Re-Engineering the IS Curriculum for the IS Professional of the Future

Eugenia M. W. Ng Tye

Janice M. Burn

Louis C. K. Ma

Ray S. K. Poon

ABSTRACT: *Many articles have reported that there are serious implications for the skill requirements of future IS professionals as a result of a new "IS Paradigm". In order to assess the extent of such changes and relate these to IS curriculum development a long term research study has been funded in Hong Kong. The objectives of the study are to evaluate the effectiveness of the IS curriculum by relating this to the career development requirements of IS professionals who graduated from these IS programs. This report covers a period up to five years after graduation.*

The study asks respondents to identify the most important IS skills required now and in five years time; the perceived emphasis of IS skills which were imparted through the IS curriculum and; the perceived relevance of these skills to the requirements of their jobs now and in the future.

The results suggest that while there is a close match between the needs of today and the training received there will be an ever widening gap with the needs of the future. Where serious discrepancies currently exist these relate to interpersonal and business skills. The methodology used allows curriculum designers to clearly identify directions for improvement and to re-engineer the curriculum accordingly. This has the advantage of being related specifically to the cultural environment in which the course operates and so the IS program can more closely meet the needs of the local IS community.

KEYWORDS: *IS Curriculum, Career, IS Professionals, Reengineering, Culture.*

INTRODUCTION

Much has been written about the changing "IS paradigm" and the impact which this will have on the skills and knowledge requirements of IS professionals in the future [1,2,3,4]. Educators, managers and IT professionals and users have all been surveyed and this data analyzed and correlated to produce a consensus view. Just as the role of IT in organizations has changed over the last 30 years so the role of the IS professional must reflect this change. The success of IT has seen the demise of the old breed of computer professional and highlighted the need for the hybrid bridge builders and integrators who need to combine technical skills with business skills. Increasingly, the latter are becoming more important as technology becomes more transparent and stable and organizations become more flexible and dynamic.

There is a strong case for the "re-engineering" of the IS professional [5] and hence a strong implication for radical change in the IS education curriculum. Whilst there may be agreement on the need for change there is little evidence to suggest that current IS curriculum reflect these views or that re-engineering processes are in place. [6,7,8,9].

The results of some recent research studies have, in fact, seemed to indicate acute complacency in academics with respects to the relevance of their IS programs and current industry needs [10,11]. The fact that employers continue to want such basic skills as "COBOL Programming" is more likely to reflect the inability of that organization to use IT effectively or strategically than it is to support the continuation of IS curriculum with such outdated approaches.

Traditionally, change in curriculum development is initiated top-down reflecting the academic view of business needs. The more enlightened have also considered the views of business but again from a top-down perspective by asking senior management to identify their needs. In "real life" this is no longer happening with Business Process Re-engineering (BPR) emerging as an integrated and collaborative process of change. The same process needs to be replicated in the academic world with the focus on our clients and users of our systems. In this case, it should revolve around IS professionals who have also been IS students and can then provide a direct comparison between the skills learned and the skills required.

In order to address this issue a research study was initiated to investigate the views of IS professionals in Hong Kong both with respect to their programs of academic studies in IS and the job requirements they perceive. These two views from the same group were then matched to identify the relevance of IS programs now and for the future.

This paper reports on the results of this study. The implications for IS curriculum are discussed and related specifically to program changes which should be implemented to meet the current and future needs of the Hong Kong environment. Finally, the methodology and its application are reviewed and suggestions made for similar work of this nature to continue.

THE CHANGING IS PARADIGM

A number of recent studies have suggested that an IS paradigm shift has created different job descriptions for IS professionals which requires them to acquire new knowledge and skills. The ideal IS professional of the 21st century will be multifaceted individuals. They

Table 1: Perceived Skills of IS Professionals - HK vs. US Findings

Ranking	Hong Kong		US		
	1993	1998	1990	1995	2000
1	Interpersonal	Business	Interpersonal	Interpersonal	Interpersonal
2	Business	Analysis & Design	Business	Business	Business
3	Programming	Interpersonal	Programming	Programming	Analysis & Design
4	Analysis & Design	Programming	Analysis & Design	Analysis & Design	Programming
5	Applications	Applications	Environment/ Platform	Environment/ Platform	Applications
6	Environment/ Platform	Environment/ Platform	Applications	Applications	Environment/ Platform
7	Computer Language	Computer Language	Computer Language	Computer Language	Computer Language

(Adapted from Chau and Tye (1993) and from Leitheiser (1992))

will possess a combination of interpersonal, technical and business skills that will allow them to analyze problems, integrate applications, and implement new business processes built around information technology [1,2,12,13].

