

Educating Information Systems Professionals: Towards a Rapprochement Between New Graduates And Employers

Rodney Turner, Glenn Lowry
Department of Information Systems
Victoria University
Melbourne VIC 8001 Australia
Rod.Turner@vut.edu.au

Abstract

This paper is the first of a series of studies of a research program aimed at achieving a better fit between university study and professional practise of information systems. The paper reports the results of two surveys: the first of university information systems (IS) students and a second of employers of information systems graduates. Students were asked what they perceived as important technical knowledge, academic knowledge, and personal attributes sought by employers of new IS graduates. A similar questionnaire was sent to employers and consulting firms that advertised positions for junior IS professionals, asking what was actually sought by them in new IS graduates. The results of the two surveys are compared and similarities and differences noted. Implications for new graduates preparing themselves for employment and for curriculum planning that takes into account the competing needs students and employers in the IS field are discussed.

Keywords

IS Curriculum IA01, IS Career Path EH0205, IS Training and Development EH0201, IS Recruiting EH0206, IS Skill Requirements EH0208, IS Staffing Issues EH02

INTRODUCTION

Discerning and reconciling the aspirations of university students preparing for careers in business information systems with the skills, competencies, personal characteristics and qualities desired by employers is, at best, the art of finding an acceptable, if not optimal balance between them.

Students are first and foremost concerned with future employability. They classically desire to develop sufficient skills and base of knowledge to secure their first professional position following graduation, to survive in that position, and to feel that their education will also prepare them for advancement in the medium term of five or more years.

Employers, on the other hand, often indicate that they want new graduates who can be immediately productive in their environment, who are teachable, loyal team players who work to deadlines, who possess the ability to make an intelligible presentation, who can write understandable business letters, memoranda, and reports.

Are the aspirations of students and employers fundamentally incompatible? How can IS educators help to find a workable and satisfying balance?

The Research Program

This paper is the first of a series of reports of a research program aimed at achieving a better fit between university study and professional practise of information systems. Students were surveyed to determine their beliefs about the areas of knowledge, skills, and personal characteristics they believed employers sought in new graduates. Employers were surveyed to ascertain their views regarding the knowledge, skill, and personal qualities they seek in entry level professionals

Introduction
Studies conducted in other practice-oriented business disciplines such as accounting [13] have indicated that students may not fully appreciate the importance of non-technical skills sought by prospective employers. The authors refer to several studies that point to the need for business students to develop more than the specific technical skills to succeed. Several writers, including Ang [1], Ang and Jiwahhasuchin [2], and most especially Young & Keen [15] have noted the long-term shift from programming and other technical subjects to business analysis and people-oriented skills in IS curricula and in employer requirements expressed in recruiting advertisements over the past two decades.

In a study of Australian academics and employers of graduates from university-based IS courses, Snoke & Underwood [10] found that certain generic attributes such as continued intellectual development, self-motivation, and ability to define problems were more important than specific topics in the IS curriculum. Stewart [11] found that conscious professionalism that includes ongoing intellectual development and education must be cultivated during the period of university study.

The past decade has been characterised by a rapidly and constantly changing business environment. Writing in 1995, Lee *et al* [5] noted the necessity for IS professionals to develop a wider range of non-technical skills than was previously the case. Similar views have been expressed by others including Burn *et al* [3], Cafasso [4], Lowry [6], Main [7], and Morgan and Lowry [8]. Competition for the best entry positions has been heightened by IS outsourcing [9]. Students are more aware of the need to insure that they develop “career resilience” [14] to prepare themselves to manage their own careers through regular self-evaluation and ongoing, self-initiated training and skills development.

Method

Students in Melbourne, Australia were surveyed in late 1998 to determine their beliefs about the areas of knowledge, skill repertoire, and personal characteristics they believed employers sought in new graduates. Employers were surveyed to ascertain their views regarding the knowledge, skill, and personal qualities they seek in new graduates.

A pair of questionnaires was devised for the purpose of soliciting answers to a series of questions from employers of IS professionals and from students undertaking tertiary courses prior to seeking employment in this field. The same basic questionnaire was distributed to both groups with the only differences being in the wording of the preamble for each section according to the target audience.

