and part of the "real world". Similarly in CST100, the wealth of material, and of controversy, in the field of ethics can enliven a subject that often seems remote to the concerns of students.

3. Transportation

The program should consider ways to make an automobile available to visiting faculty at SUT. Although SUT make good effort to provide transportation on request and we were impressed with the effort and concern, the use of a car would greatly enhance the experience at SUT. The SUT campus is very large; the distance from the residences to the library and academic buildings requires a walk of a minimum of twenty minutes. That is manageable in the early morning or in the evening but can be quite uncomfortable in the heat of the day or during inclement weather. The campus bus service is fairly reliable but of course quite limited. The nearest stores are in Khorat some 20 km away. Once again SUT makes good effort to provide transportation on request but obviously that has limitations.

Local rentals of cars is prohibitively expensive, and purchase and resale of a vehicle during a short residence is not practical. SUT might consider an arrangement under which it could rent a private vehicle to a visitor under terms that would be viable, or assist in arrangements with a local entrepreneur.

The COURSES

CST100

A copy of the course outline is attached. The text "Introduction to Engineering", by P.H. Wright, is satisfactory and I would use it again. I provided a variety of supplementary material on professional ethics, and much additional material on communication and report writing.

Ready access to the internet would have been valuable, for example, in report writing. The best experience in report writing is obtained when students generate real data on a topic. In a six week course we have difficulty creating realistic data. My intention was to access some of the numerous models and data banks on subjects such as global warming and the green house effect. The students could have a good learning experience in the subject itself while also generating real data to be the basis of a technical report. Over a six week term students could become familiar with the topic, generate data, and still have time to go through a reasonable draft and revision process to produce a good written report.

Because the course emphasizes communication, we had some flexibility to integrate elements of the course with ESL300. Between the two courses the students had several opportunities to make technical presentations.

ESL300

The English Department provided four complete units and outlines for two others. The material was generally excellent. I followed units one through four much as prepared; each has more than enough material for one week; number four has enough for two weeks. With a class of five, we had a good amount of flexibility and so spent much more time in individual exercises than would be possible in a larger class. Two exercises that I found useful are:

In the last half hour of a class I would announce a topic and ask the students to write about one page. Between CST100 and ESL300 they wrote articles on seven topics: 1. The Light Bulb; 2. How to Start a Motorbike; 3. Thailand in 2014; 4. How a Camera Works; 5. My Dream House; 6. Why the Sky is Blue. 7. Describe the SUT Campus.

The choice of topic was to some extent spontaneous but the set encompasses a variety of demands. The first, The Light Bulb, came from the material in Unit 1. The intent is to show what a challenge good description of technology can be. The second topic illustrates how difficult it can be to describe for a reader an operation that one performs regularly without conscious attention to detail. The objective is to tell someone who has never started a motorbike how to do that. Nos. 3 and 4 depend more on personal insight and invention of prose. I was pleased to find, a few days after assignment 3, a review of a book "Thailand in the year 2560 [2017]" in the Bangkok Post. I was not aware the book existed and I don't believe the students were either, but most of them identified issues similar to those in the book. In no. 6 the approach is highly audience dependent. Some students chose their fellow students as audience while others chose a "little brother". No.7 could be approached in various ways; as an aid for a newcomer on campus, or content for an advertising brochure, for example. In every instance the student is expected to produce a structured document: a clear thesis statement; appropriate support; and a suitable concluding statement.

We spent considerable time on individual presentation as envisioned by the Units. Again, because the class was small, we had time to do three sessions on -delivering an address from prepared text. The approach is an adaptation of that used by most public speakers. I find this exercise is useful in helping students develop a stress pattern more similar to the native speaker. For the exercise we used the introductory essay from Unit 4. We retype the text in large type and then mark the text using four indicators: underline; single slash; double slash; and triple slash.

Underline tells the speaker to stress the words.

Single slash tells the speaker to insert a short pause [usually at a comma].

Double slash prompts the reader/speaker to raise the head and look at the audience while completing the remainder of the sentence or passage from memory.

Triple slash tells the speaker they can make a lengthy pause. By keeping the finger or other marker on the triple slash the speaker need not fear being unable to resume speaking at will and at the correct point in the text.

The concept is simple but mastering it takes some practice. One can quickly learn to mark the text for personal use - how close to the end of a sentence should the double slash be for example? It varies from person to person. Place the double slash at a position where you are quite confident you can raise the head and complete the remainder of the passage. For some people that may be eight words, and for others only three. The number is not important, but the action is. At the double slash the speaker looks at the audience, completes the passage, and continues to look at the audience for two or three seconds, capturing the eyes. It requires practice to avoid rapid eye movement away from and quickly back to the page.

I find that students will quickly learn to stress the underlined words and to see how important it is to stress topic words, and binder and transition words. I also encourage the students to slow the delivery and concentrate on clear enunciation. As students listen to each other speak they become more comfortable with that suggestion. My observation is that the exercise soon begins to affect the student's normal speech delivery.

The exercise is less practical to use as the class becomes larger, of course. Five is a near ideal group size; every student has frequent direct involvement.

I like to videotape the student presentations and/or make an audio recording. The student learns much more from seeing their performance than they can from a teacher's criticism, however insightful. With this class we did not have video. I recorded voice with a hand recorder but the noise from the air conditioner made the voice quality too poor to be of use to the class. The voice amplifier in the classroom was not operable. These facilities will be available when the English Department Resource Centre is in operation.

As my example of a short technical presentation, I used the Fountain Pen [Unit 1]. The title was "Surface tension, Capillary Action, and the Fountain Pen". In a twenty minute presentation I introduce or review the concepts of capillary action and surface tension, and show how by careful sizing of the capillary tube, the fountain pen is an excellent example of technology based on scientific principles. It is, of course, fortuitous that the example from the Unit [the fountain pen] fits so well my own technical

background [chemical engineering and physical chemistry]. I don't suggest another ESL teacher should feel obliged to follow that example.

The IUP CLASS

We started the class with seven students and finished with five. Of the five, one was an infrequent attendant in class and sporadic in the completion of assignments. The four regular attendants showed good interest in both CST100 and ESL300.

The STUDENTS:

Nattaphon Thongtharb has a good command of english. He speaks clearly, has a considerable vocabulary, and he writes with fluency and confidence. His technical writing ability is at least the equivalent of the average second year student of engineering in Canada. I expect he will be a superior writer by his senior year.

Auttasit Pinasa is the most hard working and enthusiastic worker in the class. He wants to master english and I have no doubt he will succeed. He made very good progress during the term. In speaking he often searches for words but he is not reticent. His writing is awkward but he has a good sense of organization and context. He knows the form of the essay and shows some flair for the interesting introduction, the attention grabber.

Nattapon Poopipat has quite a good spontaneous command of english but can be difficult to understand because of a tendency to rapid speech and a staccado stress pattern. He made good progress during the term. His writing is awkward but he has a good sense of organization. He produces complex sentences, and the concepts are usually clear.

Jirath Buakaew has the weakest command of english but showed good progress. He searches for words in oral presentation but orders his ideas well. His writing is awkward but he has a good sense of structure and logic.

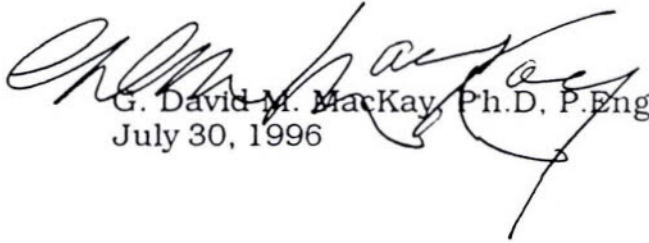
These four students are able to operate in a Canadian university. They can all communicate orally and they understand spoken english. I expect they will be comfortable in the engineering classroom and in public. Mr. Thongtharb has near native ability in speaking and in writing. The others need to improve considerably but they are at a stage where they should make rapid progress from exposure to an english speaking environment. With the exception of Thongtharb, the others could not expect to score high on TOEFL without a good amount of study and practice. The TOEFL is truly irrelevant for these students. They will all be much more comfortable, and are much more competent to operate in an english environment than many students who have devoted the effort to obtain a high TOEFL score.

PERSONAL

Ethel and I very much appreciate the treatment we received from the SUT community. The house was very comfortable and well furnished. Our seven weeks on campus were made enjoyable by the friendly and helpful attitude of the people. We want especially to thank Ms. Mantana Thammachoti for her efficiency, kindness, and personal concern for us during our stay. Some logistic details such as transportation and lodging are no doubt part of her responsibility, but the concern that she shows for us as individuals clearly is not; those beautiful human responses can never be part of a contract.

Some people told us the campus bus service might be erratic. We found it to be quite punctual, especially on the morning run from the housing area. I regret we can't personally tell the bus drivers how much we appreciated their willingness to wait a few moments when a regular passenger was late, and to stop between regular sites when we wanted to board.

Our thanks to the many, but unfortunately mostly nameless, students who picked me up on their motorbikes and went out of their way to drive me home. Their thoughtfulness will remain with us. SUT is a special place in our memories.



G. David M. MacKay Ph.D., P.Eng.
July 30, 1996

Consultant's Report

SUT/CUTC/CIDA Project

Activity A 2.12

Report: Dr. Gerry Schneider

July 8 - Sept 6'96 7 weeks

July 8 - September 6, 1996

Suranaree University of Technology

G.E. Schneider
Associate Dean of Engineering
Undergraduate Studies
University of Waterloo

September 11, 1996

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1. Introduction

The assignment of this contract, as outlined in the Terms of Reference of the Contract for Professional Consulting Services, was to deliver two courses:

Fundamentals of Mechanical Engineering:

Engineering Graphics I.

In addition, the consultant was to advise SUT faculty as required on curriculum matters related to both courses. The consultant also provided considerable assistance on matters related to the transfer of the SUT IUP students to Canadian partner universities of the Canadian University Technology Consortium. This is Consistent with the Scope of Work of the contract that "... , if required, the consultant agrees to restructure and revise activities to respond to the identified needs in the field."

The duration of the assignment was from July 15 to August 30, 1996 at Suranaree University of Technology with preparation and completion activities extending the total period of service from July 8 to September 6, 1996.

The consultant arrived in Bangkok on July 14, 1996 and completed the journey from Bangkok to Khorat on July 15, 1996. The consultant began the return trip on the evening of August 29 travelling to Bangkok from Khorat and departed Bangkok on the morning of August 30, 1996. Between these dates, as described below, the on-site activities of the contract were completed.

2. Course Delivery

Two courses were delivered:

Fundamentals of Mechanical Engineering

Engineering Graphics I

Both of these courses were delivered at twice the usual pace of delivery. The IUP students were also simultaneously taking a third course, Computer Programming, at the normal pace of a 13-week term-course. As a consequence, the workload of the students was not excessive, such workload being roughly equivalent to a five-course term in a conventional offering. In fact, the workload would be slightly less, in total, than that experienced in a typical 1B term at Waterloo. Of course, there are positive and negative aspects to the on-site delivery pace and workload. On the positive side, the fewer courses involved meant that the students had fewer differing concepts to deal with than they would have had in a full five- or six-course term. On the negative side, the gestation period for the students to absorb and/or accept new concepts was considerably diminished. However, for the above two courses, I believe that the balance is in the students' favour.

2.1 Fundamentals of Mechanical Engineering

This course was delivered at twice the usual pace. All topics normally covered in the course were covered. There were three extensive assignments that covered all major course topics except the last one, Thermodynamics, which is usual for this course. The three assignments are, however, substantial in both required effort and required depth of knowledge.

The students seemed to quite easily comprehend the oral and written instruction for the course; lectures were delivered in English and copies of notes and of assignments were also provided in English. However, the ability of the students to express themselves in English, both verbally and in writing, is not nearly as good as their comprehension, in my opinion. The exceptions to this would be Mr. Thongtharb and Mr. Popipat whose spoken English, at least, is markedly better than that of the other students.

The students were quite enthusiastic about the subject matter of the course and enjoyed, in my opinion, the 'real world' nature of the course in that this is their first course of an Engineering nature, not of mathematics nor of science. The students gave mixed impressions of their background readiness and preparation. On some issues they displayed awareness beyond my expectations while in other areas I was appalled at their lack of understanding; it was a 'real mixed bag' of impressions. I would say that generally they are lacking in the fundamentals of mathematics that were required for the course, most notably calculus and linear algebra. However, I note that this is an overall impression as opposed to a methodical evaluation.

The final grades for the course ranged from D to C+, and these grades are probably slightly on the generous side. Those who received a D (1 student) I anticipate would not be successful at Waterloo, while the others have the basic ability and background to succeed if they address some of the other issues like the work ethic one discussed below.

2.2 Engineering Graphics I

This course was also delivered at twice the usual pace and all topics normally covered in the course were covered. There was a large number of assignments and these covered all course topics. The course comprised an Engineering Graphics content as well as a complementary freehand drawing component.

The students seemed to quite easily comprehend the oral and written instruction for the course; lectures were delivered in English and copies of notes and of assignments were also provided in English. However, the ability of the students to express themselves in English, both verbally and in writing, is not nearly as good as their comprehension, in my opinion. The exceptions to this would be Mr. Thongtharb and Mr. Popipat whose spoken English, at least, is markedly better than that of the other students. Of course, this course is more 'graphical' in nature and so writing communication skills are less important here.

The students were also quite enthusiastic about the subject matter of this course and related very well

to the descriptive geometry problem-solving aspects of the course. They seemed to be able to effectively use logical thinking and intuition to solve problems once relevant, related examples were demonstrated.

The final grades for the course ranged from D+ to B, and these grades are probably also slightly on the generous side. Those who received a D+ (1 student) I anticipate would not be successful at Waterloo, while the others have the basic ability and background to succeed if they address some of the other issues like the work ethic one discussed below.

3 Other Observations

Numerous other observations were made while on assignment and I present them here for information. While the observations presented here represent areas in which I see that improvements could be made, they are presented in the positive spirit of trying to improve the learning environment at SUT and therefore to enhance the success of SUT and its partnership with the CUTC universities in the long term.

3.1 Infrastructure

The infrastructure is massive. There are many, many buildings, parts of which are not yet used effectively. As an example, the laboratory has only two lab areas in use. However, I expect that this will change over time as the university matures. However, as a young university of some 4 years, there was an unusually large amount of renovation in progress on these young buildings.

With respect to the classrooms, I note the following observations. The classrooms themselves had relatively poor soundproofing and numerous external acoustic stimuli penetrated the classroom walls having a distracting effect on the delivery of the lecture material. Many of the lecture rooms were not air-conditioned and in these rooms the impact was one of lower energy, lower attention, and of a somewhat lethargic learning environment. I suspect that part of this problem is being addressed as evidenced by the large number of air-conditioning units I observed being installed near the end of the assignment. The acoustical environment inside of the classrooms, aside from the external stimuli problem, was not conducive to effective learning; when using video presentation, it was difficult to get the volume adjusted so that it was sufficiently loud to be heard yet did not produce irritating and confusing acoustic interference. All floors and walls were acoustically hard and I suspect that a relatively small amount of acoustic protection would go a long way. The air-conditioning units, in those rooms that were air-conditioned, produced an excessive amount of duct noise and also distracted from the learning environment.

3.2 Effectiveness of Consultancy

The consultancy was designed to primarily encompass the delivery of two courses. While this is a needed ingredient of the IUP program at this point in time, it seems somewhat of a waste in the long term. I very much got the impression of being a 'warm body' to occupy the classroom for two

courses that needed offering. And while I'm sure the students benefited from this, I doubt that there was any significant transmission of information to assist SUT in the long term. I taught two courses and did a lot of 'firefighting' to attempt resolution of immediate problems, e.g. the visa problem, ESL requirements upon arrival in Waterloo, etc. It would have been much more productive, I believe, if a scheme could be designed wherein the consultant would assist in implanting the psychology, objectives, methodology, and expected outcomes of such courses while monitoring how SUT instructors progressed towards achieving these goals. This statement is made with the view that SUT intends to have the IUP program compete in the international educational marketplace.

This is not to say that I did not enjoy the experience, for I greatly did! It just seems that more effective use could have been made of my time while there to be of a more lasting benefit to SUT.

3.3 Staffing Issues and Institutional Ambitions

The general impression I get of SUT is that the university is trying to do too much too quickly. There are many programs and a multitude of students, in the regular programs, but a limited number of faculty and staff. Many of the faculty and staff expressed frustration at being overworked, and of having excessive teaching and grading loads. Some expressed frustration at the apparent (as conveyed by them) inequity in workload in that little consideration was given to the extra demands that class size and assignment load place on the teaching role. There appears to be no way of providing effective teaching assistant relief, there being no graduate students on which to draw for this purpose. It would seem useful to consider using, and paying, senior students to assist in the grading of assignments and exams for the more junior year classes. Perhaps students could be hired on their off terms to do this full-time. This, I think, would somewhat improve the morale among the very hardworking faculty members.

Some aspects of the above became evident in the delivery of the two contract courses. In the MEC 126 course, there originally was a project to be completed in the first three weeks of the course. However, to 'test' the student designs, as part of the project, a small fixture was required. A request was made, during my first week at SUT, to ascertain whether this could be accommodated before assignment of the project was made to the class; assurances were given that this would not be a problem. Notwithstanding these assurances, I never saw the test fixture and had to cancel the project component of the course. Early in the term, in about the second week, I also made a request for transcripts of the IUP students in order to assess their particular backgrounds and the implications of same for their transfer to the Canadian CUTC universities. After two subsequent reminders, I finally received these in my last week at SUT. For the MEC 170 course, I made an inquiry in week two regarding the existence of a 'light table' to use for grading the graphics assignments. While none existed, one would be constructed for me (it consists of a box with a translucent glass top and light sources inside to back light the glass top). This arrived in the second last week of my stay. These examples are symptomatic of few but very busy people.

Planning seems to be suffering somewhat and may be related to the busy and active schedule of all people involved in the operation of SUT. An example of this is the issue of the transfer of the IUP students to Canadian CUTC partner universities. The issue was first considered very late in the term

(at least I was first consulted late in the term, very late in the third week) and then there were only three weeks left before the term starts in Canada. A decision was made in the fourth week that all IUP students should transfer to CUTC partner universities, I still haven't seen a transcript, and we have a TOEFL score for only one student. The timing is such that we won't be able to get a TOEFL test in time. The issue becomes of paramount importance and, needless to say, the last two weeks were rather hectic.

As a result of low applications to the Mechanical Engineering IUP program again for the 1996 freshman year, the IUP Mechanical Engineering program will not be offered this coming academic year. I have some concern for the effect that this course of action will have on the image and future of SUT's international program. I am concerned that the Thai community, and possibly others, may read this as a signal of low commitment to the IUP program and as a signal of inability to provide such an 'international' program. While there may be an element of truth to this, in consequence of the staff recruitment difficulties, it is nevertheless, in my opinion, a troubling signal to be sending at such an early stage in the program's existence. This is compounded by the fact that the IUP student tuition is significantly higher than that of the regular programs. Indeed, an argument might be made to take the opposite approach and to underwrite the IUP program costs by offering lower (free?) tuition to the IUP program students and *selecting* only the most highly qualified applicants for participation in the program. In this way the message is sent that only the best students will qualify for this 'prestigious' program. The long term effect, I believe, would be to *create* a demand for the program. At the very least, I might expect that the same tuition might be charged as for other programs but the element of selection would remain. The appropriate course of action, of course, depends on the level of long term commitment that SUT has for this program. In any event, it is difficult to 'sell' a program as special, unique, or exceptional until one has some 'product', i.e. graduates, to present as evidence of its quality.

3.4 Student Issues

The students seem to suffer from a work ethic deficiency. The symptoms experienced in the two contract courses may or may not reflect a cultural reality within Thailand, but there will be an adjustment required by the IUP students when they study at the CUTC partner universities. When an assignment is due on Friday, it is expected to be submitted by that Friday; with the IUP students, the following Monday, Tuesday, or whenever seemed to be acceptable to them. This will not work in the Canadian environment, or in the US or Europe for that matter. The students will have to make this adjustment to survive. As I did not know how deeply this was entrenched in the Thai students, I did not attempt to change this in my 6 ½ weeks there. But it *will* have to change in the Canadian environment. The students were, however, advised of this.

The students seemed to be relatively ill-informed as to exactly what was happening with them in the context of SUT and their transfer to Canadian universities. While frequent contact was made with the IUP students, it appeared to be in the context of SUT's need to gain information to process the issue at hand rather than to fully inform the students of their status and the context of same in the bigger picture of things. This may be related to the planning issue raised earlier, but I definitely got the sense that the students, and their parents, were somewhat troubled by the uncertainty surrounding their

status and future. These are the current customers and any resulting negative 'referrals' can be damaging to the program and its reputation. The students need more feedback in a positive vein.

It is very useful at Waterloo to have a study room dedicated to each particular class for the students to be able to go after hours, between classes, etc. to study, work on assignments, chat, discuss issues, etc. While I know that B1217 was usually available to the IUP students, I also know that at times during the day it was locked. And I do not know that there might not have been an alternate study room available. However, it has proven to be very useful at Waterloo and if SUT does not have such a vehicle, I encourage them to consider this.

Finally, the current IUP students will be *ambassadors for the school and for the program* and therefore it would be wise for SUT to maintain a very strong and positive liaison with them, even, or especially, while they are abroad. This will serve two purposes: firstly, it will help to foster a positive image of SUT within the Canadian community and within the CUTC partner universities; and secondly, it will help in the image of SUT within Thailand via the public relations role served by the students on their return, albeit an implicit one.

3.5 Miscellaneous

During my contract stay at SUT, it was essential to my mental well-being to have access to transportation. In this respect, the use of car with driver is not sufficient for it would encompass the normal working day only. Further, the Transportation department has a very restricted command of the English language so that calling for a car (with driver) was, in fact, very difficult without assistance of SUT personnel. The issue is one of independence, a fundamental one from a North American perspective, and also of quality of life. In the faculty residence, very well endowed indeed, there remains a significant deficiency. The television receives three English speaking stations none of which is particularly attractive to view. There is very little else on campus in which to indulge during the after-work hours. Indeed, the location of the residence is such that returning to my office would be a significant challenge, due to the distance involved, without the use of a vehicle. The distance to Khorat is about 20 km. In this respect, I was very fortunate for I had the use of a vehicle after hours, and I thank Dr. Prasart and Dr. Weerapun for this.

A second issue has to do with trust and communication, or at least a perception of same. When I first arrived, the residence phone could not dial off-campus. I could not call into Khorat and I could not call TeleCanada Direct, which I believe to be a local call. This latter call would be the only way I could reasonably call home, using my credit card, during hours that would reasonably expect someone to be home and not in a deep sleep; the other reasonable times were consumed by lectures every morning. Even my office phone could not dial to the outside. The explanation I received for this is that I might have returned home before the telephone bill arrived. So here we are, engaged in a 5 or 6 million dollar (Canadian) project, with *professionals* engaged to do contract teaching, and there is concern about paying a telephone bill! This left a very unsettling feeling. Fortunately, this situation did get rectified, albeit the phone did not get used much, and some *key* telephone calls were, in fact, made to my family. I would be interested to know if there are, in fact, any outstanding telephone bills.

4 Conclusions

In summary, I conclude that my time at SUT was indeed interesting and productive. The students, I believe, received a solid education in the two courses offered. They certainly got an exposure to the way in which Canadian Engineering courses will be offered and to the level of proficiency expected of them in the Canadian environment. This was an international experience for these students and I doubt that they will forget it!

The courses progressed well, with the exceptions noted above, and the students are generally prepared, with the exception of ESL considerations, to continue their technical studies. The ESL considerations are particularly relevant to Waterloo, in view of the co-operative nature of the program, as they apply to interviewing skills and to on-the-job communications requirements. In addition, communications skills receive a significant emphasis even within the technical curriculum at Waterloo. The exception to the above is that none of the students has yet completed a course equivalent to M SCI 261, Engineering Economics. This credit will have to be obtained sometime during their stay at Waterloo.

Many small factors contributed to frustration during the initial days at SUT but I am pleased to report that these issues were, in fact, resolved favourably.

There are three students who plan to continue their studies at Waterloo. As of this writing, two have an offer to proceed to Conestoga College for ESL training prior to their continuation of studies at Waterloo. The third, Mr. Jirath Buakaew, is as yet uncertain; however, I am still pursuing his case in favour of his coming to Waterloo, via the Conestoga College ESL training. I am hopeful that this will come to a favourable resolution.



G.E. Schneider
Associate Dean of Engineering
Undergraduate Studies
GES:/suranaree/gesrpt.wpd

Appendix E
Reports Activity A 2.32 (a)

**Student Exchange Program:
host
Suranaree University of Technology
in
Nakhon Ratchisma, 30000, Thailand**

Student Involved: Ken T. Kelly
enrolled in the
Masters of Urban and Rural Planning
program of the
Technical University of Nova Scotia
in
Halifax, Nova Scotia, Canada, B3J 2X4

Date: September 17, 1996

Employed with:
Asian Engineering Consultants Corp, Ltd.
9th Floor Sathorn Thani Building
90 North Sathorn Road
Bangkok, 10500, Thailand

The second project was the OMEGA project, short for the Office of the Megaprojects. This project can briefly be described as an on-call technical support team to the government department responsible for the Megaprojects (large transportation infrastructure) the Office for the Commission for the Management of Road Traffic, OCMRT. The OCMRT was given the mandate for evaluating, coordinating and implementation of the Megaprojects which were to alleviate the problems of traffic congestion in the city. However, it lacked the necessary skills and resources to adequately perform the task. OMEGA would be asked to comment on a problem, evaluate contracts, troubleshoot places for traffic management problems, develop a program for database management and sharing and finally study, report and hold seminars on several areas the OCMRT had identified. My specific responsibility was to study land-use around the transfer stations of the network. There were nineteen stations where the tracks or lines of the mass rapid transit would cross. These sites were forecast to be major nodes of activity and needed to be designed and controlled in order to function properly. Two main problems were the lack of a suitable pedestrian flow around the stations and control of growth because of the increased development pressure which would now focus on these sites. Bangkok is a city that has evolved with very limited control mechanisms on how development should take place. It lacked a General Plan or Comprehensive Plan until 1992 when an outdated and weak plan was adopted. As a planner this made the design of tools to be used to control development around these sites very difficult as the traditional framework within which we usually work is non-existent. It provided a unique environment in which to work as well as a problem that was challenging and interesting. In addition to these activities I also performed the surveys for several of these sites which included an inventory of hard and soft land as well as development potential for the immediate areas.

Cultural Experience

The nature of an exchange program is such that the social and cultural experiences of the placement are just as valuable as the work experiences. I found the cultural adaptation very easy to make. Bangkok is a city of international standards and it shares a cultural similarity to other cities of its size. A person did not have to speak Thai in order to live day to day but it did help in being accepted by the people. The people I meet and worked with did their best to teach me Thai and I tried to improve their English. The cultural taboos which many warned me of did not seem to be as staunchly followed in the city as they were outside the city. This was evident in that most native Thai have shun the traditional practices and accepted a more Westernized attitude. The work experience was very unique because often I was working with foreigners as the Managers yet depending on the Thai staff to provide all of the material. The technical and analytical work was almost completely done by the expatriate staff. The attitude towards the training of younger staff or intern staff is to simply absorb and when you feel you are ready to take on tasks then you ask for work. However, the time that a supervisor can allocate to a new engineer in order to teach or familiarize them with the proper techniques is limited.

The City is a rich and diverse place that offers the visitor a great many activities and traditional cultural events to watch. One does tend to feel that you have become the

of cash. Many western banks have contracts with the South East Asian banks so it is possible to use western banking cards.

-Start using the bus system as soon as possible. The fares are extremely cheap and because of the difficulties of the Thai language it can be hard to tell taxi drivers the correct destination. Some taxis will not use the meters and a bargaining arrangement is made in which a knowledge of the City is essential. The buses are safe and the bus maps are in English and easy to follow.

-Same rules apply as do in any other city, common sense will keep you out of trouble most times unless you happen to be unfortunate enough to stumble across the wrong place at the wrong time.

In closing I would like to thank the Technical University of Nova Scotia Co-operative Education Co-ordinator Anne Marie Coolen, Suranaree University of Technology Director of Co-operative Studies Dr. Thawatchai Tekkachunhatean, and the International Association for Student Training Exchange for all of the help in making my co-op placement such a success.

Technical University of Nova Scotia
Department of Mechanical Engineering

System Maintenance at a Thai Golf Course

Laem Chabang International Golf and Country Club
Chonburi, Thailand

Sarah Bruce
September 26, 1996

Introduction

My work placement was at Laem Chabang International Country Club in Thailand. This is an International Country Club that covers 700 acres in the Sriracha district in the province of Chonburi. To give a better idea of its geography, it is located two hours south-east of Bangkok and approximately 30 minutes from the infamous Pattaya.

Laem Chabang is a deep sea port and the surrounding area has many Industrial Estates. The primary industries in the area include oil refineries and export production companies. Due to this sudden explosion of business there are many golf courses in the area either developed or currently in progress.