Acceptance of this concept has renewed interest in research in the area of IS skills requirements, IS staff motivation and IS staff management. It has also stimulated activity in IS curriculum development since many of the academic programs on offer still operate lifecycle related training which is more closely related to hierarchical career development within a centralized IT department. The findings of recent studies would suggest that rather than emphasizing technical skills IS programs should concentrate on the development of interpersonal and business skills [3,14,15,16,17]. These findings have also been supported by many articles in the management press [18,19] and through in-company research [20].

Most recently Trauth et al. [3] used data from four groups IS managers, end-user managers, IS consultants, and IS professors - to identify the key skills and knowledge that will be required of future professionals. The eighteen IS abilities were arranged into three categories: human, business, and technical. Results from 131 responses showed that the top six abilities fell under the human and business categories while only one technical skill was ranked in the top ten. Their conclusions with regard to IS curriculum suggest that there is a wide expectation gap between the needs of industry and the skills sets of graduating IS professionals. This problem can only be solved by a continual reassessment of markets and customer requirements involving all shareholders in the process.

CURRICULUM AND CULTURE

In addition to changes in the IS marketplace, curriculum designers must also be aware of the changes which have been brought about through globalization. IS graduates will require specific skills to succeed in a highly turbulent workplace characterized by a culturally and ethnically mixed labor force and a technology driven by IT [21,22]. The emphasis is increasingly on enhanced communication and adaptation to a constantly changing environment. Not all environments, however, present similar challenges in the worldwide context. Newly industrialized countries may find that the major concerns of industry are very different and relate to the stage of growth of IT as well as national economic policies.

In a 1994 study Wang and Khan [23] found that skills derived from the newer information technologies were ranked higher in U.S. studies than in the Republic of China [3,24,25]. This was also the case with higher level IS functions such as IS management and IS strategic planning. In the three U.S. studies "communication abilities" was ranked as the top skill requirement but came only fifth in the R.O.C. where "systems analysis and design" was ranked first. The second ranked skill "structured analysis and design" in the R.O.C. was not placed in the top ten in the other three surveys. The implication of these findings for educators is that while IS skill requirements may be changing. The pace of change may vary by country and academic institutes may need to provide their students with special skills to meet these unique demands. This may also imply an accelerated program for certain skill acquisitions in order for IS graduates to participate effectively in a global environment.

To identify specific skill requirements in Hong Kong a number of studies have been implemented. Chau and Tye [26] conducted a study to find out the current and projected IS skills required of IS personnel as perceived by IS managers. This study replicated the work of Leitheiser [14] which tried to identify the most important skills for systems developers from IS management perspective both for the early 1990s and projected into the year 2000. The results in Hong Kong were remarkably similar to those obtained by Leitheiser suggesting that interpersonal skills were perceived as the most important and computer languages as the least (Table 1).

An earlier Hong Kong study [27] also found remarkable similarities between the critical IS issues of concern between Hong Kong and U.S. but a notable difference in ranking for the issue of "finding appropriately qualified staff" which was ranked top in Hong

Figure 1: Mean Importance Ratings for the Seven Categories of IS Skills

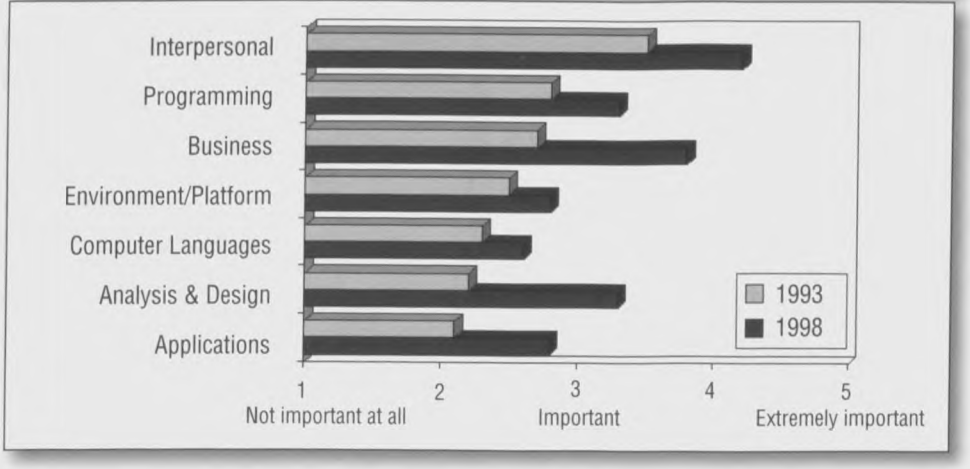


Table 2: Ranking of IS Skills in Order of Importance

1993		1998	
Programmer/ System Analyst	IS Manager *	Programmer/ System Analyst	IS Manager *
Interpersonal (3.47)	Interpersonal (3.45)	Interpersonal (4.15)	Business (3.67)
Programming (2.88)	Business (3.31)	Business (3.82)	Analysis & Design (3.67)
Business (2.71)	Programming (3.28)	Analysis & Design (3.31)	Interpersonal (3.47)
Environment/ Platform (2.48)	Analysis & Design (3.27)	Programming (3.29)	Programming (3.44)
Computer Languages (2.34)	Applications (2.85)	Environment/ Platform (2.88)	Applications (3.40)
Analysis & Design (2.27)	Environment/ Platform (2.77)	Applications (2.88)	Environment/ Platform (3.05)
Applications (2.18)	Computer Languages (2.54)	Computer Languages (2.66)	Computer Languages (2.85)