The student group was drawn from those enrolled in degree programs offered by the Department of Information Systems of Victoria University of Technology. The survey was distributed near the end of Semester 2, 1998 to a total of 180 students from whom 102 usable responses, or 55%, were returned. The employer group was comprised of companies with Melbourne mail addresses that advertised for entry level computing personnel in the Melbourne-based press during the same period. A total of 134 company questionnaires were

sent, normally to the contact person named in the advertisement. A total of 52 usable responses, or 39%, was returned.

The questionnaire sent to the employers consisted of a section soliciting details regarding size and organization type. Student questionnaires solicited details about their level in the course in which they were enrolled, age, sex and mode of study. The common part of the two questionnaires sought views regarding the importance of various technical computing skills; about non-computing academic skills, and other non-academic student attributes. Questions on academic subjects related largely to those subjects available as core subjects, specialization subjects, and elective subjects offered in the Bachelor of Business computing degrees available through the Department of Information Systems at Victoria University of Technology. Responses to each question were graded by the subjects on a five point Likert scale ranging from "not required" to "essential". Respondents were also asked to indicate the three most important and the three least important skills or attributes in each section.

The reliability of questionnaire items was ascertained through the calculation of Cronbach α coefficients of the pooled results for each section of the survey. A Cronbach α score greater than $\alpha = 0.7$ is acceptable. The Cronbach coefficient for the first group of eleven items dealing with technical IS skills was $\alpha = 0.7529$. The result for the second group of nine items dealing with other academic subjects was $\alpha = 0.8354$. The results for the third group of nineteen items representing non-academic and other personal attributes was $\alpha = 0.9190$.

DATA ANALYSIS

The data obtained through analysis of the two questionnaires are presented in the sections below which present perceptions of students and employers regarding the importance of IS subjects, of other business subjects, and personal characteristics.

Perceived Importance of Information Systems Subjects

The data from each group were recorded in an Excel worksheet using a technique reported by Turner & Zheng [12] and transferred to SPSS for Windows for statistical analysis. Non-parametric tests were applied to each of three sets of questions. Mann-Whitney **U** tests were used to test the differences between employer and student responses. This test is the non-parametric equivalent of the *t*-test for small samples and tests whether the difference between the means of two independent samples is significantly significant.

Students and employers were asked to rank the importance of information systems subjects commonly found in university undergraduate information systems curricula. For each information systems subject, Table 1 below shows the number of responses for students and employers, the mean rank of responses, and the calculated value resulting from application of the Mann-Whitney **U** procedure.

As shown in Table 1 on the next page, students generally rank information systems subjects higher than employers. In all but one of eleven subjects, students ranked the importance of the subject higher than did employers. In 8 of those 10 subjects, the difference was significant at the 0.05 level, as indicted in the table in the column headed "**Mann-Whitney U**". The only exception is Q8. "Knowledge of Programming Languages", which employers numerically and significantly rank higher than students.

Technical computing skill	Respondent	N	<i>u</i> Rank	Mann-Whitney U
Q1. Analysis & design of information systems	student	100	76.4	0.88
	employer	51	75.3	
	Total	151		
Q2. Business applications of computers	student	99	83.9	0.00
	employer	51	59.2	
	Total	150		
Q3. Data communications	student	100	82.4	0.00
	employer	50	61.7	
	Total	150		
Q4. Database design	student	100	78.2	0.25
	employer	50	70.0	
	Total	150		
Q5. Internet applications development	student	100	81.9	0.01
	employer	50	62.6	
	Total	150		
Q6. Knowledge base or expert systems	student	100	81.9	0.01
	employer	50	62.7	
	Total	150		
Q7. Knowledge of PC applications	student	99	81.8	0.01
	employer	51	63.3	
	Total	150		
Q8. Knowledge of programming languages	student	100	69.6	0.01
	employer	51	88.5	
	Total	151		
Q9. LAN operations	student	97	78.4	0.06
	employer	50	65.6	
	Total	147		
Q10. Large computer system experience/knowledge	student	97	78.7	0.03
	employer	49	63.2	
	Total	146		
Q11. Project management	student	98	83.6	0.00
	employer	51	58.4	
	Total	149		

TABLE 1: PERCEIVED IMPORTANCE OF INFORMATION SYSTEMS SUBJECTS

Perceived Importance of Other Business Subjects

Students and employers were asked to rank the importance of other business subjects commonly chosen as electives in university undergraduate information systems curricula. For each information systems subject, Table 2 shows the number of responses for students and employers, the mean rank of responses, and the calculated value resulting from application of the Mann-Whitney U procedure.

