⑤アジアにおけるＩＴ技術者比較（SEARCC 調査より）

a）国別職種比率（％）

	1	2	3	4	5	6	7	8	9	10	11	12	13
フィリピン	37.6	0.6	1.6	1.8	0.6	0.4	5.2	15.8	7.8	3.0	8.8	4.0	12.8
インド	41.6	5.2	2.9	2.7	1.1	1.5	3.6	5.9	1.5	14.8	9.7	3.0	6.5
タイ	59.7	6.9	2.4	1.6	0.4	4.5	4.5	0.8	3.2	4.0	3.2	4.0	4.8
日本	66.1	0.2	2.2	1.3	0.2	1.0	8.1	3.8	3.6	1.9	1.4	2.5	7.7
シンガポール	13.3	2.2	1.4	2.2	1.6	6.4	18.6	5.0	16.7	1.6	15.7	5.3	10.0

1 ソフトウェア開発、2　ハードウェアデザイン/開発、3　マルチメディア開発、4　インターネット開発、　5　e-commerce 開発、6　データ通信＆テレコム、7　ネットワーク（LAN 管理）、8　コンサルタント　9　テクニカルサポート/ヘルプデスク、10　教育＆トレーニング、11　セールス＆マーケティング、12　スペシャリストサポートサービス、13　ICT マネジメント

b）IT 技術者の学歴（％）

	PhD	修士	学士	ディプロマ	その他
フィリピン	—	19.1	57.1	18.7	
インド	—	26.1	57.2	10.9	0
タイ	-	34.3	56.7	1.7	-
日本	-	7.2	61.6	19.3	-
シンガポール	14.2	51.7	30.0	-	0

c）現在 IT 技術者が保有している技術のベスト５

	1	2	3	4	5
フィリピン	DCOM	アプリケーションシステム開発	CORBA	プロジェクト管理	データベース管理
インド	アプリケーションシステム開発	データベース管理	プロジェクト管理	インターネット開発	C++
タイ	アプリケーションシステム開発	プロジェクト管理	インターネット開発	データベース管理	ネットプロトコルトポロジー
日本	アプリケーションシステム開発	データベース管理	プロジェクト管理	インターネット開発	UNIX
シンガポール	NT/Novell ネットウェア	ネットプロトコルトポロジー	プロジェクト管理	インターネット開発	UNIX

（黄色はオブジェクト指向関連技術スキル、緑はネットワーク関連技術スキル、その他はシステム構築関連技術スキル）

d）（ICT 技術者に）求められている技術スキルベスト５

	1	2	3	4	5
フィリピン	電子商取引	インターネット開発	JAVA	データベース管理	プロジェクト管理
インド	インターネット開発	JAVA	電子商取引	UNIX/LINUX	アプリケーションシステム開発
タイ	電子商取引	インターネット開発	JAVA	UNIX/LINUX	XML
日本	インターネット開発	データベース管理	ネットワークシステム開発	電子商取引	JAVA
シンガポール	電子商取引	インターネット開発	ネットプロトコルトポロジー	プロジェクト管理	JAVA

e) 組織が最も重要と考える技術スキル

	1	2	3	4	5
フィリピン	アプリケーションシステム開発	インターネット開発	ネットプロトコル、トポロジー	電子商取引	データベース管理
インド	電子商取引	インターネット開発	JAVA	データベース管理	アプリケーションシステム開発
タイ					
日本	アプリケーションシステム開発	データベース管理	インターネット開発	ネットワークシステム開発	プロジェクト管理
シンガポール	インターネット開発	電子商取引	ネットプロトコル、トポロジー	モバイル/無線通信	マルチメディア/ビデオ開発

f) 組織の必要とするスキルと技術者が保有している/保有することを希望するスキルの上位5つの比較

	組織が最も重要と考えるスキル	ICT技術者が保有しているスキル	ICT技術者が取得することを希望するスキル
1	インターネット開発	アプリケーションシステム開発	インターネット開発
2	電子商取引	データベース管理	電子商取引
3	アプリケーションシステム開発	プロジェクト管理	JAVA
4	データベース管理	NT/Novell ネットウェア	データベース管理
5	ネットプロトコル、トポロジー	ネットプロトコル、トポロジー	UNIX/LINUX

⇒ **IT 技術者の再教育の必要性**

g) ICT 技術者が所有する非技術スキル

	1	2	3	4	5
フィリピン	コミュニケーション技法 customer service	創造的発想支援技術 creative thinking	プレゼンテーション presentation	顧客サービス customer service	戦略的計画法 strategic planning
インド	創造的発想支援技術	プレゼンテーション	コミュニケーション技法	顧客サービス	戦略的計画法
タイ	創造的発想支援技術	プレゼンテーション	コミュニケーション技法	顧客サービス	戦略的計画法
日本	プレゼンテーション	コミュニケーション技法	創造的発想支援技術	経営管理の改革/BPR change management/BPR	顧客サービス
シンガポール	コミュニケーション技法	プレゼンテーション	顧客サービス	創造的発想支援技術	テクニカルビジネス企画 Tech/Biz writing

h) ICT 技術者が求めている非技術スキル

	1	2	3	4	5
フィリピン	戦略的計画法	プレゼンテーション	創造的発想支援技術	コミュニケーション技法	マーケティング/セールス
インド	プレゼンテーション	創造的発想支援技術	コミュニケーション技法	顧客サービス	戦略的計画法
タイ	戦略的計画法	創造的発想支援技術	プレゼンテーション	コミュニケーション技法	経営管理の改革/BPR
日本	プレゼンテーション	コミュニケーション技法	戦略的計画法	経営管理の改革/BPR	創造的発想支援技術
シンガポール	戦略的計画法	プレゼンテーション	コミュニケーション技法	創造的発想支援技術	テクニカルビジネス企画

ｊ）組織が最も重要と考える非技術スキル

	1	2	3	4	5
フィリピン	戦略的計画法	マーケティング/セールス	顧客サービス	コミュニケーション技法	経営管理の改革/BPR
インド	マーケティング/セールス	戦略的計画法	創造的発想支援技術	顧客サービス	プレゼンテーション
タイ					
日本	経営管理の改革/BPR	プレゼンテーション	戦略的計画法	コミュニケーション技法	マーケティング/セールス
シンガポール	マーケティング/セールス	顧客サービス	コミュニケーション技法	戦略的計画法	プレゼンテーション

ｋ）組織の必要とするスキルと技術者が保有している/保有することを希望する非技術スキルの上位５つの比較

	組織が最も重要と考えるスキル	ICT技術者が保有しているスキル	ICT技術者が取得することを希望するスキル
1	マーケティング/セールス	創造的発想支援技術	プレゼンテーション
2	戦略的計画法	プレゼンテーション	戦略的計画法
3	顧客サービス	コミュニケーション技法	創造的発想支援技術
4	プレゼンテーション	顧客サービス	コミュニケーション技法
5	コミュニケーション技法	戦略的計画法	テクニカルビジネス企画

⇒ 技術スキルと非技術スキルの融合

⑥フィリピン労働者数の推移

EMPLOYMENT STATISTICS BY OCCUPATION —CALENDAR YEAR 1991 TO 1998

Occupation	1991	1992	1993	1994	1995	1996	1997	1998
Professional, Technical and Related Workers	1,357	1,354	1,396	1,382	1,430	1,567	1,649	1,654
Administrative, Executive and Managerial Workers	282	280	319	353	408	432	517	568
Clerical and Related Workers	968	977	1,036	1,057	1,130	1,194	1,244	1,248
Sales Workers	3,122	3,190	3,274	3,372	3,582	3,850	3,921	4,096
Agricultural, Animal Husbandry, and Forestry Workers, Fishermen and Hunters	10,161	10,603	11,041	11,176	11,026	11,539	11,197	10,815
Service Workers	2,092	2,150	2,109	2,262	2,342	2,462	2,745	2,957
Production and Related Workers, Transport Equipment Operators and Laborers	4,901	5,111	5,174	5,400	5,730	6,117	6,407	6,532
Occupations, n e c	31	33	32	30	29	27	36	42
TOTAL	22,915	23,696	24,382	25,032	25,677	27,186	27,715	27,911

Note n.e.c – Not Elsewhere Classified　　Source: Labor Force Survey, National Statistics Office

⇨　第1次産業からの過剰労働人口の受け皿としての役割

⑦フィリピンIT人材の競争力

＜META Group 「知的産業への人材適応評価」 （2000）＞

	国名	ポイント
1	フィリピン	4 17
2	オーストラリア	4.15
3	アメリカ	4.10
4	カナダ	4.00
5	フランス	3.97
6	フィンランド	3 68
7	スペイン	3 62
8	インド	3 59
9	ニュージーランド	3.49
10	アルゼンチン	3 45

（上級管理職人材数 （1位）、IT技能をもつ人材数 （1）、一定基準以上の技術者数 （4）、教育制度一般 （15）、大学制度 （18）、

大学進学率 （19））

＜E-Readiness by McConnell International＞

	Connectivity	E-leadership	Information Security	Human Capital	E-business Climate
China	R	A	R	A	A
India	R	A	A	A	A
Indonesia	R	R	R	R	R
Malaysia	R	B	A	A	A
Pakistan	R	R	R	R	R
Philippines	R	R	R	A	R
South Korea	A	A	A	B	B
Taiwan	A	B	A	B	B
Thailand	R	A	R	R	R
Vietnam	R	R	R	R	R

B- indicates the majority of conditions are suitable to the conduct of e-business and e-government

A- indicates improvement in the conditions necessary to support e-business and e-government