* Findings from Chau and Tye (1993)

Kong and which provided the impetus to initiate a more comprehensive longitudinal study matching skill requirements against skills developed through IS programs in Hong Kong.

As a result a research project was initiated to study the skill requirements of IS professionals currently, and five years hence. This study was not, however, to rely solely on the views of management (who often declare noble aspirations but fail to live up to these in practice) or academics (who prefer to teach that which they know) but to reflect the harsh reality of the IS field workers. In order to do this, the IS graduate population from the previous five years was used as the sample population.

The objectives of the study are to examine the current perception of IS skill importance; how that importance is expected to change over five years and; the emphasis of IS curricula on these skills. From this it would be possible to examine whether the academic training that the IS professionals received could be useful to them at present and in their further career development. More importantly, from the study, information would be provided for educational institutions to adjust their program curricula and relate this specifically to the IS environment in Hong Kong.

THE RESEARCH STUDY

A mail questionnaire approach was selected as the means to collect data for the study. The questionnaire included general questions on company and personal characteristics, the importance of different modules in the IS curriculum related to career development, the importance of different IS skills and their relevance in the IS program.

The questions which asked the perceived importance of different IS skills required, were adapted from Leitheiser's survey conducted in 1990. These skills items were created by reviewing the skill lists from the ACM Curriculum Committee, previous empirical studies, and a list of important technologies. All items on the questionnaire were ordered randomly and were weighted equally to arrive at a composite maturity score.

A total of fifty-four skills attributes was included in the questionnaire and were assigned to the following skill categories:

1) Applications Knowledge
2) Business Skill
3) Analysis & Design Skill
4) Environment/Platform Knowledge
5) Interpersonal Skill
6) Computer Languages Knowledge
7) Programming Skill

For each skill attribute the respondents were asked to rate the importance of the attribute twice, once for 1993 (present) and another one for 1998 (five years later), as well as the level of relevance of the IS curriculum studies undertaken. In all cases, the respondents were asked to rate on a Likert scale 1 to 5, with 1 meaning "not important at all" and 5 meaning "extremely important" for importance of skill, and with 1 meaning "not relevant at all" and 5 meaning "extremely relevant" for relevance of curriculum.

All IS graduates who graduated in 1988 to 1993 from Department of Computing, Hong Kong Polytechnic, were chosen in this study. A total of 395 graduates were included in the mailing list. The questionnaires were sent with a covering letter explaining the study and self-addressed envelope. Questionnaires were completed and mailed/faxed directly to the researcher.

Of the 395 questionnaires mailed, a total of 100 questionnaires was returned from the past graduates, yielding a response rate of 25.3 percent. Another similar study [26] also exhibited a similar response rate of 26.5 percent. This rate is deemed acceptable and understandable given the length of the questionnaire, inaccuracies in the mailing list, and the high rate of immigration for IS professionals.

THE RESULTS

Perceived Important IS Skills in Hong Kong

Figure 1 shows the mean importance ratings for the seven categories of IS skills required of IS professionals both in 1993 and 1998. The measure of relative importance was set at a 5-point Likert scale with 5 being "extremely important", 3 being "important", and 1 being "not important at all".

Two set of research hypotheses, for supporting further analysis, are put forward as follows:

Set 1:

H0: There is no statistically significant difference among the seven IS skills categories with respect to the perceived level of importance in 1993.

H1: There is a statistically significant difference among the seven IS skills categories with respect to the perceived level of importance in 1993.

Set 2:

Figure 2: Mean Curriculum Relevance Ratings for the Seven Categories of IS Skills

Table 3: Twenty IS Topics and Their Importance

Rank	IS Topics	Score*
1	Data Base Management	3.95
2	Computer Programming Principles	3.68
3	Communication & Interpersonal Skills	3.67
4	Information Systems Analysis & Design	3.64
5	Data Communication & Networking	3.53
6	Industrial Placement	3.43
7	Final Year Project	3.29
8	Software Engineering	3.23
9	Computer Operating System & Architecture	3.22
10	Project Planning & Control	3.11
11	Management / Business Studies	3.09
12	Business Systems Project / Case Study	3.01
13	Information Systems in Organization	2.99
14	Real Time Systems	2.90
15	Computer Simulation	2.69
16	Quantitative Techniques in Business Systems	2.56
17	Artificial Intelligence	2.40
18	Expert Systems	2.28
19	Computer Graphics	2.12
20	Social & Professional Issues	1.98

*Score is between 1 and 5. The higher the score, the more important the topic

H0: There is no statistically significant difference among the seven IS skills categories with respect to the perceived level of importance in 1998.