The Laem Chabang International Country Club (LCIC) contains a 27-hole golf course designed by Jack Nicklaus, a 10 000 m² clubhouse, 40 room Golf Lodge and 17 units of Golf View Condohomes. Future plans include a horse riding club, sports center, training center, an additional 120 room hotel and residential development.

At Laem Chabang there are approximately 150 office workers, 100 gardeners and 200 golf caddies. During my stay there were only 3 foreigners, "farangs" as we were called, so it was a total immersions experience. All staff lived on the property, comparable to university residence, so I truly was living the life of a Thai. This further enhanced my stay and also made it necessary to pick up some essential Thai phrases since few people working at the golf course spoke English.

The focus of my job at LCIC was to do a system analysis of the property and develop an efficient maintenance and operating schedule for the system maintenance department. The systems in question included the water supply, sanitary, electrical and also the air conditioning units. I had previous experience working for the Dartmouth Water Utility so this is what I spent most of my time working on.

System Maintenance and Organization

The focus of my job, as stated earlier, was to do a system analysis of the property and develop an efficient maintenance operating schedule. Since the golf course was only a few years old, and the clubhouse and hotel had only been open for six months it was essential to develop and implement a schedule which would ensure that everything ran smoothly. To develop this schedule it was first necessary to understand the tasks performed by the foremen and technicians of the department and then to assemble everything into an efficient system.

Soon after I arrived there was a meeting with my supervisor, Khun Thammanoon, and all of the foremen in the department. The System Maintenance Department consisted of one engineer, 5 foremen, and 5 technicians and none of them spoke English so I had my work cut out for me. This meeting was set up so that everyone would know why I was there and what exactly I was going to be doing. It also gave me a better idea of what were each person's responsibilities. This helped me out a great deal because I now had a starting point and a basic idea of where everyone was situated within the department.

The first step in this process was to follow the men in the department around for a few days to do a task analysis. This proved to be quite an interesting experience because if there was something which they did not know how to fix then generally it went unnoticed until it became a problem.

During the time that I was job-shadowing it was evident that there was a lot of duplication within the department when it came to responsibilities. For example there were two foremen looking after the hotel but the problems associated with it were usually only minor so one person would be enough. As a result both of these foremen usually did nothing in the course of a day while some of their co-workers did not stop. This idleness seemed to rub off on some of the others and invoke even more laziness. So, part of the system maintenance involved creating a new schedule which made better use of the employees and more a more efficient working system.

To give an idea of what I was up against I shall describe a daily scenario. A typical day would see the foremen resting at their desks, actually sleeping would be more accurate, and leaving only when a call came which required immediate attention. If it was not urgent then it would often times go ignored until it became urgent. Then they would see about the problem and return once again to rest/sleep until the next call. Obviously this was not going to be the easiest pattern to undo but I found that actually a bit of motivation went a long way, especially since it was quite a novelty to have a farang working with them.

The first thing that I implemented was daily work reports. The foremen did not welcome this additional work but would begrudgingly fill them out. Eventually they were filled out without any hassles. I soon discovered that the detail of the sheets varied depending on the writer. Some of the men were more keen than others and so meticulously filled out everything they did, even dropping in a few English words. But then a trend soon developed of simply using the phrase "Everything OK" to sum up the day. It was not long before all of the reports were simply saying "Everything OK" which was obviously not the purpose of them. This was not only because things were generally not OK but also because they were supposed to write the work accomplished that day. So it was necessary to go about this in a different way and this was done by giving each of the foremen a log book in which to write pertinent information. The books were reviewed once a week by K. Thammanoon so this ensured that they were actually used.

The log books were each divided into sections, for example air conditioning, electric, sanitary, generators and so on. The purpose of these sections was so that any problems which occurred could be detailed in one section and the progress could easily be followed. This method seemed to work much better and actually made less work for them since if there were no problems then they did not have to record anything. In addition there was one shift book which each technician had to fill in at the end of the shift. This informed the technicians coming on shift of any problems or other notices.

When I first arrived there was minimal maintenance performed on the equipment. There were no records kept on any of the machines, such as the various pressures, and this was one of the first things which I looked into. This was not easily understood since they had never performed any preventive maintenance on the equipment. There were no routine checks and the equipment only got checked if there was a problem. For instance the pumps and chillers had a variety of things wrong with them but no one ever kept track of what work was being done or what parts kept breaking down. But this is something which is important to keep track of so that analysis can be performed on the efficiency of the machinery. I developed a daily shift sheet which got checked three times a day and included things such as the inlet and outlet temperatures and pressures of the water and freon in the chillers. Now there will be a work history for the machines and any irregularities can be more easily detected. By having this checked at the beginning of each shift should ensure that any problems or irregularities in the running of the machine will be more quickly and as a result be repaired faster.

Having said this, the implementation part of it was much more difficult. So I learned a very important lesson in that whatever I devised had to be very easy to follow and fit into their daily routines. Otherwise as soon as I left everyone would revert to their old ways of doing nothing and everything I had done would be in vain. I did not want this to happen and so went to great lengths to train everyone.

Training was much easier said than done and patience was indeed a virtue. Since no one in my department spoke English, other than a few basic words it was quite a challenge to communicate. One foreman, Suwat, knew more than anyone else and so became my translator. Somehow we did manage to survive through the use of dictionaries, drawings, and actions however as a result of this barrier things took much longer to get done than it would have in a so-called normal environment. But this was all part of the experience and so we learned to laugh at ourselves when it was obvious that whatever point we were trying to make was just not getting across.

Training would involve me showing each foreman how to fill out the sheets and checking each piece of equipment with them. I quickly picked up enough Thai to convey most of my ideas but it could often take a week before they would check it themselves without assistance. I say without assistance because in general Thai people can be very lazy. I realize that this is quite the sweeping statement but it was Thai people themselves who told me this. So to get the foremen to check the equipment on a daily basis took some convincing and I did have a lot of trouble trying to explain that it would save them time in the future and it was for this reason that training took time. Often times just when I thought that everything was under control we would land back at square one. This would happen if I happened to go away and so was not there to remind them, or else if one person missed checking the machinery everyone else would follow suit. But this was just something I had to contend with and try to work around with motivational speeches in the Thai I had picked up and broken English they could understand.

I learned to accept the fact that I was very different to them, and so when I was stared at constantly throughout meals or even while just at work - I continued smiling and pretended not to notice. I even managed to maintain this smile even when they were pulling out a few hair strands so they could play with it.

Driving in the traffic was a real treat, especially after being grid-locked for what seemed like hours on end. But sometimes parking was much safer than driving since everyone drives like maniacs. They seem to have no driving rules and so pass on the left or the right, create full lanes on the shoulder and drive at one speed only - 140 kmh. The motorcycles are another story altogether since a helmet is a rarity, and seeing entire families on one vehicle was the norm. I had to resort to a motorcycle taxi a few times, and while it did provide quite the thrill I was glad it was only for a short distance as swerving in and out of Bangkok traffic is not the safest way to travel.

There is also quite a difference in the way that construction is done with regard to safety standards. The men and women would usually only wear flip flops on their feet, if anything, and they would be working with heavy machinery. They would be climbing scaffolding in their bare feet which was made of bamboo and only tied with rags. The welders would often wear sunglasses as a form of protection and often times nothing at all. My guys preferred to wear both sunglasses and a shield as they thought it provided extra protection. Located at many of these sites were also large billboard signs reading "Safety First" - but this was only written in English and so an obvious example of lip service. Another example of safety, or lack thereof, was in the fact that the fire alarm system at both the hotel and clubhouse were not finished and wires could be seen hanging from the walls. This was not even a great concern to them no matter how many times I brought it up. A classic case of TIT - This is Thailand.

The biggest challenge facing me was that of the language barrier. Needless to say there were some pretty classic moments when we were going to great lengths to get our point across. There is one time in particular I remember which occurred during one of our many water crisis. We had figured out the problem with the precipitation of the chemicals and I had taught Suwat this word, although we shortened it to ppt. During the phone call to the supplier I was frantically looking for the word in the dictionary so he would be able to explain this to the supplier. Actually I was getting quite frustrated because the dictionary did not seem to have that word. Then in a deadpan voice Suwat declares "I know, I explain in Thai" and this came as a total shock to me. Not that there would of course be an equivalent way to explain it in Thai but the fact that I sometimes forgot who I was dealing with and their very limited language.

Thailand report of co-op term

To Whom it may concern,

This is a report from an engineering co-op student who went to Thailand for four months during the summer of 1996. I worked at a new factory named Babcock Hansa that was still under construction that was building boilers for thermodynamic plants. These boilers were to be sold around the globe.

First of f the people of Thailand were more than friendly almost everywhere that I had to decided to venture. Only once did I experience a small amount of racism and it was from a group of people from south Thailand. Apparently the south has allot of hostile people for reasons unknown to me. The rest of the time I found the people all wanted to talk to me and were very curious about where I was from. Unfortunately I could not speak the language and it was difficult to communicate and get things done.

My job at Babcock Hansa could not of been much better. I spent most of my time designing and using the computer to draft up the designs to be built. The facilities at this particular factory were very good as it was a new factory and there were no corners being cut by the management. The staff at this factory were both friendly and very helpful. It was such a pleasure to work there in fact that I had decided to stay and work for a year or two but some problems arose for me and I was forced into changing my mind and returning to Canada.

As far as the Technical aspect of this venture was concerned, it definitely caused me into using my engineering skills and to refer back to text books as well. Most of the work projects I worked on were mechanical orientated but I was also exposed to electrical, and some chemical engineering as well. It is my opinion that I could not have learned any quicker anywhere else. To be present during the construction phase of a factory is by far one of the fastest ways to learn engineering.

Some of the projects that I performed are as follows:

1. The factory owners also had other factories under construction which required some attention of the Babcock engineers. There was a 27m x 6m dryer tube that had to be welded for a factory in south Thailand. I was requested to construct a building that could with stand the winds and constant bad whether known to be in south Thailand. This building was a temporary construction for the purpose of covering the dryer tube to be weld the different sections of the dryer tube together. It also had to be mobile by the use of wheels mounted to the bottom. This project had taken over a month to complete and was the largest undertaken by myself. This project required a minimum weight requirement and cheapest construction possible which turned out to be a real challenge for me and an excellent learning experience.

2. A second floor had to be designed in the factory for storage and was assigned to me to design. This project was also an excellent learning experience as well as I had to make sure of safety. I drafted this three-dimensionally in Autocad for viewing purposes and it came out well. This was constructed of I beams so I learned about the strength of I - beams. I also designed the stairwell that ran up to the second floor.

3. Designed a modern style table to be built for the cafeteria. The tables were constructed of steel tubing and wood seats and wood table tops. I performed a number of other minor projects that were to be built and they all related to my engineering training.

I support this new international co-op program and believe it to be very educational. I learned allot more than just engineering practices while I was in Thailand. Many things about culture and the rest of the world all over were revealed to me. However, I can say that to go to Thailand alone would become very lonely very quick for most people. I would highly recommend that students are sent with a companion. As for the money in Thailand, it is not very good and can be hard to manage your money for the first little while. Anybody sent to Thailand to work must be made fully aware of the fact that it is definitely not Canada and some things you must be understanding to. A venture of this sort is for people who can adapt to new situations. I am giving this program two thumbs up for co-op in Thailand.

Bill Jennings
Mechanical Engineering
Technical University of Nova Scotia

Thailand Coop Exchange Student Report
Submitted by: Peter D. Lewis
October 3rd, 1996

The Job

Between May 12th and August 31st, 1996, I was working for a company named SaNguan Wongse Industries Comp. Ltd. (SWI), which is located in the city of Korat, Nakhon Ratchasima Province, Thailand. SWI is about 20 years old and is owned and run by the Tantiwong family. The main product of the factory is Tapioca starch (flower) from the cassava root. The daily production of the starch averages around 500 tons (metric). Such a large output is possible because the factory runs 24 hours per day, seven days per week. The factory produces two types of starch, modified and unmodified. The modified starches are used in food products and the unmodified starches are used in products like glues and paper. Another factory owned by SWI for the production of glucose products is nearing completion. There are approximately 400 employees who are divided into three 8 hour shifts. I was on the 8 am to 4 pm shift. My immediate supervisor was a young mechanical engineer, Surapon, who had only been in industry for one year (all of which he spent with SWI).

My duties during my employment at SWI encompassed a wide range of engineering disciplines. My first task was to try and learn as much as I could about the process involved in the production of the starch and also how all of the machines worked. This was not as easy as it may seem, because most of the manuals for the equipment were in German and the engineers and technicians available for questions spoke very little English if they spoke any at all. This leads into the next job that I had. Since communication is a necessity the engineers and I spent the afternoons teaching each other our native languages. These lessons lasted for about one month and involved a lot of drawing, sign language and the use of dictionaries. As we became more familiar with each others language and ways of conveying ideas, the lessons subsided.

My first real engineering related job was to draw a blueprint of the factory. This was required because there was no current one available and Tidarat, the factory manager, wanted a preventative maintenance system put in place for the factory. Knowing where all of the equipment was located was the first logical step to the maintenance system. The blueprint took two months to complete. This was because SWI did not have AutoCAD or any other design programs. As a result the print was done entirely by hand. Also all of the measurements had to be taken (it is a large factory). During the course of drawing the print I was sidetracked with a small analysis project. SWI was working in conjunction with a technical university in Bangkok on a bio-gas collector to be installed in the factory. This collector was designed to capture the gases that would form in the waste water from the factory and the gases would be used to fire the oil furnaces. When this project was completed I finished the blueprint and moved on to a maintenance schedule.

I spent the last month finding information on the life of parts in the machines used in the factory. I was organizing this information in an effort to create a preventative maintenance schedule. This was required because the technicians only fixed the machines if they stopped working. This type of maintenance only ends up costing the company money. It was my job to organize the required maintenance for all of the machines. I did this by assigning specific jobs to specific technicians on specific days throughout the year. Since there are so many machines in the factory, all needing regular maintenance, the work load was divided up on regular intervals

throughout the year to ensure that there were no overlaps. This document/schedule was completed but not in time for me to watch to see how well it was implemented.

Throughout my work term at SWI I was required to submit monthly work reports. These were consisted of a short update on what I had done, was doing and had planned for the near future (basically a progress report).

Residence

During my stay I found myself moving apartments more times than I have in my entire life. My first place of residence was found for me by Dr. Thawachi's assistant. The location was in Suranaree Industrial Zone, about 15 to 20 minute out side of Korat. This was an apartment building owned by Forward Freeland and Pranda Jewelers, two companies next to the apartment building. The apartment was meant for the workers of the two factories but since it was not full they allowed others to rent.

The apartment consisted of a single room 10ft x 11ft with a 5ft x 3ft balcony and a 3 ft x 3ft bathroom. There was no furniture or carpet, just white concrete walls and a linoleum covered floor, the bathroom toilet was designed in such a way that if you needed to have a movement you had to drop your drawers and squat. I requested that air conditioning (AC) units be installed into the rooms, as I was not fully adjusted to the heat at that point. This was not a problem but, it raised the rent from 1700 Bath to 2700 Bath per month. The rent was due at the end of the month along with the bill for water and electricity which came to around 50 Bath. There was also a 2700 Bath deposit required on the day I moved in.

My second apartment was in the same building. This one was exactly the same as the first except that it did not have the luxury of the AC. I decided that the cost of AC was too much and I was well adjusted to the heat by that time. Happy with the price I was beginning to become annoyed with the noise level in the building. The people are extremely nice, but I was getting woken up at 5 am by the sound of motor bike that had their mufflers modified to make noise. Fortunately for me there was an apartment for rent very near SWI. This was extremely good, as I was able to walk to work.

The new apartment only cost 1000 Bath per month including utilities. It was bigger than the other two, but these apartments were slightly less than most would find desirable. The water utility was free but it was only available when it rained. Fortunately it was the rainy season. There was no shower because there was no water pressure and the toilets were the standard "squat and drop issue". I did a little improvisation and fabbed up a shower from a bucket and some hose. It worked very well and if it was full all day I could have a hot shower when I came home from work. The area of this apartment was half way into the jungle in a small village off the highway. Besides the dogs that started fighting at 4 am and the roosters singing to the sun at 5 am, the area was extremely quiet and the people were very nice to me. I did not move for the next two months, after which time I came home to Canada.

Suggestions

First and foremost, relax and learn to enjoy the way that the Thai people live their lives and go about running their businesses because it is nowhere near as hectic as it is in Canada. If you are planning to work in Thailand I would strongly suggest that you be easygoing. By that, I mean that you are not easily irritated by little things like people staring at you, heat that can reach 28 C at 6 am, the sight of garbage laying around, extremely foul smells, seeing four people on one motor bike at the same time passing you on the highway, the great distinction in social classes, living in conditions that don't meet the high standards that we have here in Canada, or and the high levels of poverty. I would also recommend that you have the ability to learn a new language. This was one of the most frustrating aspects of my stay. A couple of other little things that will help you enjoy your stay are, to learn to try to love Thai food (it's not for every one), have money easily accessible (best if you bring around \$700 US to help get you going), try to be as adventurous as you possibly can, and last but not least, if you don't like the idea of being in a situations where you are not able to talk to some one for a long time, make sure that were you will be working where there is someone that speaks the same language as you.

Appendix F
Reports Activity A 3.22

FINAL REPORT ON ACTIVITY A3.22

Technical Services by 5 Canadian Consultants to Provide Training Seminars in Thailand for Personnel from the Thai Industrial Enterprises

The Technical Seminars were given in Thailand at SUT in the last week of July 1996. In fact two seminars were given and a total of 6 Canadians participated in preparation and delivery of these seminars.

1. *26 July, 1996: University/Industry Technology Transfer: A Process That Really Works!*

Dr. Edward Rhodes, President of the Technical University of Nova Scotia addressed the SUT Anniversary Day Celebrations. The intent of the talk was to familiarize SUT faculty and staff, and local industrial representatives with the benefits of technology transfer between universities and industry. Dr. Rhodes also met with industrial representatives to further this initiative.

Dr. Rhodes discussed a University Centre devoted to technology transfer between university and industry. Case studies of several individual projects such as the developments of

- a new animal feed single cell protein process
- a computerized grain dryer controller
- an ash fouling control systems for utility boilers, and
a new heat resistant rubber

illustrated both the great risks and the golden opportunities for academics to engage in the transfer of technology. A University Centre succeeded in protecting 25 technologies with 103 patents leading to 18 international licenses. Three Canada Awards for Business Excellence have been won by the Centre. The paper concluded that "strong market pull" is the most important ingredient of success in technology transfer. Universities should preferably invest technology transfer dollars in protection of intellectual property.

Approximately 100 people attended the address. Considerable interest was shown by those who attended.

2. *Water Resources Management and Wastewater Engineering Workshop, July 21-25, 1996* This workshop included the following program:

21 July	Arrival and Registration
22 July	Monday - Opening Ceremony am - Presentation of Keynote paper pm - Plenary Sessions - presentation of major papers
23 July	Tuesday - Plenary Sessions continue
24 July	Wednesday - Field Trip
25 July	Thursday - Plenary Sessions continue - Conclusions & Resolutions/Closing Ceremony

The details of the sessions, the topics and the speakers are shown in the attached detailed program.

There were five speakers from Canada who participated in the preparation and delivery of the seminar. These people were:

Dr. William Hart, Associate Director, CWRS. Watershed planning and management environmental auditing, Canadian coordinator.

Dr. Bruce Mitchell, Professor of Geography, University of Waterloo. Watershed planning and management, water use development, licensing.

Dr. John Underwood, Nova Scotia Power Inc. Water quality management, environmental auditing, corporate environmental issues.

Ms. Catriona Moir, Senior Policy Advisor, Nova Scotia Department of Environment. Watershed planning and management, governmental policy review, regulatory frameworks.

Dr. Dave Swayne, University of Guelph. Computer modelling of environmental systems.

Each speaker is preparing a written paper for publication in Thailand. As you can see from the detailed program, over a dozen contributors from Thailand were involved in the program as speakers, chairs or rapporteurs.

A follow-up seminar is being planned and recommended as one of the future seminars.

Attached you will find a copy of a brief report from Dr. Hart outlining his thoughts on the Seminar and a second letter from Dr. Hart discussing the future seminar.



Sixth Anniversary
Suranaree University of Technology
(SUT)

International Seminar Workshop

*"Advances in Water Resources
Management
and
Wastewater Treatment Technologies"*

*Surasammanakhan Hall
Suranaree University of Technology
Nakhon Ratchasima, Thailand*

22-25 July 1996

INTERNATIONAL SEMINAR WORKSHOP ON ADVANCES IN WATER RESOURCES MANAGEMENT AND WASTEWATER TREATMENT TECHNOLOGIES

22-25 JULY, 1996

PROGRAM

22 July Monday

0830 - 0930 REGISTRATION

0930 - 1000 OPENING CEREMONY

Welcome Remarks

Prof. Dr. Wichit Srissan,

Rector, Suranaree University of Technology

Address

H.E. Mr. Boonchoo Treethong,

Minister of University Affairs

1000 - 1045 COFFEE BREAK

1045 - 1200 KEYNOTE PAPER PRESENTATION

*Advances in Water Resources Management and
Wastewater Treatment Technologies*

by Mr. Pramote Maiklad,

Inspector General, Ministry of Agriculture and Cooperatives

Chair: Assoc. Prof. Dr. Sam-ang Srirak

Rapporteur:

Prof. Dr. Ruben C. Umay

1200 - 1330 LUNCH BREAK

1330 - 1500 PLENARY SESSION I: INVITED PAPERS ON
WATER RESOURCES MANAGEMENT

Canada Experience

by Dr. Bruce Mitchell, Technical University of Nova Scotia

Thailand Experience

by Prof. Dr. Kasem Jankaew,

Faculty of Forestry, Kasetsart University

Chair: Mr. Manom Omalump

Rapporteur:

Assoc. Prof. Dr. Chaiyot Tangsathitkitchai

1500 - 1530 COFFEE BREAK

1530 - 1700 PLENARY SESSION II: INVITED PAPERS ON
WATER USE AND DEVELOPMENT

Water Use and Development - Canada Experience

by Ms. Catriona Moir, Technical University of Nova Scotia

*Urban Development Impact on Water
and Wastewater Treatment Needs*

by Mr. Bichit Rattakul

Governor, Bangkok Metropolitan Authority

Water Use / Development Policies and Regulations

by Ms. Chuampit Dhamasin,

Governor, Metropolitan Waterworks Authority

Chair: Asst. Prof. Dr. Tavee Lertpanyavik

Rapporteur:

Asst. Prof. Dr. Sarawat Suttijorn

1800

DINNER RECEPTION

23 July Tuesday

0830 - 1000 PLENARY SESSION III: INVITED PAPERS ON ENVIRONMENTAL IMPACT AUDITING

Environmental Impact Auditing Techniques: Thailand Experience

by Ms. Nipaporn Watcharasin,
Office of Environmental Policy and Planning
Quality Assurance and Environmental Auditing

by Dr. John K. Underwood,
Technical University of Nova Scotia

Minimizing Environmental Impact

by Dr. William Hart, Technical University of Nova Scotia

Chair: Prof. Dr. Ronald Goforth

Rapporteur:

Assoc. Prof. Dr. Amnat Apichatvullop

1000 - 1030 COFFEE BREAK

1030 - 1200 PLENARY SESSION IV: INVITED PAPERS ON WASTEWATER TREATMENT TECHNOLOGIES

Wastewater Treatment Technologies

Thailand Experience

by Dr. Chongrak Polprasert,
Asian Institute of Technology

Advances in Wastewater Treatment Technologies

Canada Experience

by Dr. Michel Khalil, University of Quebec at Rimouski

Chair: Prof. Dr. Ruben C. Umaly

Rapporteur:

Assoc. Prof. Dr. Vorapot Khomph

1200 - 1330 LUNCH BREAK

1330 - 1500 PLENARY SESSION V: INVITED PAPERS ON USE OF COMPUTER TOOLS FOR WATER MANAGEMENT

Computer Tools for Water Management

by Dr. David Swayne, Department of Computing and
Information Science, University of Guelph

*Impact of Eutrophication and Other Degradation Processes
on Water Quality of Tropical Ecosystems*

by Dr. Jacques Moreau,
Institut National Polytechnique de Toulouse

Chair: Dr. Angelina Galang

Rapporteur:

Dr. Nathawut Thanee

1500 - 1530 COFFEE BREAK

1530 - 1730 PLENARY SESSION VI: CONTRIBUTED PAPERS ON WATER RESOURCES MANAGEMENT

Watershed Classification: Macro Land Use Planning for

Sustainable Development of Water Resources

by Assoc. Prof. Nipon Tangtham,
Faculty of Forestry, Kasetsart University

*Impact of Various Land Uses on Water Quality at
Mae Klong Head Watershed Area, Kanchanaburi*

by Dr. Songtam Suksawang,
Royal Forestry Department

Kok River Diversion Schemes

by Dr. Chaitawat Saowapon,
Faculty of Engineering, Chiangmai University

Chair: Dr. David Swayne

Rapporteur:

Dr. Chongchai Polprasert

1900 DINNER

24 July Wednesday FIELD TRIP

0730 ASSEMBLY AND DEPARTURE
0830 - 0930 JIM THOMPSON'S SILK FACTORY
1100 - 1400 LAM TAKONG RESERVOIR
LUNCH AT THE RESERVOIR
1430 - 1530 SEAGATE WASTE TREATMENT PLANT
1600 - 1700 DAN KWIAN CERAMICS
1730 - 1830 THAI HI-TECH HOUSE, SUT
1900 DINNER

25 July Thursday

0830 - 1000 PLENARY SESSION VII: CONTRIBUTED PAPERS ON WATER QUALITY ASSESSMENT

Application of Anthropological Assessment in Water Resources Management

by Luisa Umaly and Lucas Fernan,
Anthropological Association of the Philippines
Institute of Biology, University of The Philippines
Water Quality of Malabon River

by Dr. Annabelle Herrera,
Institute of Biology, University of the Philippines
Wastewater in Navotas-Malabon River: Its Impact on Milkfish (Chanos chanos)

by Dr. Edna Amparado,
Institute of Biology, University of the Philippines

Chair : Dr. Jacques Morvan
Rapporteur :
Dr. Noppadol Kongsricharoern

1000 - 1030 COFFEE BREAK

1030 - 1200 PLENARY SESSION VIII: CONTRIBUTED PAPERS ON WASTEWATER TREATMENT

Wastewater Treatment in Huaxi

Mr. Zhang Chao,
Department of Chemistry, Guizhou University

Removal of Ca, Cr, Ni, Zn Ions by Amidoximated Cellulose

by Asst. Prof. Winai Somboon,
KMITL Thonburi

The Treatment of the Scalp Industrial Wastewater Using Its Solid Waste by Trickling Filter Method

by Mrs. Endang Sriahayu,
Polytechnic ITB, Ciwaruga, Bandung, Indonesia

Possibility of Narrow-leaved Cattail for Wastewater Treatment

by Ms. Supaporn Junrungreang, et al.
Land Development Department

Chair : Dr. Michel Khalil
Rapporteur :
Dr. Narong Akkarapattanasoon

1200 CLOSING REMARKS

Prof. Dr. Wichit Srisa-an,
Rector, Suranaree University of Technology

1230 CLOSING LUNCH



To return to some of the concerns expressed by Canadian and Thai participants:

- The "workshop" did not follow the format we expected, therefore presenters were only able to touch on various topics.
- Most participants wanted more time with individual speakers and a more structured workshop environment.
- The field trip day was interesting, but the time could have been better spent in workshops/seminars.
- Some SUT faculty were not informed about the workshop until one month prior, but were asked to make significant time contributions.
- Other SUT faculty learned about the workshop only two weeks before and were therefore unable to attend due to previous commitments.

FILE: WHE08066

MEMORANDUM

TO: Rob Eagle, Research Services
FROM: Dr. W.C. Hart 
DATE: September 24, 1996
RE: Other SUT Activities

When we were in Thailand for our recent workshop, I met with Dr. Mitchell (University of Waterloo), John Underwood, Dr. Manu Omakupt who is with Institute of Science at SUT, and Dr. Nathawut Thanee of the School of Biology to discuss other activities related to water resources management.

We were joined by a third gentleman whose name I do not have, who attended the conference and is the Manager of one of the 25 water districts in Thailand. They felt that we could provide them with new expertise in watershed management and policy development. They have a considerable amount data available on their watersheds but have no structure in place to utilize that information in a way that will be beneficial to the population at large. We discussed a variety of possible activities including provision of more workshops that would be tightly focused on water resources management policy development etc., and could include university personnel, and or government managers.

My feeling was that we could begin very slowly and identify a number of individual activities that could be completed sequentially, and as a whole would result in increasing the ability of SUT and the water management authority to carry out their educational, and management mandates.

I believe we decided that at a first step a small workshop could be carried out to more clearly:

- Identify the needs of the varies contingencies.
- The existing and potential capacity to address those needs.
- Priorize the abilities, and needs into future activities.
- Plan future technology transfer activities.

