Study on the Social Needs and Supply of I.T. Engineers

I.T. STUDENTS

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PROFILE OF RESPONDENTS

A total of 129 students from 6 different schools were interviewed (Table 1.) The mean age of students was 20 years old (sd=1.4, range: 18-25 yrs). More than half of the students (56%) were female and none of them was married. Two-thirds of the students were enrolled in the degree of Bachelor of Science in Computer Science while one-fourth was enrolled in the Bachelor of Science in Computer Engineering (Table 2). Majority was on their 4th year level of schooling (Table 3)

Table 1. Distribution of Respondents by School

SCHOOL	NO. OF STUDENTS	PERCENT
ARELLANO UNIVERSITY	21	16.3
DE LA SALLE UNIVERSITY	20	15.5
EAST ASIA COLLEGE	20	15.5
PAMANTASAN NG LUNGSOD NG MAYNILA	24	18.6
POLYTECHNIC UNIVERSITY OF THE PHILIPPINES	22	17 1
TECHNOLOGICAL INSTITUTE OF THE PHILIPPINES	22	17.1
TOTAL	129	100

Table 2. Degree Courses Enrolled by the Students

COURSE	NO. OF STUDENTS	PERCENT
BS COMPUTER INFORMATION SYSTEMS	6	4.6
BS COMPUTER SCIENCE	83	64.3
BS COMPUTER ENGINEERING	30	23.3
BS ELECTRONICS AND COMMUNICATIONS ENGINEERING	10	7.8
TOTAL	129	100

Table 3. Year Level Status of the Respondents

YEAR LEVEL	NO. OF STUDENTS	PERCENT
3RD	32	24.8
4TH	81	62.8
5TH	16	12.4
TOTAL	129	100

OPINIONS OF STUDENTS REGARDING THE ESTABLISHMENT OF U.P. I.T. TRAINING AND EDUCATION CENTER (UPTEC)

Quality education is a major concern for students. With the establishment of an education and recruitment center by a State University such as University of the Philippines, students, I.T. professionals and other interested individuals will be provided with an opportunity for quality I.T. training at an affordable and lower cost. UPTEC is believed to complement what has been offered by the I.T. institutions present today.

The students strongly agree in the establishment of the UPTEC because the training will improve their skills, upgrade their knowledge on I.T. and improve the I.T. education, in general. The survey in fact has introduced new I.T. concepts to respondents that created their desire to know more about I.T. They think that the I.T. fields of interests which are not included in the school curriculum and the applications and solutions to technology that are not available in school will be made available to them at UPTEC. The UPTEC training will provide more hands-on-training and on-the-job training and exposure to latest information technologies. They believe that the Center will have enough resources and will be equipped with the facilities needed for the training of an I.T. professional. UPTEC faculties are carefully chosen and are experts in the I.T. field. It is desirable if scholarships will be made available for students who have I.T. inclination but are financially incapable.

UPTEC will provide a world-class training that will produce I.T professionals and experts who can globally compete in the increasing I.T. market. The standard of intelligence of strong willed, intelligent Filipino I.T. students would be uplifted paving the way towards brighter chances of employment locally and abroad. The Center, to be sponsored by Japan which is known for their highly advanced technologies, will be a medium of transference of skills and technologies, that will empower the country's human resources and technologies to compete with India and even with other developed countries.

Upon its establishment, UPTEC should evaluate the curriculum it will offer and assess whether the needs of students in terms of desired knowledge and skills are addressed

.   The establishment of UPTEC will help boost the I.T. industry in the country, resulting to an increase in the number of highly skilled I.T. individuals and the creation of more job opportunities, not only for the I.T. professionals but also for the young I.T. students who would be leaving their universities and will be entering the world of I.T. business With this, skills and technology advancement will likely lead to our country's development and improved economic situation.

Establishment of UPTEC will also create an atmosphere that will encourage schools offering I.T. education to produce high quality graduates.

Nevertheless, students are concerned about the country's present technology not being able to cope and being far behind when compared with other highly developed countries.

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Lastly, it is interesting to note that the students appreciated the concern about the social needs and supply of I.T. engineers in the country.

Tables 4 to 7 describe the present skills of students on Application, System Development and Programming, Networking Solution and Telecommunication and Electronics Engineering.

The Application skill that was mostly present among the students was the Office Application Macro Programming by VBA (83.7%)   About half of the students have skill on Computer Graphics, Multimedia Contents Creation and Game Contents Creation. The skill levels on Office Application of almost two-thirds of students were at the user and primary levels.   Few students were highly skilled (7%) and one-third of students were in the middle level. For those who have the other skills, students were usually at the user and primary levels (Table 4).

Table 4. Application Skills of Students (n=129)

Skill	Students with skill No. (%)	Skill level			
		High level No. (%)	Middle level No (%)	Primary level No. (%)	User level No. (%)
Computer Graphics/3DCG Editor Operation (e.g. for film industry)	66 (51.2)		1 (1.5)	27 (40.9)	38 (57.6)
CADAM/CATIA Operation for Electronics and Mechanical Industry	38 (29.5)		1 (2.6)	11 (29.0)	26 (68.4)
Multimedia Contents Creation (e.g for e-learning)	56 (43.4)		7 (12.5)	20 (35.7)	29 (51.8)
Game Contents Creation (PlayStation, Xbox and Windows platform)	61 (47.3)	1 (1.6)	10 (16.4)	19 (31.2)	31 (50.8)
Office Application Macro Programming by VBA (Word, Excel)	108 (83.7)	8 (7.4)	34 (31.5)	41 (38.0)	25 (23.2)
Others VB5; Other Computer Graphics	1 (0.8)				1 (100.0)

Sixty percent or more have skills on 6 out of 12 System Development and Programming skills (Table 5).   These skills are as follows: Visual Basic Programming (Windows Application) (76.7%), C++ Programming (Multi platform) (89.2%), JAVA Programming (Multi platform) (65.1%), Internet Application Design (HTML/XML, CGI cording by perl) (76.7%), Application System Design (Windows base) (64.3%) and Database Design (RDB, SQL3, DBMA) (59.7%)   Their skill levels however were mostly at the user and primary levels.

Not many students have skills on Enterprise and Banking System Maintenance (MVS, OS/390, z/OS) (21.7%) and GUI (graphical user interface) design by Japanese language (12.4%)   The skill level of majority of these students was at the user level.

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Table 5. System Development and Programming Skills of Students (n=129)

Skill	Students with skill No. (%)	Skill level High level No. (%)	Middle level No. (%)	Primary level No. (%)	User level No (%)
Visual Basic Programming (Windows Application)	99 (76.7)	1 (1.0)	23 (23.2)	42 (42.4)	33 (33.3)
C++ Programming (Multi platform)	115 (89.2)		21 (18.3)	56 (48.7)	38 (33.0)
JAVA Programming (Multi platform)	84 (65.1)	1 (1.2)	11 (13.1)	30 (35.7)	42 (50.0)
Internet Application Design (HTML/XML, CGI cording by perl)	99 (76.7)		13 (13.1)	49 (49.5)	37 (37.4)
Application System Design (Windows base)	83 (64.3)		7 (8.4)	48 (57.8)	28 (33.8)
Application System Design (Unix, Linux base)	47 (36.4)		7 (14.9)	12 (25.5)	28 (59 6)
Database Design (RDB, SQL3, DBMA)	77 (59.7)	1 (1.3)	8 (10 4)	36 (46.8)	32 (41.6)
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	28 (21.7)		2 (7.1)	5 (17.9)	21 (75.0)
Project Management/ System Consultation	54 (41.9)		8 (14.8)	20 (37.0)	26 (48 2)
Firmware or micro-code cording by Assembly	48 (37.2)	1 (2.1)	5 (10.4)	16 (33.3)	26 (54 2)
GUI (graphical user interface) design by Japanese language	16 (12.4)		2 (12 5)	4 (25.0)	10 (62 5)
Others	2 (1.6)				2 (100 0)

A high proportion of students has the skill on LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology (70%) (Table 6). Skills on Internet Protocol Technology (IPv6)/ Application (e.g. VoIP) (53.5%) and Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology (56.6%) were present in only a little more than half of the students. About one-third to one-half of the students has other networking and telecommunication skills. Similar to the other skills category, students were mostly at the user and primary levels and very few were highly skilled.

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Table 6. Networking Solution and Telecommunication Skills of Students (n=129)

Skill	Students with skill No. (%)	Skill level			
		High level No. (%)	Middle level No. (%)	Primary level No. (%)	User level No (%)
Groupware Application Design (e.g. Lotus Notes)	45 (34.9)	1 (2.2)	1 (2.2)	9 (20.0)	34 (75.6)
Client Server System Design	56 (43.4)		6 (10.7)	26 (46.4)	24 (42.9)
Web/Mail/DNS Server Design	50 (38.8)	1 (2.0)	3 (6.0)	17 (34.0)	29 (58.0)
Network Security Technology (DES/RAS, Firewall)	49 (38.0)		6 (12.2)	19 (38.8)	24 (49.0)
Internet Protocol Technology (IPv6)/ Application (e g. VoIP)	69 (53.5)	1 (1.4)	6 (8.7)	26 (37.7)	36 (52.2)
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology	90 (69.8)	6 (6.6)	9 (10.0)	42 (46.7)	33 (36 7)
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	73 (56.6)	5 (6 8)	7 (9.6)	34 (46.6)	27 (37.0)
Optical Fiber, xDSL, Brodband Cable Technology	63 (48.8)	2 (3.2)	4 (6.3)	24 (38.1)	33 (52.4)
Cellular Phone Technology	46 (35.7)	1 (2.2)	3 (6 5)	9 (19.6)	33 (71.7)
Radio Communication Engineering (RF)	47 (36.4)		3 (6.4)	19 (40.4)	25 (53.2)
Others Telnet (CRT)	1 (0.8)				1 (100.0)

The students were also equipped with some of the skills on Electronics Engineering (Table 7). Majority of them have the skills on Personal Computer Hardware/ Intel CPU Architecture (74.4%) and Logic Circuit Design (ASIC/FPGA by VHDL) (81.4%). The other skills were present on about one-fourth of the students except for Analog Circuit Design where about 42% of students were skilled. Just like the other skills, the students were at the user and primary skill levels.

Table 7. Inventory of Electronics Engineering Skills of Students (n=129)

Skill	Students with skill No. (%)	Skill level			
		High level No. (%)	Middle level No. (%)	Primary level No. (%)	User level No (%)
Personal Computer Hardware/ Intel CPU Architecture	96 (74.4)	2 (2.1)	17 (17.7)	52 (54.2)	25 (26.0)
Logic Circuit Design (ASIC/FPGA by VHDL)	105 (81.4)		13 (12 4)	55 (52.4)	37 (35.2)
Analog Circuit Design (w/ Simulation by SPICE)	54 (41.9)		8 (14.8)	25 (46.3)	21 (38 9)
Print Circuit Design (e.g. CADENCE)	36 (27.9)		5 (13.9)	15 (41.7)	16 (44 4)
Mfg and Test Technology for Device Industry (Semiconductor)	30 (23.3)	1 (3.3)	1 (3.3)	8 (26.7)	20 (66.7)
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	32 (24.8)	1 (3.1)	4 (12.5)	14 (43.8)	13 (40 6)
Plant Management / Production and Quality Control	30 (23.3)		1 (3.3)	8 (26 7)	21 (70 0)
Others PC-8086,8088 ARCH	1 (0.8)				1 (100.0)

Tables 8 to 11 describe the different skills studied in school by the students. Not many students studied application skills in their schools except for Office Application Macro Programming by VBA (Word, Excel) where 45.7% of them have acquired their skill in school (Table 8). About one-third of the students who studied Office application Macro Programming have reached a middle skill level The skill levels of students in the other skills category were at the user and primary levels.

Table 8. Application Skills Studied in School at Present (n=129)

Skill	No. of students (%)	Skill level			
		High level No. (%)	Middle level No. (%)	Primary level No. (%)	User level No. (%)
Computer Graphics/3DCG Editor Operation (e g. for film industry)	32 (24 8)			16 (50.0)	16 (50.0)
CADAM/CATIA Operation for Electronics and Mechanical Industry	9 (7 0)		1 (11.1)	3 (33.3)	5 (55.6)
Multimedia Contents* Creation (e.g. for e-learning)	22 (17.0)	1 (4.6)	3 (13.6)	10 (45.4)	8 (36.4)
Game Contents Creation (PlayStation, Xbox and Windows platform)	14 (10.8)		3 (21.4)	9 (64.3)	2 (14.3)
Office Application Macro Programming by VBA (Word, Excel)	59 (45.7)	5 (8.5)	21 (35.6)	20 (33.9)	13 (22.0)
Others	1 (0.8)				1 (100.0)

* One student did not specify skill level

A high proportion of students have attained skills on Visual Basic Programming (Windows Application) (67.4%) and C++ Programming (Multi platform) (82.2%) in school (Table 9). In addition, about half of them studied JAVA Programming (Multi platform), Internet Application Design (HTML/XML, CGI cording by perl) and Database Design (RDB, SQL3, DBMA). Their skill levels acquired were mostly user and primary levels. Less than ten percent of students studied Enterprise and Banking System Maintenance (MVS, OS/390, z/OS) and GUI (graphical user interface) design by Japanese language. Most of them were at the user level.

.Table 9. System Development and Programming Skills Studied in School at Present (n=129)

Skill	Number of students (%)	Skill level			
		High level No. (%)	Middle level No. (%)	Primary level No (%)	User level No (%)
Visual Basic Programming (Windows Application)	87 (67.4)		18 (20.7)	37 (42.5)	32 (36.8)
C++ Programming (Multi platform)	106 (82.2)		20 (18.9)	50 (47.2)	36 (33.9)
JAVA Programming (Multi platform)	68 (52.7)		11 (16.2)	29 (42.6)	28 (41.2)
Internet Application Design (HTML/XML, CGI cording by perl)	66 (51.2)		8 (12.1)	33 (50.0)	25 (37.9)
Application System Design (Windows base)	54 (41.9)		7 (13.0)	29 (53.7)	18 (33.3)
Application System Design (Unix, Linux base)	27 (20.9)	1 (3.7)	4 (14.8)	10 (37.0)	12 (44.5)
Database Design (RDB, SQL3, DBMA)	65 (50.4)		8 (12.3)	31 (47.7)	26 (40.0)
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	10 (7.8)		2 (20.0)	3 (30.0)	5 (50.0)
Project Management/ System Consultation*	38 (29.5)		6 (15.8)	18 (47.4)	13 (34.2)
Firmware or micro-code cording by Assembly*	38 (29.5)		9 (23.7)	13 (34.2)	15 (39.5)
GUI (graphical user interface) design by Japanese language	6 (4.6)		1 (16.7)		5 (83.3)
Others	2 (1.6)				2 (100.0)

*One student did not indicate skill level

Among the Networking and Telecommunication skills, only LAN (IEEE802 3), Wireless LAN (IEEE802.11) Technology was studied by majority of students (68.2%) (Table 10). Half of the students were trained on Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology (Table 10). Most of them attained user and primary skill levels.

Table 10. Networking Solution and Telecommunication Skills Studied in School at Present (n=129)

Skill	No. of Students (%)	Skill level			
		High level No. (%)	Middle level No (%)	Primary level No. (%)	User level No (%)
Groupware Application Design (e.g Lotus Notes)	17 (13.2)	1 (5.9)		4 (23 5)	12 (70 6)
Client Server System Design	42 (32.6)		5 (11.9)	21 (50 0)	16 (38.1)
Web/Mail/DNS Server Design	27 (20.9)			11 (40.7)	16 (59 3)
Network Security Technology (DES/RAS, Firewall)	32 (24.8)		5 (15 6)	14 (43 8)	13 (40.6)
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)*	47 (36.4)	1 (2.1)	5 (10 7)	22 (46 8)	18 (38.3)
LAN (IEEE802.3), Wireless LAN (IEEE802 11) Technology**	88 (68 2)	4 (4.6)	12 (13 6)	42 (47 7)	26 (29.6)
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology**	67 (51.9)	5 (7.5)	5 (7.5)	32 (47.8)	22 (32 8)
Optical Fiber, xDSL, Brodband Cable Technology	50 (38.8)	2 (4.0)	4 (8 0)	25 (50.0)	19 (38.0)
Cellular Phone Technology*	27 (20.9)		1 (3.7)	10 (37.0)	15 (55.6)
Radio Communication Engineering (RF)	34 (26.4)		3 (8.8)	15 (44.1)	16 (47.1)
Others	0				

*One student/**more than one students did not indicate skill level

About 62% of students have indicated that Personal Computer Hardware/Intel CPU Architecture was presently being studied in school (Table 11). The skill level attained by the majority was up to the primary level Logic and Circuit Design skill was also one of the skills studied by a large proportion of students (71.3%). Their skill levels were mostly user and primary levels. Less than ten percent of students studied Mfg and Test Technology for Device Industry (Semiconductor) and Plant Management/Production and Quality Control.