Table 2 below shows that the non-IS subjects “Accounting” (Q14), “Business finance” (Q15) and “Business ethics” (Q16) are not ranked significantly differently. The student cohort ranked all other non-IS subjects significantly higher in importance.

Other academic skills	Respondent	N	<i>u</i> Rank	Mann-Whitney U
Q14. Accounting N = 150	student	98	74.7	0.75
	employer	52	76.9	
	Total	150		
Q15. Business finance N = 151	student	99	80.0	0.09
	employer	52	68.4	
	Total	151		
Q16. Business ethics	student	99	78.3	0.35
	employer	52	71.7	
	Total	151		
Q17. Business law	student	99	86.4	0.00
	employer	52	56.2	
	Total	151		
Q18. Business statistics	student	98	84.8	0.00
	employer	52	58.0	
	Total	150		
Q19. Economics	student	99	88.7	0.00
	employer	52	51.8	
	Total	151		
Q20. Foreign language(s)	student	98	87.5	0.00
	employer	51	50.9	
	Total	149		
Q21. Management	student	99	91.2	0.00
	employer	52	47.1	
	Total	151		
Q22. Marketing	student	98	84.2	0.00
	employer	52	59.1	
	Total	150		

TABLE 2: PERCEIVED IMPORTANCE OF OTHER BUSINESS SUBJECTS

Table 2 indicates that there is no statistically significant difference in perception of the importance of the non-IS subjects “Accounting” (Q14), “Business finance” (Q15) and “Business ethics” (Q16) between student and employer respondents.

Personal Characteristics of New Graduates

Students and employers were asked to rank the importance of personal attitudes and attributes possessed by new university undergraduate information systems graduates. For each characteristic identified, Table 3 shows the number of responses for students and employers, the mean rank of responses, and the calculated value resulting from application of the Mann-Whitney U procedure.

There are some important differences in the responses to the questions on non-academic attributes and skills as presented in Table 3.

Other personal attitudes and attributes	Respondent	N	<i>u</i> Rank	Mann-Whitney U
Q25. Accept direction N = 152	student employer	100 52	66.2 96.3	0.00
Q26. Acquire new skills N = 152	student employer	100 52	71.3 86.6	0.01
Q27. Meet deadlines N = 152	student employer	100 52	76.9 75.8	0.86
Q28. Work as part of a team N = 152	student employer	100 52	72.7 83.9	0.06
Q29. Think creatively N = 151	student employer	99 52	73.5 80.8	0.29
Q30. Work independently N = 152	student employer	100 52	74.2 80.9	0.33
Q31. Work under pressure N = 152	student employer	100 52	73.0 83.3	0.13
Q32. Accept organizational objectives N = 152	student employer	100 52	74.2 80.9	0.34
Q33. Business analysis skills N = 152	student employer	100 52	81.3 67.3	0.05
Q34. General work experience N = 151	student employer	99 52	78.8 70.7	0.25
Q35. Information seeking skills N = 152	student employer	100 52	73.4 82.5	0.19
Q36. Client focussed N = 152	student employer	100 52	72.9 83.4	0.14
Q37. Leadership potential N = 152	student employer	100 52	84.7 60.8	0.00
Q38. Oral presentation skills N = 152	student employer	100 52	81.7 66.5	0.03
Q39. Problem definition skills N = 152	student employer	100 52	74.1 81.0	0.32
Q40. Problem solving skills N = 151	student employer	99 52	72.7 82.4	0.15
Q41. Time management N = 152	student employer	100 52	79.9 70.0	0.15
Q42. Undergo ongoing professional development N = 152	student employer	100 52	81.8 66.2	0.03
Q43. Written communication skills N = 151	student employer	99 52	82.0 64.7	0.01

TABLE 3: EMPLOYER-VALUED PERSONAL CHARACTERISTICS

In only seven questions did the student group rank the responses as more important than the employer group. In three cases however (Q27, Q34 & Q41), these differences were not statistically significant.