H1: There is a statistically significant difference among the seven IS skills categories with respect to the perceived level of importance in 1998.

A One-Way ANOVA analysis using F-test with a significance level of 0.05 was used to analyze the data as they pertain to the above research hypotheses. Results showed that the null hypotheses of both sets are rejected ($p < 0.001$). Therefore, there is a statistically significant difference among the seven IS skills categories with respect to the perceived level of importance both in 1993 and 1998.

Important IS Skills Perceived by IS Manager and Programmer/Systems Analyst

These results are then examined in greater detail and compared with the results of a previous study [26] exploring the views of IS managers. Table 2 shows that the ranking of important IS skills perceived by of IS graduates in this study was more or less the same as the ranking perceived by the IS managers in Hong Kong. In terms of mean score, the IS graduates gave lower scores than IS managers for most skills. IS graduates gave higher scores to interpersonal skills only for 1993 and higher scores to interpersonal skills and business skills for 1998.

Interpersonal Skill is perceived as the most important IS skills in 1993 by managers and programmer/systems analyst. Programming Skill and Business Skill are rated as second and third by programmer/systems analyst but in reverse order by managers. The two groups of respondents seem to have a wide difference in perceptions regarding other skills. For example, IS managers perceive Computer Languages is the least important skill whilst programmer/system analysts perceived it as the third least important IS skill.

Business Skill, Interpersonal Skill and Analysis & Design Skill are perceived as important IS skills in 1998 by programmer/systems and IS managers, whilst Environment/Platform Knowledge and Computer Languages Knowledge are perceived as less important. The two groups seem to have a shared vision on most of the IS skills in 1998. However, there is still some difference in opinion with regard to Analysis & Design Skill and Interpersonal skill.

To draw a first picture in terms of IS skills categories, we can conclude that Interpersonal Skill, Business Skill and Programming Skill are the most critical skills for the career development of IS professionals in Hong Kong whilst Environment/Platform Knowledge and Computer Languages Knowledge are relatively less important.

Curriculum Emphasized IS Skills

The survey also asked respondents to rate the perceived relevance of the IS program studied to the IS skills they now identified as important to their jobs. Figure 2 shows the mean curriculum relevance ratings for the seven categories of IS skills in the IS Curriculum under study. Again, the measure of relative relevance is set at a 5-point Likert scale.

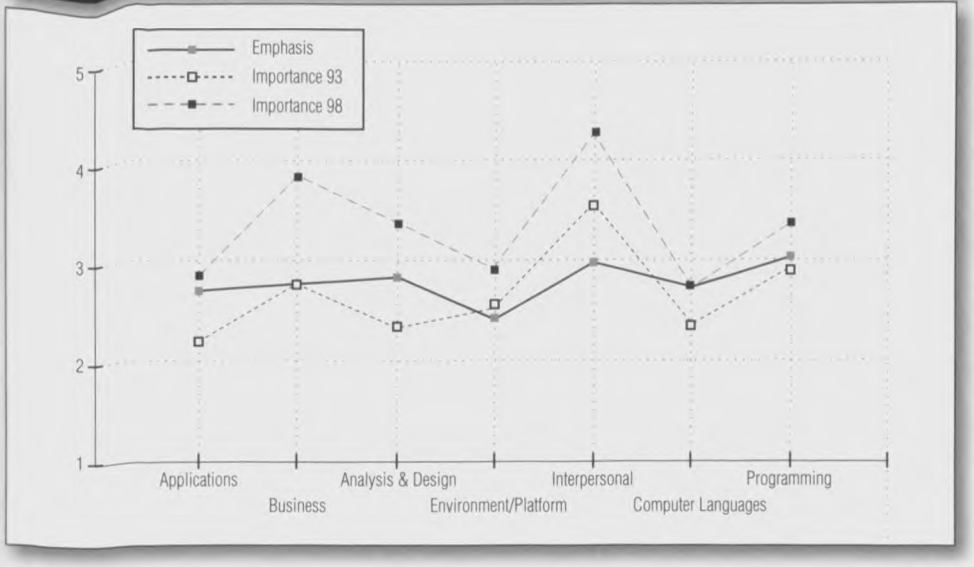
From Figure 2, we can observe that, from the viewpoint of graduates, the IS curriculum is not so relevant to the requirements of IS industry on the whole. None of the IS skill categories has a mean relevance rating greater than three. Again, for supporting further analysis, another set of research hypotheses are stated as follows:

Set 3:

H0: There is no statistically significant difference among the seven IS skills categories with respect to the level of relevance of the IS curriculum under study.