R- indicates substantial improvement needed in the conditions necessary to support e-business and e-government

up arrow- indicates improving relative to prior time periods

down arrow- indicates weakening relative to prior time periods

＜日本経済研究センター「アジアの IT 化指標」＞

	固定電話		移動体電話		パソコン		インターネットホストサーバー		インターネット利用者	
1	香港	57 6	香港	54 9	シンガポール	52 7	シンガポール	4 6	シンガポール	29 5
2	日本	55 8	台湾	52 1	香港	29 1	台湾	2 7	香港	25 2
3	台湾	54 5	韓国	50 4	日本	28 7	日本	2 1	台湾	20 5
4	シンガポール	48 2	シンガポール	47 5	韓国	18.3	香港	1 7	韓国	14.7
5	韓国	43 8	日本	44 9	台湾	18 1	韓国	0 6	日本	14 5
6	マレーシア	20 3	マレーシア	10 1	マレーシア	6 9	マレーシア	0 27	マレーシア	6 9
7	中国	8 6	中国	3 4	タイ	2 3	タイ	0 07	タイ	1 3
8	タイ	8 6	タイ	3 3	フィリピン	1 7	フィリピン	0 02	中国	0 7
9	フィリピン	3 9	フィリピン	2 4	中国	1 2	インドネシア	0 01	フィリピン	0 7
10	インドネシア	2 9	インドネシア	1 1	インドネシア	0 9	中国	0 01	インドネシア	0 2

＜IMD「The World Competitiveness Yearbook 2000」＞

フィリピン総合　38 位/47 （Domestic Economy 41, Internationalization 40, Government 31, Finance 35, Infrastructure 45, Management 35, Science & Technology 34, People 41）

• IT Infrastructure

	Philippines	Japan	Singapore	Hong Kong	Taiwan	Malaysia	India
Electricity costs for industrial clients	34	43	47	46	42	17	27
Investment in telecommunications (95-97)	8	33	28	37	6	5	14
Computer per capita (99)	35	18	12	14	23	32	47
Connections to internet (99)	42	9	17	6	19	35	47
New information technology 1)	42	15	2	9	7	10	12
e-commerce 2)	45	10	3	9	7	11	13
Cellular mobile telephone subscribers (99)	43	6	7	2	3	11	15
Labour regulations 3)	28	11	2	1	9	5	15
Telephone lines	45	7	9	5	4	13	15
International telephone costs	1	11	9	13	10	12	15

1) Implementation of new technology meets business requirements

2) Electronic commerce is sufficiently developed for business opportunities

3) Labour regulations (hiring and firing practices, minimum wages, etc)

4) Number of main lines in use per 1000 inhabitants

• Management

	Philippines	Japan	Singapore	Hong Kong	Taiwan	Malaysia	India
Creation of firms 1)	23	47	15	2	8	11	19
Shareholder value 2)	31	45	3	17	18	30	43
Competence level 3)	15	38	21	29	36	37	1
Employee training 4)	23	6	2	34	31	26	43

1) Creation of firm is common

2) Shareholder value is efficiently managed

3) Domestic and international managers have the same competence level

4) Employee training is a high priority in companies

・Science and Technology

	Philippines	Japan	Singapore	Hong Kong	Taiwan	Malaysia	India
Qualified engineers 1)	10	18	9	39	14	30	2
Availability of IT skills 2)	9	10	8	26	12	29	37
Technology cooperation 3)	27	10	8	26	12	12	37
Company-University cooperation 4)	32	25	3	27	11	29	43
Financial resources 5)	39	20	3	13	17	26	33
Develop and application of technology 6)	31	24	1	12	13	23	44
Basic research 7)	30	13	5	29	26	23	28
Science and education 8)	29	19	1	9	6	17	8
Patent & copyright protection 9)	37	21	15	36	28	35	42
Total expenditure on R&D per capita 10)	45	3	16	28	20	39	43

1) Qualified engineers are available in the country's labour market

2) Qualified information technology skills are available in the country's labour market

3) Technology cooperation is common between companies

4) Technology transfer between companies and universities

5) Lack of sufficient financial resources does not constrain technological market

6) Development and application of technology is supported by the legal environment

7) Basic research does enhance long-term economic and technological development

8) Science and education is adequately taught in compulsory schools

9) Patent and copyright protection is enforced in the country

・Human Resources

	Philippines	Japan	Singapore	Hong Kong	Taiwan	Malaysia	India
Skilled labour 1)	5	23	8	31	18	33	12
Brain drain 2)	44	9	25	11	33	32	42
The educational system 3)	15	15	1	31	12	20	27
University education 4)	17	47	4	34	20	26	25
Human development index	40	4	22	24		36	46
Total and current public expenditure on education 1996 5)	39	35	42	43	-	21	39

1) Skilled labour is available in the country's labour market

2) Well-educated people do not emigrate abroad

3) Meets the needs of a competitive economy

4) Meets the needs of the enterprises

5) As a percentage of GNP

⇒ ・概して人材分野の競争力は他の分野と比較して高い
・フィリピン IT 人材の競争力は、分野、スキルによって異なる
・これから力を入れる IT 産業分野にマッチした IT 人材の競争力を高める必要がある

＜知識型産業の競争力＞

過去の牽引産業の競争力の源泉は設備投資力やハード志向の研究開発力。

これからはソフトウェアやＩＴサービスなど情報サービス業が候牽引産業候補。ソフトウェア分野の競争力の源泉は研究開発、ＩＴサービス分野の競争力の源泉は教育。

（富士通総研）

⇒ **人材育成とともに研究開発の促進が不可欠**

⑧フィリピンにおける人材のミスマッチ

(Joy V Aberenica ”Skills Shortage and Training Needs of MNCs in the Philippines”)

＜教育と労働力供給＞

・教育が必要とされていない分野で労働力供給が大

・高度な教育が必要とされている分野で、労働力が比較的足りていない

・ＩＴ卒業生とＩＴ雇用チャンスの間にギャップがある

＜教育制度＞

・カリキュラムの貧弱さ、教師トレーニングが十分でない、投資の不足

・大学の数は多いが、その分質の分野に投資がまわっていない

・ＩＴ卒業生は増えても、技術力不足である

・アカデミックな卒業生は産業が吸収しきれない

＜産業界の動向＞

・産業界側は技術者の質に不満がある

・マネージャー、プロフェッショナルを雇用することが難しい

・ＩＴ人材、たとえばプロジェクトマネージャー、プログラムデザイナー、システムコンサルタント、システムアナリストを見つけるのに時間がかかる（技術的スキル＋マネジメント能力）。テクニシャンや電気エンジニアより時間がかかる。

・マネジメント能力の改善が必要とみなされている。

・多くの企業が人材育成の際に契約社員の活用を実施している。高度な技術人材を確保する手段となる可能性もある。

・人材トレーニングで政府のプログラムを活用する企業は少ない。企業内トレーニングを活用しているところが多い。

Time Period for Recruitment of IT Staff by Member Economy, Occupation and Industry

	Proj Manag	Programer	Sys Consult	Sys Analyst	Com Tech.	Net Consult	IT Engineers	IT Maintenance	IT Technician
Philippines									
Manufacturing	2 5	3 0	3 0	3 0	2 0	2 5	2 5	3 0	2 0
Banking & Finance	3 0	2 5	2 0	3.0	2 0	2 0	2 5	3 0	2 0
Business Services	4 0	3 0	3 0	2 5	3 0	2 0	3 0	3 0	2 5
Insurance	2 0	2 5	2 0	2 5	2 0	2 0	2 0	2 0	2 0
All industries	3 0	3 0	3 0	3 0	2 0	2.0	2 5	3 0	2 0
All Economies									
Manufacturing	3 0	3 0	3 0	3 0	3 0	3 0	3 0	3 0	2 0
Banking & Finance	3 0	3 0	2 0	3 0	2 0	2 0	2 0	2 0	2 0
Business Services	3 0	3 0	3 0	3 0	2 0	3 0	3 0	2 0	2 0
Insurance	2 0	3 0	2 0	3 0	2.0	3 0	2 0	2 0	2 0

Median shown in this table indicates that at least 50% of sample firms have identified a rough length of time for them to find particular IT skills

1 = recruited within 1-3 weeks

2 = recruited within 4-7 weeks

3 = recruited within 8-11 weeks

4 = recruited within 12-15 weeks

5 = recruited after 16 weeks

Percentage of Firms Indicating Future Recruitment Difficulty of IT skills

		Proj Manag	Programer	Sys Consult	Sys Analyst	Com Tech.	Net Consult	IT Engineers	IT Maintenance	IT Technician
Philippines										
	Manufacturing	50 00	64 52	40.00	51 52	22.73	34 78	35 71	33 33	17 86
	Banking & Finance	75 00	100 00	100 00	40 00	40 00	100 00	75 00	50 00	66 67
	Business Services	33 33	50 00	33 33	20 00	20 00	20 00	33 33	33 33	0 00
	Insurance	50 00	50 00	50.00	57 14	-	16 67	20 00	-	33 33
	All industries	51 16	61 70	43.90	47 06	21 05	35 90	37 21	31.82	23 40
All Economies										
	Manufacturing	53 68	57 30	45 33	51 46	32 86	45 71	51 02	50 00	28 57
	Banking & Finance	44 83	34 48	23 81	33 33	18 52	40 74	20 83	9 52	23 68
	Business Services	50 85	50 00	42 59	36 76	30 30	40 00	28 57	39 53	19 70
	Insurance	27 78	50 00	31 25	47 83	15 38	20 00	18.18	10 00	29 41

Training Methods by Member Economy, Occupation & Industry

	Managers			Prof & tech			Clerical, sales & service			Production		
	On-job	Off-job	External	On-job	Off-job	External	On-job	Off-job	External	On-job	Off-job	External
Philippines												
Manufacturing	60 42	47 92	64 58	69 39	59 18	77 55	77 08	50 00	35 42	82 61	47 83	36 96
Banking & Finance	100 00	50 00	50 00	60 00	80 00	80 00	100 00	50 00	33 33	66 67	100 00	0 00
Business Services	80 00	33 33	66 67	53 33	53 33	66 67	75 00	43 75	37 50	57 14	28 57	0 00
Insurance	62 50	62 50	62 50	62 50	87 50	62 50	75 00	75 00	62 50	40 00	33 33	0 00
All industries	67 53	46 75	63 64	64 94	62 34	74 03	78 21	51 28	38 46	75 41	45 90	27 42
All Economies												
Manufacturing	51 48	46 81	63.48	52.55	56 94	63.70	60 28	57 04	39 79	80 82	57 99	27 40
Banking & Finance	56 92	58 11	58.11	48 57	68 57	67 14	66 67	61 11	47 22	65 00	52 63	10 00
Business Services	63 52	39 20	58 29	56 48	50 76	59 39	66 84	45 41	39 29	76 12	45 45	26 15
Insurance	59 46	58 97	71 79	73 68	71 05	73 68	76 92	71 79	64 10	53 85	46 15	15 38