Appendix G

Reports Activity A 3.31

1. Continue to develop the Co-op Exchange Program
2. Have students from Waterloo, Guelph and Ryerson participate, by promoting the opportunity more effectively to them.
3. Maintain the Cost of Living Allowance for Canadian students going to Thailand.
4. Have Canadian and Thai students work in pairs in the same geographic location.
5. Offer a wage subsidy for employers to hire Thai student.

At 16:36 25/10/96 -0900, you wrote:

>I received the student reports and the invoice for the final
>payment. It would be appropriate if you submitted a one-page summary
>of the status of the co-op program, highlighting or reflecting on the
>experiences of the students.

>
>On Fri, 25 Oct 1996, Anne Marie Coolen wrote:

>
>> Hi Mary Jane,
>>
>> Did you receive my invoice and the reports from the students who were in
>> Thailand? I am asking because I just had a request from Bill Caley to send
>> you a one-page report from each student, but I think he got the request
>> second-hand so there has been a time lag during which I hope you received
>> the reports which I sent along with the invoice on Oct. 15. Thanks, AMC

>>
>
>*****
>Mary Jane Curtis....
>Supervisor, Administration
>Ryerson International... Tel:(416) 979-5000 ext 7310.
>Ryerson Polytechnic University.. Fax:(416) 979-5352
>350 Victoria Street... Street address:
>Toronto, Ontario.... 133 Mutual @ Gould or
>M5B 2K3..... 240 Jarvis.
>*****
>
>

Appendix H
Management Reports, Activity A 4.21

June 6, 1996

To: Dr. Vichai Tunsiri, Chair
Internal Monitoring and Evaluation Subcommittee
Thai - Canadian HRD Project

From : Dr. Sam Mikhail, Director, Ryerson International
Director of the SUT/CUTC Project

c. Dr. Stalin Boctor, Program Manager, HRD Project, Ryerson Polytechnic University
Mr. Roger Griffin, Project Coordinator, Thai Canadian HRD Project, ARA
✓ Ms. Mary Jane Curtis, CUTC Project Coordinator, Ryerson Polytechnic University

Re: Evaluation of the Status and the Lessons Learned from the SUT/CUTC Project

The following is a short report concerning the status of and the lessons learned from the SUT/CUTC project in preparation for your committee meetings in Toronto on June 23rd and your subsequent visit to Ryerson on June 24th.

Relevant Considerations

A number of factors and issues relevant to this particular project have to be taken into consideration in the evaluation of the project's progress and achievements to date, and the subsequent decision concerning the continuation of funding for the period 1996-1998.

The Challenge of Establishing a "New" University

Unlike the majority of the projects in the HRD program which involve cooperation with existing Thai institutions, this project focused on providing support for the establishment of a new university in an underdeveloped region of Thailand. The challenge of supporting the establishment of a new university, needless to say, is very different from the challenge of merely providing institutional strengthening and development support. The establishment of SUT in Korat has been hampered by the inevitable challenges caused by construction delays, faculty hiring procedures and student recruitment and housing problems; all typically faced by administrators of newly established institutions.

In spite of these difficulties, considerable progress has been witnessed at SUT since the beginning of the project. The physical infrastructure of the university has been completed, the university administrative officers and academic department heads appointed, academic programs established and students admitted to the first three years of study. The contribution of the project to institutional capacity building (Program 1) has been substantial and it involved the training of academic administrators, librarians, and administrative and technical support staff.

The impact of this project on SUT should, therefore, be assessed from a longer term perspective taking into consideration the problems and challenges presented by the establishment of a new university.

The Challenge of Consortia Building

While a number of other projects in the HRD project involve consortia of educational institutions in Canada and Thailand, the CUTC consortium is unique in that there is no lead institution subcontracting activities to other members of the consortium. All CUTC institutions are equal and decision making is achieved by consensus; a time consuming, but in the long run, a more effective and sustainable framework. Development of acceptable terms of reference for many important academic issues affecting various project components such as academic standards, admission criteria, student fees, and credit transfers was initially time consuming and slow and resulted in delays in some project activities. The emerging consensus among CUTC institutions, however, will be a strong factor in achieving sustainable academic linkages between SUT and CUTC.

The Cost of Innovation and Creativity

This project involves a number of innovative and creative components in Program 2 (The International Academic Programs) which, because of their novelty, have resulted in initial delays in their implementation. The International Undergraduate Program (IUP) in engineering, a first between Canadian and Thai institutions, was delayed because of, inter alia, time to reach agreement on academic standards among CUTC institutions, and the challenges of faculty and student recruitment at SUT. These problems have now finally been overcome, and the program promises to be highly sustainable in the future. Similarly the changing policies in Canada concerning foreign student fees did cause initial disagreement among CUTC institutions which have finally been resolved, and will provide the foundation for a sustainable flow of Thai graduate and undergraduate students to CUTC institutions.

Changes in Thai Priorities

In 1990 when I visited Thailand on a needs assessment mission to discuss the development plans for SUT with Dr. Whichit, the then permanent secretary of the Ministry of University Affairs (MUA),

the establishment of SUT and the development of the province of Nakhon Ratchasima was one of the highest priorities of the government. Initially it appeared that the government was prepared to provide all the resources and incentives needed to build the university and recruit faculty. Since 1994, however, it appears that the government of Thailand's priorities have changed somewhat. The hiring of qualified Thai and foreign faculty has been hampered by the distance from Bangkok and lack of consulting opportunities, and the recruitment of students has been less than expected because of the perception of SUT as a new "provincial" university and not a reputed (name) university. The new VP Planning at SUT, however, has recently offered assurances that funds have been allocated to remedy this situation.

Progress in The Achievement of Project Activities

The project consists of three components. The status of the three programs and the proposed changes in the structure of the project were provided to ARA, the executing agency, in the annual progress and financial report in mid May 1996. The following is a summary of the status of the three components :

Program 1: Institutional Capacity Building

All originally planned activities in this program have been completed according to schedule. Additional components have been added to the program at the request of SUT in 1994 and 1995. The latest additions were approved by the PRC in October 1995.

Program 2: International Academic Programs

This program , for the reasons outlined above, has not been implemented according to the original plan. A modified program was presented to, and approved by the PRC in October 1995. The modified plan involves limiting the disciplines in the International Undergraduate Program (IUP) to two, and shifting some of the resources to the support the joint PhD program.

Program 3: University - Industry Linkage

After some initial delays in the implementation of the activities in this program, most of the targeted activities will be implemented in the FY 1996/97, and the remainder in 1997/98.

Impact and Benefits of The Project

Impact on and Benefits to SUT

There are a number of important areas in which the project has had a relevant and sustainable impact on, and benefits to SUT. They include the following:

The Academic Administration

The impact of the training received by the Thai scholars in the CUTC institutions in various aspects of academic administration can be observed in the institutional management style that combines

traditional Thai norms and values that respect hierarchy, and seek the collective good, with western emphasis on efficiency and transparency. This impact can be clearly observed in the systems and procedures that SUT has established for the recruitment of faculty, the selection and admission of students, the development and the delivery of curricula and the academic management of programs.

The University's Infrastructure

The customized training programs in Canada, and the technical consultancies provided in Thailand helped SUT establish important components in its infrastructure. These components include the university's English Language Centre, the SUT library, the university's equipment maintenance and repair system, and the university's Management Information System (MIS).

University Governance

The establishment of SUT involved the adoption of a governance model that represents a departure from the direct government control that, until recently, was the pattern of governance in Thai universities. The SUT model involves many aspects of governance used in American and Canadian universities including university autonomy and accountability through a Board of Governors, democratic representation of stakeholders including the external and the internal communities, and participation of professional groups and employers in advisory committees to improve the relevance of academic programs. SUT scholars had the opportunity, through this project, to observe and study the governance framework of CUTC institutions, and gain understanding of its strengths and weaknesses.

The Mission of The University

The mission of a contemporary university includes teaching, research and service to the external community. The tradition of providing service to local, regional and national industries and enterprises and government agencies, as well as the immediate community is relatively weak in Thai universities. The project, through Program 3 attempted to remedy this situation by providing support to SUT to establish strong university-industry linkages and programs. The SUT/CUTC seminars and workshops in cooperation with industry have been quite successful and have established the model for sustained initiatives in that direction

The Internationalization of The University

The establishment of the International Undergraduate Program (IUP) in engineering at SUT has laid the foundation for the internationalization of the university. SUT has embarked on an ambitious program to provide access to the IUP to students from Vietnam, Laos and possibly China. A proposal for trilateral cooperation among SUT, CUTC and the Hanoi University of Technology (HUT) has been submitted to the Department of Technical and Economic Cooperation (DTEC) in Thailand.



Sixth Anniversary
Suranaree University of Technology
(SUT)

International Seminar Workshop

*"Advances in Water Resources
Management
and
Wastewater Treatment Technologies"*

*Surasammanakhan Hall
Suranaree University of Technology
Nakhon Ratchasima, Thailand*

22-25 July 1996

INTERNATIONAL SEMINAR WORKSHOP ON ADVANCES IN WATER RESOURCES MANAGEMENT AND WASTEWATER TREATMENT TECHNOLOGIES

22-25 JULY, 1996

PROGRAM

22 July Monday

0830 - 0930 REGISTRATION

0930 - 1000 OPENING CEREMONY

Welcome Remarks

Prof. Dr. Wichit Srisa-an,

Rector, Suranaree University of Technology

Address

H.E. Mr. Boonchoo Treethong,

Minister of University Affairs

1000 - 1045 COFFEE BREAK

1045 - 1200 KEYNOTE PAPER PRESENTATION

Advances in Water Resources Management and

Wastewater Treatment Technologies

by Mr. Pramote Maiklad,

Inspector General, Ministry of Agriculture and Cooperatives

Chair: Assoc. Prof. Dr. Sam-arag Srimanta

Rapporteur:

Prof. Dr. Ruben C. Urrutia

1200 - 1330 LUNCH BREAK

1330 - 1500 PLENARY SESSION I: INVITED PAPERS ON

WATER RESOURCES MANAGEMENT

Canada Experience

by Dr. Bruce Mitchell, Technical University of Nova Scotia

Thailand Experience

by Prof. Dr. Kasem Jankaew,

Faculty of Forestry, Kasetsart University

Chair: Mr. Manon Omsakunt

Rapporteur:

Assoc. Prof. Dr. Chaiyot Tangsathitkitchai

1500 - 1530 COFFEE BREAK

1530 - 1700 PLENARY SESSION II: INVITED PAPERS ON

WATER USE AND DEVELOPMENT

Water Use and Development - Canada Experience

by Ms. Catriona Moir, Technical University of Nova Scotia

Urban Development Impact on Water

and Wastewater Treatment Needs

by Mr. Bichit Rattakul,

Governor, Bangkok Metropolitan Authority

Water Use / Development Policies and Regulations

by Ms. Chuapit Dhamasiri,

Governor, Metropolitan Waterworks Authority,

Chair: Asst. Prof. Dr. Tavee Lertpanyavik

Rapporteur:

Asst. Prof. Dr. Sarawut Suttijorn

1800

DINNER RECEPTION

**0830 - 1000 PLENARY SESSION III: INVITED PAPERS
ON ENVIRONMENTAL IMPACT AUDITING**

*Environmental Impact Auditing Techniques:
Thailand Experience*

by Ms. Nipaporn Watcharasim,
Office of Environmental Policy and Planning

Quality Assurance and Environmental Auditing

by Dr. John K. Underwood,
Technical University of Nova Scotia

Minimizing Environmental Impact

by Dr. William Hart, Technical University of Nova Scotia

Chair: Prof. Dr. Ronald Goforth

Rapporteur:

Assoc. Prof. Dr. Amnat Apichatvullop

1000 - 1030 COFFEE BREAK

**1030 - 1200 PLENARY SESSION IV: INVITED PAPERS ON
WASTEWATER TREATMENT TECHNOLOGIES**

Wastewater Treatment Technologies:

Thailand Experience

by Dr. Chongrak Polprasert,
Asian Institute of Technology

Advances in Wastewater Treatment Technologies:

Canada Experience

by Dr. Michel Khalil, University of Quebec at Rimouski

Chair: Prof. Dr. Ruben C. Uraly

Rapporteur:

Assoc. Prof. Dr. Vorapot Khompla

1200 - 1330 LUNCH BREAK

**1330 - 1500 PLENARY SESSION V: INVITED PAPERS ON USE
OF COMPUTER TOOLS FOR WATER MANAGEMENT**

Computer Tools for Water Management

by Dr. David Swayne, Department of Computing and
Information Science, University of Guelph

*Impact of Eutrophication and Other Degradation Processes
on Water Quality of Tropical Ecosystems*

by Dr. Jacques Moreau,
Institut National Polytechnique de Toulouse

Chair: Dr. Angelina Galang

Rapporteur:

Dr. Nathawut Thanee

1500 - 1530 COFFEE BREAK

**1530 - 1730 PLENARY SESSION VI: CONTRIBUTED PAPERS ON
WATER RESOURCES MANAGEMENT**

*Watershed Classification: Macro Land Use Planning for
Sustainable Development of Water Resources*

by Assoc. Prof. Nipon Tangtham,
Faculty of Forestry, Kasetsart University

*Impact of Various Land Uses on Water Quality at
Mae Klong Head Watershed Area, Ranichanaburi*

by Dr. Songtam Suksawang,
Royal Forestry Department

Kok River Diversion Schemes

by Dr. Chaitawat Saowaporn,
Faculty of Engineering, Chiangmai University

Chair: Dr. David Swayne

Rapporteur:

Dr. Chongchai Polprasert

1900 DINNER

24 July Wednesday

FIELD TRIP

0730 ASSEMBLY AND DEPARTURE
0830 - 0930 JIM THOMPSON'S SILK FACTORY
1100 - 1400 LAM TAKONG RESERVOIR
LUNCH AT THE RESERVOIR
1430 - 1530 SEAGATE WASTE TREATMENT PLANT
1600 - 1700 DAN KWIAN CERAMICS
1730 - 1830 THAI HI-TECH HOUSE, SUT
1900 DINNER

25 July Thursday

0830 - 1000 **PLENARY SESSION VII: CONTRIBUTED PAPERS ON
WATER QUALITY ASSESSMENT**

*Application of Anthropological Assessment in Water
Resources Management*

by Luisa Umaly and Lucas Fernan,
Anthropological Association of the Philippines
Institute of Biology, University of The Philippines
Water Quality of Malabon River

by Dr. Annabelle Herrera,
Institute of Biology, University of the Philippines
*Wastewater in Navotas-Malabon River: Its Impact
on Milkfish (Chanos chanos)*

by Dr. Edna Amparado,
Institute of Biology, University of the Philippines

Chair : Dr. Jacques Morvan
Rapporteur :
Dr. Noppadol Kungkricharoen

1000 - 1030 **COFFEE BREAK**

1030 - 1200 **PLENARY SESSION VIII: CONTRIBUTED PAPERS
ON WASTEWATER TREATMENT**

Wastewater Treatment in Huaxi

Mr. Zhang Chao,
Department of Chemistry, Guizhou University

Removal of Ca, Cr, Ni, Zn Ions by Amidoximated Cellulose

by Asst. Prof. Winai Somboon,
KMITL Thonburi

*The Treatment of the Scalp Industrial Wastewater Using Its
Solid Waste by Trickling Filter Method*

by Mrs. Endang Sriahayu,
Polytechnic ITB, Ciwaruga, Bandung, Indonesia

Possibility of Narrow-leaved Cattail for Wastewater Treatment

by Ms. Supaporn Junrungreang, et al.
Land Development Department

Chair : Dr. Michel Khalil
Rapporteur :
Dr. Narong Akkarapattanasorn

1200 **CLOSING REMARKS**

Prof. Dr. Wichit Srisa-an,
Rector, Suranaree University of Technology

1230 **CLOSING LUNCH**



MEMORANDUM

TO: Rob Eagle, Research Services
FROM: Dr. W.C. Hart *WCH*
DATE: August 13, 1996
RE: SUT Workshop

My overall impression of our recent workshop held at SUT is positive. The Canadian participants discussed the activities and results at some length and concluded that we could have used our time more productively as outlined later in this memo.

On a positive note, our presentations were very well received and there appeared to be considerable interest in further research, specialized lectures, and training opportunities. In particular Dr. Manu Omakupt and Dr. Nathawut Thanee are interested in pursuing applied integrated watershed management. I suggested using a small watershed in District 5 (?) (one of 25 water management districts recently established by the Thai government) since Mr. (I will have to get his name - water district 5 manager) expressed strong interest, and is a colleague of Dr. Manu. We could do a desk top exercise using Canadian planning methods, investigating institutional structures and relationships etc. at SUT, and involve faculty, students, and private and public sector practitioners. Bruce Mitchell (U of O) and I agreed to discuss the possibilities with our respective ILO's regarding the goals of the linkage, availability of funds etc. as per the linkage agreement.

To return to some of the concerns expressed by Canadian and Thai participants:

- The "workshop" did not follow the format we expected, therefore presenters were only able to touch on various topics.
- Most participants wanted more time with individual speakers and a more structured workshop environment.
- The field trip day was interesting, but the time could have been better spent in workshops/seminars.
- Some SUT faculty were not informed about the workshop until one month prior, but were asked to make significant time contributions.
- Other SUT faculty learned about the workshop only two weeks before and were therefore unable to attend due to previous commitments.

FILE: WHE08066

MEMORANDUM

TO: Rob Eagle, Research Services
FROM: Dr. W.C. Hart 
DATE: September 24, 1996
RE: Other SUT Activities

When we were in Thailand for our recent workshop, I met with Dr. Mitchell (University of Waterloo), John Underwood, Dr. Manu Omakupt who is with Institute of Science at SUT, and Dr. Nathawut Thanee of the School of Biology to discuss other activities related to water resources management.

We were joined by a third gentleman whose name I do not have, who attended the conference and is the Manager of one of the 25 water districts in Thailand. They felt that we could provide them with new expertise in watershed management and policy development. They have a considerable amount data available on their watersheds but have no structure in place to utilize that information in a way that will be beneficial to the population at large. We discussed a variety of possible activities including provision of more workshops that would be tightly focused on water resources management policy development etc., and could include university personnel, and or government managers.

My feeling was that we could begin very slowly and identify a number of individual activities that could be completed sequentially, and as a whole would result in increasing the ability of SUT and the water management authority to carry out their educational, and management mandates.

I believe we decided that at a first step a small workshop could be carried out to more clearly:

- Identify the needs of the varies contingencies.
- The existing and potential capacity to address those needs.
- Priorize the abilities, and needs into future activities.
- Plan future technology transfer activities.

Appendix G

Reports Activity A 3.31

1. Continue to develop the Co-op Exchange Program
2. Have students from Waterloo, Guelph and Ryerson participate, by promoting the opportunity more effectively to them.
3. Maintain the Cost of Living Allowance for Canadian students going to Thailand.
4. Have Canadian and Thai students work in pairs in the same geographic location.
5. Offer a wage subsidy for employers to hire Thai student.

At 16:36 25/10/96 -0900, you wrote:

>I received the student reports and the invoice for the final
>payment. It would be appropriate if you submitted a one-page summary
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>experiences of the students.

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>On Fri, 25 Oct 1996, Anne Marie Coolen wrote:

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>> second-hand so there has been a time lag during which I hope you received
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>>
>>
>

>*****
>Mary Jane Curtis....
>Supervisor, Administration
>Ryerson International... Tel:(416) 979-5000 ext 7310.
>Ryerson Polytechnic University.. Fax:(416) 979-5352
>350 Victoria Street... Street address:
>Toronto, Ontario.... 133 Mutual @ Gould or
>M5B 2K3..... 240 Jarvis.
>*****
>
>

Appendix H
Management Reports, Activity A 4.2 1

June 6, 1996

To: Dr. Vichai Tunsiri, Chair
Internal Monitoring and Evaluation Subcommittee
Thai - Canadian HRD Project

From : Dr. Sam Mikhail, Director, Ryerson International
Director of the SUT/CUTC Project

c. Dr. Stalin Boctor, Program Manager, HRD Project, Ryerson Polytechnic University
Mr. Roger Griffin, Project Coordinator, Thai Canadian HRD Project, ARA
✓ Ms. Mary Jane Curtis, CUTC Project Coordinator, Ryerson Polytechnic University

Re: Evaluation of the Status and the Lessons Learned from the SUT/CUTC Project

The following is a short report concerning the status of and the lessons learned from the SUT/CUTC project in preparation for your committee meetings in Toronto on June 23rd and your subsequent visit to Ryerson on June 24th.

Relevant Considerations

A number of factors and issues relevant to this particular project have to be taken into consideration in the evaluation of the project's progress and achievements to date, and the subsequent decision concerning the continuation of funding for the period 1996-1998.

The Challenge of Establishing a "New" University

Unlike the majority of the projects in the HRD program which involve cooperation with existing Thai institutions, this project focused on providing support for the establishment of a new university in an underdeveloped region of Thailand. The challenge of supporting the establishment of a new university, needless to say, is very different from the challenge of merely providing institutional strengthening and development support. The establishment of SUT in Korat has been hampered by the inevitable challenges caused by construction delays, faculty hiring procedures and student recruitment and housing problems; all typically faced by administrators of newly established institutions.

In spite of these difficulties, considerable progress has been witnessed at SUT since the beginning of the project. The physical infrastructure of the university has been completed, the university administrative officers and academic department heads appointed, academic programs established and students admitted to the first three years of study. The contribution of the project to institutional capacity building (Program 1) has been substantial and it involved the training of academic administrators, librarians, and administrative and technical support staff.

The impact of this project on SUT should, therefore, be assessed from a longer term perspective taking into consideration the problems and challenges presented by the establishment of a new university.

The Challenge of Consortia Building

While a number of other projects in the HRD project involve consortia of educational institutions in Canada and Thailand, the CUTC consortium is unique in that there is no lead institution subcontracting activities to other members of the consortium. All CUTC institutions are equal and decision making is achieved by consensus; a time consuming, but in the long run, a more effective and sustainable framework. Development of acceptable terms of reference for many important academic issues affecting various project components such as academic standards, admission criteria, student fees, and credit transfers was initially time consuming and slow and resulted in delays in some project activities. The emerging consensus among CUTC institutions, however, will be a strong factor in achieving sustainable academic linkages between SUT and CUTC.

The Cost of Innovation and Creativity

This project involves a number of innovative and creative components in Program 2 (The International Academic Programs) which, because of their novelty, have resulted in initial delays in their implementation. The International Undergraduate Program (IUP) in engineering, a first between Canadian and Thai institutions, was delayed because of, inter alia, time to reach agreement on academic standards among CUTC institutions, and the challenges of faculty and student recruitment at SUT. These problems have now finally been overcome, and the program promises to be highly sustainable in the future. Similarly the changing policies in Canada concerning foreign student fees did cause initial disagreement among CUTC institutions which have finally been resolved, and will provide the foundation for a sustainable flow of Thai graduate and undergraduate students to CUTC institutions.

Changes in Thai Priorities

In 1990 when I visited Thailand on a needs assessment mission to discuss the development plans for SUT with Dr. Whichit, the then permanent secretary of the Ministry of University Affairs (MUA),

the establishment of SUT and the development of the province of Nakhon Ratchasima was one of the highest priorities of the government. Initially it appeared that the government was prepared to provide all the resources and incentives needed to build the university and recruit faculty. Since 1994, however, it appears that the government of Thailand's priorities have changed somewhat. The hiring of qualified Thai and foreign faculty has been hampered by the distance from Bangkok and lack of consulting opportunities, and the recruitment of students has been less than expected because of the perception of SUT as a new "provincial" university and not a reputed (name) university. The new VP Planning at SUT, however, has recently offered assurances that funds have been allocated to remedy this situation.

Progress in The Achievement of Project Activities

The project consists of three components. The status of the three programs and the proposed changes in the structure of the project were provided to ARA, the executing agency, in the annual progress and financial report in mid May 1996. The following is a summary of the status of the three components :

Program 1: Institutional Capacity Building

All originally planned activities in this program have been completed according to schedule. Additional components have been added to the program at the request of SUT in 1994 and 1995. The latest additions were approved by the PRC in October 1995.

Program 2: International Academic Programs

This program , for the reasons outlined above, has not been implemented according to the original plan. A modified program was presented to, and approved by the PRC in October 1995. The modified plan involves limiting the disciplines in the International Undergraduate Program (IUP) to two, and shifting some of the resources to the support the joint PhD program.

Program 3: University - Industry Linkage

After some initial delays in the implementation of the activities in this program, most of the targeted activities will be implemented in the FY 1996/97, and the remainder in 1997/98.

Impact and Benefits of The Project

Impact on and Benefits to SUT

There are a number of important areas in which the project has had a relevant and sustainable impact on, and benefits to SUT. They include the following:

The Academic Administration

The impact of the training received by the Thai scholars in the CUTC institutions in various aspects of academic administration can be observed in the institutional management style that combines

traditional Thai norms and values that respect hierarchy, and seek the collective good, with western emphasis on efficiency and transparency. This impact can be clearly observed in the systems and procedures that SUT has established for the recruitment of faculty, the selection and admission of students, the development and the delivery of curricula and the academic management of programs.

The University's Infrastructure

The customized training programs in Canada, and the technical consultancies provided in Thailand helped SUT establish important components in its infrastructure. These components include the university's English Language Centre, the SUT library, the university's equipment maintenance and repair system, and the university's Management Information System (MIS).

University Governance

The establishment of SUT involved the adoption of a governance model that represents a departure from the direct government control that, until recently, was the pattern of governance in Thai universities. The SUT model involves many aspects of governance used in American and Canadian universities including university autonomy and accountability through a Board of Governors, democratic representation of stakeholders including the external and the internal communities, and participation of professional groups and employers in advisory committees to improve the relevance of academic programs. SUT scholars had the opportunity, through this project, to observe and study the governance framework of CUTC institutions, and gain understanding of its strengths and weaknesses.

The Mission of The University

The mission of a contemporary university includes teaching, research and service to the external community. The tradition of providing service to local, regional and national industries and enterprises and government agencies, as well as the immediate community is relatively weak in Thai universities. The project, through Program 3 attempted to remedy this situation by providing support to SUT to establish strong university-industry linkages and programs. The SUT/CUTC seminars and workshops in cooperation with industry have been quite successful and have established the model for sustained initiatives in that direction.

The Internationalization of The University

The establishment of the International Undergraduate Program (IUP) in engineering at SUT has laid the foundation for the internationalization of the university. SUT has embarked on an ambitious program to provide access to the IUP to students from Vietnam, Laos and possibly China. A proposal for trilateral cooperation among SUT, CUTC and the Hanoi University of Technology (HUT) has been submitted to the Department of Technical and Economic Cooperation (DTEC) in Thailand.

Appendix G
Reports Activity A 3.31

Activity 43.31
SUPERVISOR ANNE MARIE COOLEN
2 pgs

C: STAGN
MAY - AUG '86
4 Students/TRANS
COOP AREN.

Date: Mon, 28 Oct 1996 13:29:25 -0300 (ADT)
From: Anne Marie Coolen <amc@edison.adm.tuns.ca>
To: mcurtis <mcurtis@acs.ryerson.ca>
Subject: Re: Student Reports

Report on Thailand Co-op Exchange Program
Submitted by: Anne Marie Coolen
Technical University of Nova Scotia
October 28, 1996

RELATES TO:
Activity A 2.32 Co-op Program
- Anne Marie Coolen: Supervisor 43.31
Reports: K. Kelly, S. Bruce, P. Lewis
(APPENDIX E) B. Jennings

The Thailand Co-op Exchange Program has been a tremendous success for the four Canadian students who participated in the summer term of 1996.

The students were employed in diverse organizations, a new steam boiler factory, an old tapioca flour company, a golf and condominium resort and the largest engineering firm in Thailand. They were spread across the country, one in Bangkok, two in Khorat and one in Chol Buri on the south east coast. And although their working and living conditions were diverse there reactions and opinions of the experience were unanimously positive.

All four of the students have been invited back by their employers for subsequent work (at much higher pay) of either a co-op or permanent nature and two are strongly considering it. The student's experiences both professionally and personally were overall very positive inspite of the tremendous cultural, language and work environment adaptations which were required of them.

I believe that there is much to be gained by continuing this program and offering this opportunity to as many students who want it because it has enriched the lives of these four students and I know from the reports of their employers that the students have made significant contributions to their organizations. For example, the employers report that the Canadian students help to motivate the Thai employees to work harder, they help the employer to present a positive image to foreign visitors, they teach English to the Thai employees and they bring a fresh perspective to problem solving. The only disadvantage to hiring foreign students was their ignorance of Thai social customs, but they also commented that they did not have the same magnitude of problems with these Canadian students as they had experienced with students or new employees from other countries.

I would like to see students from the other Canadian Universities participate. I think it would be an ideal to pair up two Canadian students from different universities to work and live in the same area. That way the Canadian students could be learning from each other as well as from their Thai co-workers and they would be company for each other to share their experiences in English after work hours.

- Unfortunately the cost of working in Thailand for a short term is prohibitive for the majority of students. The costs of immunizations, passports, visas, work permits, airfare, and insurance totalled over \$2000 for each student. In addition, while the wages paid in Thailand are enough to cover living expenses there is nothing left over to cover any of the above mentioned expenses or to pay for the upcoming year's tuition. For this reason, the number of students who will be able to participate in the program will be very low. I recently invited the entire undergraduate population to an information session on working Thailand and only had six students attend the meeting and I expect that only two will actually pursue the opportunity.