Figure 1 below graphically represents the differing views of information systems students and employers of new graduates regarding perceived importance of characteristics of new graduates. The line beginning in the upper left is the "employer" line. The other line, beginning in the lower left, is the "student" line. (These lines appear in contrasting colours in the original graph.) Note that the two lines are nearly mirror images of one another.

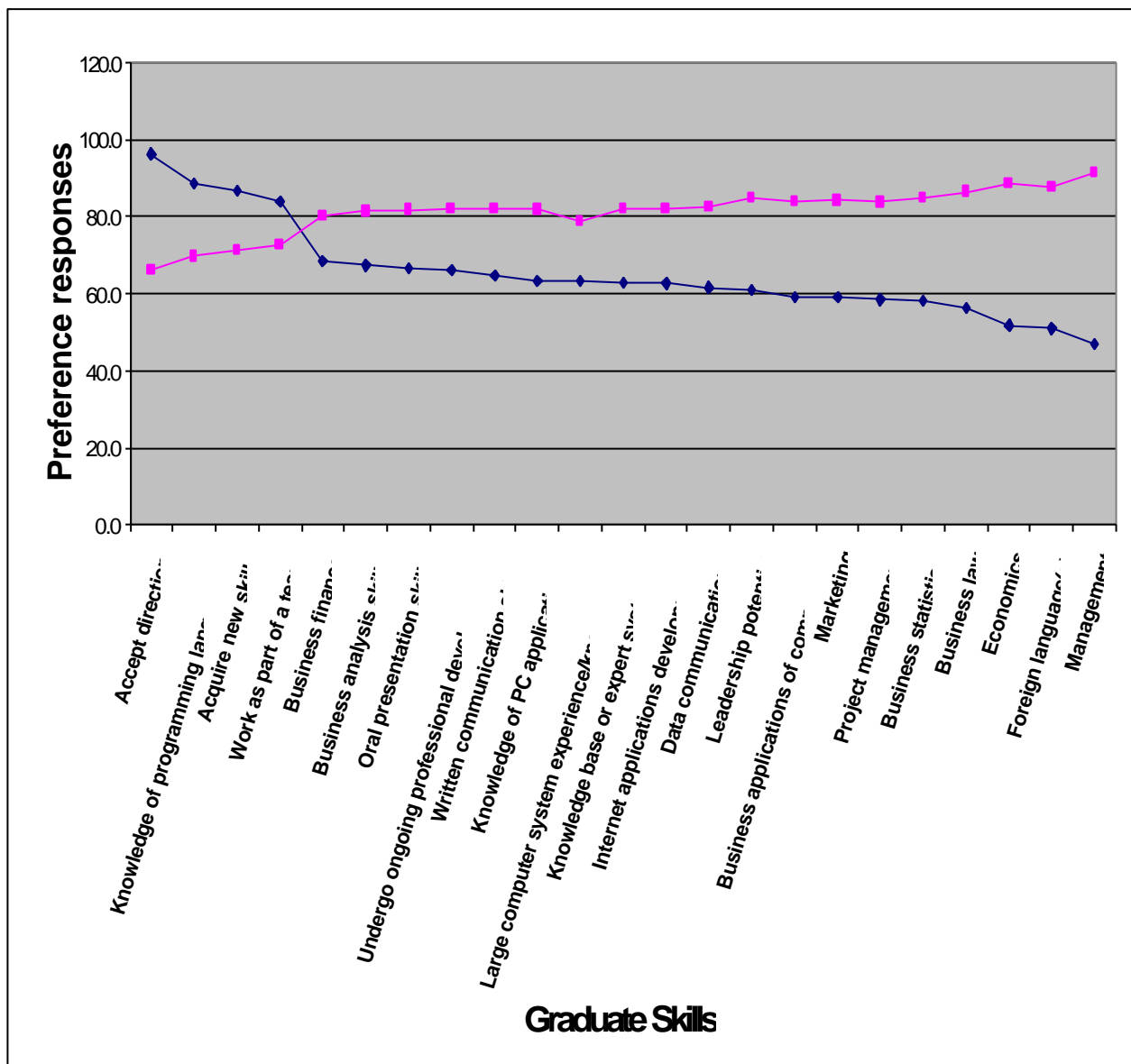


FIGURE 1: PERCEIVED IMPORTANCE OF NEW GRADUATE CHARACTERISTICS

Employers place high value on four qualities: "Accept direction", "Knowledge of programming language", "Acquire new skills", and "Work as part of a team". These are the very qualities that are less valued by students engaged in study. In contrast, the remaining qualities and areas of knowledge and skill are all more highly valued by students and, presumably, IS educators, than they are by employers of new graduates. This divergence raises some interesting questions for all of us.

CONCLUSION AND DISCUSSION

The present findings indicate differing perspectives of employers of new graduates and of students preparing for professional information systems work in some areas.

Importance of Information Systems Subjects

The findings indicate that employers want new graduates who will be immediately productive at relatively low level work as indicated by the importance placed by employers on knowledge of programming languages, as indicated in the review of data in Table 1. Students, on the other hand, are concerned with their individual development and with providing a foundation of skill and knowledge for their careers. While students are intensely focused on obtaining that first professional position following graduation, they are also aware that they need to obtain sufficient ancillary knowledge bases and skills in self-development and ongoing professional development to survive in the short to middle term and for career development for their entire working lives.

Importance of Other Business Subjects

In all cases, other business subjects shown in Table 2 as achieving statistical significance were perceived as important by students, but not by employers of new graduates. In every case, the student cohort ranked all other non-IS subjects significantly higher in importance than employers. The responses indicated that employers are less concerned than students think, or have been led by academics to expect, with the general business knowledge of new information systems graduates. The results reinforce the view that some employers of new graduates are concerned primarily with immediate productivity.

Importance of Personal Characteristics of New Graduates