Percentage of Firms Indicating Areas in Needs of Training Improvement by Member Economy and Industry

		Amount available	Quality of external	Quality of internal	Relevance	Flexibility of delivery	Completion rate or Cost of traininga	Other	N
Philippines									
	Manufacturing	68 75	47 92	68 75	75 00	43 75	41 67	8 33	48
	Banking & Finance	71 43	57.14	100 00	71 43	42 86	28 57	-	7
	Business Services	50 00	71 43	42 86	57 14	35 71	28 57	7 14	14
	Insurance	83 33	100 00	100 00	83 33	33 33	16 67	16 67	6
	All industries	66 67	57 33	69 33	72 00	41 33	36 00	8 00	75
All Economies									
	Manufacturing	51 37	54 79	65.41	70.89	46 58	30 48	6 16	292
	Banking & Finance	56 41	57 69	62 82	67 95	41 03	21 79	5 13	78
	Business Services	57 28	53 05	58 69	64.79	38 50	23.94	8 45	213
	Insurance	46 34	63 41	56 10	68 29	39 02	21 95	7 32	41
All Economies/industries		53.60	55.04	62 08	68 16	42.56	26 56	6.88	625

Comparison of Training Expenditure of MNCs in the Philippines and in other Asian Economies.
(Philippines = 1.00)

	Manufacturing	Banking	Finance Business Services	Insurance	All industries
PER FIRM					
Indonesia	1 78	0.29	0 90	-	1 22
Malaysia	0 13	4.23	0.95	1 37	0 91
Singapore	3.40	0 18	113 28	0 24	21 20
Taiwan	12.58	0 11	6.84	1 70	8 87
Thailand	1 32	5 14	1.28	-	1.40
PER EMPLOYEE					
Indonesia	1 77	0 99	0.98	-	1.55
Malaysia	3.94	3 40	0 39	2.43	0 92
Singapore	3.15	3.93	12.03	2 78	16 11
Taiwan	4.76	2 07	4.98	1 25	4.17
Thailand	1.03	1 28	0 48	-	0.96

⑨人材流出

＜SEARCC 調査＞

・ICT 技術者がひとつの組織に就職する長さの平均

フィリピン	3 年
インド	2
タイ	3
日本	10
シンガポール	2

・重要な職場環境

	1	2	3	4	5
フィリピン	昇進昇格	給与	達成目標	仕事の満足度	雇用保障
インド	会社のイメージ	職務の責任度	昇進昇格	達成目標	業務への挑戦
タイ	同僚との関係	達成目標	仕事の満足度	職務の責任度	昇進昇格
日本	仕事の満足度	給与	上司との関係	職務の責任度	達成目標
シンガポール	昇進昇格	給与	管理者からの認知	上司との関係	仕事の満足度

・IT 技術者の職場に対する満足度

	1	2	3	4	5
フィリピン	同僚との関係	上司との関係	職務の責任度	雇用保障	会社のイメージ
インド	同僚との関係	会社のイメージ	職務の責任度	上司との関係	雇用保障
タイ	同僚との関係	雇用保障	職務の責任度	仕事の満足度	上司との関係
日本	同僚との関係	上司との関係	職務の責任度	仕事の満足度	達成目標
シンガポール	同僚との関係	上司との関係	雇用保障	会社のイメージ	職務の責任度

・職場環境に対する期待と満足度のミスマッチ

	1	2	3	4	5
フィリピン	ストックオプション	海外出張	昇進昇格	従業員の特典	給与
インド	海外出張	給与	ストックオプション	昇進昇格	社内教育制度
タイ	給与	海外出張	昇進昇格	社内教育制度	作業負担
日本	給与	社内教育制度	仕事の満足度	人脈の広がり	作業負担
シンガポール	昇進昇格	給与	管理者からの認知	社内教育制度	達成目標

＜シリコンバレーとの人材交流＞

・シリコンバレーにおいてインド人・中国人によって設立された企業の比率

	ハードウェア	ソフトウェア	コンピュータ卸売
インド人	129（17%）	533（69%）	112（14%）
中国人	562（28%）	716（36%）	723（36%）

・インド人・中国人によって設立された企業

	企業数	売上高	雇用者数
インド人	774	3588	16598
中国人	2001	13237	41684
合計	2775	16825	58282
全体に占めるシェア	24%	17	14

(Annalee Saxenan, *Silicon Valley's New Immigrant Entreprenures*)

・ＰH.D取得後も米国に滞在する人の割合(National Science Foundation)

中国　80%以上

インド　約70%

台湾　約40%（台湾系は帰国する割合が多い。）

・IT技術者帰国促進政策

中国：「留学生創業園」（留学生向けベンチャーパーク）

高級コンドミニアムの提供

⇒ | 「頭脳流出」から「頭脳循環」への転換が図れるか

（２）情報通信技術に係る教育カリキュラム、教員養成ニーズについて
①IT 教育機関の数（地域、セクター別）

Region	Sector		Total
	Public	Private	
I	8	32	40
II	7	17	24
III	3	83	86
IV	9	90	99
V	5	39	44
VI	13	28	41
VII	1	43	44
VIII	4	16	20
IX	3	15	18
X	4	13	17
XI	2	23	25
XII	5	28	33
NCR	15	106	121
CAR	4	7	11
ARMM	2	3	5
Caraga	3	12	15
Total	89	554	643

Source: Commission on Higher Education

⇒ 数が多すぎて、質の向上に投資がまわっていないという指摘がある（APEC）

②IT 教育機関における講座数

	Public	Private	Total
1998-99	16,355	153,906	170,261
1999-2000	23,501	204,415	227,916
2000-01	36,009	300,633	336,642

（出展．ローカルコンサルタント資料）

⇒ 金儲けの手段となってしまっているのでは？
なお授業費の上昇率（平均 10%強）はインフレ率（7.3%）を超える

③従業員の IT 学位（全国）

レベル	人数
職業訓練校、テクニカルカレッジ	1
ディプロマ等学士以下	101
学士終了	2,266
ポストバチェラー終了	156
修士終了	288
博士終了	48
不明	3

（ローカルコンサルタント調査、以下⑩まで）

⇒　・フィリピンの IT 企業の方向性とマッチしているか

　　・技術分野で学士というのは中途半端ではないか

④現状の大学生の保有するスキルとそのレベル

アプリケーション技術	・オフィス系アプリケーション技術は約 90% の生徒が技術を有している。 ・レベルとしては、オフィス系アプリケーション以外は初級レベル
システム開発・プログラミング	・C 言語、インターネットアプリケーションデザイン、ビジュアルベーシックに関しては約 8 割の生徒が技術を有している。エンタープライズ・銀行システムメンテナンスは 25%強。 ・中級レベルと答える割合がアプリケーション技術より多い。
ネットワーク・通信技術	・LAN に関する技術を有している生徒の割合は約 83%。携帯向け技術は 35%。 ・高い技術を有すると答える数が比較的多い
電気電子工学	・ロジックサーキットデザイン、パソコンハードウェア・CPU 技術を有する学生は 80%以上。

⇒　・アプリケーション分野の技術は相対的に低レベル

　　・ネットワーク・通信技術分野の技術は相対的にレベルが高い

　　・企業側の求める技術と一致しているか

⑤大学で学んだ技術

保有している技術すべてを大学で習得したわけではない。技術によっては 6 割程度のものもある。

⑥マスターしたい技術

アプリケーション技術	コンピュータグラフィックスが 55%。IT 教育機関で学習を希望するものがどのスキルでも一番多い（学校での短期コースより出費が予想されているにもかかわらず）。修士課程でという希望は少ない。
システム開発・プログラミング	ビジュアルベーシックの学習を希望しているものは 77%。IT 教育機関での希望が多い。修士課程でという希望も平均して 15%。
ネットワーク・通信技術	LAN 技術の修得希望が 54% と一番多い。手段としては IT 教育機関の希望が平均すると多い（40%ほど）。修士課程は平均して 15%ほど。
電気電子工学	ハードウェア・CPU といったパソコンスキルを修得する希望が約 60%。手段としては IT 教育機関の希望が平均すると多い（40%ほど）。修士課程でという希望はプリントサーキットスキルで 40%を超えているが、平均すると 15%強。

$\Rightarrow$
- コストがかかるにもかかわらず、IT 教育機関で新たな技術を身につけたいという希望が多い
- 修士課程で新たな技術を身につけようという希望は少ない
- 技術修得機関は分野、スキルによって異なる
- 企業側のニーズと一致しているか
- UP における IT 人材育成センターへの需要はあるか

⑦卒業後に期待する給料

アプリケーション技術	P7000～50000、平均 P15000
システム開発・プログラミング	P8000～5000、平均 P15000
ネットワーク・通信技術	P5000～50000、平均 P15000
電気電子工学	P6000～120000、平均 P15000

⑧新たな技術を修得することによって期待する賃金上昇額

	期待上昇額
アプリケーション技術	平均 P5000
システム開発・プログラミング	平均 P5000
ネットワーク・通信技術	平均 P5000
電気電子工学	平均 P5000

$\Rightarrow$ 分野を超えて、期待する上昇額は P5000。コース授業料の目安となるのでは

⑨卒業後使いたい技術分野　（%）

	第一希望	第二希望
アプリケーション技術	5.8	24 1
システム開発・プログラミング	52.9	19.5
ネットワーク・通信技術	33 3	41 4
電気電子工学	9 2	12 6