Table 11. Electronics Engineering Skills Studied in School at Present (n=129)

Skill	Number of Students (%)	Skill level			
		High level No. (%)	Middle level No. (%)	Primary level No. (%)	User level No. (%)
Personal Computer Hardware/ Intel CPU Architecture*	80 (62.0)	2 (2.5)	14 (17.5)	45 (56 2)	18 (22.5)
Logic Circuit Design (ASIC/FPGA by VHDL)**	92 (71.3)		15 (16 3)	48 (52.2)	26 (28.3)
Analog Circuit Design (w/ Simulation by SPICE)	40 (31.0)		7 (17.5)	21 (52.5)	12 (30 0)
Print Circuit Design (e.g. CADENCE)	23 (17.8)		3 (13.1)	7 (30.4)	13 (56.5)
Mfg and Test Technology for Device Industry (Semiconductor)	12 (9.3)		2 (16.7)	3 (25 0)	7 (58.3)
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	18 (14.0)		2 (11.1)	10 (55.6)	6 (33.3)
Plant Management / Production and Quality Control	9 (7.0)			3 (33 3)	6 (66.7)
Others	1 (0.8)				1 (100.0)

*One student/**more than 1 student did not indicate skill level

Tables 12 to 15 show the skills that the students would like to master, the means of acquiring mastery of these skills and the amount of money (mean and median cost) that they are willing to spend to master such skills.

A little more than half of the students intend to master their skill on Computer graphics (Table 12). About thirty percent would like to achieve mastery on Multimedia Contents Creation, Game Contents Creation and Office Application Macro Programming by VBA.

The most preferred means of acquiring mastery of their Application skills was to attend training courses offered by local I.T. institutions. Attending short courses was also preferred by a proportion of students in mastering their skills except for mastering Game Contents Creation where students would consider being training abroad. Not many students intend to take postgraduate courses or train abroad in order to master their Application skills. Some have indicated preference for both local and training abroad

The mean and median costs that the students are willing to spend to master their skills for each type of training are shown below. Overall, the amount of money students is willing to spend for training ranged from P3,000 to P6,500 pesos. The median cost that they are willing to pay for local training that will be given by I.T. institutions ranged from 4,250 pesos to 7,500 pesos. Estimated median cost of training abroad is higher compared to other means of getting the training.

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Table 12. Application Skills Students Intend to Master, Means to Master Skill and Amount of Money they are Willing to Spend for Mastering the Skill (n=129)

Skill	Number of students (%) Mean Median	Means to Master Skill, *Mean & Median cost* (Pesos) students are willing to spend for the mastery of the skill				
		Post Graduate Courses No. (%) Mean Median	Short term courses offered by schools No. (%) Mean Median	Training courses by local IT institutions No. (%) Mean Median	Training Abroad No. (%) Mean Median	Others (specify) No (%) Mean Median
Computer Graphics/3DCG Editor Operation (for film industry)	75 (58.1) 14567 60 5000 00	7 (9.3) 11928 60 5000 00	23 (30.7) 3409 10 2750 00	27 (36.0) 11814 85 5000.00	15 (20.0) 32866.70 25000.00	2 (2.7) 52500 00
CADAM/CATIA Operation for Electronics and Mechanical Industry	22 (17.0) 19772.75 6500.00	3 (13.6) 5500.00 6000.00	6 (27.3) 5833.35 5000.00	10 (45.4) 16850.00 6500.00	1 (4.6) 200000.0 0	2 (9.1) 7500.00
Multimedia Contents Creation (e.g. for e-learning)	38 (29.5) 27855 30 6500.00	1 (2.6) 500.00	10 (26.3) 5100 00 4000.00	19 (50.0) 11684.25 7000.00	6 (15.8) 96666 70 17500 00	2 (5.3) 102500.0 0
Game Contents Creation (PlayStation, Xbox and Windows platform)	34 (26.4) 13742.45 6000.00	1 (2.9) 500.00	8 (23.5) 6312.50 4250 00	12 (35.3) 11250.00 4250.00	10 (29.4) 16700 00 12500.00	2 (5.9) 50250 00
Office Application Macro Programming by VBA (Word, Excel)	37 (28.7) 13666.70 6000.00	3 (8.1) 5166.70 5000.00	15 (40.5) 8576.95 5000.00	15 (40.5) 13500.00 7500 00	1 (2.7) 25000 00	2 (5.4) 55000 00
Others	1 (0.8) 3000.00		1 (100.0) 3000 00			

The most preferred skill to master by students on System Development and Programming is their skill on Visual Basic Programming (Table 13). About two-thirds of students intend to acquire mastery on Internet Application Design while half would train on C++ and JAVA programming.

Students preferred to get their additional training on the different skills from local I T. institutions. Taking short-term courses was their next preference except for Enterprise and Banking system and GUI where students prefer to take postgraduate courses for the former and training abroad for the latter. Some have indicated intention of taking courses either locally or abroad.

Overall, the range of median cost of training that the students are willing to spend to acquire mastery of their skills is P4,500 to P10,000 pesos. Estimated median cost students is willing to pay for training abroad is higher compared to other means of getting the training.

Mastering Networking Solution and Telecommunication Skills was not highly preferred by majority of students (Table 14). Only 46 percent would master on LAN, 40% on Web/Mail/DNS Server Design, 38% on Internet Protocol Technology and Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology and 37% on Cellular Phone Technology.

Students prefer to take short courses to master their skills on Groupware Application Design, Network Security Technology and Radio Communication Engineering Training abroad was the preference for mastering skills on Cellular Phone Technology. Acquiring mastery of the other skills is to be obtained through training courses offered by local I T institutions.

Overall, the range of median cost of training that the students are willing to spend to acquire mastery of their skills on Network Solutions and Telecommunications is P5,000 to P7,000 pesos. Estimated median cost of training abroad that they are willing to spend is higher compared to other means of getting the training.

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Table 13. System Development and Programming skills Students Intend to Master, Means to Master Skill and Amount they are Willing to Spend for Mastering the Skill (n=129)

Skill	Number of students (%) Mean Median	Means to Master Skill, Mean & Median cost (Pesos) students are willing to spend for the mastery of the skill				
		Post Graduate Courses No (%) Mean Median	Short term courses offered by schools No. (%) Mean Median	Training courses by local I T institutions No (%) Mean Median	Training Abroad No. (%) Mean Median	Others (specify) No. (%) Mean Median
Visual Basic Programming (Windows Application)	95 (73.6) 13366.30 5000.00	9 (9.5) 8222 25 5000 00	27 (28.4) 5724.00 3000.00	47 (49.5) 13079.55 5500 00	8 (8.4) 38125.00 12500 00	4 (4.2) 30666 70 10000.00
C++ Programming (Multi platform)	66 (51.2) 14763.95 5000.00	9 (13.6) 9666.70 5000.00	21 (31.8) 6742.10 3000.00	27 (40.9) 12140.00 6000.00	6 (9.1) 37000.00 10000.00	3 (4.6) 80000.00
JAVA Programming (Multi platform)	71 (55.0) 14238.45 5000.00	9 (12.7) 6000.00 5000.00	26 (36.6) 5517.35 2750.00	28 (39.4) 11846.15 5500 00	6 (8.4) 32833.35 10000.00	2 (2.8) 140000.00
Internet Application Design (HTML/XML, CGI cording by perl)*	81 (62.8) 16342.15 5000.00	6 (7.4) 19750.00 4000.00	25 (30.9) 4229.20 3000.00	31 (38.3) 13033.35 8000.00	13 (16.0) 28000.00 10000.00	4 (4.9) 73750.00 45000.00
Application System Design (Windows base)*	41 (31.8) 16800.00 5000 00	5 (12.2) 11300.00 3000.00	10 (24.4) 11611.15 5000.00	20 (48.8) 10750.00 5000.00	2 (4.9) 10000.00	3 (7.3) 78333.35 80000 00
Application System Design (Unix, Linux base)	45 (34.9) 26911.00 5000.00	8 (17.8) 7500.00 4000.00	10 (22.2) 11222.25 5000.00	21 (46.7) 14465 80 5000.00	4 (8.9) 130000 00 7500.00	2 (4.4) 77500 00
Database Design (RDB, SQL3, DBMA)	47 (36.4) 18250.00 5000.00	7 (14.9) 3750.00 4000 00	11 (23.4) 8625.00 2500.00	21 (44.7) 13210.55 5000.00	6 (12.8) 35833 35 12500 00	2 (4.3) 105000.00
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	13 (10.1) 21136 40 7000 00	4 (30.8) 8125 00 6000.00	1 (7.7) 5000.00	5 (38.5) 19000.00 7000.00	1 (7.7) no data	2 (15.4) 100000.00
Project Management/ System Consultation	27 (20.9) 11608.35 4500.00	2 (7.4) 4500.00	5 (18.5) 14750.00 3000.00	17 (63.0) 11056.70 4000.00	2 (7.4) 15000.00	
Firmware or micro-code cording by Assembly	24 (18.6) 10527.30 5000.00	4 (16.7) 5125.00 6000.00	7 (29.2) 11928.60 4500.00	11(45.8) 10833.35 3000.00	2 (8.3) 15050.00	
GUI (graphical user interface) design by Japanese language	18 (14.0) 22455.60 10000.00	2 (11.1) 1750.00	2 (11.1) 6500 00	7 (38.9) 29285.75 15000 00	6 (33.3) 13783.35 12500 00	1 (5.6) 100000.00

Table 14. *Networking Solution and Telecommunication Skills Students Intend to Master, Means to Master Skill and Amount they are Willing to Spend for Mastering the Skill (n=129)*

Skill	Number of students (%) Mean Median	Means to Master Skill, <u>Mean & Median</u> cost (Pesos) students are willing to spend for the mastery of the skill				
		Post Graduate Courses No (%) Mean Median	Short term courses offered by schools No (%) Mean Median	Training courses by local IT institutions No (%) Mean Median	Training Abroad No (%) Mean Median	Others specify No (%) Mean Median
Groupware Application Design (e g. Lotus Notes)	15 (11.6) 9791.70 7000 00	2 (13.3) 5750 00	7 (46.7) 5400.00 4000 00	4 (26.7) 20333 35 10000 00	2 (13.3) 9000 00	
Client Server System Design	40 (31.0) 11310.85 6000.00	6 (15.0) 5000.00	12 (30.0) 4409.10 2000 00	13 (32.5) 14666 70 10000 00	6 (15.0) 8833 35 8500 00	2 (5.0) 55000 00
Web/Mail/DNS Server Design	51 (39.5) 24542.55 5000.00	5 (9.8) 4750.00 5000 00	11 (21.6) 3350.00 3000 00	22 (43.1) 10380 95 5000 00	9 (17.6) 79222 25 20000 00	4 (7.8) 56666 70 10000 00
Network Security Technology (DES/RAS, Firewall)	41 (31.8) 10712.50 5000 00	6 (14.6) 4666 70 5000 00	16 (39.0) 3766.70 3000 00	12 (29.3) 18000 00 6500 00	5 (12.2) 4600 00 5000 00	2 (4.9) 52500 00
Internet Protocol Technology (IPv6)/ Application (e.g VoIP)	49 (38.0) 13043 50 5000.00	3 (6.1) 7000.00 5000.00	17 (34.7) 4133.35 2500.00	20 (40.8) 14526 35 10000 00	6 (12.2) 14000 00 10000 00	3 (6.1) 52333 35
LAN (IEEE802.3), Wireless LAN (IEEE802 11) Technology	60 (46.5) 11938.60 6000 00	6 (10.0) 6500 00 6000 00	16 (26.7) 4100 00 3000.00	25 (41.7) 12720 00 8000 00	8 (13.3) 15000.00 10000 00	4 (6.7) 39250 00 27500 00
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	49 (38.0) 12883 00 6000 00	4 (8.2) 6750.00 6000 00	12 (24.5) 3681 85 3000.00	21 (42.9) 11619 10 7000.00	10 (20.4) 31000 00 10000 00	1 (2.0) 5000 00
Optical Fiber, xDSL, Brodband Cable Technology	38 (29.5) 9930 60 5000 00	3 (7.9) 6666 70 5000.00	11 (29.0) 4300 00 3000 00	14 (36.8) 11392 90 5000.00	8 (21.0) 16250.00 10000 00	1 (2.6) 5000.00
Cellular Phone Technology*	48 (37.2) 22250.00 7000 00	6 (12.5) 20666 70 5500.00	9 (18.8) 3777.80 3000 00	12 (25.0) 10340.95 3500 00	19 (39.6) 39947.40 12000.00	2 (4.2) 7500 00
Radio Communication Engineering (RF)	28 (21.7) 9096.20 7000 00	3 (10.7) 7000 00 8000 00	11 (39.3) 4136 40 4000 00	7 (25.0) 13000 00 10000 00	4 (14.3) 18500 00 9500 00	1 (3.6) 5000 00

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Fifty-five percent of students prefer to master their skills on Personal Computer Hardware/Intel CPU Architecture and a little more than one-third of them intend to master Logic Circuit Design. Not many were interested in mastering the other electronic engineering skills.

Local training from I.T. firms was preferred to acquire mastery of Personal Computer Hardware, Logic and Analog Circuit Design. Taking a Postgraduate course. short-term course or training course by local I.T. was equally preferred for mastering Print Circuit Design. Additional training abroad on Mfg and Test Technology for Device Industry and for PC Parts Industry was preferred. Short-term course was favored for mastering Plant Management.

Overall, the range of median cost of training that the students are willing to spend to acquire mastery of their skills on Electronics Engineering is P2,250 to P5,000 pesos Estimated median cost of training abroad that they are willing to spend is higher compared to other means of getting the training.

Table 15. Electronics Engineering Skills Students Intend to Master, Means to Master Skill and Amount they are Willing to Spend for Mastering the Skill (n=129)

| Skill | Number of students (%) Mean Median | Means to Master Skill, Mean & Median cost (Pesos) students are willing to spend for the mastery of the skill | | | | |
		Post Graduate Courses No (%) Mean Median	Short term courses offered by schools No. (%) Mean Median	Training courses by local IT institutions No. (%) Mean Median	Training Abroad No (%) Mean Median	Others specify No. (%) Mean Median
Personal Computer Hardware/ Intel CPU Architecture	71 (55.0) 12462.15 5000.00	17 (23.9) 15970.60 5000.00	16 (22.5) 5218.75 3000.00	26 (36.6) 7937.50 5000.00	8 (11.3) 16714 30	3 (4.2) 80000.0 0
Logic Circuit Design (ASIC/FPGA by VHDL)	49 (38.0) 15397.75 5000 00	10 (20.4) 18600 10 5000.00	10 (20.4) 3055.60 2500 00	22 (44.9) 10666 70 5000 00	3 (6.1) 76666.70 20000.00	2 (4.1) 10000.0 0
Analog Circuit Design (w/ Simulation by SPICE)	19 (14.7) 7147.10 5000.00	4 (21.0) 5750.00 5000.00	4 (21.0) 1875.00 1750.00	8 (42.1) 8714.30 5000.00	2 (10.5) 20000 00	1 (5.3) 10000.0 0
Print Circuit Design (e g. CADENCE)	13 (10.1) 3208.35 2250 00	4 (30.8) 3666.70 3000.00	5 (38.5) 1900 00 2000.00	4 (30.8) 4500 00 3500.00		
Mfg and Test Technology for Device Industry (Semiconductor)	14 (10.8) 11028.60 3500.00	3 (21.4) 4666.70 3000.00	4 (28.6) 3750.00 2000 00	2 (14.3) 4000.00	5 (35.7) 23480.00 8000.00	
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	23 (17.8) 12363 25 5000.00	4 (17.4) 2750.00 2000 00	5 (21.7) 2400.00 2000.00	6 (26.1) 11000.00 5000.00	7 (30.4) 26485.75 15000.00	1 (4.4) 10000.0 0
Plant Management / Production and Quality Control	8 (6.2) 11562.50 4250.00	2 (25.0) 4250.00	3 (37.5) 1333.35 1000.00	2 (25.0) 35000 00	1 (12.5) 10000.00	
Others	1 (0.8)		1 (100.0)			

Tables 16 to 19 show the salaries that the students expect to receive after graduation when their skills are utilized at work. In the work involving their application skills, their expected salary has a median of 15,000 pesos. Their expected salary would be as low as 5,000 pesos and would go as high as 50,000 pesos. Students from De La Salle University noticeably have higher median expected salary compared to students from other schools. Students coming from Pamantasan ng Lungsod ng Maynila expect the lowest median salary of 10,000 pesos.