With respect to the Thai students coming to Canada to work. It is very difficult to find jobs for these students in either industry or on campus. Some of the objections I have received from faculty are: the students are not senior enough to work on research projects, there is no money to cover salary expenses for a student, research activity drops off in the fall and winter terms so there is only a need for extra people in the summer.

Recommendations:

J
Oct 30/96

1. Continue to develop the Co-op Exchange Program
2. Have students from Waterloo, Guelph and Ryerson participate, by promoting the opportunity more effectively to them.
3. Maintain the Cost of Living Allowance for Canadian students going to Thailand.
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>Mary Jane Curtis.....

>Supervisor, Administration

>Ryerson International... Tel:(416) 979-5000 ext 7310.

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>350 Victoria Street... Street address:

>Toronto, Ontario.... 133 Mutual @ Gould or

>M5B 2K3..... 240 Jarvis.

>*****

>

>

Appendix H
Management Reports, Activity A 4.2.1

June 6, 1996

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Benefits to CUTC Institutions

Academic Cooperation

The establishment of the joint IUP program necessitated an unprecedented degree of cooperation and coordination among the CUTC institutions. This included agreement on academic standards, admission criteria, academic administrative guidelines, and student fee policies. This cooperation has been particularly beneficial for the relatively new universities like Ryerson. Cooperation in the supervision of PhD students will also strengthen Ryerson's capacity for the development of graduate studies.

Internationalization of Academic Programs

The development of the IUP represents a major step for the CUTC institutions in internationalizing their academic programs. The IUP is probably the first of its kind in engineering education in Canada. The project has, therefore, been an important catalyst in facilitating the internationalization of an important professional discipline in Canadian universities. The IUP model is already creating interest among Canadian universities as a result of a number of reports and papers discussing the model presented in engineering education conferences.

Access to ASEAN International Student Markets

The cuts to public funding of Canadian universities have forced many of them to increase their recruitment of foreign students as a means of diversifying their financial resources. The IUP and the link to SUT will prove beneficial for the CUTC institutions, as it will hopefully improve their access to potential pools of students in the region.

Conclusion

This short report has made the argument that this project has unique aspects that has accounted for the delays in achieving quantitative targets for project deliverables. These aspects include the difficulties associated with establishing a new university, the uniqueness and complexity of some of the project components, and the shift in priorities of the Thai government. It is also argued that there are many "qualitative" achievements and benefits that are not directly evident from the quantitative "deliverable-oriented" evaluation framework used to monitor and evaluate the outcome of the project. Finally, it is argued that the three programs in the project have laid the foundations for the achievement of sustainable benefits to the Thai and Canadian partners, but that these benefits are at the critical "take-off" stage, where continued funding of the modified project plan is very vital to the eventual achievement of these benefits.

November 8, 1996

by courier

Mr. R. Griffin
The ARA Consulting Group, Incorporated
121 Bloor Street East
Suite 405
Toronto, Ontario.
M4W 3M5

Dear Roger:

RE: Thai Canadian HRD CUTC-SUT Project #L3004-91063
Narrative support to October 21'96 letter: Invoices - Deliverables

As you requested, please find attached detailed summaries of the activities pertaining to the invoiced deliverables.

We should appreciate your cooperation in expediting payment.

Sincerely,



Dr. S.A. Bector, P. Eng.
Program Manager

Enclosures

ATTN: KIM CHEAH, ARA
NOV 18 '96 * SUT RI

FAXED
722-5382

APPENDIX A ACTIVITIES TERMS OF REFERENCE

Activity A 2.12

1. **Assignment:** To deliver the following two courses:
 - . Fundamentals of Mechanical Engineering
 - . Engineering Graphics I
2. **Duration of Assignment:** July 15 to August 30, 1996
3. **Location:** Suranaree University of Technology
Khorat, Thailand
4. **Background:**

Both courses are implemented in the curriculum of the third semester SUT International Undergraduate Program (IUP), for Mechanical Engineering students.
5. **Details of the Assignment:**
 - a) To deliver two seven (7) week courses as follows:
 - Fundamentals of Mechanical Engineering*
previously referred to as MEC126 Scientific Principles of Mechanical Engineering, and should involve four (4) hours of lectures and four (4) student hours of a combination of project preparation, construction, testing and laboratory preparation, participation analysis and write-up work on average per week.
 - Engineering Graphics I*
previously referred to as MEC170, Engineering Graphics, and should include two (2) hours of lectures and approximately four (4) student hours of laboratory work on average per week.
 - b) Student assessments and a final exam are to be administered in both courses.
 - c) During this period the consultant will also advise SUT faculty as required on curriculum matters related to both courses.
 - d) Within two (2) weeks of return from the assignment the consultant is to provide RI with a brief activity report.

Deliverable A 1.31: Customized Training in Canada for SUT Support Personnel

1. Ms. I. Somsri (SUT) October 2-November 13, 1993 (6 weeks)
Electronic Library Automation
2. Mr. T. Apaichai (SUT) October 15-November 27, 1993
(6 weeks) ; Electronic Microscopy
3. Ms. Busaya Buranasin (SUT) September 12-Oct 7'94
(4 weeks); Management Information Systems
4. Dr. Thai Tipsumwanakul (SUT) May 8-29, 1995 (3 weeks)
Registration and Admissions Procedures and Policies
5. Dr. Weerapong Pairsuwan (SUT) May 8-29, 1995 (3 weeks)
Computer and Communication Services
6. Dr. Ongkan Indrambaya (SUT) May 8-29, 1995 (3 weeks)
Library Automation
7. Ms. A. Janyooyen (SUT) April 8-26, 1996 (3 weeks)
Electron Microscopy
8. Ms. W. Ratanachai (SUT) April 8-26, 1996 (3 weeks)
Electron Microscopy
9. Ms. T. Mantana (SUT) September 3-28, 1996 (4 weeks)
International collaboration activities
10. Dr. Ruben Umaly (SUT) September 15-28, 1996 (2 weeks)
International collaboration activities

*Deliverable A 1.32: Provision of Technical Services by Canadian
Consultants to Develop Institutional Support Services*

1. June 1-15, 1996 (2 weeks) Mr. Roger Watt:
Consultancy in Distributed Computing and Network
Communications
2. June 3-7, 1996 (1 week) Mr. John Sellens:
Consultancy in Computing Networks Operating Systems
(UNIX)

Deliverable A 2.11 a): Academic Program Planning and Coordination

1. Dr. S. Bector, November 18-Dec 3/94 (2 weeks)
Project Planning and Coordination
2. Dr. W. Caley, September 29-October 6, 1995 (1.5 weeks)
Project Planning and Coordination
3. Dr. S. Bector, September 29-October 6, 1995 (1.5 weeks)
Project Planning and Coordination
4. Dr. S. Bector, June 10-15, 1996 (1 week)
Project Planning and Coordination
5. Dr. F. Hamdullahpur, September 1-30, 1996 (2 weeks)
Project Planning and Coordination, Consultancy re: IUP
Mechanical Engineering Students

Deliverable A 2.12 a): Curriculum Implementation for IUP (Mechanical Engineering Program)

1. January to April, 1996 (14 weeks) Prof. F. Juranka:
Curriculum Development consultancy in Fundamentals of
Electrical Engineering
2. June-July, 1996 (7 weeks) Professor D. MacKay:
Curriculum Development consultancy in ESL and
Engineering Practice and Ethics
3. July- August, 1996 (7 weeks) Professor G. Schneider:
Curriculum Development Consultancy in Introduction to
Mechanical Engineering
4. July-August, 1996 (7 weeks) Professor G. Schneider:
Curriculum Development Consultancy in Engineering
Graphics

Deliverable A 2.32a): 16 weeks Coop Work Placements for Four Canadian Students in Thailand (1996)

1. May-August, 1996 (16 weeks) Mr. Ken T. Kelly
(TUNS: Urban Planning) Work term at Asian Engineering
Consultants Corporation, Bangkok.

Deliverable A 2.32a): continued

2. May-August, 1996 (16 weeks) Ms. Sarah Bruce
(TUNS: Mechanical Engineering) Work term at Laem
Chabang International Golf and Country Club, Chonburi.
3. May-August, 1996 (16 weeks) Mr. W. Jennings
(TUNS: Mechanical Engineering) Work term at Babcock
Hansa, Bangkok.
4. May-August, 1996 (16 weeks) Mr. Peter D. Lewis
(TUNS: Industrial Engineering) Work term at SWI Limited,
Khorat.

*Deliverable A 3.21: Technical Services by Canadian Consultant to Develop
Guidelines For University Industry Collaboration*

October 1-17, 1996 (2 weeks) Mr. Robert Eagle (TUNS)
Development of framework for Industrial Seminars and
Continuing Education.

*Deliverable A 3.22: Technical Services by Canadian Consultants to Provide
Industrial Seminars*

July 21-25 (1 week) Dr. T. Rodes, President of TUNS,
delivered a seminar on University/Industry Technology
Transfer.

July 21-25 (1 weeks) Five Canadian Consultants presented
seminars at the Water Resource Management Conference at
SUT as follows:

1. Dr. W. Hart (TUNS) Watershed Planning and
Management
2. Dr. B. Mitchell (Waterloo) Water Use Development
3. Dr. J. Underwood (Nova Scotia Power) Water Quality
Management, Environmental Auditing.
4. Ms. C. Moir (N.S. Dept. Of Environment) Government
Policy Review and Regulatory Framework.
5. Dr. D. Swayne (Guelph) Computer Modelling of
Environmental Systems

Deliverable A 3.31: Technical Services by Canadian Consultant to Develop and Supervise Co-op Activities

May 22 - June 8, 1996 (2 weeks)

Ms. A.M. Coolen (TUNS)

Development of Co-op placement opportunities for Canadian and Thai students.

Deliverable 4.33 a): Project Management and Coordination, Supervisory Missions to Thailand and in Canada

Missions to Thailand:

1. Mr. R. Eagle, Project Management, Sept. 29-Oct 6'95 (1.5 weeks)
2. Ms. J. Sherwood, Project Management., Sept. 29-Oct 6'95 (1 week)
3. Ms. J. Sherwood, Project Management., Nov. 24-Dec 1'95 (1 week)
4. Ms. J. Sherwood, Project Management, Nov. 20-Dec. 1'94 (1.5 wks)

Coordination and Planning Meetings in Canada

4 Planning and Coordination meetings took place at the various CUTC partner institutions over the period: September 1993 to October 1996; involving travel by; Dr. S. Boctor, Dr. W. Caley, Dr. G. Schneider, Mr. R. Eagle, Dr. F. Hamdullahpur, Dr. J. Schute, Ms. J. Sherwood and Dr. S. Mikhail.

**The ARA Consulting Group Inc.**

121 Bloor Street East, Suite 405
 Toronto, Ontario, CANADA M4W 3M5

Tel: (416) 961-1474 Fax: (416) 922-5380 e-mail: cheah@aragroup.ca

To: Dr. Samih Mikhail, Director, Ryerson International
 cc: Dr. S.A. Boctor
 Richard Leung
 Gerry Wright
 Ed Nemes
 Leon Roussos

From: Kim Cheah

Date: November 7, 1996

Fax #: 979-5352

Ref #: 91063 - Thai Cdn. HRD Project

of Pages (incl. cover): 7

RE: Thai Cdn. HRD Project
 L-3004 CUTC & SUT Linkage Project
 Revised Deliverables

Please note that as per attached, your request of revising the following Deliverables has been approved:
 as follows:

A2.11 Academic Program Planning

split into A2.11(a) - \$24,172

A2.11(b) - 16,350

A2.11(c) - 22,040

SUB-TOTAL 62,562

A2.12 Curriculum Implementation

split into A2.12(a) - \$21,840

A2.12(b) - 19,200

A2.12(c) - 32,000

A2.12(d) - 12,800

SUB-TOTAL 85,840

A2.31 Work Placements - Canada

split into A2.31(a) - \$16,000

A2.31(b) - 16,000

SUB-TOTAL 32,000

A2.32 Work Placements - Thailand

split into A2.32(a) - \$16,000

A2.32(b) - 16,000

SUB-TOTAL 32,000

ADD:

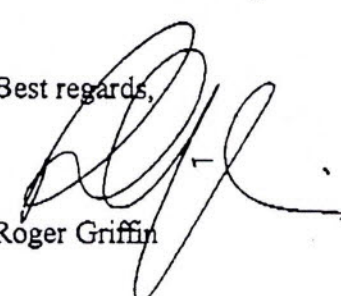
New Deliverable #3.23 Industrial Seminar in Thailand by Canadian Consultants - \$19,600
New Deliverable #4.311 Project Review Committee - Thai -\$25,560

A4.33 Project Management
split into A4.33(a) - \$24,144
 A4.33(b) 26,412
 A4.33(c) 25,000
SUB-TOTAL 75,556

We will use the attached letter and your Revised Budget as at October, 1996 and this fax as a contract amendment in this regard.

Best regards,

Roger Griffin



Deliverable	Total Expenses to Sept 96	Budgeted Expenses Oct 96 to Mar 97	Revised Exp. Budget Sept 30 96	Total Exp. Prev Budgeted	Balance Available	Delivered & Invoiced Completed	Delivered but not Invoiced	Projected Delivery Completed	Notes
1. Institutional Capacity Building Program									
A1.11a) Training Academic Administrators (4)	36,789	0	36,789	36,789	0	Mar 95			
A1.11b) Training Academic Administrators (1)	5,276	0	5,276	5,276	0	May 95			
A1.21 Training Faculty Members	50,524	0	50,524	50,524	0	May 95			
A1.31 Training Support Personnel	81,557	0	81,557	93,164	11,607		Oct 96		
A1.32 Institutional Support Services	8,936	0	8,936	14,949	6,013		Oct 96		
A1.41 Evaluate ESL Needs	9,095	0	9,095	9,095	0	Dec 93			
A1.42 Study Tour ESL	16,581	0	16,581	16,581	0	Feb 94			
A1.5 CUTC Additional Mgt Activities	31,500	0	31,500	31,500	0	Apr 96			
Program 1 Sub-total	240,258	0	240,258	257,878	17,620				
2. International Academic Program									
A2.11a) Academic Program Planning	24,172	0	24,172	66,162	41,990		Oct 96		
A2.11b) Academic Program Planning	0	16,350	16,350	(16,350)				Mar 97	
A2.11c) Academic Program Planning	0	22,040	22,040	(22,040)				Mar 98	
A2.12a) Curriculum Implementation	21,840	0	21,840	102,400	80,560		Oct 96		Split Del
A2.12b) Curriculum Implementation	0	19,200	19,200	(19,200)				July 97	Split Del
A2.12c) Curriculum Implementation	0	32,000	32,000	(32,000)				Sept 97	Split Del
A2.12d) Curriculum Implementation	0	12,800	12,800	(12,800)				Dec 97	Split Del
A2.21 Selection Supervisors PHD	11,235	4,602	15,837	15,837	0			Mar 97	
A2.23 Ph.D Research	0	10,400	10,400	10,400	0			Mar 98	
A2.25 Post Doct. Research Fellowships	16,700	28,000	44,700	40,000	(4,700)			Dec 97	
A2.26 Thai Advisors visit to Canada	0	13,000	13,000	25,000	12,000			Mar 98	
A2.27 Collaboration Co-supervisors	0	0	0	18,900	18,900				
A2.31a) Work Placements - Canada	8,000	8,000	16,000	32,000	16,000			Jan 97	Split Del
A2.31b) Work Placements - Canada	0	16,000	16,000	(16,000)				Dec 97	Split Del
A2.32a) Work Placements - Thailand	16,000	0	16,000	32,000	16,000		Oct 96		Split Del
A2.32b) Work Placements - Thailand	0	16,000	16,000	0	(16,000)			Oct 97	Split Del
Program 2 Sub-total	97,947	198,392	296,339	342,699	46,360				
3. University-Industry Linkage Program									
A3.11 Training Co-op Program	7,234	0	7,234	7,234	0	May 95			
A3.21 Industrial Training Framework	3,775	0	3,775	3,400	(375)		Oct 96		
A3.22 Training Seminars by Canadian Consult.	33,225	0	33,225	31,350	(1,875)		Oct 96		
A3.23 Addit. Industrial Seminars in Thailand	0	19,600	19,600	(19,600)				Aug 97	New
A3.31 Monitor Co-op Students	3,775	0	3,775	3,400	(375)		Oct 96		
Program 3 Sub-total	48,009	19,600	67,609	45,384	(22,225)				
4. Project Management									
A4.21a) Canadian Management Team - yr 1	34,320	0	34,320	34,320	0	Mar 95			
A4.21b) Canadian Management Team - yr 2	35,759	0	35,759	35,759	0	Mar 95			
A4.21c) Canadian Management Team - yr 3	32,881	0	32,881	32,881	0	Mar 96			
A4.21d) Canadian Management Team - yr 4	17,568	18,641	36,209	36,209	0			Mar 97	
A4.21e) Canadian Management Team - yr 5	0	36,209	36,209	36,209	0			Mar 98	
A4.31 Project Review Committee - Thai	22,298	0	22,298	22,298	0	Dec 95			
A4.31i Project Review Committee - Thai	0	25,560	25,560	25,560	0			Dec 97	
A4.32 Project Review Committee - Can	14,266	13,934	28,200	28,200	0			May 97	
A4.33a) Project Management	24,144		24,144	75,556	51,412		Oct 96		Split Del
A4.33b) Project Management		26,412	26,412	(26,412)				Aug 97	Split Del
A4.33c) Project Management		25,000	25,000	(25,000)				Mar 98	Split Del
A4.41 Communication Support	4,727	17,595	22,322	22,322	0			Mar 98	
Program 4 Sub-total	185,963	163,351	349,314	349,314	0				
Total	572,177	381,343	953,520	995,275	41,755				
Activities to be determined by 4th PRC			41,964	209	(41,755)				
	572,177	381,343	995,484	995,484	0				

October 21, 1996

Mr. Roger Griffin
The ARA Consulting Group
121 Bloor Street East, Suite 405
Toronto, Ontario.
M4W 3M5

Dear Roger:

RE: Thai Canadian HRD CUTC-SUT Project #L3004-91063
Invoices for Completed Activities/Deliverables

Please find attached invoices and related expenditure accounts for the project activities and deliverables which were completed by October, 1996. Some activities in Programs 2 and 4 have been rationally split based on nature of the deliverables, as will be explained below. The arguments for splitting the remaining deliverables were discussed and approved by the 3rd PRC meeting at the University of Waterloo (September 1996). Details of the completed activities were reported in previous Quarterly and Annual Reports, while the details of the recently completed activities will be reported upon in the upcoming semi-annual report for the period April 1 to September 30, 1996. Also provided is a comprehensive expenditure budget summary for the project, indicating actual expenditures to date in the various programs and activities, budgeted activities based on the 3rd PRC meeting, and expected completion dates of the deliverables and/or split deliverables. The follow information is provided to illustrate the present status of the budget management.

1. *Completed deliverable A 1.31:* Nine SUT support personnel have now completed their customized training programs in Canada. The latest four include two Equipment Center personnel and two Center for International Affairs personnel.
Total Expenditures Invoiced (October 1996): \$81,557
Available Balance: \$11,607
2. *Completed deliverable A 1.32:* Two Canadian Consultants in Computer Networks and MIS completed their assignments at SUT to help develop institutional support services.
Total Expenditures Invoiced (October 1996): \$8,936
Available Balance: \$6,013
3. *Activity A 2.11 is split into:*
 - A 2.11 (a) *Academic Program Planning and Coordination re: the IUP Mechanical Engineering Program.* This deliverable was fulfilled through three assignments completed over the period from June 1993 to September 1996.
Total Expenditure to be Invoiced in (Oct. 96): \$24,172
 - A 2.11 (b) *Academic Program Planning and Coordination re: S.E. Asia Dean's of Engineering.* Three assignments will take place in February 1997.
Budgeted Expenditures to be invoiced in March 1997: \$16,350

../2

A 2.11 (c) *Academic Program Planning and Coordination re: the IUP Electrical Engineering Program.* Two assignments planned for 1997/98.
Budget Expenditure to be Invoiced in March 1998: \$22,040

Available Balance in A 2.11: \$3,600

4. Activity A 2.12 is split into:

A 2.12 (a) *Curriculum Implementation re the IUP Mechanical Engineering Program.* This deliverable was fulfilled through four assignments completed over the period from January 1996 to September 1996.
Total Expenditure Invoiced (October 1996): \$21,840 *invoiced by 727,840*

A 2.12 (b) *Curriculum Implementation re Postgraduate Programming.* Three assignments are planned in this activity and will be completed in June 1997.
Budgeted Expenditure to be Invoiced in July 1997: \$19,200

A 2.12 (c) *Curriculum Implementation re the IUP Electrical Engineering Program.* Five assignments are planned in this activity over the period from January to September 1997.
Total Expenditure to be Invoiced in Sept. 97: \$32,000

A 2.12 (d) *Curriculum Implementation re the Food Technology Program.* Two assignments are planned in this activity over the period from September to December 1997.
Total Expenditure to be Invoiced in Dec. 97: \$12,800

Available Balance in A 2.12: \$16,560

5. Activity A 2.21 will be completed and invoice in March 1997, on budget: \$15,837

6. Activity A 2.23 will be completed and invoiced in March 1998, on budget \$10,400

7. Activity A 2.25: The four post doctoral research Fellowships are presently assigned and will take place from January to December 1997. Thus far the cost of the assignments is \$44,700, i.e. \$4,700 over budget. Additional post doctoral research assignments may be required, to be determined at the Fourth PRC meeting April 3, 4, 1997.
Total Expenditure to be Invoice in Dec 97: \$44,700

8. Activity A 2.26: These assignments are ongoing and will not be completed until March 1998, on budget: \$25,000.

9. Activity A 2.27: No assignments are planned in this activity. The budget allocation of \$18,900 will be applied towards A 2.25 and A 3.23 as may be determined at the 4th PRC meeting.

10. Activity A 2.31 is split into:

A 2.31 (a) *Thai Co-op Students in Canada 1996*: Four Thai students are presently completing their co-op assignments in Canada. This deliverable will be fulfilled by Dec. 96.
Budgeted Expenditure to be Invoiced in Jan 1997: \$16,000

A 2.31 (b) *Thai Co-op Students in Canada 1997*: Another four Thai students will be placed in Canadian Institutions during 1997. This activity will be completed in Dec. 1997: \$16,000

11. Activity A 2.32 is split into:

A 2.32 (a) *Canadian Co-op Students in Thailand 1996*: Four Canadian students completed their co-op assignments in Thailand in Sept 96.
Total Expenditure Invoiced (Oct. 1996): \$16,000

A 2.32 (b) *Canadian Co-op Students in Thailand 1997*: Four Canadian students will be placed in Thailand during 1997. This activity will be completed in Sept. 1997.
Budgeted Expenditure to be Invoiced in Oct. 1997: \$16,000

12. Completed deliverable A 3.21: One Canadian consultant completed his assignment to help develop an Industrial Training Framework at SUT, in Oct. 1996. Total Expenditure Invoiced (Oct. 1996): \$3,775

13. Completed deliverable A 3.22: Five Canadian consultants completed their Technical Service through the delivery of one Seminar and one Workshop Conference during July 1996.
Total Expenditure Invoiced (Oct. 1996): \$33,225

14. Completed deliverable A 3.31: One Canadian consultant completed her assignment to plan co-op placements and supervise co-op students in Thailand in June 1996. Total Expenditure Invoice (Oct. 1996): \$3,775

15. Activity A 3.23 (new): *Additional Industrial Seminars in Thailand by Canadian Consultants*. As determined by the 3rd PRC meeting, there are definite needs to expand these Industrial Seminar activities. Two Seminars/Workshops are initially planned for implementation during 1997. These activities are expected to be fully delivered by August 1997.
Budgeted Expenditure to be Invoiced in Aug. 1997: \$19,600

The balance available in Program 3 is: (\$22,225)

This amount of over-budgeted expenditure will be funded by the balance available in Program 1 and A 2.27. Completed adjustments to the Project Budget will be made after the 4th PRC meeting (Halifax, April 1997).

16. Activity A 4.311: *Final PRC meeting in Thailand*: This activity is expected to be completed in Dec. 1997, on budget: \$25,560

17. Activity A 4.32: *Project Review Committee Meetings in Canada*: The 3rd PRC is just completed and the 4th PRC planned for Halifax at TUNS in April 1997. Budgeted Expenditure to be Invoiced in May 97: \$28,200

18. Activity A 4.33 is split into:

A 4.33 (a): *Project Management and Coordination Missions in Canada and Thailand (1993-1996)*. To date many management and Coordination missions in Canada and to Thailand have been undertaken to plan, coordinate and implement the project activities completed to date.

Total Expenditure Invoiced (Oct 1996): \$24,143

A 4.33 (b) *Project Management and Coordination Missions in Canada and Thailand 1996/97)*

Budgeted Expenditure to be Invoiced in Aug. 97: \$26,412

A 4.33 (c) *Project Management and Coordination Missions in Canada and Thailand 1997/98)*

Budgeted Expenditures to be Invoiced in March 98: \$25,000

Finally, as the expenditure budget summary provided indicates, the overall project balance is \$41,755. Some assignments in A 2.12 and A 2.26 are yet to be determined. It is expected that the remaining assignments and the final project budget adjustments referred to above, will be discussed and approved at the 4th PRC meeting at TUNS in April 1997.

I hope that you will find the information provided here satisfactory and useful. Please expedite the attached invoices for payment to Ryerson. If you have any questions, you may reach me at (416) 979-5140.

Sincerely,



Dr. S.A. Boctor, P.Eng.
Program Manager

October 21, 1996

Mr. Roger Griffin
The ARA Consulting Group
121 Bloor Street East, Suite 405
Toronto, Ontario.
M4W 3M5

Dear Roger:

**RE: Thai Canadian HRD CUTC-SUT Project #L3004-91063
Invoices for Completed Activities/Deliverables**

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3. *Activity A 2.11* is split into:
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 - A 2.11 (b) *Academic Program Planning and Coordination re: S.E. Asia Dean's of Engineering.* Three assignments will take place in February 1997.
Budgeted Expenditures to be invoiced in March 1997: \$16,350

../2

A 2.11 (c) *Academic Program Planning and Coordination re: the IUP Electrical Engineering Program*. Two assignments planned for 1997/98.
Budget Expenditure to be Invoiced in March 1998: \$22,040

Available Balance in A 2.11: \$3,600

4. *Activity A 2.12 is split into:*

A 2.12 (a) *Curriculum Implementation re the IUP Mechanical Engineering Program*. This deliverable was fulfilled through four assignments completed over the period from January 1996 to September 1996.
Total Expenditure Invoiced (October 1996): \$21,840

A 2.12 (b) *Curriculum Implementation re Postgraduate Programming*. Three assignments are planned in this activity and will be completed in June 1997.
Budgeted Expenditure to be Invoiced in July 1997: \$19,200

A 2.12 (c) *Curriculum Implementation re the IUP Electrical Engineering Program*. Five assignments are planned in this activity over the period from January to September 1997.
Total Expenditure to be Invoiced in Sept. 97: \$32,000

A 2.12 (d) *Curriculum Implementation re the Food Technology Program*. Two assignments are planned in this activity over the period from September to December 1997.
Total Expenditure to be Invoiced in Dec. 97: \$12,800

Available Balance in A 2.12: \$16,560

5. *Activity A 2.21 will be completed and invoice in March 1997, on budget: \$15,837*

6. *Activity A 2.23 will be completed and invoiced in March 1998, on budget \$10,400*

7. *Activity A 2.25: The four post doctoral research Fellowships are presently assigned and will take place from January to December 1997. Thus far the cost of the assignments is \$44,700, i.e. \$4,700 over budget. Additional post doctoral research assignments may be required, to be determined at the Fourth PRC meeting April 3, 4, 1997.*
Total Expenditure to be Invoice in Dec 97: \$44,700

8. *Activity A 2.26: These assignments are ongoing and will not be completed until March 1998, on budget: \$25,000.*

9. *Activity A 2.27: No assignments are planned in this activity. The budget allocation of \$18,900 will be applied towards A 2.25 and A 3.23 as may be determined at the 4th PRC meeting.*

10. *Activity A 2.31 is split into:*
 - A 2.31 (a) Thai Co-op Students in Canada 1996:* Four Thai students are presently completing their co-op assignments in Canada. This deliverable will be fulfilled by Dec. 96.
Budgeted Expenditure to be Invoiced in Jan 1997: \$16,000
 - A 2.31 (b) Thai Co-op Students in Canada 1997:* Another four Thai students will be placed in Canadian Institutions during 1997. This activity will be completed in Dec. 1997: \$16,000
11. *Activity A 2.32 is split into:*
 - A 2.32 (a) Canadian Co-op Students in Thailand 1996:* Four Canadian students completed their co-op assignments in Thailand in Sept 96.
Total Expenditure Invoiced (Oct. 1996): \$16,000
 - A 2.32 (b) Canadian Co-op Students in Thailand 1997:* Four Canadian students will be placed in Thailand during 1997. This activity will be completed in Sept. 1997.
Budgeted Expenditure to be Invoiced in Oct. 1997: \$16,000
12. *Completed deliverable A 3.21:* One Canadian consultant completed his assignment to help develop an Industrial Training Framework at SUT, in Oct. 1996. Total Expenditure Invoiced (Oct. 1996): \$3,775
13. *Completed deliverable A 3.22:* Five Canadian consultants completed their Technical Service through the delivery of one Seminar and one Workshop Conference during July 1996.
Total Expenditure Invoiced (Oct. 1996): \$33,225
14. *Completed deliverable A 3.31:* One Canadian consultant completed her assignment to plan co-op placements and supervise co-op students in Thailand in June 1996. Total Expenditure Invoice (Oct. 1996): \$3,775
15. *Activity A 3.23 (new): Additional Industrial Seminars in Thailand by Canadian Consultants.* As determined by the 3rd PRC meeting, there are definite needs to expand these Industrial Seminar activities. Two Seminars/Workshops are initially planned for implementation during 1997. These activities are expected to be fully delivered by August 1997.
Budgeted Expenditure to be Invoiced in Aug. 1997: \$19,600

The balance available in Program 3 is: (\$22,225)
This amount of over-budgeted expenditure will be funded by the balance available in Program 1 and A 2.27. Completed adjustments to the Project Budget will be made after the 4th PRC meeting (Halifax, April 1997).
16. *Activity A 4.311: Final PRC meeting in Thailand:* This activity is expected to be completed in Dec, 1997, on budget: \$25,560

17. *Activity A 4.32: Project Review Committee Meetings in Canada:* The 3rd PRC is just completed and the 4th PRC planned for Halifax at TUNS in April 1997. Budgeted Expenditure to be Invoiced in May 97: \$28,200
18. *Activity A 4.33 is split into:*
- A 4.33 (a): *Project Management and Coordination Missions in Canada and Thailand (1993-1996).* To date many management and Coordination missions in Canada and to Thailand have been undertaken to plan, coordinate and implement the project activities completed to date.
Total Expenditure Invoiced (Oct 1996): \$24,143
- A 4.33 (b) *Project Management and Coordination Missions in Canada and Thailand 1996/97)*
Budgeted Expenditure to be Invoiced in Aug. 97: \$26,412
- A 4.33 (c) *Project Management and Coordination Missions in Canada and Thailand 1997/98)*
Budgeted Expenditures to be Invoiced in March 98: \$25,000

Finally, as the expenditure budget summary provided indicates, the overall project balance is \$41,755. Some assignments in A 2.12 and A 2.26 are yet to be determined. It is expected that the remaining assignments and the final project budget adjustments referred to above, will be discussed and approved at the 4th PRC meeting at TUNS in April 1997.