⑩卒業後働きたい企業の国籍

フィリピン企業	32.2%
多国籍企業	67.8%
日本	55.9%
アメリカ	32.2%
その他	6.8%
特定せず	5.1%

⟹ ・UP でのコースデザインの際の参考になる

・日本とフィリピンの戦略的パートナーシップ

２．日本のＯＤＡとして協力を行う必要性

（１）日本のＯＤＡとして協力を行う必要性（民間企業による開発の可能性）

①人材育成センターにおけるビジネスアイデア

例）人材育成事業　＋　人材派遣業

②アウトソーシング、ＰＦＩの活用

・岐阜県におけるアウトソーシング

県情報システムのアウトソーシング＋情報産業振興施策のアウトソーシング

例）県職員の情報化研修業務

_ビジネスアプリケーションに関する基礎的研修（３年で全職員に１回想定）

_全般的な情報化推進リーダーの養成研修（各課１名程度想定）

_情報関連業務の専門的人材の育成研修（情シス課・情産課職員等想定）

_派遣研修県職員の受け入れ（２名各２年想定）

全国マルチメディア専門研修センター研修・運営業務

_全国的な規模でのスーパーＳＥを含むＩＴ時代に必要な人材育成研修

_センターの貸し施設の貸出・運用管理

アネックス・テクノ２研修・運営業務

_地域産業の高度化を目的としたＣＡＤ／ＣＡＭ等に関する研修

3．その他

1）経済特区（Ecozones）

①数及び雇用労働者数（2002.01-02）

セクター	数	雇用者数	輸出(Million US$)	輸入(Million US$)	貿易バランス
Public	4	55,439	979.23	501.01	478.21
Private	34	161,338	2,354.746	1,513.340	841.406

②投資（1995－2001）

Electronic Parts & Products	64.3%
Electronic Machinery	13.8
Transport/Car Parts	7 4
Precision & Optical Instruments	2.2
Rubber & Plastic Products	2 2
Garments & Textiles	1.3
IT Services	1.0
Chemical Products	0 8
Other Manufactures	6 8

日本企業	39 6%
フィリピン	17.3
米国	13.3
オランダ	8.4
英国	6.2
シンガポール	5 4
韓国	3.6
ドイツ	2.2
台湾	0 9
マレーシア	0.8
その他	2.3

⇒ **Ecozone と IT パークの融合は可能か（輸出振興）**

5．現地コンサルタント調査結果要約

ローカルコンサルタント調査概要

調査団派遣前に、要請案件の実施妥当性、実現性を判断するために、必要な情報を入手・整理・分析するため、現地ローカルコンサルタントによる調査を実施した。主な調査項目は以下の通りである。

Ⅰ．IT企業側の人材育成ニーズ

    IT労働力需要の実態、人材供給側に対する企業側のニーズの把握（どのような技術レベルを有する人材がどの程度の量求められているのか、研修コストに対する認識、大学及びフィリピン大学ITセンターに対して企業が期待すること）

Ⅱ 教育を受ける側のニーズ

    各教育機関に対するニーズの把握（各教育機関に対して望む事柄、自己教育を行うインセンティブ）

Ⅰ．IT企業調査結果

（1） 調査対象

「IBM Philippines」（以下IBM）、「Fujitsu Philippines, Inc」（以下富士通）、「NEC Telecom Software Philippines」（以下NEC）等12社の人事担当者へのアンケート及びヒアリングを実施した。

（2）調査結果

① IT技術者の給与水準

各社間でIT技術者のレベルが異なることから、今回の調査結果よりフィリピンにおけるIT技術者の給与レベルを導き出すことは困難であるが、高度なIT技術者の給与水準は40,000ペソ～、中級レベルIT技術者の給与水準は20,000～40,000ペソ、初級レベルで12,500～20,000ペソ、ユーザーレベルは12,500ペソ以下である。

②IT技術者の充足感

富士通、COMMUNITY UNLIMITED, INC 社以外では、充足していると解答している。富士通では350人ほど足りていない状況である。富士通は、IT技術者の職種分野が広いこと、従業員数も多いことから、充足感の欠如につながっていることが予測される。

③これからのIT技術者の需要

5年先のIT技術者の需要に関しては、IBM、GLOBE TELECOM は10%増加すると予測している。富士通では毎年300人のIT技術者、5年間で1,500人の技術者が必要になると予測している。NEC、LG SYSTEMS PHILIPPINES, INC では5年間で50人のIT技術者を増

やすことを予定している。その他の会社は若干の増員を計画している。

④必要とされる技術

各社の事業分野を反映しているので、概括することはできないが、例えば富士通は、システム開発、プログラミング、ネットワークソリューション、通信分野のすべての技術が必要であると回答している。IBM では、これから 5 年先必要とされる技術はネットワーク技術であり、通信、netsphere, banking, Point of Sales (POS), E-business and E-mining といった技術がこれから必要になると予想している。NEC は、インターネットプロトコル技術とともに、インターネットアプリケーションデザイン、アプリケーションシステムデザイン、LAN、携帯電話技術が必要となると予測している。

⑤IT 技術者のリクルート手段

直接の紹介、学校での就職向け催し物、新聞広告、インターネット上の出版・広告、オンライン上の採用等で IT 技術者を採用している。

⑥ジョブ・ホッピング対応策

ジョブ・ホッピングを防ぐために、良好な職場環境、給与面での優遇措置、自動車や住居面での手当て、賃金アップといった措置を講じている。またキャリアパスとなるようトレーニング、新たな技術を修得する機会を与えている。

⑦従業員教育予算

各社の社内教育費用は、受講従業員 1 人あたり 10,000～30,000 ペソである。例えば NEC では、社内で C++ programming と JAVA programming の教育を実施した。27 人のユーザー・初級レベルの IT 技術者が C++ programming training に参加し、17 人の初級レベルの IT 技術者が the JAVA programming に参加した。トレーニングは 6 ヶ月間で一人当たり 10,000 ペソのコストがかかった。IBM では、IBM intranet and IBM & BUS-PARTNER でトレーニングを毎年実施している。期間は通常 15 日間で、コストは IBM intranet が年間 US$50 、IBM & BUS-PARTNER が年間 US$2,000 である。

⑧IT 技術者の流出

IBM では、2001 年度に IT 技術者の 5%が退職した。 主な理由は海外への転職である。富士通では、35 人の IT 技術者が、海外に移住するなり、他企業に転職するなりした。

⑨フィリピン大学 "IT 教育・雇用センター" 構想に関する意見

どの企業も一様に好意的な反応を示している。代表的な意見は以下の通りである。
・ IT 技術者がセンターで幅広い基礎技術とデザインコンセプトを修得できれば、会社で

は新入社員に基礎的なトレーニング(C, C++, Java, OOD, UML, XML, HTML, etc.)を与える必要はなくなり、採用後により高度なトレーニングを実施できる。

・ フィリピン大学は、企業でどのような技術が必要とされているのかといったことを調査すべき。

・ IT 企業も機材の提供、金銭の寄付といったことで協力できる。

一方で IT 企業の中には、

・ 自社のニーズにあったトレーニングを実施しており、センターでトレーニングを実施するか否かといったことは大きな問題ではない。

・ 政府は IT 技術者のジョブホッピング、海外流出を防ぐ措置を講ずるべきである。

・ IT 技術者が起業家となれるような機会が拡大されるべき。

という意見もあった

Ⅱ．教育を受ける側のニーズ調査

Ⅱ - 1　学生

（1）調査対象

6 つの大学（ARELLANO UNIVERSITY、DE LA SALLE UNIVERSITY、EAST ASIA COLLEGE、PAMANTASAN NG LUNGSOD NG MAYNILA、POLYTECHNIC UNIVERSITY OF THE PHILIPPINES、TECHNOLOGICAL INSTITUTE OF THE PHILIPPINES）から、各校 20 人強の学生を抽出し、合計で 129 人を対象としたアンケートを実施した。そのうち 2/3 はコンピュータサイエンス学部、1/3 はコンピュータエンジニアリング学部の学生。

（2）調査結果

①有する技術

アプリケーション分野の技術を有する学生の割合はアンケート対象の約半数で、その中では "Office Application Macro Programming by VBA" が 83.7%と最も高かった。しかしそのうち約 2 /3 がユーザー、初級レベルであった。その他の技術でも、ユーザー、初級レベルという回答が大半を占めた（表 1）。

表 1　アプリケーション分野で学生が有する技術 (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)

システム開発・プログラミング分野の技術で、学生が有する割合の高い技術は、 "Visual Basic Programming (Windows Application)"、 "C++ Programming (Multi platform)"、 "JAVA Programming (Multi platform)"、 "Internet Application Design (HTML/XML, CGI cording by perl)"、 " Application System Design (Windows base)"、 "Database Design (RDB, SQL3, DBMA)" であった。しかし、技術を有するといっても大半は、ユーザー、初級レベルの水準である。一方、"Enterprise and Banking System Maintenance (MVS, OS/390, z/OS)"を有する学生の割合は 21.7% 、"GUI (graphical user interface) design by Japanese language"を有する学生の割合は 12.4%のみであった。

表2　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)

ネットワーキングソリューション・通信分野では、 "LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology" を有する学生の割合が 70%と最も高かった、(表3)。 しかし、ほとんどの学生は、自己のレベルをユーザー、初級レベルと認識している。

表3　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)

電子工学分野の技術の分野で、学生が有する割合の高かった技術は、 "Personal Computer Hardware/ Intel CPU Architecture" (74.4%)と "Logic Circuit Design (ASIC/FPGA by VHDL)" (81.4%)であった。また、ほとんどの学生が自己のレベルをユーザー、初級レベルと認識している（表4）。

表4　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 Arch.	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)	(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 Mgt./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)

②学生が修得したい技術、修得方法、修得のためのコスト

アプリケーション分野では、Computer graphics を修得したいという学生の割合が多い。 また修得方法としては、国内の IT 教育機関のコースが最も人気があり、修士課程、海外で修得しようという学生の割合は少ない（Game Contents Creation に関しては、海外での修得希望者が多い）。 新たな技術取得のために支払うコストとしては、3, 000 ペソ～6, 500 ペソ、国内の IT 教育施設のコースに対して支払うコストは 4,250 ペソ～7,500 ペソである。この金額は、フィリピン大学 IT センターにおけるコース設定をする際の参考となろう。