H1: There is a statistically significant dif-

Figure 3: Mean Score of Emphasis and Importance of Seven IS Skills



ference among the seven IS skills categories with respect to the level of relevance of the IS curriculum under study.

Once more, One-Way ANOVA analysis using F-test with a significance level of 0.05 is used to analyze the data. Results that the null hypotheses is rejected ($p < 0.001$). Therefore, there is a statistically significant difference among the seven IS skills categories with respect to the level of relevance of the IS curriculum under study.

Important IS Topics for Career Development

In the second part of the questionnaire, respondents are asked to rate twenty IS topics of their studied curriculum in terms of the relative importance for their career development. Again, the measure is set at a 5-point Likert scale with 5 being "extremely important", 3 being "important", and 1 being "not important at all".

In general, Data Base Management, Computer Programming Principles, Communication & Interpersonal Skills, and Information Systems Analysis & Design are the four most important IS topics for IS professionals in their career development. The new technology such as artificial intelligence and expert systems are perceived to be less important for their career development.

INDUSTRY REQUIREMENTS VERSUS ACADEMIC PREPARATION

Having discussed the IS skills which are perceived as important for IS professionals and the curriculum emphasized IS skills in Hong Kong separately, we now move to our main research question: Is the academic training which IS professionals receive useful to them at present and in their further career development?

The previous hypotheses testings show that there is a statistically significant difference among the seven IS skills categories with respect to the perceived level of importance both in 1993 (from Hypothesis Set 1) and 1998 (from Hypothesis Set 2), and to the perceived level of emphasis of the IS curriculum (from Hypothesis Set 3). Therefore, it is important for both industry and education to have a considerable shared vision on the ranking of the seven IS skills categories in terms of importance and emphasis. Once ranking is matched, education should also make sure the level of emphasis matches with the level of what industry requires.

Overall Picture

Figure 3 shows that the level of curriculum emphasis does not match well with the industry requirements overall in terms of mean score. The training which the respondents re-

Table 4: IS Skills with Deficiency of Emphasis Both in 1993 and in 1998

Rank	Skill Type*	IS Skills Attributes	Deficiency#
1	I	Ability to respond appropriately to another's emotions	1.22
2	I	Ability to listen to others	1.16
3	I	Ability to persuade others	1.15
4	I	Ability to train others	1.09
5	B	Have an understanding of a specific business function	1.07
6	I	Ability to write clearly and effectively	0.79
7	I	Ability to work alone to accomplish some goals	0.73
8	I	Ability to work with others to accomplish some goals	0.72
9	L	Ability to use operating system Job Control Languages	0.64
10	E	Ability to build systems in a mainframe environment	0.62

* A: Applications B: Business D: Analysis & Design
E: Environment/Platform I: Interpersonal L: Computer Languages
P: Programming

Deficiency = [(Importance '93 - Emphasis) + (Importance '98 - Emphasis)] / 2

Table 5: Key Issues for Preparing Future IS Professionals

Rank	+	IS Skills Attributes	Deficiency*
1	I	Ability to persuade others	1.632
#2	I	Ability to respond appropriately to another's emotions	1.585
#2	I	Ability to train others	1.585
4	B	Ability to foresee problems that would result from introduction of new technology	1.511
5	B	Have an understanding of a specific business function	1.462
6	B	Ability to assess the usefulness of new technologies	1.394
7	I	Ability to listen to others	1.389
8	B	Ability to do project planning and control	1.213
9	B	Ability to use techniques for identifying applications that will provide competitive advantages	1.075
10	I	Ability to write clearly and effectively	1.043
11	B	Have an understanding of industry structure and behavior	1.000
12	I	Ability to work with others to accomplish some goals	0.926
13	P	Knowledge of systems development quality assurance procedures	0.916
14	D	Ability to do an adequate feasibility study	0.913
15	I	Ability to work alone to accomplish some goals	0.894
#16	D	Ability to do a cost/benefit analysis of alternative system designs	0.892
#16	P	Ability to design security, privacy, and auditing controls for applications	0.892
18	E	Ability to build applications in a UNIX environment	0.883
19	D	Ability to do a cost/benefit analysis of alternative packages or tools	0.862
20	D	Ability to perform object-oriented analysis and design for applications	0.720

\+ A : Applications B: Business D : Analysis & Design
E : Environment/Platform I : Interpersonal L : Computer Languages
P : Programming

* Deficiency = Importance '98 - Emphasis # Same deficiency value

ceived largely matches with the required skills in 1993 but not at all in 1998.

Unquestionably, a balance between curriculum emphasis and industry requirement is the optimum. If this is not the case, an overemphasis is more desirable than a deficiency.