I hope that you will find the information provided here satisfactory and useful. Please expedite the attached invoices for payment to Ryerson. If you have any questions, you may reach me at (416) 979-5140.

Sincerely,



Dr. S.A. Boctor, P.Eng.
Program Manager

Deliverable	Total Expenses to Sept 96	Budgeted Expenses Oct 96 to Mar 97	Revised Exp Budget Sept 30 96	Total Exp. Prev Budgeted	Balance Available	Delivered & Invoiced Completed	Delivered but not Invoiced	Projected Delivery Completed	Notes
1. Institutional Capacity Building Program									
A1.11a) Training Academic Administrators (4)	36,789	0	36,789	36,789	0	Mar 95			
A1.11b) Training Academic Administrators (1)	5,276	0	5,276	5,276	0	May 95			
A1.21 Training Faculty Members	50,524	0	50,524	50,524	0	May 95			
A1.31 Training Support Personnel	81,557	0	81,557	93,164	11,607		Oct 96		
A1.32 Institutional Support Services	8,936	0	8,936	14,949	6,013		Oct 96		
A1.41 Evaluate ESL Needs	9,095	0	9,095	9,095	0	Dec 93			
A1.42 Study Tour ESL	16,581	0	16,581	16,581	0	Feb 94			
A1.5 CUTC Additional Mgt Activities	31,500	0	31,500	31,500	0	Apr 96			
Program 1 Sub-total	240,258	0	240,258	257,878	17,620				
2. International Academic Program									
A2.11a) Academic Program Planning	24,172	0	24,172	66,162	41,990		Oct 96		
A2.11b) Academic Program Planning	0	16,350	16,350		(16,350)			Mar 97	
A2.11c) Academic Program Planning	0	22,040	22,040		(22,040)			Mar 98	
A2.12a) Curriculum Implementation	21,840	0	21,840	102,400	80,560		Oct 96		Split Del
A2.12b) Curriculum Implementation	0	19,200	19,200		(19,200)			July 97	Split Del
A2.12c) Curriculum Implementation	0	32,000	32,000		(32,000)			Sept 97	Split Del
A2.12d) Curriculum Implementation	0	12,800	12,800		(12,800)			Dec 97	Split Del
A2.21 Selection Supervisors PHD	11,235	4,602	15,837	15,837	0			Mar 97	
A2.23 Ph.D Research	0	10,400	10,400	10,400	0			Mar 98	
A2.25 Post Doct Research Fellowships	16,700	28,000	44,700	40,000	(4,700)			Dec 97	
A2.26 Thai Advisors visit to Canada	0	13,000	13,000	25,000	(2,000)			Mar 98	
A2.27 Collaboration Co-supervisors	0	0	0	18,900	(18,900)				
A2.31a) Work Placements - Canada	8,000	8,000	16,000	32,000	(5,000)			Jan 97	Split Del
A2.31b) Work Placements - Canada	0	16,000	16,000		(16,000)			Dec 97	Split Del
A2.32a) Work Placements - Thailand	16,000	0	16,000	32,000	(5,000)		Oct 96		Split Del
A2.32b) Work Placements - Thailand	0	16,000	16,000	0	(16,000)			Oct 97	Split Del
Program 2 Sub-total	97,947	198,392	296,339	342,699	46,360				
3. University-Industry Linkage Program									
A3.11 Training Co-op Program	7,234	0	7,234	7,234	0	May 95			
A3.21 Industrial Training Framework	3,775	0	3,775	3,400	(375)		Oct 96		
A3.22 Training Seminars by Canadian Consult.	33,225	0	33,225	31,350	(1,875)		Oct 96		
A3.23 Addit. Industrial Seminars in Thailand	0	19,600	19,600		(19,600)			Aug 97	New
A3.31 Monitor Co-op Students	3,775	0	3,775	3,400	(375)		Oct 96		
Program 3 Sub-total	48,009	19,600	67,609	45,384	(22,225)				
4. Project Management									
A4.21a) Canadian Management Team -yr 1	34,320	0	34,320	34,320	0	Mar 95			
A4.21b) Canadian Management Team -yr 2	35,759	0	35,759	35,759	0	Mar 95			
A4.21c) Canadian Management Team -yr 3	32,881	0	32,881	32,881	0	Mar 96			
A4.21d) Canadian Management Team -yr 4	17,568	18,641	36,209	36,209	0			Mar 97	
A4.21e) Canadian Management Team -yr 5	0	36,209	36,209	36,209	0			Mar 98	
A4.31 Project Review Committee - Thai	22,298	0	22,298	22,298	0	Dec 95			
A4.311 Project Review Committee - Thai	0	25,560	25,560	25,560	0			Dec 97	
A4.32 Project Review Committee- Can	14,266	13,934	28,200	28,200	0			May 97	
A4.33a) Project Management	24,144		24,144	75,556	51,412		Oct 96		Split Del
A4.33b) Project Management		26,412	26,412		(26,412)			Aug 97	Split Del
A4.33c) Project Management		25,000	25,000		(25,000)			Mar 98	Split Del
A4.41 Communication Support	4,727	17,595	22,322	22,322	0			Mar 98	
Program 4 Sub-total	185,963	163,351	349,314	349,314	0				
Total	572,177	381,343	953,520	995,275	41,755				
Activities to be determined by 4th PRC			41,964	209	(41,755)				
	572,177	381,343	995,484	995,484	0				

Deliverable/Activity-Based Actual CIDA Expenses

	Activity and Cost Items	Year to date Expenses
SUMMARY		
TOTAL		217,423
GST		15,220
TOTAL		232,643
ADVANCE		(52,861)
NET		179,782

Appendix I
Activity A 4.32
Third PRC Meeting, September 1996 - Canada

Third PRC Meeting September 26, 27, 1996
University of Waterloo

Attending

CUTC: Dr. Sam Mikhail, Dr. Stalin Boctor, Ms. Mary Jane Curtis, Dr. Gerry Schneider,
Dr. Feridun Hamdullahpur, Dr. William Caley, Mr. Robert Eagle, Dr. James Shute
Guest: Dr. Doug Goff, University of Guelph
SUT: Dr. Sam-arng Srinilta, Dr. Prasart Suebkha, Dr. Thawit Chisomboon,
Dr. Ruben Umaly, Ms. Thammachoti Mantana
ARA: Mr. Roger Griffin

1. *Opening Remarks:*

G. Schneider: Welcome and introductions, review of the activities planned. Dr. Sam-arng announced his retirement. No replacement has been named.

Sam Mikhail: Remarked that the Internal Monitoring and Evaluation Sub-Committee of the Canadian-Thailand HRD project has used quantitative indicators in assessing the CUTC/SUT project; an inappropriate approach for this project. Indicated that this has been remedied in discussion with the Committee. It is time to look at future co-operations both in Canada, Thailand and SE Asia. Thanked SUT for their co-operation in handling the affairs of Dr. Frank Juranka. A moment of silence was held in his memory.

2. *Selection of Chair:*

Dr. G. Schneider and Dr. Sam-arng, proposed as co-chairs by Dr. S. Boctor and acclaimed by the PRC.

3. *Review and Approval of Second PRC and Minutes of Mini-PRC Meetings, including the Modified Budget approved by the Second PRC Meeting.*

Dr. J. Shute proposed approval, motion seconded by S. Mikhail and carried.

4. *Review of Completed/on-going Project Activities (October 1995 - September 1996)*

Notes: (1) RI = Ryerson International (2) CIA =Committee for International Affairs at SUT

Sub-Program	Issues Discussed	Action Recommended
Program 1: Development of Institutional Capacity		
A 1.31 Provision of Customized Training in Canada	S. Boctor reported that all activities have been completed according to modified plan.	Report completion of activities to ARA
A 1.32 Provision of Technical Services to SUT by two Canadian Consultants in MIS and Computer Networks	Activities completed in October 1996. S. Boctor indicated that a balance of \$20,297 remains in Program 1. S. Mikhail proposed that SUT/CUTC prepare a report on outcome of Program 1 for the next PRC.	RI (1) to submit final report on Sub-Program to ARA. RI and CIA (2) to prepare a joint report on outcome of Program 1.
Program 2: International Academic Programs		
A 2.11 Academic Program Planning and Coordination A 2.12 Curriculum Implementation of International Engineering Programs	Problems causing delays in admission of eligible SUT Thai students to CUTC institutions including: ESL proficiency, length of time required to obtain medical clearance and visa, and individual students family circumstances.	Waterloo and TUNS would consider accepting students and issuing formal unconditional letters of admission and an additional letter to the student outlining the criteria for progress in the Canadian program. Allow sufficient time for completion of the formal process of application. Contact Department of External Affairs, Canada, to explore the possibilities of streamlining the approval and process for medical clearance and visa approval.
A. 2.21 Selection of Thai Supervisors A 2.22 Provision of Ph.D Courses A 2.23 Jointly Supervised Research Work	4 Ph.D Students: (Pornsiri Jongkok, Anat Oonsivali, Guntima Polprasert and Rangsan Wongsan) will be registered at TUNS by January 1997. A 5th candidate, presently studying in USA has requested transfer to TUNS. 1 Ph.D. candidate being considered for admission to Guelph.	TUNS and Guelph will continue to monitor the development of medical clearance and visa applications of the Ph.D candidates to ensure their admission in early 1997.

Sub-Program	Issues Discussed	Action Recommended
A 2.25 Post Doctoral Research Fellowships for Thai Scholars	2 Post Doctoral Fellowships being considered by TUNS for 1997: -Dr. Somrasong Suttayamully, Transportation Engineering - 5 months, from April 1997. -Dr. Chongchin Polprasert, Environmental Engineering, 12 months from January'97. This candidate applied directly to CUTC without formal approval by the SUT Selection Committee. -1 Post Doctoral Fellowship (Dr. Sureelak Rodtong, Biology) accepted by Guelph at the Agrafood Canada Lab for January 1997. Additional research funds requested by Guelph.	TUNS and Guelph will continue to monitor the development of medical clearance and visa applications of the Post Doctoral candidates to ensure their admission in early 1997. TUNS to confirm April start date for Dr. Somrasong. In the future CUTC will consider only candidates formally approved by the SUT Selection Committee. PRC approved additional research funds allocation of \$2,000
A 2.3 1 Thai Co-op Students in Canada A 2.32 Canadian Co-op Students in Thailand	PRC reviewed status of Co-op Program as follows: - 4 TUNS students worked in Thailand for 16 weeks; May-Aug'96 - 1 TUNS student scheduled to work in Thailand from Sept-Dec'96 - 2 Thai students worked at U. Of Guelph, Food Science, for 16 weeks June to December 1996. - 2 additional Thai students scheduled to work at TUNS from September 1996 to January, 1997.	PRC request that Anne Marie Coolen, TUNS, prepare a report on the Co-op Program for distribution via RI to SUT and CUTC institutions.

Sub-Program	Issues Discussed	Action Recommended
Program 3: University Industry Linkage Program		
A 3.21 Development of a Framework for Industrial Training Seminars	Development of a Framework is being replaced by a monitoring and follow up mission by Robert Eagle in October 1996.	Robert Eagle will disseminate a seminar report to SUT and CUTC and pursue follow up opportunities.
A 3.22 Delivery of Industrial Training Seminars in Thailand	Two seminars involving 5 Canadian consultants were delivered by SUT/TUNS in July 1996 and attended by 60 participants from Industry. Subjects of seminars included: -University/Industrial Technology Transfer (Seminar) -Water Resource Management (Workshop)	More attention will be paid in the planning of the seminars to make them more relevant to Industry and more financially sustainable.
Program 4: Project Management		
A 4.32 PRC Meeting in Canada	Committee agreed that the next PRC meeting would take place at TUNS, April 3 and 4, 1997.	
A 4.4 Project Communication Costs	CUTC institutions enquired about recovery of communication costs for the project period 1993-1998.	Each CUTC institution will submit invoices for estimated communication costs to RI.

5. *Planning for New Project Initiatives*

Sub-Program	Issues Discussed	Action Recommended
Program 1: Development of Institutional Capacity		
A 1.32 Provision of Technical Services to SUT	2 additional activities were considered by the PRC: - participation by CUTC Institutions in the Conferences of Asian Deans of Engineering at SUT in February 1997. - organization of a workshop on continuing and distance education at SUT.	Funds from activities A 2.11, and 4.33 be allocated to support the participation of 4 representatives of the CUTC at the conference to a maximum of \$2,600 per participant. Proposed by S. Mikhail, seconded by Robert Eagle and approved. Workshop to be discussed at the next PRC meeting in Halifax, April 3, 4, 1997.

Sub-Program	Issues Discussed	Action Recommended
Program 2: International Academic Programs		
A 2.11 Academic Program Planning and Coordination	PRC was informed by SUT that 12 Thai students are registered in the IUP Program for September 1996.	Students ESL and academic progress will be monitored and CUTC informed Dr. Boctor to undertake planning, coordination and monitoring of the program during his February '97 visit to SUT.
A 2.12 Curriculum Implementation of International Engineering Programs	PRC reviewed and approved the potential participation of the following Canadian professors in the IUP Program for 1997: Prof. P. Barta, Ryerson, 14 weeks, January to April '97, Circuits I; Prof. M. Zywno, Ryerson, 14 weeks, May to August '97, Circuits II; Prof. H. Hinton, Ryerson, 14 weeks, May to August '97, Digital Computing; Prof. D. Kennedy, Ryerson, 14 weeks, May to August '97, Applied Science (Semi-Conductor); and Prof. D. MacKay, TUNS, 14 weeks, May to August '97, ESL and Engineering Practise.	RI to send CV's and contracts for SUT approval and manage consultant's travel preparations. SUT to send academic management/calendar schedules and guidelines to RI.
	Dr. D. Goff, Guelph, 14 weeks, September to December '97, Food Technology; Dr. J. DeMann, Guelph, 7 weeks, September-October '97, Food Technology.	Preparation of Food Technology Laboratories to be discussed with Dr. Terd. TUNS participation in Food Technology and Agribusiness to be discussed with Guelph.
	Strategies for the recruitment of new IUP students from Thailand and S.E. Asia were discussed by the PRC.	CUTC will liaise with Canadian educational services offices in S.E. Asia to promote the marketing of the IUP programs. CIA will launch a marketing campaign in the region.

Sub-Program	Issues Discussed	Action Recommended
A. 2.21 Selection of Thai Supervisors A 2.22 Provision of Ph.D Courses A 2.23 Jointly Supervised Research Work	PRC discussed plans for the development of Post Graduate Engineering Programs at SUT in Mechanical, Chemical, Civil and Electrical Engineering. Proposals for the assignment of the following Canadian Professors to lead a 4-week CUTC mission to SUT were considered: Dr. F. Hamdullahpur, TUNS, Mechanical and Chemical Eng. TBA, TUNS, Civil Eng. Dr. M. Zeytinoglu, Ryerson, Electrical Eng.	5 graduate students accepted by TUNS and one by Guelph for January '97. Two additional applications are anticipated. RI to prepare CV's and contracts to SUT for approval.
A 2.25 Post Doctoral Research Fellowships for Thai Scholars	PRC considered the allocation of funds for the Post Doctoral Research Fellowships - \$44,400, ie. \$4,400 over budget corresponding to a total of 86 person weeks.	Additional Post Doctoral Research Fellowships to be considered at the next PRC meeting at TUNS, April 3, and April 4, 1997.
A 2.26 Thai Research Advisors	PRC considered and approved the assignment of the following Thai Research Advisors: Dr. Rewat Vipia, Electrical Engineering, at U. Of Waterloo, 1 week, November 1-7, '96. Dr. Kontorn, Mechanical Engineering, at U. Of Waterloo, 1 week, November 1-7, '96	SUT to provide CV's of Research Advisors to RI to facilitate issuance of letters of invitation, and dates for the proposed visit by Dr. Veril (Equipment Centre)
A 2.27 Collaborative Ph.D Supervision	PRC considered plans for reallocation of funds for this activity and deferred action to the next PRC meeting at TUNS, April 3, 4, 1997.	Include issue in agenda of next PRC meeting
A 2.3 1 Thai Co-op Students in Canada A 2.32 Canadian Co-op Students in Thailand	PRC approved the participation of 2 additional Thai Co-op students: -Atit Koonsrisuk and -Hathaikarn Nilawat for a 16-week assignment at TUNS from September '96 to January '97. Final group of Canadian Co-op students to be approved at next PRC.	RI to prepare contracts. Anne Marie Coolen, TUNS, to prepare plans for final group in consultation with other CUTC Institutions

Sub-Program	Issues Discussed	Action Recommended
Program 3: University Industry Linkage Program		
A 3.21 Development of a Framework for Industrial Training Seminars	PRC assessed status of program and approved the allocation of funds remaining from Program 1 to implement further seminar activities. The Committee also discussed proposed targeted Industries and sectors including: petrochemical, steel, mining, agribusiness, food technology and environmental technology.	Dr. D. Goff, Guelph, to prepare plans for a Food Technology/Agribusiness Seminar to be delivered in the Fall of 1997.
A 3.22 Delivery of Industrial Training Seminars in Thailand		Mr. Robert Eagle to assess and recommend seminar areas through his upcoming visit to SUT (Oct.'96).
Program 4: Project Management		
A 4.32 Final PRC Meeting in Thailand	Discussion of date for final PRC meeting deferred to the next PRC meeting in Halifax, April 3-4'97.	Discussion of final PRC meeting to be included in Agenda for next PRC meeting at TUNS. (Objective: future opportunities for collaboration)
A 4.33 Project Management	PRC discussed and approved the inclusion of the visit of Ryerson's President, Dr. Claude Lajuenesse to SUT in July 1997 as part of the project management activity.	RI will follow up with SUT on the planning of the visit, scheduled for July 1997.

6. *Remaining funds, Cash Flow and Other Issues*

PRC discussed the problem of the Project's Cash Flow with ARA. The PRC was informed that there is no difficulty in re-allocation of funds amongst the approved project deliverables, provided the rationale for such re-allocation is acceptable and that such amounts are limited to 10% of a given activity. Also splitting project deliverables into sub-activities is acceptable, subject to prior approval by ARA. Agreement among the CUTC partners is required and all activities have to be completed by the deadline of March 31, 1998.

7. *Adjournment*

The PRC reviewed the "draft minutes for the 3rd PRC meeting", made modifications and requested that RI prepare the final minutes for distribution. The meeting adjourned at 3 p.m. on Friday, September 27, 1996.

AGENDA

Third PRC Meeting SUT/CUTC

Waterloo, Ontario, Canada: September 26 -27, 1996

1. Welcome, Introductory Remarks (Dr. Sam-arng, Dr. Mikhail, Dr. Schneider)
2. Selection of Chair for the Third PRC Meeting
3. Review and Approval of Second PRC and Mini-PRC Meetings' Minutes, including the Modified Budget approved by Second PRC Meeting and the ARA. (See attached)
4. Review of Project Activities (October 1995 - September 1996)
(Up-to-date actual, committed and remaining funds in the project budget is attached)
 - 4.1 Program 1: Development of Institutional Capacity (completed)
 - A 1.31 Provision of Customized Training in Canada for SUT Academic Support Personnel
 - Two SUT Equipment Centre Technologists (Guelph, April 1996)
 - Director and Program Officer of SUT's CIA visits to Canada (September 1996)
 - A 1.32 Provision of Technical Service to SUT by two Canadian Consultants to develop SUT's Support Service in MIS and Computer Networks (June 1996).
 - 4.2 Program 2: International Academic Programs
 - A 2.11 and A 2.12: Planning and Implementation of IUP Program
 - Completion of Year 1 Mechanical Engineering IUP Program;
 - Faculty Assignments; Professor Juranka (February 1996), Professor Mackay (June 1996) and Professor Schneider (July 1996):
2 (14 weeks) and 2 (7 weeks);
 - Transfer of remaining five students to U of Waterloo and SMU/TUNS Mechanical Engineering (January 1997).

A 2.21, A 2.22 and A2.23: Co-operative Ph.D Program and Ph.D candidates

- Selection of Ph.D. candidates, update by Dr. Hamdullahpur
- Ph.D program implementation (1 actual plus 3 January 1997): update by Dr. Hamdullahpur.

A 2.25: Post-Doctoral Fellowships

- Three applications received approvals and implementation
 - Dr. Chongchin (Environmental Eng.), TUNS, January 1997 (12 months);
 - Dr. Sureelak (Biology), University of Guelph, January 1997 (5 months);
 - Dr. Somprasong (Transportation), TUNS, January 1997 (5 months).

A 2.3: Co-op Student Exchange Program

- Work placements for 4 Canadian students in Thailand (May-August 1996) completed;
- Work placements for 2 Thai Students in Canada (June-December 1996) Food Science, University of Guelph.

4.3 Program 3: University Industry Linkage Program (completed)

A 3.21 Technical Service to Develop Framework for Industrial Seminars, Mr. R. Eagle's (TUNS) assignment to develop new seminars is scheduled for October 1996.

A 3.22 Provision of Industrial Seminars by Canadian Consultants in Thailand, Five Canadian Consultants have provided a seminar and a workshop in July, 1996.

A 3.31 Monitor/Supervise Co-op Students: Visit by Anne-Marie Coolen (TUNS) completed in May, 1996.

4.4 Program 4: Project Management

A 4.32 PRC Meetings in Canada

- Third PRC Meeting in Canada, Waterloo (September, 1996)

5. Planning for Future Implementation of Approved Project Activities

5.1 Program 2: International Academic Programs

A 2.11 and A 2.12: Program Planning, Coordination and Implementation

- Implementation of Year 1 of the Electrical Engineering Program of the IUP, Twelve Thai students start the program in September 1996. Successful students satisfying the transfer conditions will be transferred to RPU for Years II-IV in September, 1997.
- Planned Assignments for the EE program:
 - Prof. P. Barta (14 weeks, January, 1997) Electrical Circuits I, (4 lectures, 2 labs);
 - Prof. M.T. Ghorab (14 weeks, May, 1997) Electrical Circuits II, (4 lectures, 2 labs);
 - Prof. H. Hinton (14 weeks, May, 1997) Digital Computing, (4 lectures, 2 labs);
 - Prof. D. Kennedy (14 weeks, May, 1997), Applied Science, (3 lectures, 2 labs);
 - Prof. D. MacKay (14 weeks, May, 1997, ESL 300 and Engg. Practise, (5 lectures, 1 lab)
- Program Timing and Curriculum hours changes:
 - The exact start time for second and third- trimesters to be determined;
 - No changes in curriculum offering of first trimester;
 - In second trimester:
 - . Electric Circuits I (4 lectures/2 lab - from present 3 lecture/0 lab);
 - In third trimester:
 - . Electric Circuits II (4 lectures/2 lab - from present 3 lectures/3 labs);
 - . Applied Science (3 lectures/2 lab from present 3 lectures/3 labs).
- Food Technology Program: two assignments are planned;
 - Prof. D. Goff (14 weeks, September 1997);
 - Prof. DeMann (7 weeks, September 1997)To help development curriculum and laboratories at SUT
- Planning of Postgraduate Engineering Programs
Three Canadian Professors will be assigned to plan and develop postgraduate engineering programs in Mechanical, Electrical, Chemical and Civil Engineering, in collaboration with SUT professors. Assignments to be 4 weeks duration for May/June 1997.

5.2 Program 3: University-Industry Linkages - Completed/additional activities:

- It is proposed that the PRC approves the transfer of the remaining funds from Program 1: \$22,917, to Program 3, to cover the (\$2,625) deficit in Program 3 and provide \$20,292 to support the delivery of new university-industry seminars/workshops, on either Health/Safety Consideration and/or Agribusiness. The proposed budget for this activity is indicated below..

New A 3.23 Additional Technical Service by 4 Canadian Consultants to provide training seminars for Thai Industrial Enterprises:

	<u>Unit Cost</u>	<u>Quantity</u>	<u>Total</u>	<u>SUT</u>	<u>CUTC</u>	<u>CIDA</u>
Travel to Thailand	\$3,400	4	\$13,600 -	-		\$13,600
Travel in Thailand	\$ 500	4	2,000	\$2,000	-	-
Accommodation	\$ 120/day	28	3,360	\$3,360	-	-
Per Diem	\$ 250/week	4	1,000	\$1,000	-	-
Consultant Fees	\$ 600/day	20	<u>\$ 12,000</u>	<u>-</u>	<u>\$ 6,000</u>	<u>\$ 6,000</u>
			\$31,960	\$6,360	\$ 6,000	\$19,600

- Dr. C. Lajeunesse, Ryerson's President will visit SUT in October, 1997 and deliver a speech on "Internationalization of Higher Education".

5.3 Program 4: Project Management

- Next PRC Meeting (4th) will be in Halifax, N.S., Canada, during the first week of April 1997;
- Due to the fiscal funding arrangement for cash flow to support the expenditures associated with the project, Ryerson currently has a deficit of \$144,237. Even after receiving the final funds for Programs 1 and 3 from the ARA, Ryerson will still have a deficit of over \$65,000. Most of the activities in Program 2 will not be completed until the end of the Project. CIDA funding for Program 2 is budgeted at \$342,700. It is impossible to expect Ryerson to provide such funds/cash flow over the next 18 months. The PRC is asked to support a strong letter to the ARA, requesting an alternate manageable interim funding arrangement to alleviate such a cash flow shortage.
- Details of the remaining funds, and yet to be planned/implemented assignments in Program 2 will be prepared for presentation to the Fourth PRC Meeting in Halifax (April 1997). Final budget changes will be approved at that meeting affecting the remaining activities in Program 2 that will be taking place during the last year of the project.

6. Adjournment

Appendix J
SUT Quarterly Progress Report #8

THAILAND - CANADA HRD PROJECT
SUT-CUTC INSTITUTIONAL LINKAGE
AND TECHNICAL COOPERATION

QUARTERLY PROGRESS REPORT NO. 8

1 April 1996 - 31 July 1996

Submitted to :
Ryerson Polytechnic University
and
The ARA Consulting Group Inc.
August 1996

Prepared by
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2. Invitation letter from RI for a study tour of Ms. Mantana Thammachoti.	
3. Reports of the two Canadian experts in Computer Networks.	
4. List of 1996 IUP applicants.	
5. Brochure and program of the industry-based seminar "Advances in Water Resources Management and Wastewater Treatment Technologies"	
6. Brochure and program of the international colloquium "Science Park for Meeting Technological Challenges of the 21st Century"	
7. Report of the CUTC Co-op program coordinator.	
8. Report of the Mini PRC Meeting	

I. REPORT SUMMARY

1. Program and Achievements to Date

Program 1. Institutional Capacity Building Program

Arrangements for study tour of the Director of the Center for International Affairs and of a Program Officer of the Center to examine the administration and management of the SUT-CUTC Project in Canada as well as of Centers for International Relations/ Affairs of the partner CUTC universities have been made for September 1996.