システム開発・プログラミング分野では、学生が最も修得したい技術は "Visual Basic Programming"、次に "Internet Application Design" である。 修得場所としては、IT 教育機関が最も人気があり、次に大学での短期コースが続いている。ただ "Enterprise and Banking system" と "GUI" に関しては、それぞれ修士課程、海外での修得に希望が集まっている。

また修得コストとしては、4,500 ペソ〜10,000 ペソである。

ネットワークソリューション・通信分野に関しては、一般的に学生間で修得したいという希望は少ない。その中では、"LAN" を修得したいという希望が一番多い。修得方法に関しては、技術によって異なり、"Cellular Phone Technology" に関しては海外での修得希望が一番多い。修得コストに関しては、5,000 ペソ〜7,000 ペソである。

電子工学分野では、回答の 55% が "Personal Computer Hardware/Intel CPU Architecture" の修得を希望している。次は "Logic Circuit Design" で、それ以外の技術を修得しようという希望は多くない。また修得希望機関は技術によって異なり、修得コストに関しては、2,250〜5,000 ペソである。

③卒業後に期待する給与水準
アプリケーション技術を取得して卒業した場合に、期待する給与平均は 15,000 ペソである。システム開発・プログラミング分野では 18,000 ペソ、ネットワークソリューション・通信では 20,000 ペソ、電子工学では 18,000 ペソである。

④新たな技術を取得することによって期待する給与増加額
新たに技術を修得することによって、期待する給与増加額は、アプリケーション分野の技術を修得することによって 3,000 ペソの増額、システム開発・プログラミング分野の技術を修得することによって 5,000 ペソの増額、ネットワーク・通信分野の技術を修得することによって 5,000 ペソの増額、電子工学分野の技術を修得することによって 5,000 ペソの増額を期待している。

⑤技術の修得に支払うコスト
トレーニングコストとして、5,000〜8,000 ペソは積極的に支払うという学生が多く、上述の新たな技術を修得することによって期待する給与上昇額と比較すると、学生は 1 年ちょっとで技術取得コストをカバーするだけの給与上昇を期待していることがわかる。

システム開発・プログラミング分野では、技術によって異なるが 5,000〜10,000 ペソは積極的に支払うという学生が多い。ネットワークソリューション・通信分野の技術を修得しようという希望は、学生の間で比較的低い。トレーニングコストに関しては、6,500〜15,000 ペソを積極的に支払うという回答で、その他の技術分野と比較して高い金額となっている。電子工学分野の技術を修得しようという希望は、学生の間で比較的低い。トレーニングコストに関しては、6,500〜9,000 ペソを積極的に支払うという回答が得られた。

⑥卒業後の希望

アンケート対象の学生の 50%以上が、システム開発・プログラミング分野での就職を希望し、30%以上の学生がネットワーク・通信分野での就職を希望している（表5）。また日本企業への就職希望が 45%となっている。

表5　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)

表6　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)

II-2　IT 技術者（調査対象は 12 社）

（1）調査対象

IT 企業 15 社から 56 人の IT 技術者を抽出して、アンケート及びインタビューを実施した。56 人の社内におけるポジションは異なる。平均して 4 年現在の会社に勤務しており、職種経歴は 2 年ほどである。技能レベルとしては初級レベルが約 32%、中級が 48%、上級が 18%であった。

（2）調査結果

①給与レベルと給与期待値

概して、現状の給与レベルは、その期待値を下回っている。現状の給与レベルで一番多い範囲が 16,000〜20,000 ペソで、次に 26,000〜30,000 ペソと続いている。一方期待値に関しては、一番高い期待値の範囲が 36,000〜40,000 ペソで、50,000 ペソ〜が続いている。

②現在の技術レベル

アプリケーション分野では大半がユーザー、初級レベルで、"Computer Graphics", "CADAM/CATIA"分野では、中級。上級レベルの技術者はいなかった。

システム開発・プログラミング分野では、中上級レベルの技術を有する IT 技術者も幅広く存在するが、"Enterprise and Banking System Maintenance", "Firmware or micro-code cording by Assembly", "GUI (graphical user interface) design by Japanese language" 分野の技術を有す

る技術者は少なかった。

ネットワークソリューション・通信分野では、大半の技術者が"Client Server System Design"を有する。全般的に上級レベルの技術を有する技術者は少ない

電子工学分野のスキルを有する技術者は少なく、特に、"Mfg and Test Technology for Device Industry (Semiconductor)"、"Mfg and Test Technology for PC Parts Industry (HDD, PCB assembly)"を有する技術者はいなかった。

③修得したい技術及びその手段と期間

アプリケーション分野、電子工学分野の技術を修得したいといった回答は少なかった。一方、システム開発・プログラミング分野では、各種技術分野で中上級レベルまで修得したいという回答が見受けられる。修得手段としては社内におけるコーチングを希望するが多く、トレーニング期間に関してはバラつきがある。

ネットワークソリューション・通信分野では、半数近くの技術者が"Client server system design"と"Web/Mail/DNS server design"の修得を希望している。修得手段及び期間は技術によって異なる。

④技術修得のコスト、期待する給与上昇額、海外で働く際の給与期待額

アプリケーション分野の技術を修得するためのコストは 20,000〜30,000 ペソで、修得後に期待する給与上昇額は 10,000 ペソである。つまり技術修得コストを 2,3 年で取り戻すことになる。もし海外で働く機会が与えられたら、US＄4,000 の給与を期待している。海外で働く際の給与期待額と実際の給与の差がある程度開くと IT 技術者は海外での就職を検討するようになることが予想される。特に新たな技術修得後は、修得にかかったコストを取り戻すため、海外での就職意欲が高まることが予想される。

システム開発・プログラミング分野の技術を修得するためのコストは 50,000 ペソとアプリケーション分野の技術修得よりも多くの出費を予測している。修得後に期待する給与上昇額は 6,500〜10,000 ペソである。もし海外で働く機会が与えられたら、US＄3,250〜6,000 の給与を期待している。

ネットワークソリューション・通信分野の技術を修得するためのコストは 3,000〜200,000 ペソと開きがある。修得後に期待する給与上昇額は 3,000〜10,000 ペソで、海外で働く機会が与えられた場合には、US＄3,250〜5,500 の給与を期待している。

電子工学分野の技術、"personal computer hardware/Intel CPU architecture"を修得するためのコストは 3,000 で、修得後に期待する給与上昇額は 6,000〜8,000 ペソである。もし海外で働く機会が与えられたら、US＄4,000 の給与を期待している。

⑤社内教育

表 7 に示されているように、社内教育に参加した動機に関して、システム開発・プログラ

ミング分野、ネットワークソリューション・通信分野では、スキル向上を動機としてあげる回答が多く、社内教育に対するモチベーションが高いことがわかる。また総じて満足度は高い。フィリピン大学でコースデザインする際も、IT 企業の社内教育といった実用的な教育を参考にすることが求められる。

表7　社内教育に関する調査結果

技術分野	教育を受けた回答数（複数回答）	動機（複数回答）	満足度	スポンサー
アプリケーション	計18	・ 仕事遂行上必要　8 ・ インセンティブ　7 ・ スキル向上　　2	・ 非常に満足2人 ・ 満足10人	・ 全額会社負担　10人 ・ 半分自己負担2人
システム開発・プログラミング	計106	・ 仕事遂行上必要　49 ・ スキル向上　35 ・ インセンティブ　8	・ 非常に満足　27人 ・ 満足　48人 ・ 不満足　2人	・ 全額会社負担　69人 ・ 半分自己負担　5人
ネットワークソリューション・通信	計85	・ 仕事遂行上必要　46 ・ スキル向上　23 ・ インセンティブ　3	・ 非常に満足　26人 ・ 満足　46人 ・ 不満足　3人	・ 全額会社負担　69人 ・ 半分自己負担　4人
電子工学	計21	・ スキル向上　7 ・ インセンティブ　8 ・ 仕事遂行上必要　6	・ 非常に満足　7人 ・ 満足　7人	・ 全額会社負担　9人

⑥ “フィリピン大学 IT 訓練・雇用センター”構想に関する意見

・ 構想はフィリピンの IT 産業振興に貢献する、学生を対象とするだけではなく、IT 技術者が技術革新についていけるようコースデザインされれば大変有益であろう。

・ IT 産業はこれからも進展し、IT 技術者の需要はこれからも高まることが予測される。貧富の差なしに才能のあるものが訓練を受けられるといった構想は非常にありがたく、長期的にフィリピンが世界で通用する IT 技術者を有することつながる。

・ アカデミック側が産業界で必要とされている技術・スキルを提供できるよう、アカデミックと産業界との間に対話が存在すべきである。

JAPAN INTERNATIONAL COOPERATION AGENCY
Philippine Office

STUDY ON THE SOCIAL NEEDS AND SUPPLY OF I.T. ENGINEERS

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Japan International Cooperation Agency

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

Highlights of the Study

The study on the social needs and supply of I.T. Engineers was deemed necessary by the JICA Team of Experts to take a closer look at the current Philippine I.T. industry specifically on its market and educational achievements. The data accumulation, as a result of the study, shall be used as inputs in the review of the proposal for the establishment of the I.T. Education and Training Center of the University of the Philippines. The proposal has been endorsed by the Philippine Government for possible assistance by the Japanese Government through its Grant-In-Aid Program. The Center is aimed at producing highly competent personnel in the fields of computer science, telecommunications and computer engineering, thus, it can help upgrade the capacity of the Philippine educational system to produce more high-quality, high-level IT professionals.

The study covers two major areas, namely: a) data accumulation on statistics related to the IT industry; and b) survey of the current skills of IT Professionals and Students, and the demand and supply of IT Professionals. The targeted respondents of the study include the following: a) For students, six universities/colleges that offer I.T. related courses with 20 students per school; b) For I.T. Engineers, 12 I.T. firms with five I.T. Engineers each and; and c) 12 Human Resource Managers of I.T. companies.