Table 16. Expected Salary (pesos) After Graduation for Work that Utilized Application Skills

SCHOOL	NO. OF SUBJECTS	MEAN SALARY	MEDIAN SALARY	MINIMUM SALARY	MAXIMUM SALARY
Arellano University	21	14,761.90	15,000.00	8,000 00	21,000 00
De La Salle University	18	26,833.35	25,000 00	15,000 00	50,000 00
East Asia College	18	17,388 90	13,500 00	7,000 00	50,000 00
Pamantasan ng Lungsod Ng Maynila	19	12,368 45	10,000 00	8,000 00	25,000 00
Polytechnic University of the Philippines	17	17,352 95	15,000 00	5,000.00	30,000 00
Technological Institute of the Philippines	21	16,523.85	15,000.00	10,000 00	30,000 00
TOTAL	114	17,394.75	15,000 00	5,000 00	50,000 00

The median expected salary for the application of their skills on system development and programming was higher than the median expected salary for the utilization of their application skills. Moreover, the maximum expected salary was also higher with a median of 75,000 pesos. Varied median salary was observed at different schools with students from Arellano University and De La Salle University having higher median salary expectation compared to students from other schools. Minimum and maximum salary expected by the De La Salle students were much higher compared to other schools. Students coming from Pamantasan ng Lungsod ng Maynila expect the lowest median salary of 12,000 pesos

Table 17. Expected Salary (pesos) After Graduation for Work that Utilized System Development and Programming Skills

SCHOOL	NO. OF SUBJECTS	MEAN SALARY	MEDIAN SALARY	MINIMUM SALARY	MAXIMUM SALARY
Arellano University	21	21,238.10	20,000.00	8,000 00	40,000 00
De La Salle University	20	30,500.00	25,000.00	15,000 00	75,000 00
East Asia College	20	18,850 00	15,000 00	10,000 00	50,000.00
Pamantasan ng Lungsod Ng Maynila	23	13,652.20	12,000.00	8,000 00	30,000 00
Polytechnic University of the Philippines	21	18,142 90	18,000 00	8,000.00	50,000.00
Technological Institute of the Philippines	22	18,409.10	15,000 00	10,000.00	50,000 00
TOTAL	127	19,944.90	18,000.00	8,000.00	75,000 00

Expected salaries for the application of skills on networking solution and telecommunication ranged from as low as 5,000 pesos to as high as 60,000 pesos. The

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expected median salary for the utilization of these skills was higher than that of application and system development and programming skills. Varied median salary was observed at different schools with students from De La Salle University having higher salary expectation compared to students from other schools. Students coming from Pamantasan ng Lungsod ng Maynila expect the lowest median salary of 13,500 pesos.

Table 18. Expected salary (pesos) after graduation for Work that Utilized Networking Solution and Telecommunication Skills

SCHOOL	NO. OF SUBJECTS	MEAN SALARY	MEDIAN SALARY	MINIMUM SALARY	MAXIMUM SALARY
Arellano University	21	16,238 10	15,000 00	8,000 00	30,000 00
De La Salle University	16	35,312.50	35,000 00	20,000 00	60,000 00
East Asia College	20	20,150.00	17,000 00	7,000 00	50,000 00
Pamantasan ng Lungsod Ng Maynila	24	12,958.35	13,500 00	5,000 00	20,000 00
Polytechnic University of the Philippines	16	17,250 00	20,000.00	8,000 00	25,000 00
Technological Institute of the Philippines	20	18,400.00	20,000 00	10,000 00	30,000 00
TOTAL	117	19,350 45	20,000 00	5,000 00	60,000 00

The range of expected salaries for the application of skills on electronics engineering was as low as 5000 pesos and as high as 120,000 pesos. Among the four skills category, this skill category was noted to have the highest salary expectation. The median expected salary was 16,000 pesos. Students from De La Salle University have higher salary expectation compared to students from other schools. Students coming from Pamantasan ng Lungsod ng Maynila expect the lowest median salary of 10,000 pesos.

Table 19. Expected salary (pesos) After Graduation for Work that Utilized Electronics Engineering Skills

SCHOOL	NO OF SUBJECTS	MEAN SALARY	MEDIAN SALARY	MINIMUM SALARY	MAXIMUM SALARY
Arellano University	20	17,300 00	20,000 00	7,000 00	35,000 00
De La Salle University	19	29,210 55	30,000.00	10,000 00	65,000.00
East Asia College	20	23,550 00	15,000 00	6,000 00	120,000 00
Pamantasan ng Lungsod Ng Maynila	23	12,869.60	10,000 00	8,000.00	25,000 00
Polytechnic University of the Philippines	17	15,000 00	15,000 00	5,000 00	30,000.00
Technological Institute of the Philippines	15	16,666 70	20,000 00	10,000 00	30,000.00
TOTAL	114	19,061 40	16,000.00	5,000 00	120,000 00

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The median expected salary to be received by the students after graduation for the utilization of Application skills was 15,000 pesos With additional skills, they expect to get a median increase ranging from 3,000 to 5,000 pesos. The minimum increase in salary per skill varies from 500 pesos to 3,000 pesos while the maximum increase varies from 3,000 pesos to 90,000 pesos.

Table 20. Expected Increase in Salary for the Additional Application Skills Acquired

APPLICATION SKILL	NO OF SUBJECTS	MEAN INCREASE	MEDIAN INCREASE	MINIMUM INCREASE	MAXIMUM INCREASE
Computer Graphics/3DCG Editor Operation	74	7,033 80	5,000 00	1,500 00	90,000 00
CADAM/CATIA Operation for Electronics and Mechanical Industry	22	6.659 10	5,000 00	1,000 00	15,000 00
Multimedia Contents	38	6,421 05	5,000.00	1,500.00	20,000 00
Game Contents Creation	33	7,606 10	4,000 00	1,000 00	90,000 00
Office Application Macro Programming by VBA	33	7,606 10	5,000 00	500 00	90,000 00
Others	1	3,000 00	3,000 00	3,000 00	3,000 00

The median salary expected to receive by the students after graduation if given the opportunity to work on system development and programming tasks was 18,000 pesos With additional skills, they expect to get a median increase of about 5,000 pesos per skill except for Enterprise and Banking System Maintenance where the median increase was 4,000 pesos The minimum increase in salary per skill varies from no increase to an increase of 1.500 pesos The maximum increase varies from 10,000 pesos to 70,000 pesos.

Table 21. Expected Increase in Salary for the Additional System Development and Programming Skills Acquired

SYSTEM DEVELOPMENT AND PROGRAMMING SKILL	NO. OF SUBJECTS	MEAN INCREASE	MEDIAN INCREASE	MINIMUM INCREASE	MAXIMUM INCREASE
Visual Basic Programming	89	6,634.85	5,000.00	1,000 00	50,000 00
C++ Programming	63	6,327 00	5,000.00	0 00	50,000 00
Java Programming	68	6,176 50	5,000 00	1,000 00	30,000 00
Internet Application Design	78	6,705 15	5,000 00	1,000 00	50,000.00
Application System Design (Windows Base)	35	6,785.75	5,000 00	1,000 00	70,000 00
Application System Design (Unix, Linux Base)	42	6,178 60	5,000 00	1,000.00	30,000 00
Database Design	46	7,673 95	5,000.00	1,000 00	50,000 00
Enterprise and Banking System Maintenance	10	7,300 00	4,000.00	1,500 00	30,000 00
Project Management/System Consultation	26	6,923.10	5,000 00	1,000.00	30,000 00
Firmware or micro-code coding by Assembly	23	7,000.00	5,000.00	1,000 00	30,000.00
GUI design by Japanese Language	18	5,527 80	5,000.00	1,500.00	10,000 00

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The median salary that students expect to receive after graduation if given the opportunity to work on networking and telecommunication was 20,000 pesos. With additional skills, they expect to get median increase of 5,000 pesos except for the increase of 4,000 pesos in Groupware Application Design. The minimum increase in salary was 1,000 pesos while the maximum increase varies from 20,000 pesos to 50,000 pesos.

Table 22. Expected Increase in Salary for the Additional Networking and Telecommunication Skills Acquired

NETWORKING SOLUTION AND TELECOMMUNICATION SKILL	NO OF SUBJECTS	MEAN INCREASE	MEDIAN INCREASE	MINIMUM INCREASE	MAXIMUM INCREASE
Groupware Application Design	13	7,884.65	4,000.00	1,000.00	50,000 00
Client Server System Design	37	6,635 15	5,000 00	1,000 00	50,000.00
Web/Mail/DNS Server Design	50	6,200 00	5,000 00	1,000 00	20,000.00
Network Security Technology	40	6,537 50	5,000 00	1,000.00	50,000 00
Internet Protocol Technology	45	6,800.00	5,000 00	1,000 00	30,000 00
LAN (IEEE802.3), Wireless LAN (IEEE802.11)	59	7,542.40	5,000.00	1,000.00	50,000 00
Network Switch/Router (IP/IPX)/ Packet, Frame Relay Technology	46	7,804.35	5,000 00	1,000 00	30,000.00
Optical Fiber, xDSL, Broadband Cable Technology	35	7,028 60	5,000 00	1,000 00	30,000 00
Cellular Phone Technology	45	7,766.70	5,000 00	1,000.00	30,000 00
Radio Communication Engineering	26	7,442 35	5,000 00	1,000.00	30,000.00

The median salary students expect to receive after graduation if given the opportunity to work on electronics engineering was 15,000 pesos. With additional skills, they expect to get median increase of 5,000 pesos except for desired increase of only 3,000 pesos for Print Circuit Design. The minimum increase in salary per skill varies from 750 pesos to 2,000 pesos while the maximum increase varies from 10,000 pesos to 50,000 pesos.

Table 23. Expected Increase in Salary for the Additional Electronics and Engineering Skills Acquired

ELECTRONICS ENGINEERING SKILLS	NO OF SUBJECTS	MEAN INCREASE	MEDIAN INCREASE	MINIMUM INCREASE	MAXIMUM INCREASE
Personal Computer Hardware/ Intel CPU Architecture	70	6,742 90	5,000.00	1,000 00	50,000 00
Logic Circuit Design	47	5,138 30	5,000 00	1,000 00	20,000 00
Analog Circuit Design	18	4,555.60	5,000.00	1,000.00	10,000 00
Print Circuit Design	12	4,291 70	3,000 00	1,000 00	10,000.00
Mfg and Test Technology for Device Industry	13	5,634 65	5,000 00	750 00	15,000.00
Mfg and Test Technology for PC Parts Industry	22	4,877 30	5,000.00	800.00	15,000 00
Plant Management/ Production and Quality Control	5	5,200 00	5,000.00	2,000.00	10,000.00

The most preferred public I.T. Training course that students want to attend to prepare them to become an I.T. professional was on Computer Graphics. They prefer that this course be taught through lectures and coaching approaches. Some students want to take the courses through distance learning methods. Some also indicated that hands-on or actual application and self-study will be helpful in their learning. Students want to get their training on these skills from I.T. schools and firms in the country except for the training on Game Contents Creation where half of the students want to take the training from an I.T. school abroad. Median cost of training that these students are willing to pay ranged from 5,000 pesos to 8,000 pesos.

Table 24. Public IT Training Courses and Preferred Teaching Style Students Want to Attend to Prepare them to Become an IT Professional

APPLICATION SKILL	NO. OF SUBJECTS (%)	Lecture	Distance Learning	Coaching	Others
Computer Graphics/3DCG Editor Operation	77 (59.7)	60 (77.9)	10 (13 0)	35 (45 4)	22 (28 6)
CADAM/CATIA Operation for Electronics and Mechanical Industry	11 (8 5)	9 (81.8)	0	5 (45 4)	1 (9 1)
Multimedia Contents	32 (24 8)	29 (90.6)	4 (12 5)	12 (37 5)	6 (18 8)
Game Contents Creation	22 (17 1)	13 (59.1)	2 (9.1)	10 (45 4)	6 (27.3)
Office Application Macro Programming by VBA	29 (22.5)	23 (79 3)	4 (13 8)	10 (34 5)	4 (13 8)
Others	2 (1.6)				

Table 25. Institutions Students Prefer to Get their Training on Application Skills

APPLICATION SKILL	No. of Subjects	IT School in the Philippines	IT Firm in the Philippines	IT School Abroad	IT Firm Abroad	Others
Computer Graphics/3DCG Editor Operation	77	41 (53.2)	26 (33 8)	24 (31 2)	14 (18 2)	1 (1 3)
CADAM/CATIA Operation for Electronics and Mechanical Industry	11	5 (45.4)	5 (45 4)	1 (9.1)	3 (27 3)	1 (9.1)
Multimedia Contents	32	13 (40 6)	13 (40.6)	9 (28.1)	6 (18 8)	0
Game Contents Creation	22	6 (27 3)	6 (27.3)	11 (50 0)	5 (22 7)	1 (4 6)
Office Application Macro Programming by VBA	29	16 (55 2)	12 (41.4)	6 (20.7)	6 (20 7)	0

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Table 26. Amount of Money (Pesos) Students are Willing to Pay for IT Training on Applications

APPLICATION SKILLS	No. of Subjects	Mean	Median	Minimum	Maximum
Computer Graphics/3DCG Editor Operation	70	11,478.60	8,000	1.000	15.000
CADAM/CATIA Operation for Electronics and Mechanical Industry	8	43,375	5,000	1.000	300.000
Multimedia Contents	27	15,074.10	8,000	2.000	100,000
Game Contents Creation	20	12,250	6,000	1.000	50.000
Office Application Macro Programming by VBA	27	13,907.45	5,000	1,000	100,000

The public I.T. Training courses that students want to attend to prepare them to become an I.T. professional were Visual Basic and JAVA programming. They have a high preference for lecture method of teaching. Coaching was also a teaching style of choice Some students want to take the courses through distance learning methods. Hands-on or actual application and self-study were indicated as other approaches for learning. I.T. schools and firms were noted to be the institutions of choice by the students. Some high percentages are not interpreted as such because of small number of subjects included in the computation. Median cost of training that these students are willing to pay ranged from 5,000 pesos to 10,000 pesos.