From Figure 3, we can observe that, apart from the deficiency in Interpersonal Skill, the IS graduates are well-prepared for the current IS environment. However, in the future IS environment, the level of emphasis of all IS skill categories, with the exception of Computer Languages Knowledge, is found to be insufficient. A first conclusion drawn from this study is "the IS curriculum produces graduates for today, but not to meet the expectations of industry tomorrow".

IS Skills With Deficiency of Emphasis

After applying a paired-samples T-test on the detailed attributes of each IS skill importance and its emphasis on IS curriculum, results showed that there are ten IS skills attributes with deficiency of emphasis with respect to the level of importance of 1993 (Table 4). However, with respect to the increase in skill importance projected in 1998, another twenty-seven IS skills are found to be insufficient in emphasis, forming a total of thirty-seven IS skills attributes deficient in emphasis. Of the ten IS skills attributes with deficiency of emphasis both in 1993 and 1998, seven are Interpersonal Skills, the other three are Business Skills, Environment/Platform Knowledge, and Computer Languages Knowledge, respectively.

Key Issues for Preparing Future IS Professionals

We therefore return to our main question "Are IS curricula providing the right type of education for future IS professionals?" To have a concise picture, Table 5 lists the top twenty IS skills attributes with largest deficiency between future importance and emphasis regard as the key issues for preparing future IS professionals.

Obviously, Interpersonal Skill and Business Skill are the two main IS skill categories that require more attention by the IS curriculum. Of the twenty key issues, thirteen of them are either Interpersonal Skill or Business Skill. More importantly, the top twelve key issues fall into these two categories. For the other key issues, four are Analysis & Design Skill, two are Programming Skill, and one is Environment/Platform Knowledge. Relatively speaking, the IS program outperforms on Applications Knowledge and Computer Languages Knowledge as no IS skills within these two categories are regarded as key issues.

CONCLUSION AND IMPLICATIONS

As IS tasks and skills begin to center on the reorientation of IS to solve business problems and the integration of business functions to provide competitive advantages, academic institutions in Hong Kong should provide training which provides for a combination of interpersonal, technical, and business skills. However, the existing programs do not appear to be providing the right blend.

From this study, it was found that there is a statistically significant difference among the seven IS skills categories, namely Applications Knowledge, Business Skill, Analysis & Design Skill, Environment/Platform Knowledge, Interpersonal Skill, Computer Languages Knowledge, and Programming Skill, with respect to the perceived level of importance both in 1993 and 1998, and to the perceived level of emphasis of the IS curriculum. Programming Skill is the most emphasized IS skill category in the IS curriculum, followed by Interpersonal Skill, Analysis & Design Skill, Business Skill, Applications Knowledge, and Computer Languages Knowledge. Environment/Platform Knowledge is the least emphasized IS skill category. Thus, we can conclude that "the IS curriculum produces graduates for today, but not for the needs of tomorrow".

Failure to respond to market changes by the IS curriculum and lack of contact or understanding between educators and practitioners are the two main reasons for explaining the mismatch. As 1997 is approaching, the China factor will have a greater impact on the Hong Kong job market. There is an abundant supply of computer scientists and programmers in (southern) China. They receive about one fifth to a third of the salaries of equivalent IS professionals employed in Hong Kong. Some Hong Kong organizations and software factories have already established systems development and data-entry sites in China in order to reduce costs. This trend is very likely to continue if not escalating. The mainlanders will take away a significant portion of entry-level programming jobs and technical jobs from Hong Kong IS graduates. On the other hand, large Chinese enterprises and foreign multi-national corporations in China are recruiting IS professionals and consultants from Hong Kong to carry out IS strategic studies and business systems analysis.

We propose a synergistic scenario that (a) Hong Kong educators should put more emphasis on business skills in the IS curriculum so that our IS graduates will be capable of "specifying business information requirements" and "reengineering business processes"; some of them will become IS managers or IS strategic planners after acquiring adequate practical experience; (b) Hong Kong will continue to benefit from the cheaper IT systems implemented by programmers from China.

To produce graduates who can satisfy the requirements by the industry, educators and practitioners must form a solid partnership to effectively meet the challenges of the paradigm shift facing the IS profession. Both parties must strengthen the channels of communication so that they can continually refine the skill requirements necessary for success in the future. One way to meet this challenge is to review IS education programs by IS graduates in order to reflect not only the rapid changes in the IS world but also their relevant contributions both currently and in the future. Specifically, these contributions must be assessed in relation to the needs of the cultural environment and the stage of IS development.

This research study has made the first step. Through the feedback of IS professionals, the study attempts to highlight the similarities and differences between curriculum emphasis and Hong Kong industry requirements of IS skills. From the findings, IS educators should be aware of the areas in which deficiencies exist but also change needs which are likely to accelerate given the experience of more mature IT environments. This provides direct input to the curriculum development process to facilitate reengineering which will ensure that the IS programs are geared to the development of IS professionals for the future.