Two Canadian experts from University of Waterloo have finished their assignments to assist in the formulation of SUT's MIS program.

Program 2 - International Academic Programs

2.1 International Applied Science and Engineering Undergraduate Programs

Two Canadian professors have finished their assignments while a third one is currently teaching the IUP Mechanical Engineering students.

A Mini-PRC meeting participated by 2 representatives from CUTC was held in June to discuss the on-going and future activities and the allocation of the remaining project funds.

The transcripts of the remaining five 1995 IUP students in Mechanical Engineering Program were sent to CUTC universities for consideration of admission to start the second year in Canada.

The new batch of 13 IUP students are now taking intensive courses. Only the Electrical Engineering Program will be offered in September 1996.

2.2 Joint Research and Ph.D. Program

One SUT faculty member has enrolled at TUNS. A second student will start in September, and another four candidates are being considered for admission at TUNS and the University of Guelph.

At present, two post-doctoral research proposals are available for consideration and placement. It is expected that another two will be submitted.

2.3 Co-op Student Exchange Program

Two Thai students have been working at the University of Guelph since June 1996. Another two students will start their co-op work terms at TUNS in September 1996.

Four Canadian students from TUNS have been hired by Thai companies for four-month terms.

Program 3 - University - Industry Linkage Program

The first industry-based seminars on "Advances in Water Resources Management and Wastewater Treatment Technologies" and "Science Park : Meeting Technological Challenges of the 21st Century" were held in July 1996 at SUT with the cooperation of Ryerson International and TUNS and University of Guelph.

Program 4 - Project Management

4.1 Provision of Project Management and Administration in Thailand

Dr. Sam-arng Srinilta has become the PRSC chairman and Dr. Prasart Suebka the SUT-CUTC project manager.

4.3. Project Supervision and Coordination

A Mini PRC was held at SUT with Dr. Stalin Boctor from RPU and Dr. Feridun Hamdullahpur from TUNS as the Canadian representatives.

2. Planned Activities

Program 2 - International Undergraduate Program

Assignment of CUTC professors will be needed for the IUP electrical engineering program beginning September 1996.

Professors from the University of Guelph will help the department of food technology develop its undergraduate and graduate programs.

A study visit of two SUT faculty members in electrical and mechanical engineering is being proposed at the University of Waterloo and TUNS to familiarize themselves in research facilities and projects.

Program 3 - University-Industry Linkage Program

Dr. Robert Eagle from TUNS will visit SUT for discussion on other industry-based workshops for which some of the remaining funds will be used.

Program 4 - Project Management

A PRC meeting is scheduled at the University of Waterloo in 26-27 September 1996.

II. PROGRESS REPORT ON PROJECT PROGRAMS, ACTIVITIES AND DELIVERABLES

1. Accomplishments

Program 1 - Institutional Capacity Building Program

1.2 Development of Academic Program and Curricula at SUT

A1.21 Provision of customized study tour in Canada for SUT faculty members and coordinators.

Ryerson International has arranged the study tour Program for September 1996 of Prof. Dr. Ruben C. Umaly Director of the Center for International Affairs and SUT CUTC Project Coordinator. (Attachment 1) The study tour would familiarize Dr. Umaly with the administration and management of the CUTC Project in Canada. It would also allow him to discuss plans for the implementation of the remaining activities in the SUT-CUTC Project including its evaluation and planning of possible Phase II

1.3 Development of Institution Support Services at SUT

A1.31 Provision of customized training in Canada for SUT support personnel

Ryerson International has arranged the 4-week training course in September 1996 for Ms. Mantana Thammachoti, Program Officer of the Center for International Affairs (Attachment 2)

The training program is aimed at familiarizing Ms Mantana Thammachoti with the strategic and operational management of Centers for International Relations /Affairs of the partner CUTC universities.

A1.32 Provision of technical services to SUT by 2 Canadian consultants to develop SUT's Institutional support services and information systems (MIS).

Two Canadians experts from Computer Center, University of Waterloo, Mr. John Sellens and Mr. Roger Watt were assigned to the SUT's Computer Center from 2nd-7th and 2nd -14th June 1996, respectively to assist in the formulation of an MIS program

The reports made by the two Canadian experts are provided. (Attachment3)

Program 2 - International Academic Programs

2.1 International Applied Science and Engineering Undergraduate Programs

A2.11 Academic programs planning and coordinations.

During the period under review three Canadian professors were seconded for short-term at SUT to teach some courses under the International Undergraduate Program:

Name /Institute	Subject Taught	Duration
1. Prof. Frank Juranka Ryerson Polytechnic Univ.	- Electrical Engr I & Lab I	7 Feb. - 29 Apr
2. Prof. David MacKay TUNS	- Engineering Practice, Ethics Technical Communication - ESL 300	1 June - 19 July
3. Prof. Gerry Schneider Univ. of Waterloo	- Engineering Graphics I - Fundamental of Mechanical Engineering	17 July - 29 Aug.

Prof. Frank Juranka was not able to finish his term due to a tragic bus accident at Rajdamri Road, Bangkok where he was fatally hit by a bus. His remains were cremated in Wat Lak Si (Lak Si Buddhist Temple) after a necrological service arranged by SUT and the Canadian Embassy.

Dr. Stalin Doctor of Ryerson Polytechnic University and Dr. Feridun Hamdullahpur of TUNS came to SUT during 11-13 June, 1996 for a mini PRC meeting with Dr. Sam-ang Srinilta, VR for Academic Affairs and Chair of PRSC, Dr. Prasart Suebka, VR for Planning and SUT-CUTC Project Manager, Dr. Ruben C. Umaly, Director of the Center for International Affairs and SUT-CUTC Project Coordinator as well with other SUT staff involved in the project.

An update of the on-going and future activities was made for improved operation and management of the project.

A2.12 Curriculum Implementation of the international applied science and engineering undergraduate programs.

a) Status of Second Year Students

Of the 11 students, 4 transferred to the SUT regular program, 1 has left the program, 1 re-applied for admission to the 1996 IUP batch. Thus, presently only 5 are most likely to be considered for admission as second year students in September.

Academic transcripts of the five students were provided to Dr. Hamdullahpur and to Dr. Schneider for consideration of admission to either University of Waterloo or Technical University of Nova Scotia.

Discussion on admission of the students to University of Waterloo was made with Dr. Schneider at SUT by Dr. Thawit Chitsomboon, IUP Mechanical Engineering Coordinator.

b) Status of New Students

As of May 1996, there were 54 applicants to the program: 21 for electrical engineering, 19 for mechanical engineering, and 14 for chemical engineering. **(Attachment 4)**

However, of the applicants only 23 took the English placement examination and at present 13 students are enrolled in Intensive English, 11 in Intensive Chemistry and 12 in Intensive Physics. Only Electrical Engineering Program will be offered in September for first year students.

2.2 Joint Research and Ph. D. Program

A2.21 Ph. D. Program

One Ph.D. student is presently enrolled at TUNS in the field of industrial engineering (since October 1996) and a second student will come to TUNS to study electrical engineering in September 1996.

Another three candidates have met with Dr. Hamdullahpur. Two of these (one in transportation engineering and one in telecommunication engineering) will enroll in Ph.D. programs at TUNS by January 1997, the latest. The third candidate in chemical engineering is expected to start her Ph.D. program at TUNS by September of this year. There is a fourth candidate in food science who is expected to apply and enroll at Guelph University by the end of this year.

A2.25 Post-Doctoral Program

Presently, two four-month research proposals have been submitted for consideration and placement at the CUTC partner universities. One is in biology and the other in transportation engineering. Another SUT faculty member has expressed his wish to apply for the SUT-CUTC post-doctoral research program but will delay submission of his research topic pending discussion with Dr. Gerry Schneider.

A fourth candidate in environmental engineering is expected to apply and start his research project at TUNS in September 1996, and may possibly stay for one year if the necessary additional budget can be allocated.

2.3 Co-op Student Exchange Program

A2.31 Provision of work placement and supervision for Thai students in Canada by CUTC institutions.

Since June 1996, two Thai students in food science, have been at Guelph University for their Co-op work terms. They intend to stay for 6 months instead of the usual 4-month period. Two students from mechanical engineering and electrical engineering each will be hired by TUNS in September 1996.

A2.32 Provision of work placement and supervision for 10 Canadian students in Thailand by SUT

Four Canadian Co-op students from TUNS are presently spending four months each of work in Thai industrial companies. One student may continue for another term.

Program 3 : University - Industry Linkage Program

3.2 Joint University-Industry Cooperation and Training Activities

A3.22 Provision of 4-6 industry based training seminars in Thailand for personnel from Thai industries and enterprises.

Ryerson International in cooperation with TUNS and University of Guelph has made arrangements for the participation of five Canadian experts in the first industry-based seminar at SUT during 22-25 July on "Advances in Water Resources Management and Wastewater Treatment Technologies". (Attachment 5)

Dr.E.(Ted) Rhodes President of TUNS was the keynote speaker in another industry based Colloquium "Science Park : Meeting Technological Challenges of the 21st Century" held on 26 July at SUT . (Attachment 6)

A3.31 Visit of CUTC Co-op program Coordinator to Thailand.

Ms. Anne Marie Coolen, the CUTC Co-op program coordinator from TUNS, visited Thailand during 14-30 June, 1996 to coordinate with Dr. Thawatchai the placement of Canadian students in Thailand. (Attachment 7)

Program 4 : Project Management

4.1 Provision of Project Management and Administration in Thailand.

In principle, the Vice Rector for Academic Affairs serves as the PRSC's chairman. Therefore, with the change in position of Dr. Prasart Suebka from Vice Rector for Academic Affairs to Vice Rector for Planning, and the assignment of Dr. Sam-ang Srinilta as VR for Academic Affairs. Dr. Sam-ang Srinilta is the present PRSC's chairman. Dr. Prasart Suebka is the Project Manager.

4.3 Project Supervision and Coordination

A4.31 Canadian Project Review sub-committee visits to Thailand.

Dr. Stalin Bector of Ryerson Polytechnic University and Dr. Feridun Hamdullahpur from TUNS visited SUT on June 11th-13th for a mini PRC meeting. The agenda and report are provided herewith . (Attachment 8)

2. PLANNED ACTIVITIES

Program 2 : International Academic Programs

A 2.11, A 2.12 : Curriculum Implementation of the IUP

Since the remaining IUP mechanical engineering students may transfer to CUTC partner universities for their second year of study, the proposed assignments of CUTC experts to teach second year mechanical engineering courses may be cancelled.

In 1996, the SUT- IUP will offer only an electrical engineering program which is to start in September. Currently, there are 13 students taking Intensive Courses in preparation for the IUP program. The following four assignments for CUTC professors will therefore be needed for 1996/1997:

Fundamental Electrical Engineering and Lab , Jan 97

Electric Circuits II and Lab II, May 97

Applied Science for Electrical Engineering, May 97

Engineering Practice, Ethics and Technical Communication, May97

ESL III, May 97

The remaining funds for CUTC expert assignments will be used to help SUT in the formulation, planning and development of graduate programs in engineering and applied science.

Dr. Goff and Dr. DeMann from the University of Guelph will visit SUT in September of 1997 to help the Institute of Agricultural Technology develop its undergraduate and graduate programs in food technology.

A.2.25 Postdoctoral Research Fellowships

SUT will forward the applicants' research proposals to RI. It is expected that at least 3 SUT faculty staff will commence their research in September, 96.

A 2.26 : Thai Ph. D. Visits

Two SUT faculty staff from electrical engineering and mechanical engineering are proposing a visit the CUTC partner universities in September, 96 to explore research facilities in the area of high voltage and energy or manufacturing.

A. 2.26, A. 2.27 : Collaboration and Co-supervision in Canada

Some of the funds remaining from these two activities may be used to support additional postdoctoral fellowships and additional industrial seminar activities.

Program 3 : University- Industry Linkage Program

A.3.22 Technical Service by Canadian Consultants to provide Training Seminars in Thailand

Dr. Robert Eagle from TUNS will visit SUT in October 1996 for discussions with the Director of Center for International Affairs and plan a workshop on other topics that will be identified after the survey. (e.g. agro-industry or industrial safety and health)

Program 4 : Project Management

A4.32 PRC Meeting in Canada

The third PRC meeting is scheduled to be held at the University of Waterloo, Canada during September 26-27, 1996.

III. Attachments

1. Invitation letter from RI for a study tour of Prof. Dr. Ruben C. Umaly.
2. Invitation letter from RI for a study tour Ms. Mantana Thammachoti.
3. Reports of the two Canadian experts in Computer Networks.
4. List of 1996 IUP applicants.
5. Brochure and program of the industry-based seminar "Advances in Water Resources Management and Wastewater Treatment Technologies"
6. Brochure and program of the international colloquium "Science Parks: Meeting Technological Challenges of the 21st Century"
7. Report of the CUTC Co-op program coordinator.
8. Report of the Mini PRC Meeting



June 13, 1996

Dr. Ruben Umaly, Director
Centre for International Affairs,
Suranaree University of Technology
Tambon Suranaree
Muang District
Nakhon Rachasima 30000
Thailand

Dear Dr. Umaly:

As part of the CIDA funded Thailand-HRD CUTC-SUT Institutional Linkage Project with Suranaree University of Technology, #906-14868, you are invited to Canada to participate in a 2-week Study Tour from September 16 to 27, 1996, involving visits to each of the participating university partner institutions and to attend the Project Review Committee (PRC) meeting at the University of Waterloo on September 26 and 27. The schedule is as follows:

September 16-17	Technical University of Nova Scotia
September 18-20	Ryerson Polytechnic University
September 23-24	University of Guelph
September 25-27	University of Waterloo (PRC 26-27)

The project will cover a full economy airline ticket, ground transportation in Canada as well as a weekly living allowance of \$300 per week to cover food, accommodation and incidentals. Ryerson International is responsible for purchasing your airline ticket, arranging for transportation and in making the necessary hotel reservations.

With this letter you can apply for the necessary visa documentation for your trip to Canada. We look forward to seeing you in September.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Dr. Sam Mikhail", written over a horizontal line.

Dr. Sam Mikhail
Director, RI
Project Director
Thailand-HRD CUTC-SUT

June 13, 1996

Ms. Manthana Thammachoti
Centre for International Affairs,
Suranaree University of Technology
Tambon Suranaree
Muang District
Nakhon Rachasima 30000
Thailand

Dear Ms. Manthana:

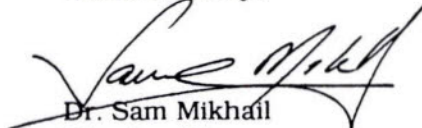
As part of the CIDA funded Thailand-HRD CUTC-SUT Institutional Linkage Project with Suranaree University of Technology, #906-14868, you are invited to Canada to participate in a 4-week Study Tour from September 3 to 27, 1996, involving visits to each of the participating university partner institutions and to attend the Project Review Committee (PRC) meeting at the University of Waterloo on September 26 and 27. The schedule is as follows:

September 3-6	University of Guelph
September 9-13	Ryerson Polytechnic University
September 16-20	Technical University of Nova Scotia
September 23-27	University of Waterloo (PRC 26-27)

The project will cover a full economy airline ticket, ground transportation in Canada as well as a weekly living allowance of \$300 per week to cover food, accommodation and incidentals. Ryerson International is responsible for purchasing your airline ticket, arranging for transportation and in making the necessary hotel reservations.

With this letter you can apply for the necessary visa documentation for your trip to Canada. We look forward to seeing you in September.

Yours sincerely,


Dr. Sam Mikhail
Director, RI
Project Director
Thailand-HRD CUTC-SUT

Notes on UNIX Systems and Network Integration at Suranaree University of Technology

John Sellens
University of Waterloo

Introduction

These are my notes on the things that come to mind while at SUT.

This document will likely end up containing a list of issues to be addressed during my stay, other issues that likely merit some investigation or consideration, some background information, and some recommendations of what CCS at SUT could do in order to make the best use of its resources to provide an appropriate UNIX infrastructure. As well, I will try to provide a list of references that may be of use to CCS staff.

Much of the software and resources that I will recommend are available (as far as I know) in English only, which may unfortunately, limit their usefulness to some members of the SUT staff.

Issues

Dr. Weerapong Pairsuwan mentioned the following issues as things that SUT would like assistance with, or least this is my understanding of what SUT's interests are, based on the discussion with him and with Pratpat.

- Web server speed and performance
- Performance tuning in general, especially on the Sun servers
- Directions for future expansion e.g. single large machine vs. multiple smaller machines, system selection Sun, DEC, other
- Issues related to the DEC Alpha server used in the academic areas
- Student mail servers, and issues related to account creation and maintenance

Other issues that came to mind during our discussions and tour of the CS facilities are as follows:

- System backups -- I've understand that there are currently no backups of the central UNIX servers
- System staff training and knowledge resources -- how should CCS staff gain more knowledge about UNIX programming and system administration?
- Software consistency across multiple platforms -- how can CCS ensure that its multiple systems are appropriately and consistently maintained and configured?
- Integration of Windows PC systems with the UNIX servers -- how can all the systems work together, sharing all resources?
- Protection of the administrative network(s) -- would it be appropriate to install some sort of network firewall system to protect the administrative systems? Would it be appropriate to protect the campus networks from outside intruders?
- Other security issues and intrusion detection -- things like cops, tripwire, passwd file scanning and problem reporting.
- General system organization -- are generic mail aliases in use? /.forward files?
- DNS name service -- is it appropriately configured for redundancy and reliability? We have noticed that many machines (primarily PC's) are not registered in the DNS name server database, even though they are using IP addresses. I believe that Roger Watt will address this along with some other DNS issues. This morning (Thursday May 6) the network connection in Bangkok was not working, and there were problems resolving host names at SUT e.g. ccs could not resolve the name ccs.sut.ac.th. You should carefully review your DNS setup with an eye to being self-sufficient on campus, at least for the sut.ac.th domain, and to having redundant nameservers (i.e. a primary and at least one secondary).
- During our time at SUT, we have noticed that the satellite links to Bangkok introduce substantial delays (up to 7 seconds) in internet traffic, and make it difficult to use services and information outside SUT. If off-campus internet access is important to SUT, you may wish to investigate networking options with higher capacity and shorter round-trip times.

Backups

Important. For now, a short shell script. Perhaps then Amanda. If and when volume justifies it and the budget allows, consider a commercial product such as Networker from Legato (<http://www.legato.com>). That is what we use at Waterloo with large central tape jukeboxes -- we currently have 3 on campus.

How are the Netware servers being backed up? Individual PC's?

amanda is <ftp://ftp.cs.umd.edu/pub/amanda> and there are mailing lists available.

Linux have dump? Amanda multiple types of machines (yes I think). Can't find Linux dump yet.

Web Server Speed and Performance

www.sut.ac.th is currently running (I believe) version 1.4.2 of the NCSA HTTP server. The highest performance (and least buggy) HTTP server right now is the Apache server, available from

<http://www.apache.org>. This server is based on the NCSA server and claims to be a "drop-in" replacement for it. One nice feature that the Apache server has is the ability to leave the connection to the server open, and retrieve multiple documents or images without having to create a connection for each one.

If performance is a concern, I would recommend that SUT obtain and investigate the Apache server with the goal of replacing the current NCSA server.

DNS Name Service

We have noticed that many machines (primarily PC's) are not registered in the DNS name server database, even though they are using IP addresses. I believe that Roger Watt will address this along with some other DNS issues.

This morning (Thursday May 6) the network connection in Bangkok was not working, and there were problems resolving host names at SUT e.g. ccs could not resolve the name ccs.sut.ac.th. You should carefully review your DNS setup with an eye to being self-sufficient on campus, at least for the sut.ac.th domain, and to having redundant nameservers (i.e. a primary and at least one secondary). There are inconsistencies between the names of machines and the names recorded in the DNS database. For example, the machine known primarily as www.sut.ac.th thinks that its name is "sura", and there is confusion on the research machine about whether its name is "research" or "garfield".

Performance Tuning

Since the major UNIX servers are running SunOS and Solaris, I would recommend that SUT purchase a copy of the book *Sun Performance and Tuning* by Adrian Cockcroft, published by Sun Soft Press through Prentice Hall, ISBN 0-13-149642-5. This book covers every possible performance and tuning question on Sun systems, and provides a lot of information on detecting and correcting problems. Adrian Cockcroft also writes a monthly column on performance issues in *SunWorld Online*, a net magazine, available at <http://www.sun.com/sunworldonline>. *SunWorld Online* also includes many other Sun-related articles.

Research Configuration Problems

It was brought to my attention that there are some configuration problems on the research machine. The most obvious problem is that there is confusion over the name of the machine – the machine itself believes that its name is "garfield", but it is registered in the DNS database as "research" and "garfield" is not listed as an alias. The machine also seems to be configured to use NIS+, but as it is a standalone machine, that just adds extra complexity and confusion – there seems to be inconsistencies between the passwd file and the information in the NIS+ database. I have noticed a few anomalies on the research machine (e.g. can't find the "vi" command), and with the confusion over NIS+ and naming, you may wish to re-install the operating system and rationalize the configuration at that point. You may wish to consider a "from scratch" installation in order to start fresh.

I would recommend that you purchase at least one copy of Sun's C compiler. The GNU C compiler (gcc) is very good, but there are a number of situations and software packages that require the Sun compiler in order to perform properly.

In order to optimize the performance of the research machine, I would recommend that you follow some of the tuning and monitoring suggestions in *Sun Performance and Tuning*. In particular, you should ensure that there is an appropriate amount of memory in order to run the larger jobs.

Future Directions and System Planning

I was asked to give some opinions on suitable ways to plan to expand the UNIX systems and services offered at SUT. As I understand it, there are currently only a small number of UNIX machines at SUT and within CCS. I believe that CCS has 3 Sun Sparc 10 and 20 systems, and 2 or 3 Linux machines. In addition, I understand that the Library is using a large HP system, and there is a DEC Alpha in an academic area.

At the University of Waterloo we currently have about 550 UNIX machines on campus, all provided with software distributed from a central server. We have spent a lot of time developing our software installation and distribution systems which enable us to deal with so many machines. As SUT is just getting started in UNIX services, I do not think that it will be practical for SUT to develop any sort of large scale software support mechanism. There is some software available on the Net to do some of the necessary software distribution and configuration, but I believe that it is still likely to be a difficult task for SUT at this time.

My recommendation is that it will be more appropriate for SUT to try to have fewer, larger UNIX systems than to have more, smaller machines. I would also recommend that SUT try to standardize on systems from one vendor, as multi-vendor system administration is much more complicated. Sun's current UltraSparc offerings are quite competitive, and offer a good range of capacities.

Examples of how this can be applied are as follows:

- Have one large, centralized database server, rather than multiple replicated servers.
- Have one student mail and UNIX server.

There are problems with this approach, however:

- Single point of failure – with only one database server, if it goes down, no database information will be available. With replicated databases, the information would still be available, but it may not be possible to modify the information in the database until all servers are up and running. This

potential impact of this kind of problem can be reduced by implementing some amount of redundancy and fault-tolerance in the database server itself. The most common example of this is disk striping and mirroring using RAID.

- Capacity limits and expansion. With a single server, you will likely hit the capacity limit of that server and will be unable to increase capacity without buying a substantially larger server (unless, of course, you buy a very large server to start with). If, on the other hand, you started with multiple servers, you would have already solved the (potentially substantial) problems associated with multiple servers, and adding another one should not be much of a problem.
- Purchase cost. Large UNIX machines tend to be more expensive per unit of computing power than smaller machines. By buying larger machines you would increase your acquisition costs, but decrease your human costs – the time to set it up. With multiple smaller machines, you save on the purchase price, but pay more to configure and administer the systems. At Universities in Canada, it is almost always worthwhile to spend more on the machines in order to save people time – the cost of a person's time tends to be much larger than the increased cost of a machine, especially at educational prices.

There are some situations and services in which it is appropriate to have separate machines:

- It is a good idea to separate student computing from administrative computing. This lessens the risk that students will gain unauthorized access to confidential information.
- It is a good idea to separate public services from private services – for example, the administrative web server should be a separate machine from the administrative database server.

Tracking System Changes

One very important aspect of UNIX system administration is keeping a record of the changes that have been made. There are several ways to do this, and I would recommend using a combination of all of them.

- Using a revision control system. A revision control system allows you to keep track of all the changes to a file or files, and allows you to view the differences between different versions of a file. There are two main revision control systems in use on UNIX systems. SCCS (Source Code Control System) comes with a number of UNIX systems. RCS (Revision Control System) is freely available software, and would usually have to be installed locally. At Waterloo, we make extensive use of RCS, recording changes to system configuration files, source code, and recording the changes that we have made to localize software that we have installed from the Net. RCS is available from the directory <ftp://prep.ai.mit.edu/pub/gnu> – I have temporarily installed RCS in `~john/rcs` on `ccs.sut.ac.th`.
- A log book and paper copies of important information are also important system administration tools. A log book is very handy because you can carry it around easily, to meetings or to other buildings, and it's always available, even when the machines are down. Paper copies of important information can be vital when repairing a system that is not running. Examples of things that should be available offline are copies of "df" output, the `/etc/fstab` and `/etc/vfstab` files, disk partition information from the "format" command, etc.
- Mailing lists are very useful in keeping people up to date on important changes. The most common type of mailing list is a system alias including all members of the system support group. This makes it easy to let everyone know about important changes or problems, as they occur. You may wish to have a mailing list for the users of a system, but such mailing lists can easily get too large to be useful.
- Local USENET newsgroups are very useful for recording changes. They are similar to mailing lists, but are less immediate and reach a (potentially) wider audience. This will be more difficult to implement at SUT since there is not currently a news system running on campus. A less convenient alternative that you may wish to consider would be to record changes and notices in a web page (or pages) and make the information available that way.

Training and Assistance for System Administrators

UNIX system administration can be a task requiring large amounts of knowledge and experience, and it is important for a beginning system administrator (or an experienced one) to have appropriate training and resources available to them if they are to be able to do an effective job.

Many of the References and Resources listed below will be helpful in providing training and assistance for the SUT UNIX system administration staff. Sun offers various Sun-specific training courses, and if Sun offers some of these courses in Bangkok, it might be worthwhile for SUT staff to attend. USENIX is one of the best opportunities for system administration training and publications – I have included information about USENIX below.

The USENET newsgroups are a wonderful resource for system administrators – it's possible to get an answer to almost any question, and often within just a few hours. And reading a few newsgroups is a wonderful way to learn more about systems, through reading about other people's experiences. SUT should determine whether it's possible to read news from a server in Bangkok – this will be much easier than trying to arrange and maintain a local news server at SUT (in the short term at least).

PC Networking and Integration

We believe that it is important for PC and UNIX systems to be integrated with each other. At

Waterloo, we are addressing this issue in the following ways:

- All PC networking will be based on the Microsoft protocols for file and print sharing, using TCP/IP as the transport protocol. We believe that NetBEUI is unsuited to networks larger than a few machines.
- We are using the freely available Samba software to allow our UNIX machines to talk Microsoft protocols, and so participate in file and print service. At SUT, this would allow the use of PC printers from UNIX machines, and would allow file service between PC's and UNIX machines.
- When a PC-based file server is appropriate, we are standardizing on Windows NT servers. The NT servers can be TCP/IP based, support lpr-based print service, and work with no additional software required on the PC's.

I would recommend that SUT investigate the Samba software to aid in integrating its PC and UNIX systems. I have included a reference to Samba below. I will attempt to put together a small experiment with Samba while I am at SUT.

Useful Software and Tools

There are many freely available tools and software packages that are useful for UNIX and network administration. I will mention a few here, and will make references to these programs available to you.

- Perl is a very useful language that is a cross between C, awk, sed, and the shells, that provides easy prototyping and is very powerful. Many system administration tools are written in Perl
- TCP wrapper is a program that helps control and log access to network services. It is useful for implementing certain security rules, and may be useful on those machines that you wish to control a little more tightly.
- rdist is a command that is used to ensure that files are consistent across sets of machines. It can be used to distribute software packages to different machines, or to ensure that configuration files (/etc/resolv.conf for example) are consistent across multiple machines. rdist is included with most UNIX systems. There is a newer version available with more features, but the stock rdist is likely sufficient for SUT's immediate needs.
- The CMU bootp server software with DHCP modifications will allow SUT to automatically configure PC networking parameters. I believe that Roger Watt will discuss this in more detail.
- The CMU SNMP tools are very useful for network monitoring, and I believe that Roger will also cover the use of tools like this.