Table 27. Public IT Training Courses and Preferred Teaching Method on System Development and Programming that Students want to Attend to Prepare them to Become an IT Professional

SYSTEM DEVELOPMENT AND PROGRAMMING SKILL	NO. OF SUBJECTS (%)	Lecture	Distance Learning	Coaching	Others
Visual Basic Programming	73 (56 6)	58 (79 4)	9 (12 3)	35 (48 0)	17 (23.3)
C++ Programming	37 (28.7)	27 (73 0)	3 (8.1)	19 (51 4)	7 (18 9)
Java Programming	60 (46.5)	46 (76.7)	6 (10.0)	28 (46 7)	13 (21 7)
Internet Application Design	45 (34.9)	35 (77 8)	9 (20 0)	26 (57.8)	5 (11 1)
Application System Design (Windows Base)	23 (17 8)	12 (52 2)	2 (8 7)	9 (39 1)	9 (39 1)
Application System Design (Unix, Linux Base)	12 (9 3)	9 (75.0)	0	5 (41.7)	1 (8 3)
Database Design	32 (24 8)	25 (78.1)	2 (6 2)	17 (53 1)	7 (21.9)
Enterprise and Banking System Maintenance	5 (3 9)	5 (100 0)	0	1 (20 0)	3 (60.0)
Project Management/System Consultation	12 (9.3)	11 (91 7)	2 (16.7)	6 (50 0)	2 (16 7)
Firmware or micro-code coding by Assembly	3 (2.3)	2 (66 7)	0	3 (100.0)	0
GUI design by Japanese Language	11 (8 5)	9 (81.8)	0	5 (45 4)	1 (9 1)

Table 28. Institutions Students Prefer to Get their Training on System Development and Programming

SYSTEM DEVELOPMENT AND PROGRAMMING SKILL	NO OF SUBJECTS	IT School in the Philippines	IT Firm in the Philippines	IT School Abroad	IT Firm Abroad	Others
Visual Basic Programming	73	49 (67.1)	30 (41.1)	17 (23 3)	11 (15 1)	1 (1 4)
C++ Programming	37	19 (51.4)	15 (40 5)	8 (21 6)	5 (13 5)	0
Java Programming	60	33 (55 0)	25 (41 7)	20 (33 3)	10 (16 7)	1 (1 7)
Internet Application Design	45	20 (44 4)	18 (40.0)	15 (33 3)	8 (17 8)	1 (2 2)
Application System Design (Windows Base)	23	13 (56 5)	9 (39 1)	2 (8 7)	5 (21.7)	1 (4 3)
Application System Design (Unix, Linux Base)	12	5 (41.7)	4 (33.3)	4 (33.3)	5 (41 7)	0
Database Design	32	18 (56 2)	11 (34.4)	12 (37 5)	9 (28 1)	1 (3 1)
Enterprise and Banking System Maintenance	5	1 (20 0)	2 (40 0)	1 (20 0)	1 (20 0)	0
Project Management/System Consultation	12	5 (41 7)	7 (58 3)	3 (25 0)	5 (41 7)	0
Firmware or micro-code coding by Assembly	3	1 (33.3)	2 (66 7)	0	2 (66 7)	0
GUI design by Japanese Language	11	5 (45 4)	1 (9 1)	2 (18 2)	4 (36 4)	0

Table 29. Amount of Money (Pesos) Students are Willing to Pay for IT Training on System Development and Programming

SYSTEM DEVELOPMENT AND PROGRAMMING SKILL	NO OF SUBJECTS (%)	Mean	Median	Minimum	Maximum
Visual Basic Programming	68	13,544 15	8,000 00	500 00	15,0000 00
C++ Programming	34	16,676 50	10,000.00	2,000 00	10,0000 00
Java Programming	54	13,879.65	6,000 00	1,000.00	20,0000 00
Internet Application Design	40	22,012.50	10,000 00	1,500 00	15,0000.00
Application System Design (Windows Base)	21	9,595 25	5,000 00	500.00	40,000 00
Application System Design (Unix, Linux Base)	9	21,444.45	10,000.00	5,000 00	100,000 00
Database Design	31	88,06.45	6,000 00	500 00	30,000.00
Enterprise and Banking System Maintenance	4	8,250 00	5,000 00	3,000 00	20,000 00
Project Management/System Consultation	10	8,450.00	9,000.00	500 00	20,000 00
Firmware or micro-code cording by Assembly	2	6,000.00	6,000 00	2,000.00	10,000 00
GUI design by Japanese Language	10	11,900 00	9,000.00	3,000 00	40,000.00

Not many students have considered public I.T. courses on Network Solution and Telecommunication as priority courses to take that will prepare them to become an I.T. professional This was indicated by only thirty percent of students signifying their intention

to attend Public I.T. training course on Web/Mail/DNS Server Design and lower proportion of students wanting to attend the other courses. They highly prefer lecture methods and coaching as means of teaching these courses. Few wanted to take the courses through distance learning methods. Some also indicated that hands-on or actual application and self-study will be useful for their learning. Students have equally chosen I.T. schools and firms in the country and abroad as institutions where they can get their training. Median cost of training that these students are willing to pay ranged from 6,500 pesos to 15,000 pesos

Table 30. Public IT Training Courses and Preferred Teaching Method on Networking Solution and Telecommunication that Students want to Attend to Prepare them to Become an IT Professional

NETWORKING SOLUTION AND TELECOMMUNICATION SKILL	NO OF SUBJECTS (%)	Lecture	Distance Learning	Coaching	Others
Groupware Application Design	3 (2 3)	1 (33.3)	0	1 (33 3)	2 (66 7)
Client Server System Design	27 (20.9)	18 (66 7)	1 (3 7)	12 (44 4)	9 (33 3)
Web/Mail/DNS Server Design	39 (30 2)	29 (74 4)	6 (15.4)	21 (53 8)	10 (25 6)
Network Security Technology	32 (24 8)	26 (81 2)	3 (9 4)	13 (40 6)	7 (21.9)
Internet Protocol Technology	33 (25.6)	23 (69 7)	5 (15 2)	17 (51 5)	8 (24 2)
LAN (IEEE802.3), Wireless LAN (IEEE802.11)	36 (27 9)	27 (75 0)	6 (16 7)	17 (47 2)	9 (25 0)
Network Switch/Router (IP/IPX)/ Packet, Frame Relay Technology	15 (11.6)	9 (60 0)	2 (13 3)	8 (53 3)	6 (40 0)
Optical Fiber, xDSL, Broadband Cable Technology	8 (6.2)	7 (87 5)	3 (37 5)	6 (75 0)	0
Cellular Phone Technology	27 (20 9)	21 (77 8)	3 (11.1)	16 (59 3)	3 (11 1)
Radio Communication Engineering	8 (6 2)	5 (62 5)	0	5 (62 5)	1 (12 5)

Table 31. Institutions Students Prefer to Get their Training on Networking Solution and Telecommunication Skills

NETWORKING SOLUTION AND TELECOMMUNICATION SKILL	No of Subjects	IT School in the Philippines	IT Firm in the Philippines	IT School Abroad	IT Firm Abroad	Others
Groupware Application Design	3	0	1 (33 3)	1 (33 3)	1 (33 3)	0
Client Server System Design	27	14 (51 8)	11 (40 7)	11 (40 7)	10 (37 0)	1 (3 7)
Web/Mail/DNS Server Design	39	16 (41.0)	14 (35.9)	17 (43 6)	12 (30.8)	1 (2.6)
Network Security Technology	32	18 (56.2)	11 (34 4)	10 (31 2)	14 (43 8)	0
Internet Protocol Technology	33	15 (45 4)	13 (39 4)	10 (30 3)	8 (24 2)	1 (3.0)
LAN (IEEE802 3), Wireless LAN (IEEE802 11)	36	16 (44 4)	16 (44.4)	11 (30 6)	15 (41.7)	1 (2 8)
Network Switch/Router (IP/IPX)/ Packet, Frame Relay Technology	15	7 (46.7)	0	6 (40 0)	3 (20 0)	0
Optical Fiber, xDSL, Broadband Cable Technology	8	5 (62.5)	2 (25 0)	3 (37 5)	2 (25 0)	0
Cellular Phone Technology	27	10 (37.0)	10 (37.0)	8 (29 6)	9 (33.3)	0
Radio Communication Engineering	8	6 (75 0)	3 (37.5)	1 (12 5)	2 (25.0)	0

Table 32. Amount of Money (Pesos) Students are Willing to Pay for IT Training on
Networking Solution and Telecommunication

NETWORKING SOLUTION AND TELECOMMUNICATION SKILL	NO OF SUBJECTS (%)	Mean	Median	Minimum	Maximum
Groupware Application Design	3	13,333 35	15,000.00	5,000 00	20 000 00
Client Server System Design	24	16,062 50	10,000 00	1,000 00	150,000 00
Web/Mail/DNS Server Design	37	17,391 90	10,000 00	2,000 00	50,000 00
Network Security Technology	30	15,150 00	7,000 00	1,000.00	150,000 00
Internet Protocol Technology	29	10,069 00	5,000 00	1,000 00	40,000 00
LAN (IEEE802 3), Wireless LAN (IEEE802.11)	32	18,984 40	9,000 00	1,000 00	300,000 00
Network Switch/Router (IP/IPX)/ Packet, Frame Relay Technology	14	30,428 60	10,000 00	1,000 00	300,000 00
Optical Fiber, xDSL, Broadband Cable Technology	8	25,625 00	6,500 00	2,000 00	150,000 00
Cellular Phone Technology	24	16,812 50	9,000 00	1,000 00	150,000 00
Radio Communication Engineering	8	28,000 00	10,000.00	1,000 00	150,000 00

Similar to Network Solution and Telecommunication, not many students have considered public I.T. courses on Electronics Engineering as priority courses to take that will prepare them to become an I.T. professional. Only forty-six percent of students signify their intention to attend Public I.T. training course on Personal Computer Hardware and less than one-fourth wanted to attend Logic Circuit Design. Less than ten percent of students consider attending training coursers for the other skills. Similar to the other skills category, students highly prefer lecture and coaching methods as means of teaching these courses. Few students wanted to take the courses through distance learning methods and some indicated hands-on or actual application and self-study as useful approaches. Students prefer to attend training courses offered by I.T. schools in the country. There were small number of subjects in some of the skills category thus the percentages will not be interpreted as such. Median cost of training that these students are willing to pay ranged from 6,500 pesos to 9,000 pesos.

Table 33. Public IT Training Courses and Preferred Teaching Method on Electronics
and Engineering that Students want to Attend to Prepare them to Become
an IT Professional

ELECTRONICS ENGINEERING SKILLS	NO OF SUBJECTS (%)	Lecture	Distance Learning	Coaching	Others
Personal Computer Hardware/ Intel CPU Architecture	59 (45.7)	44 (74.6)	7 (11.9)	30 (50 8)	15 (25 4)
Logic Circuit Design	29 (22 5)	23 (79.3)	4 (13.8)	14 (48 3)	9 (31 0)
Analog Circuit Design	9 (7.0)	5 (55.6)	2 (22.2)	4 (44 4)	2 (22 2)
Print Circuit Design	3 (2 3)	2 (66.7)	1 (33.3)	1 (33 3)	1 (33 3)
Mfg and Test Technology for Device Industry	10 (7.8)	7 (70.0)	1 (10 0)	5 (50 0)	2 (20 0)
Mfg and Test Technology for PC Parts Industry	7(5 4)	4 (57.1)	2 (28 6)	2 (28.6)	2 (28.6)
Plant Management/ Production and Quality Control	11 (8.5)	7 (63 6)	1 (9.1)	6 (54.6)	2 (18 2)

Table 34. Institutions Students Prefer to Get their Training on Electronics and Engineering

ELECTRONICS ENGINEERING SKILLS	No. of Subjects	IT School in the Philippines	IT Firm in the Philippines	IT School Abroad	IT Firm Abroad	Others
Personal Computer Hardware/ Intel CPU Architecture	59	34 (57.6)	20 (33.9)	15 (25.4)	15 (25.4)	1 (1.7)
Logic Circuit Design	29	18 (62.1)	10 (34.5)	5 (17.2)	9 (31.0)	1 (3.4)
Analog Circuit Design	9	6 (66.7)	3 (33.3)	2 (22.2)	4 (44.4)	1 (11.1)
Print Circuit Design	3	2 (66.7)	1 (33.3)	2 (66.7)	2 (66.7)	1 (33.3)
Mfg and Test Technology for Device Industry	10	3 (30.0)	3 (30.0)	3 (30.0)	5 (50.0)	1 (10.0)
Mfg and Test Technology for PC Parts Industry	7	2 (28.6)	2 (28.6)	1 (14.3)	3 (42.9)	0
Plant Management/ Production and Quality Control	11	6 (54.6)	3 (27.3)	3 (27.3)	3 (27.3)	1 (9.1)

Table 35. Amount of Money (Pesos) Students are Willing to Pay for IT Training on Electronics and Engineering

ELECTRONICS ENGINEERING SKILLS	NO. OF SUBJECTS (%)	Mean	Median	Minimum	Maximum
Personal Computer Hardware/ Intel CPU Architecture	54	19,907.45	6,500.00	500.00	300,000.00
Logic Circuit Design	24	17,291.70	9,000 00	1,000.00	150,000.00
Analog Circuit Design	8	8,500.00	6,500.00	1,000.00	30,000.00
Print Circuit Design	2	8,000.00	8,000.00	1,000.00	15,000.00
Mfg and Test Technology for Device Industry	8	27,125.00	7,500.00	2,000.00	150,000.00
Mfg and Test Technology for PC Parts Industry	6	14,166.70	9,000.00	2,000.00	40,000.00
Plant Management/ Production and Quality Control	10	12,750.00	9,000 00	2,000.00	30,000.00

Table 36 shows that after graduation, one half of the students would prefer to work in companies engaged in System Development and Programming while one-third would prefer working in those engaged in Networking and Telecommunication firms. Almost three-fourths of the students want to work abroad, more specifically, Japanese firms (Table 37).

Table 36. Desired Skills Category the Students Like to Work with after Graduation

Skills Category	1st Priority No. (%)	2nd Priority No. (%)
Application Skills	11 (8.5)	27 (20.9)
System Development and Programming Skill	66 (51.2)	32 (24.8)
Networking Solution and Telecommunication Skills	39 (30.2)	51 (39.5)
Electronics Engineering Skills	13 (10.1)	17 (13.2)

Table 37. Company Students want to be Employed after Graduation

Company	No. (%)	No. (%)
Local Company	37 (28.7)	
International Company	92 (71.3)	
Japan		42 (45.6)
American		36 (39 1)
Others		9 (9 8)
Did not specify		5 (5 4)

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Study on the Social Needs and Supply of I.T. Engineers

I.T. ENGINEERS

JAPAN INTERNATIONAL COOPERATION AGENCY
STUDY ON THE SOCIAL NEEDS AND SUPPLY OF I.T. ENGINEERS

SURVEY OF I.T. ENGINEERS

PROFILE OF RESPONDENTS

Fifty-six respondents from fifteen companies were interviewed (Table 1.) The mean age of subjects was 28 years old (std. dev.=4.5, range: 23 to 44). Majority of the engineers (82%) was male and 69 percent were not married. Table 2 shows the different positions held by the respondents in their respective companies. The median years of practicing their profession were 4 years. They have worked in their companies for a median of 2 years and have been in their current position for a median of 1 year (Table 3). Almost half of the respondents were at the supervisory level and none was at the user level.

Table 1. List of Companies Surveyed

COMPANY	NO. OF SUBJECTS	PERCENT
ASIA ONLINE PHILIPPINES	3	5.4
CANON MARKETING (PHILS.), INC.	2	3.6
COMMUNITY UNLIMITED, INC.	5	8.9
ENGINE RED SOLUTIONS	1	1.8
FUJITSU (respondents came from four different subsidiary companies)	10	17.9
GLOBAL STRIDE CUSTOMER SOLUTIONS	5	8.9
GLOBE TELECOMS, INC	3	5.4
HP PHILIPPINES	1	1.8
IBM PHILIPPINES	4	7.1
LG SYSTEMS PHILIPPINES, INC	1	1.8
LIGHTHOUSE CREDIT TECHNOLOGIES CORP	6	10.7
MILLENIUM MICROELECTRONICS, INC	2	3.6
NEC TELECOM SOFTWARE PHILIPPINES INC.	5	8.9
PLDT	4	7.1
SUN MICROSYSTEMS PHILS., INC .	4	7.1
TOTAL	56	100

Table 2. Position Held by the Respondents

Position	No. of Subjects
ANALYST PROGRAMMER	1
ARCHITECT ANALYST	1
COMMUNICATIONS AND NETWORK ENGINEER	1
APPLICATION SYSTEM CONSULTANT	1
APPLICATION SYSTEM ENGINEER	1
DBA/NETWORK SUPERVISOR	1
DEVELOPMENT AND SUPPORT ENGINEER	1
DIRECTOR	1
IS SECURITY SPECIALIST	1
I.T ARCHITECT	2
I.T. ASST. MANAGER	1
I.T. CONSULTANT	1
I.T MANAGER	3
I.T. SPECIALIST	2
INFRASTRUCTURE SPECIALIST	1
INTERNETWORK SPECIALIST	1
LAN TECHNOLOGY ENGINEER	2
LEAD PROGRAMMER	1
MISSION CRITICAL SYSTEMS ENGINEER	1
NETWORK ADMINISTRATOR	1
PRODUCT SPECIALIST	1
PROGRAMMER	5
PROJECT MANAGER	1
SOFTWARE DESIGN ENGINEER	7
SUPERVISOR	2
SUPPORT ENGINEER	1
SYSTEM ADMINISTRATOR	1
SYSTEM ADMINISTRATOR/WEB APPLICATION	1
SYSTEMS ANALYST	1
SYSTEMS ANALYST/PROGRAMMER	2
SYSTEMS ENGINEER	1
TECHNOLOGY SERVICE ENGINEER	3
TECHNOLOGY SERVICE SPECIALIST	3
WEB APPLICATIONS DEVELOPER	2
TOTAL	56

Table 3. Years of Service as I.T. Engineer/Employee in the Company

	Mean	Median
Years working in the company	3.1	2
Years in the current position	1.4	1
Years practicing the profession	5.3	4

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Table 4. I.T. Engineer Level in the Company

Level	No. of subjects	Percent
High Level Engineer (Managerial)	10	17 9
Middle Level Engineer (Supervisory)	27	48.2
Primary Level Engineer (Staff)	18	32.1
User Level (Recipient of the Outputs of IT Engineers)	0	0
Did not specify	1	1.8
TOTAL	56	100

Table 5 shows the distribution of monthly salary received by the engineers and their assessment as to how much they should receive based on their current skills and job responsibilities. The lowest salary range received by the I.T. engineers was from 11,000 pesos to 15,000 pesos. The lowest salary range expected to receive by the I T. engineers was from 16,000 pesos to 20,000 pesos. Half of the engineers received a salary lower than what they expect to receive.