A total of ten schools were invited to participate in the study because some of these schools previously sent with invitation letters had to get the approval from their respective higher authorities that took longer time and still no decisions yet for them to participate. Likewise, a number of schools had already conducted their commencement exercises that left no students to be interviewed during the survey period.

Thirty companies were sent invitation letters to participate in the study. However, due to various reasons such as time constraints where the companies cannot accommodate the researchers per schedules set and the current workload of HR Managers where they could hardly participate, the following companies participated:

The following are the major highlights of the study:

Data On IT Industry

Philippine Population

The Philippine population as of May 1, 2000 is 76,498,735 persons. An increase of 11.5 percent or 7.88 million persons over the 1995 census count of 68,616,536 persons. Population growth rate is 2.36 percent annually between 1995 and 2000. This is slightly higher than the growth rating during the first half of the nineties (2.32 percent).

Employment

Employed persons: 29.7 million in January 2002, up by 5.7% over January 2001
    Employment in agriculture increased by 7.4% to 11.0 million from 10.3 million.
    In industry, employment decreased by 86,000 or by 1.8%.
    Employment in services increased by 943,000 or by 7.2%. Its share to total employed
    increased to 47.5% from 46.8% last year.

Unemployment rate decreased to 10.3% from 11.3% in January last year.
Underemployment rate declined by 1.0 percentage point from 16.9% in January last year
to 15.9% this year.

Labor Market. As of Jan. 2002. By Occupation

Labor Force Participation Rate	66.4%
Employment Rate	89.7%
Professionals	4.7%
Technicians and Associate Professionals	2.6%
Plant and Machine Operators and Assemblers	7.4%
Farmers, Forestry Workers and Fishermen	21.1%
Trades and Related Workers	10 0%
Laborers and Unskilled Workers	29.9%
Officials of Government, Corporate Exec.	10.3%

Labor Force Participation. By Sector

Agriculture		37 1%
Services		47.5
Industry		15.5%
Mining and Quarrying:	0.4	
Manufacturing:	9.5	
Electricity, Gas & Water	0 4	
Construction	5.2	

Regional Labor Situationer: (Metro Manila): July 2001

Household Population 15 Years Old and Over		7,135,000
Labor Force		4,548,000
Employed		3,835,000
Unemployed		713,000
Labor Force Participation Rate	63.7%	
Employment Rate	84.3%	
Underemployment Rate	14.1%	
Unemployment Rate	15.7%	

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Merchandise Export Performance: January 2002

MERCHANDISE EXPORTS REGISTER 9.0 % DECREASE. From $2.889 Billion in 2001 to $2.630 Billion in January 2002

- Receipts from Electronic Components, accounting for 54.6 percent of the aggregate export revenue for the month, declined by 14 5 percent to $1.437 billion from $1.681 billion last year.
- Articles of Apparel and Clothing Accessories remained as the country's second top earner with a combined share of 6.3 percent and an aggregate receipt of $165.95 million or 21.4 percent lower than $211.06 million a year ago.
- Ignition Wiring Set Used in Vehicles, Aircrafts, and Ships ranked third with a total revenue of $53.57 million reflecting a 40.7 percent increase from $38.08 million last year
- Metal Components ranked fourth with sales amounting to $28.61 million or a year-on-year decline of 21.7 percent from $36 51 million.
- Revenue from Woodcrafts and Furniture fell by 44.3 percent to $25.84 million from $46.42 million during the same month of 2001.

Performance in the Philippine Economic Zones

Employment (January to February 2002)

Public Economic Zones·	55,439
Private Economic Zones:	161,338
Direct Employment:	278,823
Indirect Employment:	418,234
TOTAL :	697,057

Economic Zone Employment (Total) 1994 to Feb. 2002

1994	229,650	1998	609,044
1995	304,557	1999	617,690
1996	380,625	2000	696,035
1997	562,085	2001	708,657
		Feb 2002	697,057

Summary of Exports and Imports, Economic Zones (Million US$) Jan.-Feb. 2002

	Exports	Imports	Net Trade
Public Economic Zones	979.23	501.010	478.210
Private Economic Zones	2,354.746	1,513.340	841.406

Salaries and Wages: In Million Pesos (January-February 2002)

Public Economic Zones.	1,965.380
Private Economic Zones:	3,758.224

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Locator Investments by Sector: 1995-2001

Electronic Parts & Products	64.3%
Electrical Machinery	13.8%
Transport/Car Parts	7.4%
Precision and Optical Instruments	2.2%
Rubber and Plastic Products	2.2%
Garments and Textiles	1.3%
IT Services	1.0%
Chemical Products	0.8%
Other Manufactures	6.8%

Locator Investments by Nationality: 1995-2001

Japanese	39 6%	Singaporean	5.45%
Filipino	17.3%	Korean	3.6%
American	13.3%	German	2.2%
Dutch	8.4%	Taiwanese	0.9%
British	6 2%	Malaysian	0.8%
		Others	22.3%

No. of I.T. Schools and Enrollment

Type of Institutions	Total No. of IT Institutions As of Mar 2000	Enrollment in IT Courses 2000-2001
Public Schools	89	36,009
Private Schools	554	300,633
Total	643	336,642

Number of I.T. Faculty: Year 2000-2001

Computer Engineering Courses	664
I.T. Related Courses:	2,863
TOTAL:	3,527

Tuition Fees

Schools offering I T. related courses in Metro Manila charge each student for tuition and fee for 21 units per semester varying amounts from as low as P5,700 to more than P30,000 for school year 2001-2002. The following are some of the schools with their charges: a) Ateneo de Manila University, P32,250; b) De La Salle University, 25,302, c) Asia Pacific College, 19, 199; d) Mapua Institute of Technology, 20,769; e) Miriam College, 20,770; f) Philippine School of Business Administration, 19,700; g) Metro Manila College, P5,700; h) National University, 8,831; i) STI College Makati, P6,230, j) Central Colleges of the Philippines, 8,960.

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Data on I.T. Students

The 129 respondents came from six schools in Metro Manila. Four of the schools are privately owned while two are under government supervision.

Description of the Present Skills of Students

On Application Skills

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

On System Development and Programming Skills of Students

Sixty percent or more have skills on 6 out of 12 System Development and Programming skills. 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.

On Networking Solution and Telecommunication Skills of Students

A high proportion of students has the skill on LAN (IEEE802.3), Wireless LAN (IEEE802.11) Technology (70%). 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.

On Electronics Engineering Skills of Students

The students were also equipped with some of the skills on Electronics Engineering. 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.

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On Application Skills

A little more than half of the students intend to master their skill on Computer graphics 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. Overall, the amount of money students is willing to spend for training ranged from P3, 00 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.

On System Development and Programming Skills

The most preferred skill to master by students on System Development and Programming is their skill on Visual Basic Programming. 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 a student is willing to pay for training abroad is higher compared to other means of getting the training.

On Networking Solution and Telecommunication Skills

Mastering Networking Solution and Telecommunication Skills was not highly preferred by majority of students 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

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was the preference for mastering skills on Cellular Phone Technology. Acquiring mastery of the other skills were 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   P5,000.00 to P7,000.00 pesos. Estimated median cost of training abroad that they are willing to spend is higher compared to other means of getting the training.

On Electronics Engineering Skills

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.

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

On Application Skills

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 to 8,000 pesos.

On System Development and Programming Skills

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

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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 to 10,000 pesos.

On Networking Solution and Telecommunication Skills

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 to 15,000 pesos.

On Electronics and Engineering Skills

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 numbers 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 to 9,000 pesos

Desired Skills Category the Students Like to Work with after Graduation

One half of the students would prefer to work in companies engaged in System Development and Programming while one-third would prefer in Networking and Telecommunication firms. Almost three-fourths of the students want to work abroad, more specifically, Japanese firms

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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)

Data on I.T. Engineers

The fifty-six respondents came from fifteen I.T. companies that participated in the survey.

Current Skills Inventory

On Application Skills of I.T. Engineers

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.

On System Development and Programming Skills of I.T. Engineers

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.

Networking Solution and Telecommunication Skills of I.T. Engineers

More than two-thirds of the I.T. engineers were skilled on Client Server System Design 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

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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.

On Electronics Engineering Skills of I.T. Engineers

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.

Skills IT Engineers Like to Master and Desired Skill Level to Attain

On Application Skills of I.T. Engineers

Not very many I.T engineers intend to master their Applications skills 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. Training abroad was considered by a few. The training duration mostly preferred by the engineers was about one month or more. Some though have stated that less than two week to about three weeks was desired.

On System and Development Skills of IT Engineers

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. 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. 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 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.

On Networking Solution and Telecommunications Skills of I.T. Engineers

About half of the I.T. engineers intend to master Client Server System Design. 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

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Training in the Philippines remains to be the most preferred means to master their skills on networking solution and telecommunications. 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

On Electronics Engineering Skills of I.T. Engineers

One out of five I.T. engineers intends to master their skills on Personal Computer Hardware/Intel CPU Architecture. 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. 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.

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

On Application Skills

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.

On System Development and Programming Skills

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 cording by Assembly and Graphical User Interface, having a lower expected pay increase than the others.

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The median expected salary if they will work abroad did not vary much, ranging from US$5,000 to US$6,000.

On Networking Solution and Telecommunication Skills

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.

On Electronics Engineering Skills

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

Company Sponsored Training Courses or On-The-Job Training Programs

On Application

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. 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. Some courses lasted for less than one week to about two weeks. 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. They were somewhat satisfied with the training Majority of the trainings were company sponsored. Few engineers paid half of the training fees while the other half was paid by the company.

On System Development and Programming

One out of four engineers was able to attend training courses on Visual Basic, C++ and JAVA programming and Database Design in their companies in the past two years. 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

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the other methods used in the courses The skill level of the courses varied from user level to high level. Duration of the training courses varied in length (less than one week to 5 weeks up). 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 incentive to them.   Engineers were somewhat to very satisfied with the training Majority of the trainings were company sponsored.