Miscellaneous

Many documents from the internet come only in Postscript form, and it will be useful for SUT staff to be able to print Postscript documents. I was unable to identify a Postscript capable printer. There are 2 basic approaches that you can take:

- Buy a new Postscript printer, or upgrade an existing printer to add Postscript. In particular, it may be possible to add Postscript to the HP5si printer that you already have in the main office area (thereby converting it to an HP5si MX).
- Install the ghostscript software (available I believe from the GNU software archive) which is a Postscript interpreter and can, among other things, convert Postscript to HP's PCL.

The first option (a Postscript capable printer) will be the most reliable and convenient.

References and Resources

The following references may be useful

- UNIX System Administration by Nemeth et al
- O'Reilly Associates publishes a large number of books related to UNIX systems, and most of them are quite good. The books tend to be practical guides that can be put to use immediately. The O'Reilly catalog is available at <http://www.ora.com>.
- The newsgroups comp.unix.admin, comp.unix.sun, comp.unix.solaris (I think those are the groups I find most useful – I have to check the names).
- The USENIX Association home page <http://www.usenix.org> contains a lot of information about conferences, publications, and references to papers. You may wish to join USENIX, which will provide you with a subscription to the bi-monthly newsletter "login:" which contains a lot of information and tips for UNIX system administrators.
- USENIX also holds a number of conferences during the year, the most useful of which would likely be the LISA System Administration conference. The 1996 conference will be held in Chicago, USA in September, and will include a number of tutorials that SUT staff may find very useful. If SUT is unable to send someone to the conference, it would probably be worthwhile to obtain a copy of the conference proceedings, which will likely contain a number of papers that will be of use to SUT staff. More information about the conferences is available through <http://www.usenix.org>.
- The "UNIX Guru Universe" web site, containing links to lots of things that are useful to the UNIX system administrator, is at <http://www.polaris.net/ugu>.
- The GNU software archive at <ftp://prep.ai.mit.edu/pub/gnu> which includes things like gcc, rcs, and so on. The GNU project creates a large amount of software for UNIX systems, most of it quite good. Some of it is replacements for stock UNIX software, and some is useful additions. One of the most well-known is the GNU emacs editor, which can be very highly customized into an complete working environment – it may, however, be best left to the "experts".
- I made a presentation at the 26th Ontario Universities Computing Conference in late May, identifying some of the things that we are doing at Waterloo to make our administrative networks

more secure. My presentation is available at <http://www.adm.uwaterloo.ca/~jmseller/Papers/towards> in various formats.

- SunWorld Online magazine, at <http://www.sun.com/sunworldonline>, is a monthly online magazine that contains a lot of information that is useful to a Sun system administrator.
- **Sun Performance and Tuning**, mentioned above.
- The Samba software for provided PC-style networking on UNIX hosts is available at <ftp://nimbus.anu.edu.au/pub/tiidge/samba> and a web page is available at <http://lake.canberra.edu.au/pub/samba/samba.html> and includes documentation and information about Samba.

Date: Friday June 14, 1996
From: Roger Watt
Associate Director, Distributed Computing
University of Waterloo
To: Dr. Weerapong Pairsuwan
Director, Centre for Computer Services
Suranaree University of Technology
Subject: Recommendations

Questions about issues in this report should be sent by email to
rwwatt@uwaterloo.ca

PART ONE IMMEDIATE-TERM CONSIDERATIONS

1.1 Administration of the IP Address Space

A strict administrative record-keeping "standard operating procedure" must be imposed on the IP address space, using SUT's Domain Name System database as the official record of the network. There are currently only a few dozen computers registered in the DNS database. There are no DNS records for the additional machines that have been assigned (or are using, without CCS authority?) an IP address, and this condition will lead to disaster.

The standard operating procedure should be that a device must not be connected to a cabling system until that device has been assigned a "host" name and an IP address by CCS personnel, and the name and address have been entered into the DNS database, and that they are now visible via mechanisms such as the "nslookup" command. For a device with multiple IP interfaces, such as a router, every IP address assigned to the device should be registered in the DNS. Also, every IP subnet should be assigned a name and be registered in the DNS database.

A naming scheme should be devised for the network-equipment IP devices (routers, network-management modules in the Ethernet/UTP repeaters), plus the network and its subnets. The name of each device and each subnet should reflect what it is and where it is or what it services (for example, by using building and floor codes). For example,

203.158.4.16	= net-campus.sut.ac.th
203.158.4.19	= router-W.sut.ac.th
	(same for its other interfaces)
203.158.5.32	= net-W-1a.sut.ac.th
203.158.5.64	= net-W-1b.sut.ac.th
	...

The DNS "HINFO" and "TXT" record types can be used to publish additional information about the DNS entry. HINFO's purpose is to record information about hardware and software. TXT's purpose is to record arbitrary comments; multiple TXT records per device could be used to record date-last-modified and who-to-contact information.

Also, the IP-topology map for the campus must up to date at all times.

Planning For and Making Changes

Any change to the IP network requires a change to the corresponding DNS entry or entries (such as the name or address of a device). Any such change must be planned far enough in advance of the default TTL (time to live) value such that the TTL value for the device can be set to a lower value (from days to hours, and then from hours to minutes) before the change, so that the rest of the world will detect the change in a timely fashion.

Also, making a change must involve updating the map as well as the DNS.

1.3 Network Connectivity and Utilization Monitoring

A program that provides real-time information about the current state of the network is required. It must have more features than the PC-based "WS-watch" currently in use. The program must have an "auto discovery" mode that uses SNMP to determine the topology of the network, rather than depending on information provided by a human. The program must also show current traffic levels on the links between the devices that it has discovered, and provide a mechanism for logging such data to an external file for post-processing analysis and reporting.

There are two approaches to such a program. The "complexity" approach involves a large "industrial strength" network monitoring program such as Cabletron's "Spectrum", HP's "OpenView", or Bay's "Optivity" (which I understand SUT has but is not currently using). Such programs provide a vast range of features, but they do so at the considerable expense of requiring CCS Unix-support staff to learn, install, configure, and use. The "simplicity" approach involves a program such as "InterMapper" from Dartmouth College in the US. InterMapper runs on an Apple Macintosh. We use it at the University of Waterloo to monitor the campus network, and I recommend it most highly; it is available from <http://www.dartmouth.edu>, and installs over the Internet. It is currently free, but will soon cost several hundred US dollars (for an academic institution). It is almost immediately "obvious" as to how to use it. There is also a PC program called "SNMPc" that is somewhat similar, but it does not have all of the same features as InterMapper, but it is much less complex than Optivity. (URL <http://crc.castlerock.com>)

1.4 Network Utilization Data Collection and Reporting

Some basic information about the loading of the critical components of the IP network must be maintained so that projections can be made that will identify "future requirements" long before they become "current problems". There are three traffic loads that must be measured ... response across the external connection, traffic through the backbone router ports, and traffic within each cabling system.

Response across the external connection can be measured by a PERL program that issues a "ping" command to transmit ten 1024-byte packets and then record the transit times (min, average, max) and percent packet loss. This task can be run by "cron" from one of the backbone-connected Unix systems, automated by a control program that collects the data at intervals throughout the day, reduces the interval records to a single daily-averages record at the end of the day, reduces the daily-averages records to a single monthly-averages record at the end of the month, keeps the most recent 24 monthly-averages records, and performs linear and exponential projections for the next 12 months. I have copied software to

do this from UWaterloo and modified for SUT, as a model for the "interval, day, month" process, in research:/user/roger/software/linkspeed. It is currently running under control of a crontab entry.

Traffic though the backbone router ports can be collected, reduced, and reported using the same "interval, day, month, projection" methodology, again from a backbone-connected Unix machine. In this case, the interval program will need to invoke a program that can issue SNMP "GET" requests to each of the routers. I have copied software to do this from UWaterloo and modified it for SUT, in research:/user/roger/software/routerwalk. However, it requires "snmpwalk" software from Carnegie-Mellon University (available via FTP from cmu.edu) that does the SNMP communication.

Collecting data on the traffic within the cabling system that services an IP subnet requires the continuous presence of an "agent" device that supports the SNMP "RMON" MIB. Such devices are expensive (several thousand dollars US, each). However, the network-management module of the Bay Networks "SynOptics 2813SA" Ethernet/UTP hub contains a Data Collection Module (DCM) that implements all nine groups of the RMON specification.

The daily and monthly reports from all three types of collection should be published in a "campus networks" section of the SUT webspace so that all interested parties within the university can stay abreast of the "health" of the network.

1.5 Labelling of all Cabling Runs

Every fibre and UTP connection should have a label on the cabling that identifies the device it connects to and the device at the other end of the connection. Otherwise, if two connections are unplugged at the same time (for maintenance work), it is too easy to make a mistake and plug the wrong cable into the wrong port when reconnecting them.

PART TWO SHORT-TERM CONSIDERATIONS

2.1 Dynamic IP Configuration of Computing Systems

Every IP-connected computing system that COULD be configured to obtain its IP-configuration information (hostname, IP address, subnet mask, address of default route, etc) from a central network server SHOULD be configured to do so, rather than hardcoding that information in the computing system, so that making a change does not require that a person go to the machine.

Today, the means for doing this is a central "bootp" server. This requires a CCS Unix-support person to install and maintain the "bootp" server, and enter and maintain the data for each computing system, but the resulting simplicity will provide long-term payoff.

The industry is currently in the process of developing a much more functional mechanism, based on the "Dynamic Host Configuration Protocol" (DHCP). Some Unix-based DHCP server software exists, and vendors (such as Microsoft) are in the process of developing industrial-strength DHCP servers. Today's DHCP servers do not yet integrate adequately with the DNS, and I would advise a "wait and watch" approach for perhaps the next six to nine months before any acquisition. However, something should be done before the environment gets much bigger.

2.2 Connection to the Student Residences

The current 28.8Kbps modem link to the computers in the Student Residences is not sufficient to support any significant use. If a fibre link to the Ethernet cabling system within the Residences is not justifiable, then perhaps it will be possible to consider a spread-spectrum radio (SSR) link. This involves a matched pair of "remote Ethernet bridge" devices that communicate over a line-of-sight low-power low-frequency radio link, with a mast and antenna on the building at each end of the link. Several vendors make such equipment in CA and US. The product with which I am familiar is the ARLAN 640, made in Canada, which operates at 2Mbps, and costs CA\$7000 for the pair. (Sorapat has the URL for further information.)

2.3 External Connection

The external 64Kbps connections from SUT to Bangkok and beyond via satellite introduces packet-latency delays that make effective real-time interaction unworkable, and I strongly recommend you replace them with a single higher-speed land-based line to Bangkok as soon as funds permit.

From examining the documentation for release 8 of the Wellfleet router software, I found Wellfleet's solution to the "alternate default routes" problem. It requires a two-step "traffic filter" on the router that has the two satellite links. The router must examine every packet that arrives from the FDDI ring, first to ensure that traffic destined for local interfaces is delivered there, and second to decide which of the remaining (ie, off-campus) traffic is to try which of the two satellite links as its first choice. In testing, we discovered two problems that I believe are "bugs" in Wellfleet's code.

The version of software currently running in the routers is almost two years old, and should be upgraded to Wellfleet's current version as soon as possible. Bay Networks has most certainly found and fixed numerous bugs in the last two years; the problem we encountered may be among them. The Bay Networks representative in Bangkok is pursuing the matter with central technical-support personnel at this time.

2.4 Cabling-System Security in Student Areas

A number of vendors make a version of Ethernet/UTP repeater (hub) in which a port can be configured to talk only to a specific Ethernet address, and also not to send an Ethernet frame out a port other than the one to which the destination device is connected without first destroying the data portion of that frame. This creates an environment in which it is possible for students to attempt to install "sniffer" software on a connected PC, or to disconnect the PC and connect a machine of their own.

At UWaterloo, we no longer install hubs without these features. We have tried several vendors' products and are currently using hubs from ATI for this purpose, because SynOptics did not have them at the time we needed them. I do not know if SynOptics now has such hubs.

2.5 Campus Newsgroups

The "network newsgroups" features now common in web-browser software such as Netscape provide an excellent opportunity to establish a central NNTP network-newsgroups server for use within SUT (it is not necessary

For example, a set of "th.ac.sut.*" newsgroups would provide a mechanism for SUT students, faculty, and staff to voice concerns and discuss issues in a campus-wide open electronic forum.

Doing this will require obtaining and installing news-server software on one of the central Unix machines. The software currently in use at most places for this is called "INN" (Internet Network News). I did not have time to track down a reference, but will do so when I return to UWaterloo.

PART THREE LONGER-TERM CONSIDERATIONS .

3.1 Transmission Layer

The design of the transmission system that supports SUT's two-level campus IP network is excellent.

The level-one IP network is serviced by an FDDI-transmission fibre cabling system between buildings that contains the "building point-of-presence" IP routers plus the critical network-server computing systems. Each level-two IP network is serviced by an Ethernet-transmission Category 5 UTP cabling system that connects office/lab computers back to the workgroup's "floor point-of-presence" wiring centre containing an Ethernet/UTP repeater that is connected by fibre back to the building's router.

The use of fibre and Category 5 UTP in this tiered and modular design enables future expansion as necessary. As the distributed-computing environment grows, a workgroup can acquire its own server(s) so that it is no longer dependent on central servers, and if transmission-loading conditions within the workgroup become too severe for shared 10Mbps Ethernet, the workgroup's Ethernet/UTP repeater can be replaced by a 10Mbps/100Mbps Ethernet switch. If transmission-loading conditions between a workgroup and the building router become too severe for 10Mbps Ethernet, that link can be upgraded to 100Mbps Ethernet. Similarly, if and when warranted, the Ethernet/FastEthernet transmission systems and the core FDDI transmission system can be upgraded to ATM (or, hopefully by then, Gigabit Ethernet will be a commercial reality and the complexities of ATM can be avoided).

I did not have time to determine whether Bay Networks has a FastEthernet interface for the models of Wellfleet routers that SUT is currently using.

3.2 Network Layer

The complexities of multiple aggregated Class-C network numbers and the related problems that the Internet is encountering with the growing size of routing tables could eventually lead to disaster for SUT. To date, the only possible solution to this appears to be the emerging field of "Network Address Translation" devices that would permit SUT to exist behind such a device in a private Class-B (or even Class-A) address space as set forth in RFC1597, "Address Assignment for Private Networks". Until such devices become a commercial "commodity", it will be some time before this becomes a move that SUT can consider.

3.3 A "Proxy Caching" Web Server for the Campus

"Some web-server software provides the ability to perform "proxy" and "caching" services for the web-browser clients. In this manner, the client's request to retrieve a document is sent to the proxy/caching server rather than the destination server. If the proxy/caching server does not currently have that document in its cache, it fetches it from the destination server, stores it in the cache, and then delivers it to the requesting client. Under certain circumstances, this can save considerably on the off-campus traffic consumption cause by webspace browsers.

NCSA's server, which SUT is currently using, does not provide this. However, both Netscape and Microsoft have commercial-strength server software that does this.

PART FOUR PROFESSIONAL DEVELOPMENT

There are a number of reference-materials sources that will be of significant benefit to the CCS staff involved in support of the campus network. (Some of these may already be in use.)

- books, such as:
O'Reilly Associates has many great books (<http://www.ora.com>)
- trade magazines, such as:
Network Computing (<http://www.cmp.com>)
Communications Week (<http://www.cmp.com>)
- network newsgroups, such as:
comp.dcom.sys.wellfleet
comp.dcom.net-management
comp.security.firewalls

The network newsgroups are invaluable ... they provide the ability to post a question or a request for advice that will be seen and responded to by experienced people throughout the world in less than 24 hours, and to learn from questions/responses on related topics. Unfortunately, one also gets responses from people who do not know what they are talking about, so it is always wise to wait and see if someone's response is rapidly criticized by other readers of the newsgroup, before taking action. I used this ability, from UW, several times this week in pursuit of the Wellfleet traffic-filter routing problem. CCS should attempt to obtain permission from the Internet Service Provider in Bangkok for CCS staff to use its NNTP newsfeeding machine (if it has one) as a remote newsreading/newsposting server, until such time as it is appropriate to obtain an actual newsfeed for SUT and begin importing some of the newsgroup structures.

- conferences sponsored by "user group" associations and by vendors
- (?) working groups of support staffs from the universities throughout Thailand, who meet regularly to discuss common problems and solutions

In closing, I wish to thank you VERY MUCH for inviting me to SUT for these past two weeks. It has been a fascinating experience, and I have enjoyed working with Sorapat and Prapat and Krit; you have every reason to be

proud of them.

Please, whenever there are questions or issues on which you would like comment from me, whether in the immediate future or beyond, I would welcome email from you and/or your staff.

Sincerely,

A handwritten signature in cursive script, reading "Roger Watt". The signature is written in dark ink on a white background.

1996 SUT-IUP APPLICANTS

No.	NAME	Intensive Course	
1.	Ms. Sunisa Sandhu	Chemistry	—
2.	Ms. Piyapa Wongla	—	—
3.	Mr. Mehedi Munsur Khan (Bangladesh)	Chemistry	Physics
4.	Ms. Patcharaporn Pongjaratphan	Chemistry	Physics
5.	Ms. Noppawan Motong	—	—
6.	Mr. Tanyawat Sanpote	—	—
7.	Ms. Ratchaporn Wisedrat	—	Physics
8.	Ms. Komchai Thaiying	—	Physics
9.	Mr. Arwut Arunsit	Chemistry	Physics
10.	Ms. Thanida Pinsiri	—	Physics
11.	Mr. Gal Smanmoo	Chemistry	Physics
12.	Mr. Patchara Piloug	—	—
13.	Ms. Yada Sawangkokkhruad	Chemistry	Physics
14.	Ms. Duan Intarakumhaeng	—	Physics
15.	Mr. Tharapong Singto	Chemistry	Physics
16.	Mr. Jackapong Khamraksa	—	Physics
17.	Mr. Sathit Wajeeprasae	—	Physics
18.	Ms. Wajee Teswanich	—	—
19.	Ms. Sudaporn Locket	—	Physics
20.	Ms. Pitanan Datsawana	—	Physics
21.	Mr. Prapoosak Talerngsri	—	Physics
22.	Mr. Jesada Sinsiripong	—	—
23.	Ms. Kantima Dara-in	—	—
24.	Ms. Al-U-Ma Virikun	—	—
25.	Mr. Tawan Gunatilaka	Chemistry	Physics
26.	Ms. Sirinapa Yuangyai	—	Physics
27.	Ms. Supichaya Kitrunroj	Chemistry	Physics

28.	Ms. Napan Kitpanit	—	Physics
29.	Mr. Nawanon Kochawat	Chemistry	Physics
30.	Ms. Thawadee Leelatjaroen	Chemistry	Physics
31.	Mr. Tanawit Nirundorn	Chemistry	Physics
32.	Mr. Karuna Thanapongsothorn	—	—
33.	Mr. Ronnachai Triratanaprapuntha	Chemistry	—
34.	Ms. Kawintra Chongsuksantikul	—	—
35.	Mr. Aunnop Hongthong	—	—
36.	Mr. Kavee Stithongkul	—	—
37.	Mr. Krisada Paldool	—	Physics
38.	Ms. Wanitchaya Wongwattana	—	Physics
39.	Ms. Euai Chantarasombat	Chemistry	Physics
40.	Ms. Natawan Wannatrong	Chemistry	Physics
41.	Ms. Pilaiwan Rasanon	—	—
42.	Mr. Pawee Lorsuwannarat	Chemistry	Physics
43.	Mr. Avirut Kat Kaew	Chemistry	Physics
44.	Mr. Peetaya Raksaboldej	Chemistry	Physics
45.	Mr. Weerasak Pattarasiripanya	—	Physics
46.	Mr. Sudkhet Satthamnuwong	Chemistry	—
47.	Mr. Panit Prinyanusorn	—	Physics
48.	Ms. Kritsadaporn Komkong	Chemistry	Physics
49.	Mr. Surayut Pinyomit	Chemistry	Physics
50.	Mr. Damrong Sudta	—	—
51.	Mr. Suwatchai Phasuk	Chemistry	Physics
52.	Mr. Nuttawit Konjing	Chemistry	Physics
53.	Mr. Namruthep Cherdchai	Chemistry	Physics
54.	Mr. Prin Sae-Hor	Chemistry	Physics



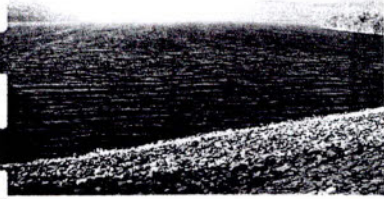
Sixth Anniversary
Suranaree University of Technology
(SUT)

International Seminar Workshop

*" Advances in Water Resources
Management
and
Wastewater Treatment Technologies "*

Surasammanakhan Hall
Suranaree University of Technology
Nakhon Ratchasima, Thailand

22-25 July 1996



In pursuance of the mission of Suranaree University of Technology (SUT) of providing academic services to the public and various units, both government and private, the Center for International Affairs (CIA) is launching its series of International Seminars, Conferences and Workshops aimed to provide continuing education opportunities to the general public, specially the engineers, scientists, entrepreneurs, and managers.

With the collaboration of the Canadian Universities of Technology Consortium (CUTC), specially the Technical University of Nova Scotia, and partial financial assistance of the Canadian International Development Agency (CIDA), SUT is organizing an international seminar - workshop on **"Advances in Water Resources Management and Wastewater Treatment Technologies"** on 22-25 July 1996.

Freshwater, either as surface or ground water, is a vital renewable community resource that is limited in amount and is subject to conflicting and ever increasing demand. An equitable distribution for domestic, industrial, agricultural and recreational uses is not always easy to attain.

Proper water resources management which involves both quality and quantity assurance is a complex and enormous task requiring integrated activities of many sectors of the community and various government agencies. It involves different activities from provision of high quality potable water supply for domestic consumption to management of dams and reservoirs for agricultural and energy generation purposes, control of canals and drainage systems to prevent floods and conserve rain water, protection of ground water from salt water intrusion and seepage of wastes to even forest conservation.

Although there are usually local, national and regional water authorities, the integrated water resource management is a concern of many institutions and agencies. Data must be collected and analysed, researches undertaken, policies formulated, resources managed and wastewater treated. All these activities and many more would require corresponding trained manpower, a management information system and efficiently functioning organizational structure.

Equally important is the issue of wastewater management. Sewage and industrial waste effluents must not pollute the aquatic ecosystems which are usually used as discharge points of these wastes. Technologies must be developed and applied so that polluting properties of wastewater could be minimized if not completely removed. It is through these recovery and treatment processes that sufficient quantity and good quality water can be assured.



Program 3: University-Industry Linkage Program

A3.21: Technical Services to Develop Guidelines and Framework for Joint Industrial Training Seminars in Thailand

This assignment is expected to take place during the first two weeks of October 96 by Mr. R. Eagle from TUNS. Plans will be discussed at that time to consider the implementation of another industrial workshop/seminar during July 97. Topics related to agroindustry and industrial safety and health, were proposed, among others.

A3.22: Technical Service by Five Canadian Consultant to Provide Training Seminars in Thailand

Plans and preparations for two seminars, involving five Canadian consultants are presently well advanced. These two seminars will take place in July 96, involving:

- seminar on university-industry technology transfer and collaboration
- workshop on water resource management and waste water treatment

A3.31: Technical Service by Canadian Consultant to Monitor/Supervise Co-op Students

This project activity was just concluded this month through the visit of Ann-Mary Colin from TUNS. She visited the co-op students on site, discussed their placements with them and their employers and considered future placement plans as already reported above.

Thus all activities under Program 3 will be fully completed by October 96, satisfying all of the approved project deliverables in this area.

Program 4: Project Management

A4.32: PRC Meetings in Canada

Plans were confirmed regarding the third PRC meeting, which will take place at the University of Waterloo on September 26 and 27, 1996. It is expected that the fourth PRC meeting will also take place in Canada, in late March or early April 97 at TUNS.

The above review clearly indicates that all of the project deliverables under Programs 1 and 3 are either fully achieved or well underway for completion by the Fall of 1996. The following presents the plans discussed at this Mini-PRC meeting for the implementation of Program 2 activities. Further, the possibilities for extending Program 3 industrial seminar activities are also examined.

MAJOR TOPICS

- Integrated Water Resources Management
- Environmental Impact Assessment used in Water Related Developments including Industrial Environmental auditing Techniques
- Urban Development : Impact on Water and Wastewater Treatment Needs
- Advances in Wastewater Treatment Technologies
- Water Use / Development Policies & Regulations
- Aquatic Ecosystems Management, including Impact of Industry

TENTATIVE PROGRAM

The tentative program would include :

- 21 July : Arrival and Registration of Participants
- 22 July : Opening Ceremony
 - a.m. - Presentation of Keynote Address
 - p.m. - Plenary Session
 - Presentation of major Papers
- 23 July : Concurrent Round Table
 - Discussions and WORKSHOPS
- 24 July : Field Trip
- 25 July : a.m.-Presentation of Results of Round Table Discussions
 - Closing Ceremonies

REGISTRATION FEE

US \$ 250

(inclusive of 4 nights of twin sharing accommodation & all meals)

Single room occupancy at slightly higher price is for an additional US\$ 100.

PRE - REGISTRATION FORM

Title.....Name.....

Agency : Name.....

Address.....

Fax:Tel.....E-mail.....

Please check and fill the blanks.

I will ☐ / will not ☐ present a paper or poster

Title.....

I am willing ☐ / not willing ☐ to share Hotel Room : Single room : Additional US\$ 100

I will arrive in Korat on.....(date) at.....(time)

by ☐ Plane ☐ Bus ☐ Train ☐ Private Car

I will ☐ / will not ☐ stay on for the International Colloquium on Science Park (25 July.)

Participants of the Seminar who want to attend the Colloquium will be required to pay an additional fee of US\$ 100.



Sixth Anniversary
Suranaree University of Technology (SUT)

International Colloquium
" Science Park for Meeting Technological
Challenges of the 21st Century "

Saranithed Conference Room
Suranaree University of Technology
Nakhon Ratchasima, Thailand

26 July 1996



INTERNATIONAL COLLOQUIUM ON SCIENCE PARK FOR MEETING TECHNOLOGICAL CHALLENGES OF THE 21ST CENTURY

26 JULY 1996

PROGRAM

0730-0845
0900-0910

REGISTRATION
OPENING AND WELCOME REMARKS
Prof. Dr. Wichit Srisa-an, Rector

1200-1300

Lunch

0910-1000

KEYNOTE ADDRESS
*University/Industry Technology Transfer
A Process That Really Works!*
Dr. E (Ted) Rhodes,
President, Technical University of Nova Scotia

1315-1430

PANEL PRESENTATION (continued)
*Technology Transfer from Universities and
Research Centers to the Private Sector
: Case study: Quebec-Canada*
Dr. Michel Khalil,
University of Quebec at Rimouski
*Industry-University Linkage: INP de Toulouse's
experience*
Dr. Christophe Haunold,
Institut National Polytechnique, Toulouse.

1000-1015

Break

PANEL PRESENTATIONS

1430-1500

PAPER PRESENTATION

1015-1200

*British Experiences in Science Park Operation and
Management*
Mr. George Hunter,
Chief Executive Belasis Hall Technology Park
*The Science Park of Labège Innopole
: From High Tech. Development To Social Integration*
Dr. Alain Gares,
Director General SICOVAL Innopole-
Labège, Toulouse
*University / Industry Linkage in Thailand:
Critical Concept of Education Reform*
Dr. Peter Brimble, Brookers Co., Ltd. Bangkok
Dr. Chatri Sripaipan, Chulalongkorn University

1500

1515

TECHNOPOLIS: SUT SCIENCE PARK
Asst. Prof. Dr. Weerapun Sriboonlue
Vice Rector for Development,
Suranaree University of Technology

CLOSING REMARKS

Asst. Prof. Dr. Weerapun Sriboonlue
Vice Rector for Development,
Suranaree University of Technology

Coffee Break



Participation Fee : US\$ 200 or 5,000 ฿
(including registration fee, all meals and two nights stay at Surasammanakarn) Additional US\$ 50 will be charged for single room occupancy for 2 nights.



For Further Information

Please Contact
The Director
Center for International Affairs
Suranaree University of Technology
111 University Avenue
Nakhon Ratchasima 30000
Tel : (66-44) 216191-8 ext. 1155, 1156
FAX : (66-44) 216122
Email : cenintaf @ ccs.sut.ac.th

TARGET PARTICIPANTS

ACADEMIC

1. University administrators especially those in charged of Development Projects and Research
2. Deans and staff of
Faculty of Engineering
Faculty of Applied Science
Faculty of Business Management
3. AUAP Members

INDUSTRIES

1. National and International Industries-those in charged of Research and Development (R&D) and
2. Commercial Organizations/Chamber of Commerce
3. Private Enterprises / Entrepreneurs

GOVERNMENT AGENCIES

1. Ministry of Commerce
2. Ministry of Industry
3. Ministry of Science, Technology and Environment
4. Ministry of University Affairs
5. Industrial Estates

EMBASSIES AND INTERNATIONAL ORGANIZATIONS

1. ILO, ESCAP, APEC, ASEAN
2. Science and Commercial Attaches



"SCIENCE PARK FOR MEETING TECHNOLOGICAL CHALLENGES OF THE 21ST CENTURY"

6 th Anniversary
SURANAREE
UNIVERSITY
OF TECHNOLOGY
26-27 July 1996

INTERNATIONAL
COLLOQUIUM



ORGANIZED BY
SURANAREE UNIVERSITY
OF TECHNOLOGY
TECHNICAL UNIVERSITY
OF NOVA SCOTIA



SCIENCE PARK FOR MEETING TECHNOLOGICAL CHALLENGES OF THE 21ST CENTURY

WORLDTECH'95 Thailand has provided a showcase of the latest international advances in agriculture, industrial and environmental technologies. It gave a glimpse of present developments and future technologies that could be available for food security, sustainable economic progress through industrial technologies that maintain ecological balance and thus assures better quality of life, equitable economy and living in harmony with nature.