Table 5. Frequency Distribution of Salary Received and Expected by the Respondents (in Pesos)

Salary range (Pesos)	Received	Expected
	Frequency	Frequency
Below P10,000		
11,000 to 15,000	5	
16,000 to 20,000	12	5
21,000 to 25.000	7	9
26,000 to 30,000	9	5
31,000 to 35,000	5	7
36,000 to 40,000	8	12
Above 50,000	8	15
No Response	2	3
TOTAL	56	56

SKILLS INVENTORY

Tables 6 to 9 describe the present skills of the I.T. engineers on Application, System Development and Programming, Networking Solution and Telecommunication and Electronics Engineering.

Almost half of the I.T. engineers have skills on Office Application Macro Programming and of these, half were middle to highly skilled. About one-fourth has skills on Computer Graphics and Multimedia Contents Creation and majority of them were at the primary and user levels. Few engineers have skills on CADAM/CATIA and Game Contents Creation and their skill levels were at the user and primary levels.

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Table 6. Application Skills of I.T. Engineers (n=56)

Skill	Resp. with skill No.	Skill level High level No.	Middle level No.	Primary level No	User level No.
Computer Graphics/3DCG Editor Operation (e g. for film industry)	15 (26.8)			8	7
CADAM/CATIA Operation for Electronics and Mechanical Industry	6 (10.7)			2	4
Multimedia Contents Creation (e.g. for e-learning)	15 (26.8)	2	1	7	5
Game Contents Creation (PlayStation, Xbox and Windows platform)	9 (16.1)	1		1	7
Office Application Macro Programming by VBA (Word. Excel)	27 (48.2)	5	7	11	4

About two-thirds of the engineers were primary to middle skilled on project Management/System Consultation. More than half of them have skills on Visual Basic Programming, C++ programming, Internet Application Design, Application System Design (Windows Base and Unix) and Database Design. There were few engineers highly skilled on these skill categories and the others were user to middle skilled.

One-fourth or less have skills on Enterprise and Banking System Maintenance (MVS, OS/390, z/OS), Firmware or micro-code cording by Assembly and GUI (graphical user interface) design by Japanese language. Their skill levels were mostly at the user and primary skill levels and a few were middle skilled and one highly skilled on Enterprise and Banking System Maintenance.

Table 7. System Development and Programming Skills of I.T. Engineers (n=56)

Skill	Respondents with skill No.	Skill level High level No.	Middle level No.	Primary level No.	User level No.
Visual Basic Programming (Windows Appl.)	33 (58.9)	5	12	10	6
C++ Programming (Multi platform)	31 (55 4)	3	6	16	6
JAVA Programming (Multi platform)	23 (41 1)	6	7	7	3
Internet Application Design (HTML/XML, CGI cording by perl)	34·(60 7)	5	11	13	5
Application System Design (Windows base)	34 (60 7)	6	16	6	6
Application System Design (Unix. Linux base)	29 (51.8)	3	11	7	8
Database Design (RDB. SQL3, DBMA)	29(51.8)	7	15	4	3
Enterprise and Banking System Maintenance (MVS. OS/390. z/OS)	14 (25.0)	1	5	5 .	3
Project Management/ System Consultation	36 (64.3)	6	15	15	
Firmware or micro-code coding by Assembly	14 (25.0)		1	5	8
GUI design by Japanese language	7 (12.5)			4	3
Others	1 (1.8)	1			

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More than two-thirds of the I T engineers were skilled on Client Server System Design (Table 8) and half of these were at the middle skill level. Skill on Groupware Application Design was present on 34 percent of the engineers with half being at the user level. About one-fourth has skills on Optical Fiber Technology, Cellular Phone Technology and Radio Communication Engineering and their skill levels were at primary and user levels. The other skills were present in a little less than half of the respondents and their skill levels vary from user to high skill level.

Table 8. Networking Solution and Telecommunication Skills of I.T. Engineers (n=56)

Skill	Respondents with skill No.	Skill level			
		High level No	Middle level No.	Primary level No.	User level No.
Groupware Application Design (e g. Lotus)	19 (33 9)	2	5	2	10
Client Server System Design	38 (67 9)	4	19	10	5
Web/Mail/DNS Server Design	25 (44 6)	4	8	8	5
Network Security Technology (DES/RAS, Firewall)	24 (42.9)	2	6	10	6
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)	24 (42.9)	3	9	8	4
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology	23 (41.1)	2	10	8	3
Network Switch / Router (IP/IPX)/ Packet Frame Relay Technology	25 (44.6)	3	9	8	5
Optical Fiber, xDSL, Broadband Cable Tech.	16 (28.6)	1	3	6	6
Cellular Phone Technology	13 (23.2)		2	3	8
Radio Communication Engineering	13 (23 2)	1	1	5	6
Others	1 (1.8)	1			

Almost half of the respondents have skills on Personal Computer Hardware. There were an equal number of I.T. engineers in the different skill levels. One out of four engineers has skills on Logic and Analog Circuit Design and most of them were at the primary skill level. Other electronics and communication skills were present on less than twenty percent of the I.T. engineers and their skill levels were at the primary and user levels (Table 9).

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Table 9. Electronics Engineering Skills of I.T. Engineers (n=56)

Skill	Resp. with skill No.	Current Skill Level			
		High level No.	Middle level No.	Primary level No.	User level No.
Personal Computer Hardware/Intel CPU Architecture	27 (48.2)	7	7	6	7
Logic Circuit Design (ASIC/FPGA by VHDL)	16 (28.6)		5	7	4
Analog Circuit Design (w/ Simulation by SPICE)	15 (26.8)	2	2	6	5
Print Circuit Design (e.g. CADENCE)	11 (19 6)	2	3	2	4
Mfg and Test Technology for Device Industry (Semiconductor)	8 (14.3)		2	2	4
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	10 (17.9)		2	3	5
Plant Mgt./Production and Quality Control	9 (16 1)		1	2	6
Others	1 (1.8)			1	

MASTERY OF SKILLS

Not very many I.T engineers intend to master their Applications skills (Table 10). Of those who will master their skills, they want to reach middle to high skill level. They indicated training in the Philippines as their preferred means of mastering their skills except for skill on Office Application Macro Programming where Coaching in their own company was considered as another alternative (Table 11) Training abroad was considered by a few. The training duration mostly preferred by the engineers was about one month or more (Table 12). Some though have stated that less than two week to about three weeks was desired.

Table 10. Application Skills I.T. Engineers Like to Master and Desired Skill Level to Attain

Skill	Number of Respondents	Desired Skill Level			
		High level No.	Middle level No	Primary level No.	User level No.
Computer Graphics/3DCG Editor Operation (for film industry)	8 (14.3)	4	3	1	
CADAM/CATIA Operation for Electronics and Mechanical Industry	5 (8 9)	2	3		
Multimedia Contents Creation (e.g. for e-learning)	9 (16.1)	4	4	1	
Game Contents Creation (PlayStation, Xbox and Windows platform)*	5 (8.9)	2	1	1	
Office Application Macro Programming by VBA (Word, Excel)	12 (21 4)	10	2		

* some respondents did not indicate desired skill level to attain

Table 11. Means to Master Application Skills

Skill	No. of Respondents	Means to Master Skill			
		Training within the Philippines No.	Training Overseas No	Coaching-Own Company No	Others No.
Computer Graphics/3DCG Editor Operation (for film industry)	8	5	2	1	
CADAM/CATIA Operation for Electronics and Mechanical Ind.	5	4	1		
Multimedia Contents Creation (e.g. for e-learning)	9	6	1	1	1
Game Contents Creation (PlayStation, Xbox and Windows Platform)	5	2	2	1	
Office Application Macro Programming by VBA (Word, Excel)	12	5	1	4	2

Table 12. Preferred Duration of Training in Order to Master Application Skills

Skill	No. of Respondents	Training Duration			
		Less 2 Weeks No.	2-3 Weeks No.	1 Month No.	1 Month and Above No.
Computer Graphics/3DCG Editor Operation (for film industry)	8		2	2	4
CADAM/CATIA Operation for Electronics and Mechanical Industry	5		1	1	3
Multimedia Contents Creation (e.g. for e-learning)	9	1	3	2	3
Game Contents Creation (PlayStation, Xbox and Windows platform)	5	1			4
Office Application Macro Programming by VBA (Word, Excel)	12	2	2	5	3

Among the system development and programming skills, the two leading skills that engineers would like to master was JAVA programming and Project Management/System Consultation. They intend to become moderately skilled to highly skilled on these aspects (Table 13) Other skills where almost half of the engineers intend to master were Internet Application Design, Application System Design (Windows and Unix) and Database Design. One-third of them will master Visual Basic and C++ Programming. In general, they desire to attain moderate to high skill levels.

The engineers indicated that they generally prefer to get training here in the Philippines to master their system development and programming skills (Table 14). Local training and coaching in their own company were equally preferred in order to attain mastery on Database Design and Enterprise and Banking System Maintenance Twenty-eight engineers prefer to

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combine local training with coaching in their own company while nine of them favor either to be trained locally or abroad. Other means were through experience, doing research and self-study.

Majority of engineers preferred to have the training on these skills for more than one month (Table 15).

Table 13. System Development and Programming Skills I.T. Engineers Like to Master and Desired Skill Level to Attain (n=56)

Skill	No. of Respon-dents	Skill level			
		High level No.	Middle level No.	Primary level No.	User level No.
Visual Basic Programming (Windows Appl)	19 (33 9)	16	3		
C++ Programming (Multi platform)*	21 (37.5)	9	10	1	
JAVA Programming (Multi platform)*	28 (50 0)	16	6	3	
Internet Application Design (HTML/XML, CGI cording by perl)*	25 (44 6)	15	8	1	
Application System Design (Windows base)*	24 (42.9)	13	7	3	
Application System Design (Unix, Linux base)	25 (44 6)	17	8		
Database Design (RDB, SQL3, DBMA)	26 (46 4)	17	8	1	
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	11 (19.6)	6	3	2	
Project Management/ System Consultation*	31 (55.4)	17	9	2	
Firmware or micro-code coding by Assembly	6 (10.7)		1	4	1
GUI (graphical user interface) design by Japanese language	4 (7 1)	1	1	1	1

* some respondents did not indicate desired skill level to attain

Table 14. Means to Master System Development and Programming Skills

Skill	No. of Respon dents	Means to Master Skill			
		Trng. in Phil. No.	Trng. Abroad No.	Coaching Own Co. No.	Others No.
Visual Basic Programming (Windows Appl.)	19	7	1	3	8
C++ Programming (Multi platform)	21	9	2	2	8
JAVA Programming (Multi platform)*	28	12	1	4	10
Internet Application Design (HTML/XML, CGI cording by perl)	25	11	2	4	8
Application System Design (Windows)	24	10	2	6	6
Application System Design (Unix, Linux)	25	10	3	6	5
Database Design (RDB, SQL3, DBMA)	26	8	2	8	8
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	11	4	1	4	2
Project Management/ System Consultation*	31	12	3	6	9
Firmware or micro-code coding by Assembly	6	5		1	
GUI design by Japanese language	4	2	1	1	

* some respondents did not specify means to master skill

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Table 15. Preferred Duration of Training in Order to Master System Development and Programming Skills

Skill	No. of Respondents	Training Duration			
		Less 2 Weeks No.	2-3 Weeks No.	1 Mo. No. (%)	1 Mo. & Above No.
Visual Basic Programming (Windows)*	19	1	5	2	9
C++ Programming (Multi platform)*	21	2	3	5	9
JAVA Programming (Multi platform)*	28	2	5	5	15
Internet Application Design (HTML/XML, CGI cording by perl)*	25	3	5	5	11
Application System Design (Windows base)	24	6	3	4	11
Application System Design (Unix, Linux)*	25	2	5	6	11
Database Design (RDB, SQL3. DBMA)	26	3	6	5	12
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	11	1	2	2	6
Project Management/ System Consultation*	31	4	8	2	15
Firmware or micro-code coding by Assembly	6	1	1	1	3
GUI (graphical user interface) design by Japanese language	4		1	1	2

* Some respondents did not indicate preferred duration of training

About half of the I.T. engineers intend to master Client Server System Design (Table 16). Other skills category with moderately high number of engineers intending to master were Web/Mail/DNS Server Design, Network Security Technology, Internet Protocol Technology, LAN Technology and Network Switch/Router Technology. They aspire to reach middle to high skill levels.

Training in the Philippines remains to be the most preferred means to master their skills on networking solution and telecommunications (Table 17). Coaching in their own company was their next preference. Preference on the means to master cellular phone technology and radio communications engineering however, were not distinctively clear because of few respondents. Some have indicated multiple choices as to the means they would pursue to master their skills. Eighteen engineers would prefer any among local training, training abroad or coaching within their company. Five would choose either to get training locally or abroad. Some of them would consider local training and coaching within the company while some would go for training abroad and coaching within the company. Seven of them would do practice applications while self-study was preferred by few engineers.

The training duration that majority of engineers have specified to master their skills on networking solution and telecommunication was 1 month or more. Others though consider 2-3 weeks sufficient for the training.

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Table 16. Networking Solution and Telecommunication Skills I.T. Engineers Like to Master and Desired Skill Level to Attain (n=56)

Skill	No. of Respondents	Skill level			
		High level No	Middle level No	Primary level No.	User level No.
Groupware Application Design (e.g. Lotus Notes)	12 (21 4)	5	7		
Client Server System Design*	29 (51 8)	15	10	1	
Web/Mail/DNS Server Design*	24 (42.9)	12	8	1	1
Network Security Technology (DES/RAS, Firewall)*	26 (46.4)	12	10	1	
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)*	25 (44.6)	13	9		
LAN (IEEE802.3), Wireless LAN (IEEE802 11) Technology*	23 (41.1)	15	6	1	
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology*	23 (41.1)	15	6		
Optical Fiber, xDSL, Broadband Cable Tech.*	12 (21.4)	6	4	1	
Cellular Phone Technology*	6 (10.7)	4	1		
Radio Communication Engineering (RF)	6 (10.7)	5	1		
Others	1 (1.8)	1			

* Some respondents did not indicate desired skill level to attain

Table 17. Means to Master Networking Solution and Telecommunication Skills

Skill	No. of Respondents	Means to Master Skill			
		Training in Phil. No.	Training Overseas No.	Coaching- Own Co. No.	Others No
Groupware Application Design (e g. Lotus Notes)	12	6	1	3	2
Client Server System Design	29	11	3	6	9
Web/Mail/DNS Server Design	24	10	3	5	6
Network Security Technology (DES/RAS. Firewall)	26	11	4	5	6
Internet Protocol Technology (IPv6)/ Application (e.g VoIP)	25	11	3	6	5
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology*	23	9	1	6	6
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	23	12	2	3	6
Optical Fiber, xDSL, Broadband Cable Technology	12	4	2	1	5
Cellular Phone Technology	6	1	2	1	2
Radio Communication Engineering (RF)	6	2	2	1	1
Others	1	1			

* Some respondents did not specify means to master skill

Table 18. Preferred Duration of Training in Order to Master Networking Solution and Programming Skills

Skill	No. of Respondents	Training Duration			
		Less 2 Weeks No.	2-3 Weeks No.	1 Mo. No.	1 Mo. & Above No
Groupware Application Design (e.g. Lotus)	12	1	2	3	6
Client Server System Design	29	4	9	7	9
Web/Mail/DNS Server Design	24	4	7	4	9
Network Security Technology (DES/RAS, Firewall)*	26	5	5	5	10
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)	25	4	5	6	10
LAN (IEEE802.3), Wireless LAN (IEEE802 11) Technology*	23	4	5	5	8
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology*	23	2	7	3	10
Optical Fiber, xDSL, Broadband Cable Tech.	12	2	2	3	5
Cellular Phone Technology	6		1	1	4
Radio Communication Engineering (RF)*	6			2	3

* Some respondents did not indicate preferred duration of training

One out of five I.T. engineers intends to master their skills on Personal Computer Hardware/ Intel CPU Architecture (Table 19). Few engineers would like to attain mastery on the other skills. Of those who intend to master their skills, they desire to reach the highest skill level.