ACKNOWLEDGEMENTS

This research is supported by the Research Grant Council (project number: HKPU 4/94H) to Dr. Janice M. Burn as the principal investigator.

The authors would like to thank Dr. R. L. Leitheiser for permitting them to adapt his questionnaire and Mr. Wai Keung Mak for formatting this paper.

REFERENCES

[1] Green, G. I. (1989) "Perceived Importance of Systems Analysts' Job Skills, Roles, and Non-Salary Incentives", *MIS Quarterly*, 13(2), 115-133.

[2] Cheney, P. H., Hale, D. P., and Kasper, G. M. (1990) "Knowledge, Skills and Abilities of Information Systems Professionals: Past, Present, and Future", *Information and Journal of Education for Business*, July/August.

[3] Trauth, E. M., Farwell, D. W., and Lee, D. (1993) "The IS Expectation Gap: Industry Expectations Versus Academic Preparation", *MIS Quarterly*, 17(3), 293-307.

[4] Burn, J. M., Tye Ng, E. M. W., Ma, L. C. K., and Poon, R. S. K. (1994) "Managing IT Professionals in Hong Kong - A Review of Career Expectations and Progression", *Journal of Information Technology*, Focus on Asia, June, 5(3), 17-27.

[5] Bjorn-Andersen, M. and Cavaye, A. (1994) "Re-engineering the Role of IS Professionals", *Proceedings of IFIP 8.2 Information Systems International Working Conference*, May.

[6] Behling, R. and Wood, W. (1993) "Successful Planning for a Changing MIS Education", *Journal of Education for Business*, July/August.

[7] Laribee, J. F. (1992) "Building A Stronger IRM Curriculum - Views from IS Managers and Educators", *Information Systems Management*, Spring.

[8] Forgionne, G. A. (1992) "Streamlining Information Science Research and Education", *Information and Management*, 141-147.

[9] Quarstein, V. A., Ramakrishna, H. V., and Vijayaraman, B. S. (1994) "Information Technology Knowledge and Skills for MBAs: Non-MIS Faculty's Perspective", *Journal of Education for Business*, March/April, 204-210.

[10] Knapp, J. A. (1993) "Information Systems: Educational Offerings vs. Industry Needs - How Well Do They Match?", *Proceedings of ACM SIGCPR*, 18-26.

[11] Richards, R. M., and Pelley, L. (1994) "The Ten Most Valuable Components of An Information Systems Education", *Information and Management*, 27, 59-68.

[12] Nelson, R. R. (1991) "Educational Needs as Perceived by IS and End-User Personnel: A Survey of Knowledge and Skill Requirements", *MIS Quarterly*, December, 503-525.

[13] Farwell, D. W., Kuramoto. L., Lee, D., Trauth, E. M., and Winslow, C. (1992) "A New Paradigm for IS: The Educational Implications", *Information Systems Management*, 9(2), 7-14.

[14] Leitheiser, R. L. (1992) "MIS Skills for the 1990s: A Survey of MIS Managers' Perception", *Journal of Management Information Systems*, 9(1), 69-91.

[15] McLean, E. R., and Smiths. S. J. (1991) "Managing New MIS Professionals", *Information and Management*, 20, 257-263.

[16] McLean, E. R et al (1994) "The Career Outlooks of I/S Professionals", *Proceedings of ACM SIGCPR*, 46-56.

[17] Monin, D. J., and Dewe, P. J. (1994) "Skills in An Environment of Turbulence: A Survey of Information Systems Professionals in New Zealand", *Proceedings of ACM SIGCPR*, 208-218.

[18] Pastore, R. (1993) "A Decade Slant", *Computer Information Officer*, November 15.

[19] Stokes, S. L. Jr.. (1993) "Blueprint For Business Literacy", *Information Systems Management*, Spring.

[20] United Communications Group (1988) "Preparing for Tomorrow's Systems Jobs", *I/S Analyzer*, 26(5).

[21] Ghorpade, J., and McKenna, J. F. (1990) "MBA of the Future: Generalist or Specialist?" *Journal of Education for Business*, 66(1), 341-346.

[22] Dibble, D. A. (1992) "Development of a Graduate-Level MIS Program : A Case Study", *Journal of Education for Business*, March/April, 2229-232.

[23] Wang, P., and Khan, M. B. (1994) " MIS Skills of IS Graduates in the Republic of China", *Journal of Global Information Management*, 2(3), 29-40.

[24] Ravichandran, R., and Gupta, J. N. D. (1993) "Information Systems Education Issues: The US and European Perspectives", In Khosrowpour M and Loch K (Ed) Gobal Information Technology Education: Issues and Trends. Idea Group Publishing. Harrisburg, PA, USA, 83-121.