On Networking Solution and Telecommunications

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 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 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. Training courses were conducted for less than a week to about two weeks Some have lasted for more than one month. Major reasons for attending the courses were job requirement and professional advancement. Training was an incentive for a few of them Majority of the engineers were somewhat to very satisfied with the training Few though were not satisfied with it. Majority of the trainings were sponsored by the company.

On Electronics Engineering

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 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 user and primary levels with few conducted on a high level. Most of the training courses were conducted for less than a week. Few lasted for more than one week. The reasons for attending the courses were job requirement, professional advancement and given as an incentive. 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. Majority of the trainings were sponsored by the company.

Attendance in the Training Courses 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 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

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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.

Data on HR Managers

The data below were generated from twelve I.T companies

Recruitment of I.T 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 Courses 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: CISCO IP Telephony, Image Scanner, Periphonics, ATM Concentrator Conf, DMR Telecom, Java Factory, Storage Sys Const Tech, MS WIN 2K, Microsoft Certification, Project Management, Active Server Pages, Visual Basic Training, LAN/Network Related Training, Web-Based Training, Fundamentals of Aptech Computer, XML, and 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.

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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.

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.

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. Millenium 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

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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.

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 to 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

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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.

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

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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 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

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MAIN REPORT

International Cooperation Agency
Philippine Office

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

I. Rationale

In support of the review of the proposal for the establishment of the I.T. Training and Education Center of the University of the Philippines, the JICA Philippine Office undertook a preliminary study to get the necessary and relevant data on the current information and technology industry to include IT market and IT education. The results of the study shall be utilized by a team of Japanese experts who will be visiting the country to support its recommendation on the proposed facility.

II. Scope of the Study

The targeted respondents of the study include the following: a) For students, six universities/colleges that offer I.T. related courses with 20 students per school; b) For I.T. Engineers, 12 I.T. firms with five I.T. Engineers each and; and c) 12 Human Resource Managers of I.T. companies.

A total of ten schools were invited to participate in the study because some of these schools previously sent with invitation letters had to get the approval from their respective higher authorities that took longer time and still no decisions yet for them to participate. Likewise, a number of schools had already conducted their commencement exercises that left no students to be interviewed.

The following schools participated in the study:

1. Technological Institute of the Philippines, a private institution

TIP offered courses such as Chemical, Civil, Electrical and Mechanical Engineering, Architecture and Commerce. It also offered Industrial Education, Industrial Arts, Liberal Arts, High School and Technical-Vocational courses. TIP then directed itself toward specialization in the field of technology. In 1977, it offered a two-year associate course in Marine Engineering. In 1980, the Liberal Arts and high school programs were phased out to make way for the school's new thrust. In 1981, additional buildings were leased to accommodate the student population, which already exceeded 23,000.

TIP offers Bachelor of Science in Computer Science. The Computer Science program emphasizes comprehension and understanding of the principles and concepts needed for designing and formulating computerized systems and applications. The program includes subjects in mathematical logic formulation, calculus, discrete mathematics, statistics, data structures, theory of computation, programming languages, and automation. The program is for those who are more interested in the applications or software aspect of computer systems. In line with the thrust of the TIP to provide well-rounded, industry-related, quality education, and in preparation to e-commerce, the Institute recently partnered with the world's leading Internet software and hardware companies: ORACLE SYSTEMS, Inc. and CISCO SYSTEMS, Inc.

2. *Pamantasan ng Lungsod ng Maynila (PLM) College of Engineering and Technology, owned and managed by the Local Government of the City of Manila*

The Pamantasan ng Lungsod ng Maynila (University of the City of Manila) was the first institution of higher learning in the Philippines to have an official name in Filipino, formally opened in 1967 to one hundred fifty-six freshman scholars, all coming from the top ten percent of the graduating classes of Manila's twenty-nine public high schools. As the first and only community university, it is tuition-free, funded by the City of Manila to offer tertiary education, most especially to the disadvantaged but deserving students.

In 1988, IT related courses were included in the College of Engineering, to wit

Bachelor of Science in Computer Science

Objectives of the course are the following: a) be able to write a program in a reasonable amount of time that work correctly, are well documented and are readable; b) be able to determine whether or not they have written a reasonable, efficient and well organized program; c) know what general types of problems are amenable to computer solutions and the various tools necessary for solving such problems; d) be able to assess the implications of work performed either as an individual or as a member of a team; e) understand basic computer architecture; and f) be prepared to pursue in-depth training on one or more application areas of further education in computer science.

Bachelor of Science in Electronics and Communication Engineering

Objectives of the course are following: a) have a broad general education that will assist them to become productive and versatile citizens; b) have a strong foundation of basic sciences of mathematics, chemistry and physics and engineering science courses; c) define and apply the basic theoretical concepts in electronics and communications as gained in previous study; d) learn the design techniques and methodologies as maybe applied in industry; and e) be able to gain practical work experience related to their career objectives through the industry internship program.

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Bachelor of Science in Computer Engineering

Objectives of the course are the following: a) have a broad general education that will assist them to become productive and versatile citizens; b) have a solid foundation on the basic sciences of mathematics, chemistry and physics, and engineering science courses; c) understand the basic theoretical and technological principles governing the design and analysis of computer software and hardware; and d) be able to gain practical work experiences related to their career objectives through internship in industry.

3. East Asia College of Information and Technology, A private Institution

The course offered at the start was leading to the degree of Bachelor of Science in Computer and Information Science (BSCIS). In 1994, East Asia started offering courses leading to the degree of Bachelor of Science in Computer Engineering (BSCOE) The first permit to offer a BSCIS program was granted by the Department of Education and Sports on June 15, 1992. The permit to offer the BSCOE was granted on July 27, 1995 on which day the formal recognition for the BSCIS was also granted.

The school offers an extensive scholarship program with SM Foundation, Inc. providing the bulk of the scholarship funds No less than 15% of the student body enjoys financial grants at present The school also offers student assistantships to students who are willing to work part-time.

Bachelor of Science in Computer Engineering (BSCOE)

This course bridges the gap between computer science and electronic engineering and is the link between software and hardware. As an engineer, you can design, implement, and maintain computer-based systems intended to solve real world problems.

It is only at East Asia where the BS COE course has integrated a program in which students spend three-month internship in an industrial environment receiving practical training.

Bachelor of Science in Computer Science (BS CS)

This course combines professional expertise in both hardware and software. One interesting focus is Artificial Intelligence - A.I. From banking, to industrial mass production systems, to intelligent home appliances.

Bachelor of Science in Information Technology: BS IT

Networking is the main focus of this course. Students will become experts in having computers link-up and interact with one another. From peer networks, to LAN, to WAN. The students can create their own global internet system, or apply their talents in innovating ATM's, and other e-based business applications

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Bachelor of Science in Information Management: BS IM

This course will make students professional in creating programs for utilizing and managing data/information in various commercial applications like sales, accounting, warehousing and logistical systems. It is also an ideal second-degree course for BS Commerce graduates.

4. De la Salle University, a Private Institution.

The College of Computer Studies (CCS), which is the newest member-college of De La Salle University, started as the Center for Planning, Information, and Computer Science in 1981, and was formally declared the College of Computer Studies in 1985. In 1996, the College of Computer Studies and the Graduate School of Business spin off from the DLSU-Manila to form the De La Salle University Professional Schools, Inc. In 2002, the College of Computer Studies will establish a satellite campus at the Filinvest Information Technology zone in Ayala Alabang. CCS envisions itself to be the country's and region's preferred provider of education in Computer Science, Information Systems, and Computer Engineering that is world-class at the same time that it promotes the Lasallian spirit of faith and zeal. Computer-related courses are the following:

BS Computer Science major in Computer Engineering (CE)

The Computer Engineering Specialization emphasizes on the fundamental concepts of electricity, the theory and use of electronic analog and digital components, the analysis and design of combinational and sequential digital circuits, and the techniques required in order to interface a microprocessor to memory units, input-output ports, and other devices or to other microprocessors

BS Computer Science major in Information Technology (IT)

The IT specialization focuses on the study, design, implementation, and evaluation of information systems for organizations. Students are trained to recognize problems that are amenable to computer solutions.

BS Computer Science major in Software Technology (ST)

The ST specialization's main objective is to prepare students for graduate studies and research in Computer Science while training them in the engineering of software.

Master of Science in Computer Science (MSCS)

The objective of the MSCS program is to prepare students for further studies at the doctoral level by training them to undertake high-level research in Computer Science, exposing them to theories and underlying principles of computation and enabling them to use abstract models in studying computer and software systems

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Master of Science in Information Technology (MSIT)

The MSIT degree program was established mainly for industry practitioners who would like to develop and improve their capability in using information technology and in applying IT to the modern business setting.

5. Arellano University, A Private Institution

Computer related subjects were lodged into electronic data processing, and applied mathematics courses under the College of Commerce in early 1980s. Courses in Computer Science were then offered in mid 1990s. The Department of Computer Science was created in November 2001 that the College was able to set up with its own distinct name and office. The College, in consonance with the objectives of the Commission on Higher Education expects the students to: a) develop analytical and logical thinking; b) apply different programming skills and techniques in developing simple to complex programs; c) employ acquired knowledge in making decisions and in dealing with real life problems; d) develop students autonomy and responsibility and love for work; and e) assimilate and demonstrate the values and traits of loyalty, honesty, integrity and social responsibility.

6. Polytechnic University of the Philippines, A National University

The College of Computer Management and Information Technology (CCMIT) was set up in 1969 under the short-term courses in Electronic Data Processing (EDP) In 1987, the degree Bachelor in Information Technology was offered, the course was mathematics oriented. In 1999, CCMIT was chosen by CHED as one of the schools considered to be a Center of Development Excellence.

Currently two courses are offered, to wit:

Bachelor of Science in Information Technology (BSIT)

The BSIT focuses on overall discipline of information technology, which covers more technological and applied aspects of computing. Area ranges from programming to software design, networking including internet and web, decision-makers in the preparation of decision support and system programming.