I.T. engineers indicated that in order to master their skills on Personal Computer, they would like to be trained here in the country (Table 20). There was no clear preference with regards to what means they would pursue to get mastery on the other skills. About four engineers consider the options of being trained locally, abroad and coaching within the company.

Similar to other skills, engineers prefer to get their additional training here in the Philippines for more than one month (Table 21)

Table 19. Electronics Engineering Skills I.T. Engineers Like to Master and Desired Skill Level to Attain (n=56)

Skill	Respon-dents w/ skill No.	Skill level			
		High level No.	Middle level No	Primary level No	User level No.
Personal Computer Hardware/ Intel CPU Architecture*	13 (23.2)	9	2		
Logic Circuit Design (ASIC/FPGA by VHDL)*	8 (14.3)	6	1		
Analog Circuit Design (w/ Simulation by SPICE)	8 (14.3)	6	2		
Print Circuit Design (e.g. CADENCE)*	5 (8.9)	3	1		
Mfg and Test Technology for Device Industry (Semiconductor)*	3 (5.4)	2			
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)*	4 (7.1)	3			
Plant Management/ Production & Quality Control	2 (3.6)	2			
Others	1 (1.8)	1			

* Some respondents did not indicate desired skill level to attain

Table 20. Means to Master Electronics Engineering Skills

Skill	No. of Respon-dents	Means to Master Skill			
		Training in Phil. No	Training Overseas No	Coaching-Own Co. No.	Others No.
Personal Computer Hardware/ Intel CPU Architecture	13	6	2	2	3
Logic Circuit Design (ASIC/FPGA by VHDL)	8	2	2	2	2
Analog Circuit Design (w/ Simulation by SPICE)	8	2	2	2	2
Print Circuit Design (e.g. CADENCE)	5	2	1	1	1
Mfg and Test Technology for Device Industry (Semiconductor)	3	2		1	
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	4	1	1	1	1
Plant Management/ Production & Quality Control	2	1		1	
Others	1		1		

Table 21. Preferred Duration of Training in Order to Master Electronics Engineering Skills

Skill	No. of Respondents	Training Duration			
		Less 2 Weeks No	2-3 Weeks No.	1 Mo. No	1 Mo & Above No.
Personal Computer Hardware/ Intel CPU Architecture	13	2	3	3	5
Logic Circuit Design (ASIC/FPGA by VHDL)	8	1	1	1	5
Analog Circuit Design (w/ Simulation by SPICE)	8	1	1	2	4
Print Circuit Design (e.g. CADENCE)	5		1	1	3
Mfg and Test Technology for Device Industry (Semiconductor)	3	1		1	1
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	4	1		1	2
Plant Management/ Production & Quality Control	2	1		1	

Tables 22 to 25 show the amount of money needed by the I.T. engineers to master their skills, the pay increase per month they expect after they master the skill and the salary they expect to receive if they will be working abroad.

The amount needed for mastering their skills on applications range from a median of 20,000 pesos to a median 50,000 pesos The median pay increase after mastering their skills ranged from 5,000 pesos to 7,500 pesos. If given the chance to work abroad, the median expected salary was as low as US$1000 for Game Contents Creation and as high as US$3,500 for CADAM/CATIA Operation for Electronics and Mechanical Industry.

Table 22. Amount Needed to Master Application Skills, Pay Increase Expected after Mastering the Skill and Expected Salary if Working Abroad

Skill	Amount Needed For Mastering Skill Median, Pesos	Pay Increase Median, Pesos	Expected Salary Median, US$
Computer Graphics/3DCG Editor Operation (for film industry)	50,000	5,000	3,000
CADAM/CATIA Operation for Electronics and Mechanical Industry	40,000	7,500	3,500
Multimedia Contents Creation (e.g. for e-learning)	20,000	7,500	2,000
Game Contents Creation (PlayStation, Xbox and Windows platform)	25,000	5,000	1,000
Office Application Macro Programming by VBA (Word, Excel)	20,000	5,000	2,000

The I.T. engineers indicated that the amount needed for mastering their skills on system development and programming was as low as 20,000 pesos for Firmware or Micro-code Cording by Assembly and C++ programming and as high as 50,000 pesos for Project Management System Consultation. After mastering their skills, they expect a pay increase of 10,000 pesos for each of the skills mastered with the exception of two skills, Firmware or micro-code coding by Assembly and Graphical User Interface, having a lower expected pay increase than the others. The median expected salary if they will work abroad did not vary much. ranging from US$5,000 to US$6,000.

Table 23. Amount Needed to Master System Development and Programming Skills, Pay Increase Expected after Mastering the Skill and Expected Salary if Working Abroad

Skill	Amount Needed For Mastering Skill Median, Pesos	Pay Increase Median, Pesos	Expected Salary Median, US$
Visual Basic Programming (Windows Application)	37,500 00	10,000 00	5,500.00
C++ Programming (Multi platform)	20,000.00	10,000.00	5,500 00
JAVA Programming (Multi platform)	40,000.00	10,000.00	6,000.00
Internet Application Design (HTML/XML, CGI cording by perl)*	32,500 00	10,000 00	5,000.00
Application System Design (Windows base)*	37,500.00	10,000.00	5,833.00
Application System Design (Unix, Linux base)	40,000.00	10,000.00	5,500 00
Database Design (RDB, SQL3. DBMA)	40,000.00	10,000.00	6,000.00
Enterprise and Banking System Maintenance (MVS, OS/390. z/OS)	30,000 00	10,000.00	5,000 00
Project Management/ System Consultation	50,000.00	10,000.00	6,000.00
Firmware or micro-code coding by Assembly	20,000.00	9,000 00	5,000.00
GUI (graphical user interface) design by Japanese language	35,000 00	7,500.00	5,500.00

The amount needed by the I T. engineers to master their skills on networking solution and telecommunication ranged from a median of 22,500 pesos to 90,000 pesos. They expect to receive a median pay increase that was as low as 5,000 pesos and as high as 10,000 pesos. The median salary expected if given the chance to work abroad and utilizing their networking skills was US$5,000 with the exception of optical fiber technology where the salary expected is a little lower than the rest.

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Table 24. Amount Needed to Master Networking Solution and Telecommunication Skills, Pay Increase Expected after Mastering the Skill and Expected Salary if Working Abroad

Skill	Amount Needed For Mastering Skill Median, Pesos	Pay Increase Median, Pesos	Expected Salary Median, US$
Groupware Application Design (e.g. Lotus)	30,000	10,000	5,000
Client Server System Design	22,500	50,00	5,000
Web/Mail/DNS Server Design	35,000	5,000	5,000
Network Security Technology (DES/RAS, Firewall)	50,000	10,000	5,000
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)	35,000	6,000	5,000
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology	50,000	10,000	5,000
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	75,000	10,000	5,000
Optical Fiber, xDSL, Broadband Cable Technology	90,000	6,000	4,750
Cellular Phone Technology*		10,000	
Radio Communication Engineering (RF)		10,000	

For those who will master their skills on Electronics Engineering, specifically, personal computer hardware/Intel CPU architecture, Logic and Analog Circuit Design, the median amount needed for training ranged from 12,500 pesos to 40,000 pesos. After mastering their skills, they expect to receive a median pay increase ranging from 6,000 pesos to 10,000 pesos. If given the chance to work abroad, they expect a median salary of about US$4,000 or less.

Table 25. Amount Needed to Master Electronics Engineering Skills. Pay Increase Expected after Mastering the Skill and Expected Salary if Working Abroad

Skill	Amount Needed For Mastering Skill Median, Pesos	Pay Increase Median, Pesos	Expected Salary Median, US$
Personal Computer Hardware/Intel CPU Arch.	12,500	6,000	3,750
Logic Circuit Design (ASIC/FPGA by VHDL)	30,000	6,000	2,062.50
Analog Circuit Design (w/ Simulation by SPICE)	40,000	7,000	2,075
Print Circuit Design (e.g. CADENCE)		10,000	
Mfg and Test Technology for Device Industry (Semiconductor)			
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)		10,000	
Plant Management / Production and Quality Control			

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COMPANY SPONSORED TRAINING COURSES OR ON-THE-JOB TRAINING PROGRAMS

In the past two years, I.T. engineers experienced attending training courses or on-the-job training programs in their companies. About twelve percent (7 out of 56) attended courses on Office Application Macro Programming (Table 26). Less than ten percent attended courses on the other application skills. Teaching methods used in the courses were lectures and on the job coaching. Some have attended courses that were presented using both methods. The skill level of the courses varied from user level to high level (Table 27) Some courses lasted for less than one week to about two weeks (Table 28). Others got the training for five weeks or longer. The engineers attended the training programs because they were required for their jobs or the trainings were given as incentives for them (Table 29). They were somewhat satisfied with the training (Table 30). Majority of the trainings were company sponsored (Table 31). Few engineers paid half of the training fees while the other half was paid by the company.

Table 26. Company Sponsored Training Courses on Applications Attended by the Respondents in the Past Two Years

Skill	Number of Respondents	Lecture	On the Job Coaching	Others
Computer Graphics/3DCG Editor Operation (for film industry)	4	1		3
CADAM/CATIA Operation for Electronics and Mechanical Industry	2	1		1
Multimedia Contents Creation (e.g. for e-learning)	3	1	1	1
Game Contents Creation (PlayStation, Xbox and Windows platform)	2	1		1
Office Application Macro Programming by VBA (Word, Excel)	7	4	3	

Table 27. Skill Level of the Training Courses Attended by the Respondents On Applications

Skill	No. of Respondents	High Level	Medium Level	Primary Level	User Level
Computer Graphics/3DCG Editor Operation (for film industry)*	4	1	1		1
CADAM/CATIA Operation for Electronics and Mechanical Industry	2	1			1
Multimedia Contents Creation (e.g. for e-learning)	3		2		1
Game Contents Creation (PlayStation, Xbox and Windows platform)	2		1		1
Office Application Macro Programming by VBA (Word, Excel)	7	1	3	2	1

*Some respondents did not indicate skill level

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Table 28. Duration of the Training Courses Attended by the Respondents On Applications

Skill	No. of Respondents	Less 1 week	1-2 weeks	3-4 weeks	5 weeks up
Computer Graphics/3DCG Editor Operation (for film industry)*	4	1	1		1
CADAM/CATIA Operation for Electronics and Mechanical Industry	2	1			1
Multimedia Contents Creation (e g. for e-learning)	3	1	1		1
Game Contents Creation (PlayStation, Xbox and Windows platform)	2	1			1
Office Application Macro Programming by VBA (Word, Excel)	7	3	3		1

*Some respondents did not indicate duration of training courses

Table 29. Relevance of the Training Courses Attended by the Respondents On Applications to the Position Held in the Company

Skill	No. of Respondents	Required	For Advancement	Incentives	Others
Computer Graphics/3DCG Editor Operation (for film industry)	4	1		2	
CADAM/CATIA Operation for Electronics and Mechanical Industry	2	1		1	
Multimedia Contents Creation (e.g. for e-learning)	3	1		2	
Game Contents Creation (PlayStation, Xbox and Windows platform)	2	1		1	
Office Application Macro Programming by VBA (Word, Excel)	7	4	2	1	

Table 30. Level of Satisfaction on the Training Courses Attended by the Respondents
On Applications

Skill	No. of Respondents	Very Satisfied	Somewhat Satisfied	Not satisfied
Computer Graphics/3DCG Editor Operation (for film industry)*	4		2	
CADAM/CATIA Operation for Electronics and Mechanical Industry*	2		1	
Multimedia Contents Creation (e g. for e-learning)*	3		2	
Game Contents Creation (PlayStation, Xbox and Windows platform)*	2		1	
Office Application Macro Programming by VBA (Word, Excel)*	7	2	4	

* Some respondents did not indicate level of satisfaction

Table 31. Sponsorship Received by the Respondents for the Training Courses
On Applications

Skill	No. of Respondents	100% Company	50% Employee 50% Company	Others
Computer Graphics/3DCG Editor Operation (for film industry)*	4	1	1	
CADAM/CATIA Operation for Electronics and Mechanical Industry*	2	1		
Multimedia Contents Creation (e.g for e-learning)*	3	1	1	
Game Contents Creation (PlayStation, Xbox and Windows platform)*	2	1		
Office Application Macro Programming by VBA (Word, Excel)*	7	6		

* Some respondents did not indicate training sponsorship

One out of four engineers were able to attend training courses on Visual Basic, C++ and JAVA programming and Database Design in their companies in the past two years (Table 32). Eighteen percent attended training programs on Internet Application Design and Project Management/System Consultation. Few engineers got training on other system development and programming skills courses The most common teaching method used in the courses was giving a lecture on the topics. It was followed by a combination of lectures and on the job coaching. Very few have attended a training that used on-the-job coaching method alone as a teaching method. Doing group study, having lecture and laboratory/hands-on/assignments were some of the other methods used in the courses. The skill level of the courses varied from user level to high level (Table 33). Duration of the training courses varied in length (less than one week to 5 weeks up) (Table 34). The engineers attended the training programs because it is required in their jobs or for professional advancement. The training for a few of the engineers was a form of an

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incentive to them (Table 35)   Engineers were somewhat to very satisfied with the training (Table 36). Majority of the trainings were company sponsored (Table 37).