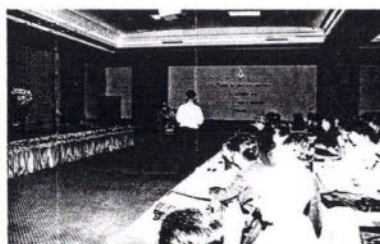
However, these will not happen without concerted and sustained efforts in Research and Development by universities, industries, business enterprises and government agencies as well as an informed and concerned general public. In answer to the challenges for technological needs of the next century and with the spirit of Worldtech'95 as guide, Suranaree University of Technology is converting some of the buildings and facilities of Worldtech'95 into **TECHNOPOLIS**, a Science Park for technology innovation and fine-tuning, technology transfer and exhibition.

Suranaree University of Technology has therefore chosen as the theme of an international colloquium to mark its 6th Founding Anniversary on 26-27 July 1996, **TECHNOPOLIS : SUT SCIENCE PARK FOR MEETING TECHNOLOGICAL CHALLENGES OF THE 21ST CENTURY**



The colloquium aims to provide a forum for representatives of universities, industries, business enterprises and relevant government agencies to :

- present comparative paradigms and experiences from America, Canada, Europe and Asia on Science Park operation and management ;
- discuss the various strategies and activities for better cooperation between universities & industries in technology innovation, fine-tuning, and dissemination;
- provide an opportunity for SUT to dialogue with representatives of industries in the northeast and eastern seaboard regions to determine areas of collaboration in the operation of Technopolis ; and
- develop a framework for the strategic and operational management of **TECHNOPOLIS**.



TENTATIVE PROGRAM

Keynote Address : Paradigms of Technology Transfer by the President of Technical University. of Nova Scotia, Canada. Panel Discussion on Paradigms of Science Park Operation and Management by Science Park Directors from :

Asia
America
Canada
France
United Kingdom

Round Table Discussions

For International Participants : Strategies for Industry-University Cooperation

For SUT and Thai Participants : Areas of concern or technological needs for the 21st century in Thailand specially the northeast and eastern seaboard regions ; role of **TECHNOPOLIS**

Closing Paper : Paradigm for SUT **TECHNOPOLIS** Operation and Management



SUT-CUTC Co-op Exchange Program

July 1996 - Update

Submitted by: Technical University of Nova Scotia

Thai Student Exchange

- Guelph has hired two Thai students for six months from June to December 1996.
- TUNS will be hiring two students for the Fall '96 work term.
- There are several other Thai students available for the Fall work term, dossiers can be obtained through the TUNS Co-op Office.

Canadian Student Exchange

- Four students from TUNS are currently working in Thailand, one in Bangkok, two in Khorat, and one in Lam Chabang. All four are working in industrial placement.
- Two students from TUNS are hoping to work in Thailand for the Fall '96 work term.
- Two students from Guelph have applied for jobs in Thailand for the Fall '96 work term.
- There have been no applications from students at Waterloo.

Report on Visit to Thailand by TUNS Co-op Director

I recently visited Thailand where I was very pleased to find that the four TUNS students working there, are having excellent work terms. They are getting excellent discipline-related experience at a variety of employers including: a golf and condominium resort, a tapioca flour factory, a steam boiler factory and an engineering consultancy (the largest in Thailand, with 400 employees).

The students have adapted very easily to the culture, the language, the weather and the different living and working conditions. All four students are giving English lessons to their co-workers in exchange for Thai lessons and have become very comfortable in their surroundings.

They will be excellent ambassadors of the exchange program when they return to Canada and it is our hope that they will encourage more people to participate in the program inspite of the economic difficulties of working abroad as a student.

Report on the SUT/CUTC Project Activities Mini-PRC Meeting June 11-13, 1996

*Participants: Representing SUT: Dr. Sam-arng Srinilta
Dr. Prasart Suebka
Dr. Ruben Umaly
Representing CUTC: Dr. Stalin Boctor (RPU)
Dr. Feridun Hamdullahpur (TUNS)*

I. Review of On-going Project Activities

Program 1: Development of Institutional Capacity

A1.31: Provision of Customized Training in Canada for SUT Academic Support Personnel

The training of two equipment centre technologist in electron microscopy at the University of Guelph was satisfactorily and successfully completed in April 96. The visit by the Director and the Program Officer of C.I.A. in September 96, to the CUTC partner universities, will complete the activities in this project deliverable.

A1.32: Provision of Technical Services to SUT by two Canadian Consultants to Develop SUT's Institutional Services in MIS and Computer Networks

Two consultants from the computer centre at the University of Waterloo are presently engaged in this activity at SUT. Their tasks will be completed by June 14, 1996. This project deliverable will thus be completed.

Program 1 will therefore be fully implemented by September 30, 1996. Any unspent funds in this program will be added to program 3 (see below).

Program 2: International Academic Program

A2.11, A2.12: Curriculum Implementation of the IUP

Status of the first batch of students: Of the eleven students who enrolled in the IUP mechanical engineering program in June 95, only four are academically "clear" with no course failures, and most likely to be considered for admission as second year students. Three options were explored.

Option 1: Four of the seven remaining students (two with GPA over 3.0, and two with GPA of about 2.5) will be eligible to apply for admission to second year mechanical engineering at the University of Waterloo or to first year of the three year part of mechanical engineering program at TUNS, provided that their TOEFL scores are acceptable (600 and 550 respectively). Academic transcripts for these students will be provided to Dr. Hamdullahpur and to Dr. Schneider for consideration. A

meeting with these students was held and their options was discussed. Arrangements will be made to run a trial TOEFL exam by their english instructor, Dr. David MacKay before the actual TOEFL exam is written.

The University of Waterloo, being the sponsoring university of the mechanical engineering program, and having a second year entrance possibility in January 97, will be consulted about this option when Dr. Schneider is at SUT in July 96.

Option 2: Those students who may not be admitted to CUTC universities due to academic language deficiencies, but are otherwise eligible for promotion to try second year of mechanical engineering at SUT may opt to transfer to the regular mechanical engineering program at SUT, or

Option 3: Discussions will take place between SUT and other Thai universities which offer International Undergraduate program in mechanical engineering to examine the transfer eligibility of those students. Options 2 and 3 above will be presented to SUT's senate for approval.

As planned, four teaching assignments by Canadian professors will be completed by September 96, consisting of: Prof. F. Juranka (1), Dr. D. MacKay (1), Dr. G. Schneider (2). Dr. Bector's present visit is part of the activities under A2.11.

A2.21, A2.22: Selection of Thai Supervisors and Ph.D. Students

Two Thai Ph.D. students are presently enrolled in postgraduate programs at TUNS. One (industrial engineering) started in October 95, and one (electrical engineering) will start in July 96. Dr. Hamdullahpur met the electrical engineering student and provided him with final letters to facilitate his visa requirements. He will arrive with his family in Canada on July 4, 96. His wife is also expecting to be admitted in the near future to Mt. St. Vincent University in Halifax to do her masters in nutrition.

Three other prospective Ph.D. students were available for a meeting with Dr. Hamdullahpur and Dr. Bector on Wednesday, June 12, 96. One candidate in civil/transportation engineering, and one candidate in computer science expressed strong interest to apply to and enrol in Ph.D. programs at TUNS by September 96 or at most by January 97. Some family commitments and personal considerations were discussed. Those two students will probably stay at TUNS for the duration of their Ph.D. programs and their wives are also expecting to do their Ph.D. degrees in Canada. The third candidate in chemical engineering is expected to start her Ph.D. program at TUNS by September 96. She will be co-supervised by professors at TUNS and SUT and will return to SUT to continue her Ph.D. research. Her flexible residency requirements and co-supervision in Canada and Thailand will be facilitated through the program (A2.23). A fourth Ph.D. candidate in food science is expected to apply to and enroll at Guelph University before December 96. Dr. Hamdullahpur's present visit is part of the activities under A2.21 and A4.33.

A2.25: Postdoctoral Research Fellowships

Flexible arrangements of this activity will allow for possible one-year fellowship duration instead of four months. One candidate, in environmental engineering is expected to apply for and start his research project at TUNS in September 96, and possibly stay for one-year, accompanying his wife (Ph.D. candidate in chemical engineering).

The other one (or two) candidates for the postdoctoral research fellowships are expected to apply, describing their proposed research programs by June 96, for consideration and placements at the CUTC partner universities.

Further consideration of this activity will be discussed during the upcoming PRC meeting in September 96.

A2.26, A2.27 (see below)

A2.3 Co-op Student Exchange Program

Currently, four Canadian students from TUNS are spending one term co-op placements in Thailand. They were placed in Thai industrial corporations through the assistance of SUT, and the support of the project. One of the four students may spend one additional co-op term in Thailand, continuing through Fall 96 as requested by his employer. Three-four similar placements of Canadian students are planned for May 97.

At present two Thai students, in food science, are placed at Guelph University. Their placements will be extended to six months instead of four. Each will therefore be considered as equivalent to 1.5 placement position and will be supported accordingly. Two similar placements are planned at Guelph University next June 97. Further, two Thai engineering students (mechanical and electrical) will be placed at TUNS during the Fall 96 for one co-op term each.

Thus, all eight co-op placements for the Canadian and the Thai students, supported by the project will be completed, satisfying the deliverables of this project activity.

The financial support provided by the project is to be considered as seed funding. The continuation of this co-op placement activity is expected beyond the termination of the project, i.e., after March 98. The Thai and Canadian organizations involved in such placements are then expected to contribute the full costs associated with these co-op placements.

Program 3: University-Industry Linkage Program

A3.21: Technical Services to Develop Guidelines and Framework for Joint Industrial Training Seminars in Thailand

This assignment is expected to take place during the first two weeks of October 96 by Mr. R. Eagle from TUNS. Plans will be discussed at that time to consider the implementation of another industrial workshop/seminar during July 97. Topics related to agroindustry and industrial safety and health, were proposed, among others.

A3.22: Technical Service by Five Canadian Consultant to Provide Training Seminars in Thailand

Plans and preparations for two seminars, involving five Canadian consultants are presently well advanced. These two seminars will take place in July 96, involving:

- seminar on university-industry technology transfer and collaboration
- workshop on water resource management and waste water treatment

A3.31: Technical Service by Canadian Consultant to Monitor/Supervise Co-op Students

This project activity was just concluded this month through the visit of Ann-Mary Colin from TUNS. She visited the co-op students on site, discussed their placements with them and their employers and considered future placement plans as already reported above.

Thus all activities under Program 3 will be fully completed by October 96, satisfying all of the approved project deliverables in this area.

Program 4: Project Management

A4.32: PRC Meetings in Canada

Plans were confirmed regarding the third PRC meeting, which will take place at the University of Waterloo on September 26 and 27, 1996. It is expected that the fourth PRC meeting will also take place in Canada, in late March or early April 97 at TUNS.

The above review clearly indicates that all of the project deliverables under Programs 1 and 3 are either fully achieved or well underway for completion by the Fall of 1996. The following presents the plans discussed at this Mini-PRC meeting for the implementation of Program 2 activities. Further, the possibilities for extending Program 3 industrial seminar activities are also examined.

II. Plans for Future Implementation of Approved Project Activities

Program 2: International Academic Programs

42.11, A2.12: Curriculum Implementation of the IUP

Based on the discussions conducted during the Mini-PRC, it is clear that SUT is fully committed to the continued implementation of the IUP. Dr. Tawit, from mechanical engineering, has been recently appointed as Director of the IUP. During the admissions cycle that has just been completed for the second batch of IUP students, 14 out of 54 applicants were admitted in the intensive ESL program. SUT has approved the implementation of the electrical engineering program, starting in September 96. The target of the promotional activities this year was focused on Thailand, with visits to over 20 high schools, and various advertisements. SUT will put stronger emphasis next year on targeting Malaysian, Indonesian, Taiwanese and South Korean students, among other countries in Southeast Asia. Admissions promotional material are urgently requested from the partner CUTC universities, in order to use these material during the upcoming IUP promotional activities.

Since the increase in student enrollment is not as fast as originally anticipated, SUT has decided to change the mode of the IUP delivery until appreciable expansion materializes. The academic program offered at SUT will concentrate on only the first-year of the IUP program, with support from the CUTC partner universities. The particular program offered during any given year will depend on the interest area expressed by the majority of applicants. The delivery of two or more IUP programs will depend on the number of students enrolled. After the students successfully complete year 1 at SUT, they will be offered second year admissions to the CUTC universities, provided they satisfy the agreed upon admission requirements (TOEFL > 550, CGPA > 2.7). The two other options discussed earlier will be available to the remaining students.

It was unanimously agreed that this mode of delivery offers the best chance for the continuation of the IUP in the near future. It is still expected that as SUT's reputation grows, and more students are recruited from other Southeast Asian countries, the full implementation of the IUP will take place on a sound academic and economic basis. The future continuation and sustainability of the IUP beyond the life of the project is now much more certain than was felt earlier.

Since the remaining IUP students in the first batch will be accommodated as discussed earlier, the proposed assignments for the second year mechanical engineering will be cancelled. The electrical engineering program of the IUP, which will be implemented in September 96 will probably have an enrollment of 12-14 students. After the successful completion of year 1 at SUT, about 4-6 students will be transferred to RPU in September 97, as discussed earlier. The 14 students enrolled in the second batch were visited by Dr. Hamdullahpur and Dr. Boctor on June 12, 96. Their transferability to the CUTC universities and the other options were also discussed with them.

Four assignments for CUTC professors to implement the electrical engineering program are planned for 1996/97, as follows:

1. Fundamentals electrical engineering and lab I, January 97
2. Electric circuits II and lab II, May 97
3. Applied science for electrical engineering, May 97
4. Engineering practice, ethics and technical communication and ESL III, May 97

In addition, two assignments for Dr. Goff and Dr. DeMann, from the University of Guelph's food science program were approved to help SUT develop and implement its undergraduate and graduate program in food technology. These assignments are expected to take place during the Fall of 97, i.e., September 97.

It was suggested and approved that four of the remaining six assignments be implemented during May-June 97, for 4-6 weeks duration, to help SUT in the formulation, planning and development of graduate program in engineering and applied science. These activities are expected to concentrate on chemical, mechanical, civil and electrical engineering, according to SUT's new five-year plan.

It was unanimously agreed that the planned academic assignments for the upcoming academic year provide positive proof of the successful Thai-Canadian collaboration in the area of international academic program's development. The newly approved assignments provide a new avenue for the sustainability of future collaboration in the area of postgraduate programming and research, beyond the life of the present project.

A2.21, A2.22, A2.23: Ph.D. Programs

As discussed earlier, it is expected that six Ph.D. candidates who are presently staff members at SUT (and their spouses), will be enrolled in Ph.D. programs at TUNS and the University of Guelph by January 97. The jointly supervised Ph.D. candidate in chemical engineering will require the full implementation of activity A2.23, as originally anticipated. Thus, the successful implementation of the Ph.D. programs will be fully achieved.

A2.25: Postdoctoral Research Fellowships

With the restructuring of this activity to provide the flexibility for one-year long assignments, together with one-term assignments, it is expected that at least 3 faculty members from SUT will take part in this activity, starting in September 96, and possibly continuing during 1997.

A2.26: Ph.D. Thai Advisors Visit

Two faculty members, one in electrical engineering (high voltage) and one in mechanical engineering

(energy, manufacturing) will visit relevant research facilities at the CUTC partner universities, starting September 7, 96. SUT will recommend and advise CUTC about the two visitors.

A2.26, A2.27: Collaboration and Co-supervision in Canada

It was felt that some of these remaining activities may not take place during the remaining project period. The upcoming PRC meeting will examine the possibility of using the remaining funds available in these activities to support:

- (a) additional postdoctoral fellowships (A2.25)
- (b) additional industrial seminar activities (A3.22)

Program 3: University-Industry Linkage program

A3.22: Technical Service by Canadian Consultants to provide Training Seminars in Thailand

It is expected that:

1. RPU President will provide a seminar in the area of University-Industry Linkage during the 1997 SUT's anniversary celebrations.
2. A workshop on either agroindustry or industrial safety and health, or other relevant topics be planned and delivered during July 97.

As discussed earlier, any remaining funds from Program 1 and activity A2.27 can be reallocated to support these additional Program 3 activities.

Submitted by:



Dr. S.A. Bactor

for Dr. F. Hamdullahpur

cc: SUT
University of Guelph
University of Waterloo
RPU
TUNS



Sixth Anniversary
Suranaree University of Technology
(SUT)

International Seminar Workshop

*" Advances in Water Resources
Management
and
Wastewater Treatment Technologies "*

Surasammanakhan Hall

Suranaree University of Technology

Nakhon Ratchasima, Thailand

22-25 July 1996



INTERNATIONAL SEMINAR WORKSHOP ON ADVANCES IN WATER RESOURCES MANAGEMENT AND WASTEWATER TREATMENT TECHNOLOGIES

22 -25 JULY, 1996

PROGRAM

22 July Monday

0830 - 0930 REGISTRATION

0930 -1000 OPENING CEREMONY

Welcome Remarks :

Prof. Dr. Wichit Srisa-an,
Rector, Suranaree University of Technology

Address :

H.E. Mr. Boonchoo Treethong,
Minister of University Affairs

1000 -1045 COFFEE BREAK

1045 -1200 KEYNOTE PAPER PRESENTATION

*Advances in Water Resources Management and
Wastewater Treatment Technologies*

by Mr. Pramote Maiklad,
Inspector General, Ministry of Agriculture and Cooperatives

Chair: Assoc. Prof. Dr. Sam-ang Srimita

Rapporteur:

Prof. Dr. Ruben C. Umaly

1200 - 1330 LUNCH BREAK

1330 - 1500 PLENARY SESSION I: INVITED PAPERS ON
WATER RESOURCES MANAGEMENT

Canada Experience

by Dr. Bruce Mitchell, Technical University of Nova Scotia

Thailand Experience

by Prof. Dr. Kasem Jankaew,
Faculty of Forestry, Kasetsart University

Chair: Mr. Manu Omakunt

Rapporteur:

Assoc. Prof. Dr. Chaiyot Tangsathitkulchai

1500 - 1530 COFFEE BREAK

1530 - 1700 PLENARY SESSION II: INVITED PAPERS ON
WATER USE AND DEVELOPMENT

Water Use and Development - Canada Experience

by Ms. Catriona Moir, Technical University of Nova Scotia

*Urban Development Impact on Water
and Wastewater Treatment Needs*

by Mr. Bichit Rattakul,
Governor, Bangkok Metropolitan Authority
Water Use / Development Policies and Regulations
by Ms. Chuanpit Dhamasiri,
Governor, Metropolitan Waterworks Authority,

Chair: Asst. Prof. Dr. Tavee Lertpanyavit

Rapporteur:

Asst. Prof. Dr. Sarawut Sujitjorn

1800

DINNER RECEPTION

23 July Tuesday

**0830 - 1000 PLENARY SESSION III: INVITED PAPERS
ON ENVIRONMENTAL IMPACT AUDITING**

***Environmental Impact Auditing Techniques:
Thailand Experience***

by Ms. Nipaporn Watcharasin,
Office of Environmental Policy and Planning
Quality Assurance and Environmental Auditing:

by Dr. John K. Underwood,
Technical University of Nova Scotia
Minimizing Environmental Impact
by Dr. William Hart, Technical University of Nova Scotia

Chair: Prof. Dr. Ronald Goforth

Rapporteur:

Assoc. Prof. Dr. Amnat Apichatvullop

1000 - 1030 COFFEE BREAK

**1030 - 1200 PLENARY SESSION IV: INVITED PAPERS ON
WASTEWATER TREATMENT TECHNOLOGIES**

***Wastewater Treatment Technologies:
Thailand Experience***

by Dr. Chongrak Polprasert,
Asian Institute of Technology
***Advances in Wastewater Treatment Technologies:
Canada Experience***

by Dr. Michel Khalil, University of Quebec at Rimouski

Chair: Prof. Dr. Ruben C. Umaly

Rapporteur:

Assoc. Prof. Dr. Vorapot Khompis

1200 - 1330 LUNCH BREAK

**1330 - 1500 PLENARY SESSION V: INVITED PAPERS ON USE
OF COMPUTER TOOLS FOR WATER MANAGEMENT**

Computer Tools for Water Management

by Dr. David Swayne, Department of Computing and
Information Science, University of Guelph
***Impact of Eutrophication and Other Degradation Processes
on Water Quality of Tropical Ecosystems***

by Dr. Jacques Moreau,
Institut National Polytechnique de Toulouse

Chair: Dr. Angelina Galang

Rapporteur:

Dr. Nathawut Thanee

1500 - 1530 COFFEE BREAK

**1530 - 1730 PLENARY SESSION VI: CONTRIBUTED PAPERS ON
WATER RESOURCES MANAGEMENT**

***Watershed Classification: Macro Land Use Planning for
Sustainable Development of Water Resources***

by Assoc. Prof. Nipon Tangtham,
Faculty of Forestry, Kasetsart University
***Impact of Various Land Uses on Water Quality at
Mae Klong Head Watershed Area, Kanchanaburi***

by Dr. Songtam Suksawang,
Royal Forestry Department
Kok River Diversion Schemes
by Dr. Chaitawat Saowapon,
Faculty of Engineering, Chiangmai University

Chair: Dr. David Swayne

Rapporteur:

Dr. Chongchln Polprasert

1900 DINNER

24 July Wednesday

FIELD TRIP

0730 ASSEMBLY AND DEPARTURE
0830 - 0930 JIM THOMPSON'S SILK FACTORY
1100 - 1400 LAM TAKONG RESERVOIR
LUNCH AT THE RESERVOIR
1430 - 1530 SEAGATE WASTE TREATMENT PLANT
1600 - 1700 DAN KWIAN CERAMICS
1730 - 1830 THAI HI-TECH HOUSE, SUT
1900 DINNER

25 July Thursday

**0830 - 1000 PLENARY SESSION VII: CONTRIBUTED PAPERS ON
WATER QUALITY ASSESSMENT**

*Application of Anthropological Assessment in Water
Resources Management*

by Luisa Umaly and Lucas Fernan,
Anthropological Association of the Philippines
Institute of Biology, University of The Philippines
Water Quality of Malabon River

by Dr. Annabelle Herrera,
Institute of Biology, University of the Philippines
*Wastewater in Navotas-Malabon River: Its Impact
on Milkfish (Chanos chanos)*

by Dr. Edna Amparado,
Institute of Biology, University of the Philippines

Chair : Dr. Jacques Moreau
Rapporteur :
Dr. Noppadol Kongritharoen

1000 - 1030 COFFEE BREAK

**1030 - 1200 PLENARY SESSION VIII: CONTRIBUTED PAPERS
ON WASTEWATER TREATMENT**

Wastewater Treatment in Huaxi

Mr. Zhang Chao,
Department of Chemistry, Guizhou University
Removal of Ca, Cr, Ni, Zn Ions by Amidoximated Cellulose

by Asst. Prof. Winai Somboon,
KMIT Thonburi

*The Treatment of the Scalp Industrial Wastewater Using Its
Solid Waste by Trickling Filter Method*

by Mrs. Endang Sriahayu,
Polytechnic ITB, Ciwaruga, Bandung, Indonesia

Possibility of Narrow-leaved Cattail for Wastewater Treatment

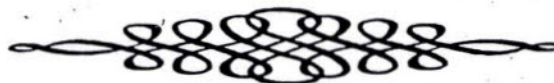
by Ms. Supaporn Junrungreang, et al.
Land Development Department

Chair : Dr. Michel Khalil
Rapporteur :
Dr. Narong Akkarapattanasoon

1200 CLOSING REMARKS

Prof. Dr. Wichit Srisa-an,
Rector, Suranaree University of Technology

1230 CLOSING LUNCH

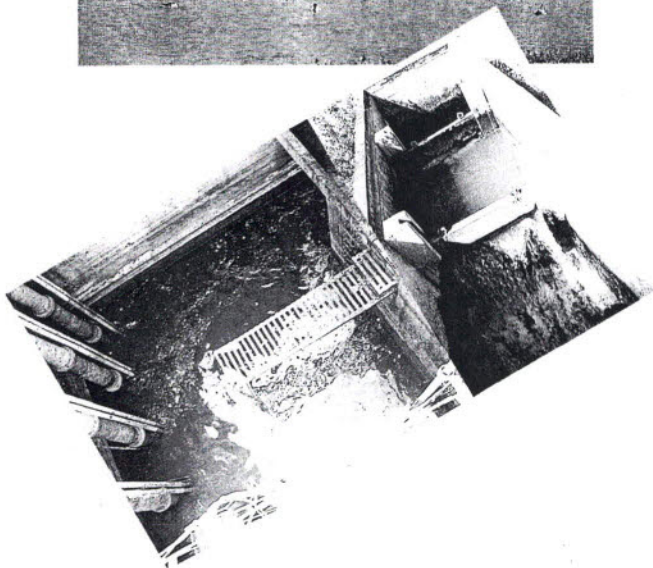
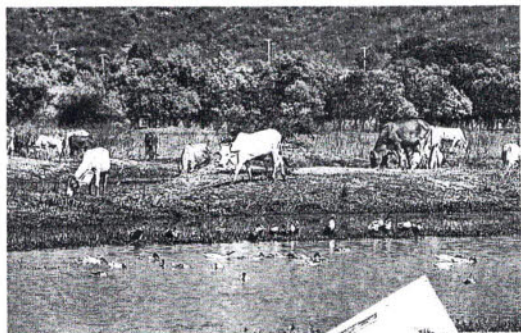


CALL FOR PAPERS AND POSTERS

During the seminar / workshop one day will be devoted to six concurrent Round Table Discussions on the major topics.



Invitations are being called for short (15 minutes) paper presentation. Deadline for submission of title is on 30 APRIL and abstract of accepted paper/poster on 1 JUNE. Text of complete paper / poster (or diskette) must be submitted on or before 28 JUNE 1996



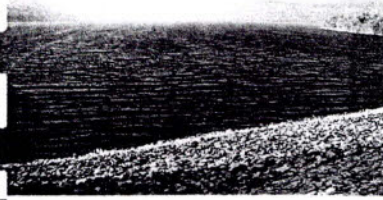
INTERNATIONAL

SEMINAR WORKSHOP
ON "ADVANCES IN
WATER RESOURCES
MANAGEMENT AND
WASTEWATER
TREATMENT
TECHNOLOGIES"
22-25 July 1996



6 th Anniversary
SURANAREE UNIVERSITY
OF TECHNOLOGY

ORGANIZED BY
SURANAREE UNIVERSITY OF TECHNOLOGY
TECHNICAL UNIVERSITY OF NOVA SCOTIA



In pursuance of the mission of Suranaree University of Technology (SUT) of providing academic services to the public and various units, both government and private, the Center for International Affairs (CIA) is launching its series of International Seminars, Conferences and Workshops aimed to provide continuing education opportunities to the general public, specially the engineers, scientists, entrepreneurs, and managers.

With the collaboration of the Canadian Universities of Technology Consortium (CUTC), specially the Technical University of Nova Scotia, and partial financial assistance of the Canadian International Development Agency (CIDA), SUT is organizing an international seminar - workshop on "Advances in Water Resources Management and Wastewater Treatment Technologies" on 22-25 July 1996.

Freshwater, either as surface or ground water, is a vital renewable community resource that is limited in amount and is subject to conflicting and ever increasing demand. An equitable distribution for domestic, industrial, agricultural and recreational uses is not always easy to attain.

Proper water resources management which involves both quality and quantity assurance is a complex and enormous task requiring integrated activities of many sectors of the community and various government agencies. It involves different activities from provision of high quality potable water supply for domestic consumption to management of dams and reservoirs for agricultural and energy generation purposes, control of canals and drainage systems to prevent floods and conserve rain water, protection of ground water from salt water intrusion and seepage of wastes to even forest conservation.

Although there are usually local, national and regional water authorities, the integrated water resource management is a concern of many institutions and agencies. Data must be collected and analysed, researches undertaken, policies formulated, resources managed and wastewater treated. All these activities and many more would require corresponding trained manpower, a management information system and efficiently functioning organizational structure.

Equally important is the issue of wastewater management. Sewage and industrial waste effluents must not pollute the aquatic ecosystems which are usually used as discharge points of these wastes. Technologies must be developed and applied so that polluting properties of wastewater could be minimized if not completely removed. It is through these recovery and treatment processes that sufficient quantity and good quality water can be assured.