The students enrolled in the course are expected to acquire: a) knowledge in the management of the use of IT based systems which address the specific needs of the organization; b) develop strong conceptual knowledge in IT through their area of specialization; c) actual experience in developing IT products; and d) enhance social responsibility.

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Bachelor of Science in Computer Science (BSCS)

The BSCS is a four-year course, which focuses on the underlying principles and the mathematical and logical nature of computing as a science. With its emphasis on theory and design of software, the program prepares the student for a career in software design, development, and quality test. Moreover, the program provides extensive hands-on for various systems and applications software, either on an individual or team basis

The BSCS program aims to equip the students with: a) knowledge of the structure, organization and operation of computer systems; b) understanding of the underlying theories on computer design and programming; c) technical skills in operation research as well as in the assessment of existing technology and software; d) actual experience in the development of efficient systems software and application software; and e) self-discipline, concern for the welfare of others and matured disposition at all times

I.T. Engineers

Around 30 companies were sent invitation letters to participate in the study. However, due to various reasons such as time constraints where the companies cannot accommodate the researchers per schedules set and the current workload of HR Managers where they could hardly participate, the following companies participated:

1. Asia on Line. It is a pioneer provider of full range internet-related consulting services, solutions and technologies. It offers leading-edge internet-based communication solutions that plan and create webpresence, transform business processes and launch client's own e-business initiative.

2. Canon Marketing Philippines (CMP). Established on December 1996, brings into the Canon Group's many years of experience in selling and servicing CANON products in the Philippines. As of year 2001, CMP has 289 professional employees. Its prestigious clientele, ranging from multi-million dollar companies to rising entrepreneurs like the copy center next door.

3. Fujitsu Philippines Inc. (FPI). One of the country's leading I T. system integrators. FPI's capability as a systems integrator comes from a blend of local knowledge and global expertise. It has almost 40 years of operations in the Philippines. FPI started operations as the local reseller of Fujitsu computer and communication systems. Competing against the other traditional computer hardware vendors, FPI differentiated itself through its high-quality proprietary products and its superior after-sales services. In the 1990's, with the advent of open systems and the ever-increasing sophistication of Information Technology, FPI began a deliberate process of business expansion, with the long-term goal of seizing market leadership in the local IT industry. It recasts its former

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image of being a traditional hardware vendor, and is now positioned as one-stop shop for computers, communications, software and technology services.

4. IBM Philippines. Today, IBM has been called the biggest dot.com company as it transforms itself into a successful e-business. IBM's strong push and implementation of e-business has earned it the reputation of "Internet Business Machines". IBM will continue to transform itself and help its clients do the same even as global companies become e-businesses. It has become the leading supplier of information technology hardware, software and services in the country and transformed itself into one of the top 500 corporations of the Philippines. It is known for the quality of its products and services in a long-standing tradition of excellence, customer satisfaction, and commitment to business ethics and integrity. With more than 300 employees, it has the largest pool of technical support staff and hardware/software availability engineers in the country. It has also an IT College joint venture, Asia Pacific College that is closely linked to business and prepares skilled IT Professionals for the industry.

5. NEC Telecom Software Philippines, Inc. (NSP). NSP is the newest subsidiary under NEC Networks, the latter being one of the three in-house companies of NEC Corporation. Established in 1999, NSP commenced operations in February 2000 with an initial workforce of less than a hundred employees from NEC Technologies Philippines Incorporated located at Mactan Economic Zone, Lapulapu City. As a software development company, NSP serves as a strategic development center for NEC's global activities, enhancing its competitiveness to provide total solutions based on photonic and optical transmission systems. Its current projects include Network Management Systems, Element Management Systems, Service Management Systems, and Embedded Systems.

6. Lighthouse Credit Technology. Established in the Philippines in 1998, Lighthouse Credit Technologies Corporation is an independent outsource provider focused on the origination and servicing of consumer receivables. It combines international best practice with leading edge technology to manage credit receivables for financial institutions and other businesses. Lighthouses'solutions improve the quality and productivity of client marketing and origination as well as managing account servicing from setup through collections. Its services are available in a product spectrum that ranges from a total outsourcing solution to the provision of appropriate applications tailored to fit the needs of companies.

7. Sun MicroSystems. Since its inception in 1982, The Network has propelled Sun Microsystems, Inc. to its position as a leading provider of industrial-strength hardware, software, and services that make the Net work. Sun can be found in more than 170 countries. Sun Microsystems is involved with the acquisition of products and services from outside companies to help conduct its business more effectively
It provides the following services to companies. A) Operations: For suppliers marketing products or services that support business operations, including maintenance, repair and operations; b) Production: For suppliers marketing products or services to support the manufacture or production of Sun's products: c) Customer Services: For suppliers marketing professional, technical, repair or maintenance services to support Sun's

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customers; d) Other Opportunities: For suppliers marketing human resource services, or for those seeking information on how to become a Sun value added reseller or developer.

8. Globe Telecom. Globe is a full-service telecommunications company offering cellular mobile telephone system (CMTS), fixed telephone and international communications services, International Private Leased (IPL) lines, Internet access, VSAT (Very Small Aperture Terminal) service, Inter-Exchange Carrier service, Frame Relay, Value-added Network Services (VANS) and other domestic data communications services. It is owned by Ayala Corporation, Singapore Telecom International and Deutsche Telekom. Today, Globe Telecom intends to build on the legacy of its pioneering past, transforming the world into a global community just as Filipinos in centuries past were in constant and direct communications with every family in the community.

9. Global Stride. Globalstride's vision is to be the leading customer care provider in the world. With superior Customer Relationship Management services and a unique offshore value proposition, Globalstride offers an excellent outsourcing solution that allows companies to exceed the demands of their customers without squeezing their margins. We help improve our clients customer service operations by designing a custom outsourcing program and shifting their customer service operations to a more cost effective offshore location in the Philippines. The result is better customer satisfaction at rates that are more affordable than doing the same type of service in-house. Globalstride is backed by leading venture capital firms in Asia, including Hambrecht & Quist Asia Pacific, Vsource and AIVP. To date, Globalstride has raised two rounds of financing to provide the necessary capital for its rapid expansion activities.

10. Millennium Microelectronics (M2I). (M2I) is a domestic corporation incorporated on February 2001. It immediately went into research and development. It provides its clients with system automation and other application programs fitted to the needs of their respective industry. Moreover, it provides the corresponding services that include system development or custom programming, installation, training and maintenance support services. M2I is in the business of providing information technology solutions. Under the Information Technology industry, it is classified as providing "solutions", i.e., hardware, software and services.

11 LG Industrial Systems. A leader in providing total solutions for areas which are essential in creating a comfortable and productive industrial environment such as the power transmission & distribution sector and automation equipment & service sector. Currently recognized as a forerunner in the Korean electric and electronic industry, and further aiming to become an internationally recognized company. It continues to improve its competitiveness through e-business technologies.

12. Hewlett Packard. HP is one of the world's foremost suppliers of measurement, computation and communication products and services. Its product offerings range from consumer products for home offices, small businesses and on-the-go professionals to precision instruments and extremely powerful computer systems for the most advanced applications. Service and support offerings also cover a broad spectrum, from world-class

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hardware maintenance and support to professional services, such as consulting and outsourcing. It continued to invest heavily in research and development to strengthen capabilities in measurement, computation and communication.

13. Philippine Long Distance Telephone Company (PLDT). The country's principal supplier of domestic and international telecommunications services. The Company's charter, which extends until 2028, authorizes it to provide virtually every type of telecommunications service. PLDT has a network of 174 central office exchanges serving the Metro Manila area and 188 other cities and municipalities throughout the country. International long distance services are provided by PLDT using two international gateway switching exchanges, submarine cables and satellite systems that connect PLDT's network worldwide. PLDT also operates the Philippines' only nationwide digital microwave backbone, which connects its own exchanges with 466 other local exchanges and 3 exchanges operated by the Philippine government. PLDT's national long distance network links 1,106 calling points in 806 municipalities throughout the country.

To meet the challenges of increasing competition, cope with the growing demand for technologically advanced telecommunications services, and increase the country's telephone density, PLDT continues to expand and modernize its network. Under its ongoing major expansion and modernization program, PLDT aims to install about 2.1 million additional lines by the year 2002. By then, PLDT will have approximately 3.7 million lines and a fully digitalized network with the capacity to provide not only enhanced and value-added services but also multi-media and broadband services.

14. Community Unlimited, Inc. A domestic consulting firm engaged in the design and development of management information system of different organizations such as cooperatives, microfinance institutions, donor agencies, and private corporations. Since its operation in 1997, it continued to bring in technologies to the countryside by developing customized systems for businesses and organizations.

15. Engine Red Solutions. A domestic corporation engaged in system's development/web applications. It develops application systems on Human Resource Development, Payroll, Inventory, etc. It started its operation in 2001 with foreign investors that are based in the Philippines.

III. Methodology

Three sets of questionnaires were developed and administered, one each for I.S. Students, I.T. Engineers and HR Managers. Face to face interview and individual filling-out of questionnaires were undertaken to gather the information. Some respondents preferred to have answered the questionnaire individually and sent back the accomplished forms through e-mail or telefax. Follow-up questions were made through telephone calls and e-mails. For the selection of respondents, in the case of students, the respective Department Heads assigned focal point persons (faculty or student leader) who identified

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the I.T. students and made the schedule for the interview. A team of researchers conducted the interview simultaneously.

For I.T. Engineers and HR Managers, appointments to hold the interview were first sought. Scheduling and the actual conduct of the interview took a longer time because they had to settle first with their routinely tasks. Oftentimes the IT Engineers were on field or mobile where they could hardly be reached.

Consolidation software was developed to statistically present and analyze the data coming from the students and I.T. Engineers while qualitative analysis was undertaken to consolidate the data coming from the Human Resource Managers.

IV. Findings of the Study

The results of the study are presented in four parts, to wit:

A. IT Students
B. I.T. Engineers
C. H.R. Managers
D. IT Industry/Market
E. IT Education

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