Table 32. Company Sponsored Training Courses on System Development
and Programming Attended by the Respondents in the Past Two Years

Skill	No. of Respondents	Lecture	On the Job Coaching	Others
Visual Basic Programming (Windows App)	15	4	3	8
C++ Programming (Multi platform)	15	7	3	5
JAVA Programming (Multi platform)	15	7	2	6
Internet Application Design (HTML/XML, CGI cording bv perl)	10	4	1	5
Application System Design (Windows base)	9	3	3	3
Application System Design (Unix, Linux base)	9	6		3
Database Design (RDB, SQL3, DBMA)	13	6	2	5
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	5	1	2	2
Project Management/ System Consultation	10	3	3	4
Firmware or micro-code coding by Assembly	2	1		1
GUI (graphical user interface) design by Japanese language	3		2	1

Table 33. Skill Level of the Training Courses Attended by the Respondents on System
Development and Programming

Skill	No. of Resp.	High Level	Medium Level	Primary Level	User Level
Visual Basic Programming (Windows App.)*	15	3	5	5	1
C++ Programming (Multi platform)	15	2	3	8	2
JAVA Programming (Multi platform)	15	5	6	3	1
Internet Application Design (HTML/XML, CGI cording by perl)	10	3	4	3	
Application System Design (Windows base)*	9	1	2	3	1
Application System Design (Unix, Linux base)	9	1	2	3	3
Database Design (RDB, SQL3, DBMA)*	13	1	7	4	
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)	5	2	2		1
Project Management/ System Consultation*	10		7	2	
Firmware or micro-code coding by Assembly*	2				1
GUI (graphical user interface) design by Japanese language	· 3		1	1	1

* Some respondents did not indicate skill level

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Table 34. Duration of the Training Courses Attended by the Respondents on System Development and Programming

Skill	No. of Resp.	Less 1 week	1-2 weeks	3-4 weeks	5 weeks up
Visual Basic Programming (Windows App) *	15	1	6	3	3
C++ Programming (Multi platform) *	15	1	4	3	6
JAVA Programming (Multi platform)*	15	2	3	1	8
Internet Application Design (HTML/XML, CGI cording by perl)*	10	3	3		3
Application System Design (Windows base)*	9	3	2		2
Application System Design (Unix, Linux base)	9	4	3	1	1
Database Design (RDB, SQL3, DBMA)*	13	2	4	3	2
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)*	5		1		2
Project Management/ System Consultation	10	4	3		3
Firmware or micro-code coding by Assembly	2	2			
GUI (graphical user interface) design by Japanese language	3	2	1		

* Some respondents did not indicate duration of training courses attended

Table 35. Relevance of the Training Courses Attended by the Respondents on System Development and Programming to the Position Held in the Company

Skill	No. of Resp.	Required	For Advancement	Incentives	Others
Visual Basic Programming (Windows App.)*	15	6	5	1	1
C++ Programming (Multi platform) *	15	8	4	1	1
JAVA Programming (Multi platform)*	15	8	5	1	
Internet Application Design (HTML/XML, CGI cording by perl)*	10	3	6		
Application System Design (Windows base)*	9	3	4		
Application System Design (Unix, Linux base)	9	5	3	1	
Database Design (RDB, SQL3, DBMA)*	13	9	2		1
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)*	5	2		1	
Project Management/ System Consultation	10	4	4	1	1
Firmware or micro-code coding by Assembly	2		1	1	
GUI (graphical user interface) design by Japanese language	3	1	1	1	

* Some respondents did not indicate relevance of the training course

Table 36. Level of Satisfaction on the Training Courses Attended by the Respondents on System Development and Programming

Skill	No of Resp	Very Satisfied	Somewhat Satisfied	Not Satisfied
Visual Basic Programming (Windows Appl)*	15	3	8	1
C++ Programming (Multi platform) *	15	4	8	
JAVA Programming (Multi platform)*	15	4	8	
Internet Application Design (HTML/XML, CGI cording by perl)*	10	1	7	
Application System Design (Windows base)*	9	2	1	1
Application System Design (Unix, Linux)*	9	4	3	
Database Design (RDB, SQL3, DBMA)*	13	3	6	
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)*	5	1	1	
Project Management/ System Consultation*	10	5	3	
Firmware or micro-code coding by Assembly*	2		1	
GUI (graphical user interface) design by Japanese language*	3		2	

* Some respondents did not indicate level of satisfaction

Table 37. Sponsorship Received by the Respondents for the Training Courses on System Development and Programming

Skill	No of Resp.	100% Company	50% Employee 50% Company	Others
Visual Basic Programming (Windows Application)*	15	10	1	
C++ Programming (Multi platform) *	15	10	2	
JAVA Programming (Multi platform)*	15	10	1	
Internet Application Design (HTML/XML, CGI cording by perl)*	10	7		
Application System Design (Windows base)*	9	4		
Application System Design (Unix, Linux base)*	9	7		
Database Design (RDB, SQL3, DBMA)*	13	9		
Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)*	5	2		
Project Management/ System Consultation*	10	7	1	
Firmware or micro-code cording by Assembly*	2	1		
GUI (graphical user interface) design by Japanese language*	3	2		

* Some respondents did not indicate sponsorship of training

In the past two years, one out of four engineers was able to attend training courses on Web/Mail/DNS Server Design in their companies (Table 38). Other training courses attended were on Client Server System Design, Network Security Technology and LAN Technology. Only few engineers were able to attend courses on the other networking skills. The commonly used teaching method in the courses was giving lectures. It was followed by a combination of

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lectures and on the job coaching. On-the-job coaching was used for training on Groupware Application Design. Other means of training such as lecture with laboratory and use of virtual classroom were also conducted. Online courses were also done. The course skill levels varied from user level to high level (Table 39). Training courses were conducted for less than a week to about two weeks. Some have lasted for more than one month (Table 40). Major reasons for attending the courses were job requirement and professional advancement. Training was an incentive for a few of them (Table 41) Majority of the engineers were somewhat to very satisfied with the training (Table 42). Few though were not satisfied with it. Majority of the trainings were sponsored by the company (Table 43).

Table 38. Company Sponsored Training Courses on Networking Solution and Telecommunications Attended by the Respondents in the Past Two Years

Skill	No of Resp.	Lecture	On the Job Coaching	Others
Groupware Application Design (e g. Lotus Notes)	8	2	4	2
Client Server System Design	13	6	1	6
Web/Mail/DNS Server Design	15	4	2	9
Network Security Technology (DES/RAS, Firewall)	11	5	3	3
Internet Protocol Technology (IPv6)/ Application (e g. VoIP)	8	4		4
LAN (IEEE802.3), Wireless LAN (IEEE802 11) Technology	10	4		6
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	9	3	3	3
Optical Fiber, xDSL, Broadband Cable Technology	5	3		2
Cellular Phone Technology*	3	2		1
Radio Communication Engineering (RF)	3	2		1

* Some respondents did not indicate the type of training courses attended

Table 39. Skill Level of the Training Courses Attended by the Respondents on Networking Solution and Telecommunications

Skill	No. of Resp.	High Level	Med Level	Prim Level	Others
Groupware Application Design (e.g. Lotus)	8	2	1	3	2
Client Server System Design	13	4	5	3	1
Web/Mail/DNS Server Design	15	4	5	5	1
Network Security Technology (DES/RAS, Firewall)	11	3	3	2	3
Internet Protocol Technology (IPv6)/ Application (e g. VoIP)	8	3	2	3	
LAN (IEEE802.3). Wireless LAN (IEEE802 11)	10	2	6	1	1
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	9	2	3	3	1
Optical Fiber, xDSL, Broadband Cable Tech	5		2	2	1
Cellular Phone Technology*	3			1	2
Radio Communication Engineering (RF)	3			2	1

* Some respondents did not indicate the skills level

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Table 40. Duration of the Training Courses Attended by the Respondents on Networking Solution and Telecommunications

Skill	No of Resp.	Less 1 week	1-2 weeks	3-4 weeks	5 up weeks
Groupware Application Design (e g Lotus Notes)	8	4	1	1	2
Client Server System Design	13	5	4		4
Web/Mail/DNS Server Design	15	5	6		4
Network Security Technology (DES/RAS, Firewall)*	11	5	3		2
Internet Protocol Technology (IPv6)/ Application (e g. VoIP)	8	4	2		2
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology	10	5	3		2
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	9	6	1		2
Optical Fiber, xDSL, Broadband Cable Technology	5	3	1	1	
Cellular Phone Technology*	3	3			
Radio Communication Engineering (RF)	3	3			

Table 41. Relevance of the Training Courses Attended by the Respondents on Networking Solution and Telecommunications to the Position Held in the Company

Skill	No. of Resp.	Required	For Advance ment	Incen tives	Others
Groupware Application Design (e.g. Lotus Notes)	8	4	3		1
Client Server System Design	13	9	2	1	1
Web/Mail/DNS Server Design	15	10	3		2
Network Security Technology (DES/RAS, Firewall)	11	6	2	1	2
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)	8	4	3		1
LAN (IEEE802 3), Wireless LAN (IEEE802 11) Technology	10	6	2		2
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology	9	4	4		1
Optical Fiber, xDSL, Broadband Cable Technology	5	3	1		1
Cellular Phone Technology	3		1	1	1
Radio Communication Engineering (RF)	3		2	1	

Table 42. Level of Satisfaction on the Training Courses Attended by the Respondents on Networking Solution and Telecommunications

Skill	No. of Resp	Very Satisfied	Somewhat Satisfied	Not Satisfied
Groupware Application Design (e.g. Lotus Notes)*	8	3	3	1
Client Server System Design*	13	4	8	
Web/Mail/DNS Server Design*	15	6	7	1
Network Security Technology (DES/RAS, Firewall)*	11	3	7	
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)*	8	2	5	
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology*	10	4	5	
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology*	9	2	6	
Optical Fiber, xDSL, Broadband Cable Technology*	5		3	1
Cellular Phone Technology*	3	1	1	
Radio Communication Engineering (RF)*	3	1	1	

* Some respondents did not indicate level of satisfaction

Table 43. Sponsorship Received by the Respondents for the Training Courses on Networking Solution and Telecommunications

Skill	No. of Respondents	100% Company	50% Employee 50% Company	Others
Groupware Application Design (e.g. Lotus Notes)*	8	4	1	2
Client Server System Design*	13	8	1	1
Web/Mail/DNS Server Design*	15	10	1	1
Network Security Technology (DES/RAS, Firewall)*	11	6	1	1
Internet Protocol Technology (IPv6)/ Application (e.g. VoIP)*	8	5		
LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology*	10	6		
Network Switch / Router (IP/IPX)/ Packet, Frame Relay Technology*	9	6		
Optical Fiber, xDSL, Broadband Cable Technology*	5	3		
Cellular Phone Technology*	3	1		1
Radio Communication Engineering (RF)*	3	1		1

* Some respondents did not indicate the type of training sponsorship attended

In the past two years, very few engineers were able to attend training courses on Electronics Engineering in their companies in the past two years. Only fifteen percent (8/56) had training on Personal Computer Hardware (Table 44). Few engineers were able to attend courses on the other electronics engineering skills. Lecture was the commonly used training method. Lectures and on-the-job coaching combined was also conducted. The course skill levels were at

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user and primary levels with few conducted on a high level (Table 45). Most of the training courses were conducted for less than a week. Few lasted for more than one week (Table 46). The reasons for attending the courses were job requirement, professional advancement and given as an incentive (Table 47). It was mostly because of requirement that engineers were able to attend the training on Personal Computer Hardware. The engineers were somewhat to very satisfied with the training (Table 48). Majority of the trainings were sponsored by the company (Table 49).

Table 44. Company Sponsored Training Courses on Electronics Engineering Attended by the Respondents in the Past Two Years

Skill	No. of Resp.	Lecture	On the Job Coaching	Others
Personal Computer Hardware/ Intel CPU Architecture	8	1		7
Logic Circuit Design (ASIC/FPGA by VHDL)	3	3		
Analog Circuit Design (w/ Simulation by SPICE)	3	3		
Print Circuit Design (e.g. CADENCE)	2	1		1
Mfg and Test Technology for Device Industry (Semiconductor)	1	1		
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	1	1		
Plant Management / Production and Quality Control	3	1	2	

Table 45. Skill Level of the Training Courses Attended by the Respondents on Electronics Engineering

Skill	No. of Respondents	High Level	Medium Level	Primary Level	User Level
Personal Computer Hardware/ Intel CPU Architecture	8	3	3		2
Logic Circuit Design (ASIC/FPGA by VHDL)	3	1		1	1
Analog Circuit Design (w/ Simulation by SPICE)	3	1		1	1
Print Circuit Design (e.g. CADENCE)	2	1			1
Mfg and Test Technology for Device Industry (Semiconductor)	1				1
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	1				1
Plant Management / Production and Quality Control	3			2	1

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Table 46. Duration of the Training Courses Attended by the Respondents on Electronics Engineering

Skill	No. of Respondents	Less 1 week	1-2 Weeks	3-4 Weeks	5 up weeks
Personal Computer Hardware/ Intel CPU Architecture	8	3	3	1	1
Logic Circuit Design (ASIC/FPGA by VHDL)	3	3			
Analog Circuit Design (w/ Simulation by SPICE)	3	3			
Print Circuit Design (e.g. CADENCE)	2	1	`		1
Mfg and Test Technology for Device Industry (Semiconductor)	1	1			
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	1	1			
Plant Management / Production and Quality Control	3	1			2

Table 47. Relevance of the Training Courses Attended by the Respondents on Electronics Engineering to the Position Held in the Company

Skill	No. of Respondents	Required	For advancement	Incentives	Others
Personal Computer Hardware/ Intel CPU Architecture	8	4	2	2	
Logic Circuit Design (ASIC/FPGA by VHDL)	3		2	1	
Analog Circuit Design (w/ Simulation by SPICE)	3		2	1	
Print Circuit Design (e.g. CADENCE)	2	1		1	
Mfg and Test Technology for Device Industry (Semiconductor)	1			1	
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)	1			1	
Plant Management / Production and Quality Control	3	1	1	1	

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Table 48. Level of Satisfaction on the Training Courses Attended by the Respondents on Electronics Engineering

Skill	No. of Resp.	Very Satisfied	Somewhat Satisfied	Not Satisfied
Personal Computer Hardware/ Intel CPU Architecture*	8	3	4	
Logic Circuit Design (ASIC/FPGA by VHDL)*	3	1	1	
Analog Circuit Design (w/ Simulation by SPICE)*	3	1	1	
Print Circuit Design (e.g. CADENCE)*	2	1		
Mfg and Test Technology for Device Industry (Semiconductor)*	1			
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)*	1			
Plant Management / Production and Quality Control*	3	1	1	

* Some respondents did not indicate level of satisfaction of training attended

Table 49. Sponsorship Received by the Respondents for the Training Courses on Electronics Engineering

Skill	No. of Respondents	100% Company	50% Employee 50% Company	Others
Personal Computer Hardware/ Intel CPU Architecture*	8	4		2
Logic Circuit Design (ASIC/FPGA by VHDL)	3	1		1
Analog Circuit Design (w/ Simulation by SPICE)*	3	1		1
Print Circuit Design (e.g. CADENCE)*	2	1		
Mfg and Test Technology for Device Industry (Semiconductor)*	1			
Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)*	1			
Plant Management / Production and Quality Control*	3	2		

* Some respondents did not indicate sponsorship of training attended

TRAINING COURSES ATTENDED IN THE PAST TWO YEARS, CONDUCTED BY EXTERNAL I.T. COMPANIES

Forty-five percent of the engineers (25 out of 56 engineers) were able to attend various training courses conducted by external I.T. companies. The list of the courses is shown in Table 50. Of the 60 different courses, two-thirds were held here in the Philippines, 2 % in the US, 12% in Japan and 8% in other countries. Fifty percent of these courses were conducted in less than one week to about two weeks. The training courses were conducted by a local private I.T. company (42%) or a foreign I.T. company (39%). Only 2% of the courses were conducted by government agencies. Attendance of engineers to two-thirds of these courses was paid by their respective companies and attendance in half of the training courses was required in their jobs About one-third of the courses attended were for their professional advancement. Two percent were given as incentives to them. They were generally satisfied with the courses.