[25] Pollack, T. A. (1990) "The MIS Curriculum; Which Competencies Are Really Important to Business Professionals?", *Proceedings of ISECON 1990*, 117-122.

[26] Chau, P. Y. K., and Tye Ng, E. M. W. (1993) "IS Skills Required for the 1990s. The Hong Kong Scenario", *Proceedings of 8th International Academy for Information Management Conference*, Florida, December, 99-111.

[27] Burn ,J. M., Saxena, K. B. C., Ma, L. and Cheung, H. K. (1993) "Critical Issues of IS Management in Hong Kong: A Cultural Comparison", *Journal of Global Information Management*, Fall, 28-37.

Eugenia M. W. Ng Tye
Hong Kong Institute of Education
Department of Science and Mathematics

Eugenia M. W. Ng Tye's research interests include: information systems education, information systems management and decision support systems. She has published (or forthcoming) in Journal of Information Technology Management, Journal of Global Information Management, Journal of Information Science and International Journal of Management.

Janice M. Burn
Louis C. K. Ma
Department of Computing, Hong Kong Polytechnic University
Hung Hom, Kowloon, Hong Kong
Tel No. (852) 27667266, Fax No. (852) 27740842
E-Mail. csetye@comp.polyu.edu.hk

Janice M. Burn is Associate Professor in Computing at Hong Kong Polytechnic University and Course Leader for the Masters Degree in Information Systems. Her research interests are in IS strategic planning, global IS, information resource management and IS education and training. She has published over 40 papers and is currently editing a book on International Information Systems focusing on Asia as well as contributing to five other books.

Louis C.K. Ma is currently Assistant Professor in Computing at the Hong Kong Polytechnic University. Prior to his academic career in 1987, he worked for over 11 years in systems development, IT management and consulting. His major responsibility is teaching MIS subjects for masters level courses. His research interests include IS management, IS strategic planning, business process reengineering and IS education. He has published over 20 papers in IS management and has conducted several IS management consulting projects and workshops for senior executives and IT managers in Hong Kong and Australia.

Ray S. K. Poon
Department of Group Data Processing,
Hong Kong and Shanghai Bank
23/F., 1 Queen's Road Central, Central,
Hong Kong

Ray S. K. Poon graduated with first class honor from the Hong Kong Polytechnic University. He was the top student throughout his studies at the university. He is working at the Hong Kong and Shanghai Bank as system analyst programmer at present. His research interest is information system management.

Down Under

continued from page 122

connects through the computer's parallel port. It is a breeze to connect to an Ethernet network; just plug the adapter between my computer and the network, and set my computer's network software. Setting the network software is the next hurdle.

Activity Three: Establishing Network Services on the client computer.

At the start of this article, I stated that there are three consideration in setting up Internet access: getting a host computer account, wiring the connection, and setting up the network software on the client computer. That last consideration is the problem confronting me now – how to get Windows 95 to talk to the Internet. It turns out to be surprisingly easy to overcome this hurdle, once you have done it several times.

Setting up Windows 95 for Internet is fairly straightforward. Select "Network" from the Control Panel and ADD the Adapter you are using (mine was Xircom Pocket III) and TCP/IP protocol. Adding software components requires having handy the installation disks or CD-ROM. When you add the TCP/IP protocol, select properties and tell Windows 95 about your network connection: its IP address and mask, the domain name server's name and IP address, and the gateway. If you, the user, don't know what an IP address or gateway is, you may need the help of a network wizard to complete this portion.

Of course, it helps if someone can tell you this information. If not, find a computer on the network that no one is using and copy the data from its net.cfg before you turn it off.

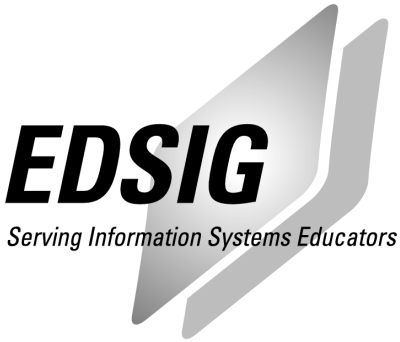
The only problem arises if, as in Fiji, the network wizards have blocked IP addresses from accessing off campus. Then you need their help.

Conclusion

It turns out that the hardest part in establishing Internet access overseas was not the computer technology, rather it was the unavailability of public phones with data ports. The problem of different phone connectors and cables and high telecommunication costs pale in comparison to the problem of no public data ports. Until we have direct satellite links to phone service (and Internet services) available at affordable prices, the traveler is at the ruthless mercy of the local PT&Ts.

Eli Cohen
Wollongong University
Wollongong, New South Wales, Australia
e-mail: Eli_Cohen@ACM.ORG

Information Systems & Computing
Academic Professionals



STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

ISSN 1055-3096