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Table 50. Attendance in the Training Courses Conducted by External I.T. Companies

TRAINING COURSE	No. of Respondents
3COM PARTNER FORUM TECHNICAL TRAINING	1
A+ CERTIFICATION TRAINING	1
ADVANCE ROUTER CONFIGURATION	1
AOTS TRAINING	2
APPLICATION DESIGN AND DEVELOPMENT	1
BASIC ROUTER CONFIGURATION	1
BUILDING MULTI-LAYER SCALABLE CISCO NETWORK	1
BUILDING SCALABLE CISCO NETWORK	1
CERTIFIED INTERNET PROFESSIONAL	1
CISCO INTERNETWORK TROUBLESHOOTING	1
CISCO IP TELEPHONY	1
CISCO NETWORK DEVICES INTERCONNECTION	1
CONSULTING	1
DBA TRAINING ON MS SQL 7 0	1
EXTREME NETWORKING PRODUCTS CONFIG AND DESIGN	1
FUJITSU 8000 SERIES ATM	1
FUNDAMENTALS OF XML	1
GR 720 CE TRAINING COURSE	1
HP OPENVIEW NETWORK MANAGER I	1
HP OPENVIEW SUITE	1
HP STAR (NTC)	1
HTML	1
IBM WEBSPHERE COMMERCE CUSTOMATION	1
ICAD – MX	1
IMPLEMENTING WINDOWS XP (INTRO)	1
JAVA	1
JAVA DEVELOPMENT TRAINING	1
JAVA PROGRAMMING (SUNS MICROSOFT)	2
JAVASCRIPT	1
JD EDWARDS ADDRESS BOOK	1
JD EDWARDS TECHNICAL FOUNDATION	1
JD EDWARDS TRAINING	1
JSP	1
MAINTENANCE OF FI2040/2240 FUJITSU SCANNER	1
MICROSOFT INFRASTRUCTURE SERIES	1
MS CERTIFICATION IN VISUAL BASIC 6 0 DESKTOP	1
NETWORK APPLIANCES	1
PABX	1
PHP	1
PRIME CLUSTER TRAINING	1
PRIMEPOWER 650/850 CE TRAINING COURSE	1
RED HAT LINUX 6 2 TRAINING	1
RPG REPORT GENERATION PROGRAM	1

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Table 50. Attendance in Training Courses (continued)

SERVLET	1
SOLARIS 8 SYSTEM ADMINISTRATION (PART 1, 2)	1
SOLARIS/SUN STORAGE W/VXVM	1
SOLARIS TCP/IP AND NETWORK ADMINISTRATION	1
SQL 7 0 DESIGN AND IMPROVEMENT	2
SUN NETWORK ADMINISTRATOR	1
SUN VOLUME MGR TRNG	1
TARANTELLA ENTERPRISE 3 ADMINISTRATION	1
TECHNICAL TRAINING	1
VISUAL BASIC/FUNDAMENTALS (6 0)	2
VISUAL INTERDEV 6 0 TRAINING	1
VISUAL STUDIO 6 0 MASTERY	1
VOLUME MANAGEMENT W/SDS	1
WINDOWS 2000 FUNDAMENTALS AND IMPLEMENTATION	1
WINDOWS 2000 (PROF) IMPLEMENTATION	1
WINDOWS 2000 NETWORK 1 IMPLEMENTATION	1

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Opinion of I.T. Engineers on the proposed establishment of I.T. education and recruitment center by the University of the Philippines:

The respondents agreed that the proposed establishment of I.T. Education and Recruitment Center would be an advantage for the I.T. industry in the Philippines as we progress and develop in this industry. It would be very beneficial not only for the students but also for career professionals who are currently employed. They indicated that I.T. industry is in demand today where trends of businesses at this time are towards I.T. and therefore young and highly skilled professionals are needed. The proposal is very encouraging because it can invite the best of talents without discriminating the less fortunate who happened to have financial difficulties. In the long term, they believed that this would help the nation in building pool of I.T. talents to compete globally.

Through this program, they expected that young professionals would have exposure and mastery on the specialized courses being offered. In addition, they expected that the program would offer wide variety of courses and would extend and update the I.T. services/courses offered as new technologies are emerging.

In view of this project, there must be an open communication between the academe and the I.T. industry to enable the academe to recognize the technologies and skills that are practical and much needed in the professional world. Furthermore, a lot of effort is essential to address the issue of brain drain and so to uplift the image of our I T. industry and its talents

Another school of thought from various I.T. Engineers is that there are over supply of I.T. Centers which have been turning into diploma mills that churning out an increasing number of graduates who cannot find jobs. The issue at hand is in terms of the quality of IT education that these I.T. graduates possess and the availability of IT firms to accommodate them in order for them to apply their skills and eventually hone their individual capacities to become full-fledged IT professionals.

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Study on the Social Needs and Supply of I.T. Engineers

H.R. MANAGERS

JAPAN INTERNATIONAL COOPERATION AGENCY
STUDY ON THE SOCIAL NEEDS AND SUPPLY OF I.T. ENGINEERS

HUMAN RESOURCE MANAGERS

PROFILE OF RESPONDENTS

Twelve companies participated in the survey (Table 1). Of these companies, only Canon Marketing (Phils.), Inc. is engaged in all of the skills categories. All companies are engaged in System Development and Programming. Seven out of eleven are engaged in Applications and Network Solution and Telecommunication. Only two companies are involved in Electronics Engineering.

Table 1. List of Companies Participated in the Survey

COMPANY NAME	SKILL CATEGORY			
	Application	System Development & Programming	Network Solution & Telecommunication	Electronics Engineering
ASIA ONLINE SOLUTIONS, INC	x	x		
CANON MARKETING (PHILS), INC	x	x	x	x
COMMUNITY UNLIMITED, INC		x		
FUJITSU PHILIPPINES, INC	x	x	x	
GLOBAL STRIDE		x	x	
GLOBE TELECOM	x	x	x	
IBM PHILIPPINES	x		x	
LG SYSTEMS PHILIPPINES, INC	x	x	x	
MILLENIUM MICROELECTRONICS, INC	x	x		x
NEC TELECOM SOFTWARE PHILIPPINES		x		
PHILIPPINE LONG DISTANCE TELEPHONE COMPANY	x	x	x	
SUN MICROSYSTEM PHILIPPINES, INC		x	x	

x- skill category the company is engaged in

The human resource managers of these companies have been serving their companies in that particular position for a range of less than one year to 9 years.

Recruitment of IT engineers

Majority of these companies have utilized internet publication (8/11) and newspaper ad (7/11) in recruiting I.T. engineers. They also made use of direct referrals, school job fairs, web advertisements and online recruitment tools to recruit.

Measures done to prevent job-hopping of IT engineers

In order to prevent job-hopping, all eleven companies provided competitive salaries, seven gave annual increase in salaries and two provided kind incentives such as service vehicles, housing, cell phones and health insurance. Some gave their engineers bonuses, other fringe benefits and shares of stocks. Their skills are continuously developed through training and are directed to pursue a career path. They are given the opportunity to be exposed to high tech projects and good working environment is ensured.

Budget allocation for staff development program

Ten out of eleven companies indicated that they allocated a budget for staff development. Three companies stated that their budget allocations were 100,000 pesos (US$2000), 200,000 pesos and 300,000 pesos. One company mentioned that 25,000 pesos per staff were allocated while another company allocated a budget that depended on the training program and courses.

Training course offered by other IT training institution

Half of the companies stated that there were training courses offered by other IT training institutions in the last two years. The training courses offered were as follows:

1) CISCO IP Telephony
2) Image Scanner
3) Periphonics
4) ATM Concentrator Conf
5) DMR Telecom
6) Java Factory
7) Storage Sys Const Tech
8) MS WIN 2K
9) Microsoft Certification
10) Project Management
11) Active Server Pages
12) Visual Basic Training
13) LAN/Network Related Training
14) Web-Based Training
15) Fundamentals of Aptech Computer

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16) XML

17) Oracle

The courses were offered by training institutions from abroad namely Japan, Singapore and the United States. Several I.T. consulting firms also offered courses to the companies. These institutions and consulting firms were mostly private. The duration of training course varied between 3 days and two weeks. For some courses, the costs incurred (in dollars) ranged from US$720 to US$5,850 per person. Others were as low as 6,000 pesos to 25,000 pesos.

Table 2 shows the number of I.T. engineers per specific category in each company.

Table 2. Number of Engineers Per Specific Category

COMPANY NAME	SKILL CATEGORY			
	Application	System Development & Programming	Network Solution & Telecommunication	Electronics Engineering
ASIA ONLINE SOLUTIONS, INC	3	10		
CANON MARKETING (PHILS), INC	2	2	2	
COMMUNITY UNLIMITED, INC		7	4	
FUJITSU PHILIPPINES, INC	31	630	347	132
GLOBAL STRIDE		15		
GLOBE TELECOM	90	105	90	
IBM PHILIPPINES	55		15	
LG SYSTEMS PHILIPPINES, INC	10	30		5
MILLENIUM MICROELECTRONICS, INC	1	1		1
NEC TELECOM SOFTWARE PHILIPPINES		30		
SUN MICROSYSTEM PHILIPPINES, INC	1	101	80	

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SKILL LEVEL AND WAGE LEVEL OF I.T. ENGINEERS

Two-thirds of the IT engineers of IBM Phils. are highly skilled on Applications and Networking. NEC IT engineers were mostly at the primary and user levels with few middle and highly skilled engineers. The engineers of Globe Telecoms, Globe Stride, PLDT and Asia Online were mostly medium to highly skilled, with very few from Globe Telecoms who were primary skilled. Canon Marketing (Phils.) Inc, on the other hand have primary and highly skilled engineers while Millennium Microelectronics, Inc., LG Systems and Sun Microsystem Phils., Inc. have primary and middle skilled engineers. Most I.T. engineers of Community Unlimited, Inc working on System Development and Programming were middle skilled. Engineers working on networking and telecommunications were all highly skilled. Table 3 shows the salaries given to engineers of some of the companies.

Table 3. Wage Level of I.T. Engineers

COMPANY NAME	SKILL LEVEL			
	High	Middle	Primary	User
COMMUNITY UNLIMITED, INC	40,000 to 50,000	25,000 to 40,000	15,000 to 24,000	
FUJITSU PHILIPPINES, INC	50,000+	21,000 to 45,000	12,500	7,700
IBM PHILIPPINES	60,000 to 80,000	40,000 to 60,000		
NEC TELECOM SOFTWARE PHILIPPINES	25,000	20,000	18,000	17,000
SUN MICROSYSTEM PHILIPPINES, INC	30,000 to 50,000 application system design and database design	*25,000 to 35,000* progm *40,000 to 50,000* dbase design *30,000 to 50,000* client server design and network security	15,000 to 20,000	

CURRENT I.T. PERSONNEL

All companies believe that at present, they have enough number of IT engineers in their companies except for FUJITSU and CUI. These two companies consider their current staff of IT engineers not enough and FUJITSU estimated an additional of 350 IT engineers needed to cover all areas of work while CUI needed 20 IT engineers. Globe Telecoms consider their number of engineers enough for all skills category except for Database Design.

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DEMAND FOR I.T. ENGINEERS FIVE YEARS FROM NOW

Five years from now, IBM and Globe Telecoms expect that the demand for I.T. engineers will increase by 10%. FUJITSU estimated that 300 I.T. engineers per year are needed, a total of 1,500 I.T. engineers for five years. NEC and LG Philippines projected an increase in demand of 50 I.T. engineers for five years (10 per year) while CUI projected a demand of 25 I.T. engineers. Milllenium Microelectronics would need 1-3 engineers and Asia Online would need 5-10 engineers in five years. Sun Microsystem Phils Inc thinks to maintain the same number of engineers or even less.

REDUCTION OF I.T. ENGINEERS

There were no I.T. engineers that left LG System, Canon Marketing (Philippines), Inc., Community Unlimited, Inc. and Millenium Microelectronics in the Year 2001

IBM claimed that there was a 5% migration of IT engineers in year 2001 mainly due to work offered abroad. There were 35 I.T. engineers of FUJITSU and 5 I.T engineers of Asia Online Solutions, Inc. who either had the opportunity to work abroad or had transferred to other companies. Five to ten engineers left Sun Microsystem because of a reduction of workforce and opportunities to work abroad. One engineer left Global Stride to work abroad.

VACANCY

There are 50 I.T. positions that need to be filled up at FUJITSU in the next three months. Asia Online needs an addition of one Applications I.T engineer and two System Development Programming Engineer in their workforce and LG Systems Philippines, Inc needs five more engineers.

PREFERRED TECHNOLOGIES

FUJITSU indicated that all technologies in the system development and programming and networking solution and telecommunication will be used now and five years from now.

IBM agrees with FUJITSU about networking technologies that will be preferred now and five years from now. In addition to networking, IBM thinks that application systems for point of sales will also be favored.

Asia Online agrees with FUJITSU with regard to System Development and Programming Technologies except for GUI, which was not preferred at all, and Firmware or micro-code coding by Assembly preferred only later. Computer Graphics and Game Contents Creation was all preferred.

NEC on the other hand, preferred technologies such as Internet Application Design, Application System Design (Windows and UNIX) as well as Internet Protocol Technology, LAN and Cellular Phone Technology.

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LG Systems Philippines, Inc. specified Multimedia Contents Creation and Office Application Macro Programming as technologies that are preferred to use now but not five years from now. Visual Basic and C++ programming skills, Database Design and Project Management and Consultation are preferred now and in the next five years. The same is true for the technology on Personal Computer Hardware.

Canon Marketing Phils Inc considers the Oracle as a technology that will be preferred in the next five years. Moreover, Networking solution technologies such as Groupware Application Design, Client Server System Design, Web/Mail/DNS Design, Network Security, Internet Protocol and LAN are preferred now but not in the next five years. They believe that Optical Fiber, Cellular Phone Technology and Radio Communications will be more preferred.

Community Unlimited, Inc regards System Development and Programming technologies as useful now and five years from now except for GUI technology. Similar opinion was given with regard to some of the networking solution and telecommunication technologies.

INTERNAL TRAINING COURSES OR ON-THE-JOB TRAINING PROGRAMS PROVIDED TO THE COMPANY'S I.T. ENGINEERS IN THE PAST YEAR

NEC conducted an in-house training courses on C++ programming and JAVA programming. Twenty-seven user and primary level IT engineers attended the C++ programming training while seventeen primary level engineers attended the JAVA programming. The training lasted for six months and cost per person trained was 10000 pesos.

IBM conducts training courses on IBM intranet and IBM & BUS-PARTNER every year. The usual duration of the training is 15 days per year. The cost of training is US$50 per person per year for the IBM intranet course and US$2000 per person per year for IBM & BUS-PARTNER.

In the past year, CUI engineers attended middle skill level training on Visual Basic programming, JAVA programming and Database Design. Eight engineers were able to attend and the training lasted for one week. The cost of each of the training was 10,000 pesos. Microsoft was the Resource Institution for the training.

Globe Telecom provided middle skill level training on Applications, System Development and Programming and Networking Solution and Telecommunication for their engineers Five to two engineers were able to attend and the training lasted for five days except for Database Design that lasted for ten days. Various resource institutions conducted the training, some of which were MISNET, DB Wizard, Microsoft, HP, SAP, Oracle, D/ACT, CISCO, ERICSSON and NOKIA.

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Asia Online engineers were provided with middle skill level training on System Development and Programming in the past year. Three to six engineers attended the different trainings for 3 days. Only the training on Project Management lasted for one week. The cost of training ranged from 20,000 to 30,000 pesos each. The resource institution for the training was Microsoft.

Sun Microsystem Philippines Inc. carried out an in-house middle skilled training on JAVA programming and Application System Design. JAVA programming was attended by five engineers while Application System Design was attended by thirty engineers. The duration of the training was 3 to 5 days and the cost ranged from 18 000 to 25.000 pesos. The resource institution for the training was SunPhils Education Service Group. Network security technology training was also provided to thirty engineers. The skill level of the training was medium level. The training lasted for one week and the cost ranged from 20.000 to 25.000 pesos. The same resource institution conducted the training.

LG Systems Phils, Inc provided a middle skilled training on Visual Basic Programming to their engineers. The cost incurred for the training was 20,000 per person and the resource institution was MISNET.

OPINION ON THE PROPOSED ESTABLISHMENT OF THE I.T. TRAINING AND EDUCATION CENTER

Generally, all IT firms favored for the establishment of the IT Training and Education Center. According to NSTC, the Center being proposed would provide basic programming skills and applied design concepts so companies can immediately hire without basic training (C, C++, Java, OOD, UML, XML, HTML, etc). Companies on the other hand, could provide more advanced/project related training to new engineers. It is recommended that UP should survey the industry to identify which technology application areas they can focus on so they can provide technical guidance in these identified areas (e.g , mobile phone applications, wireless LAN applications, etc.). The basic technology like the programming languages can be broader since investment in these areas are not so big compared with technology-specific application areas like mobile phone applications 2.5G or 3G, wireless LAN apps 802 11 a,b,g).

Private companies can provide support by providing kits (hardware and software) and/or research grants in the form of cash. It is suggested by NEC that the training levels can be divided into two basic levels 1) Programming Proficiency Level (student has mastered 2 or 3 common programming languages e.g., C, C++, JAVA; and Specific Application Proficiency Level; and 2) Application Level (student has mastered the design and implementation of specific application software like development of mobile phone apps as mobile banking applications

According to IBM, the IT Education Center would be of help in hiring "Ready-to-Use" Engineers from day one of employment. Standard skills should be identified to ensure the effectiveness of engineers on the job. FUJITSU, on the other hand, accounts that both the

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private sector and government institutions could do skills enhancement. It is not of big concern on the part of the private sector because it has focused-technologies based on its line of operations to train its workforce. However, government should take a parallel strategy to hold these trained engineers to stay and work in the country. Government should devise a mechanism where open opportunities should be provided to IT Engineers for them to become IT entrepreneurs.

It is envisioned by the I.T. firms that once the Center is established their engineers could avail of the training services and more IT professionals from their provincial offices could benefit from this initiative. Likewise, those individuals with IT inclination but could not afford to attend the specialized training courses would be given the opportunity