Again, the data suggest a clear division between groups. Employers seem to value what the authors think of as “malleability”, with only two qualities shown in Table 3, “accepts direction”, and “ability to work as part of a team”, achieving statistical significance or near significance for employers. All of other qualities that achieved statistical significance were valued by students, including the “ability to acquire new skills”, “business analysis skills”, “leadership potential”, “oral presentation skills”, “expectation to engage in ongoing professional development”, and “written communication skills”. The current results fly in the face of the many requests and calls we have both experienced over many years from employers for “soft-edge” skills rated significantly by students.

Discussion

The current findings are partially consistent with previous work cited, but only from the perspective of students and educators.

The results are reflective of the longer term shift from programming and other technical subjects to attitudes and attributes represented in Table 3 that were noted by Ang [1], Ang and Jiwahhasuchin [2], Snoke and Underwood [10], Usoff & Feldmann [13] and Young & Keen [15]. Students appeared to possess a greater appreciation of the necessity for cultivating habits of ongoing intellectual development and education identified by Stewart [11]. Students are more concerned than employers with the development of “career resilience” identified by Waterman & Waterman [14], and of the repertoire of non-technical communication and people skills identified by Burn *et al* [3], Cafasso [4], Lowry [6], Main [7], and Morgan and Lowry [8]. This may reflect the increasing move to outsourcing and employment of short-term contractors [9].

As has been reported elsewhere [10][13] there are substantial differences in what employers seek in graduates and what they may get. Employers seem to want graduates who can accept their position within an organisation and accept direction. Teamwork, the ability to learn new

skills and other personal attributes, except for the knowledge of programming languages, appear to be more important to employers than specific academic skills. On the other hand, students rank management, leadership potential and other business related subjects as being more important to employers.

This disparity in expectations suggests that students need to become more aware of what is realistic for them early in their careers. Employers could assist in this by providing more opportunities to students during their course to work alongside IS professionals through paid vacation work and cooperative placements in sandwich years.

Direction of further work

Over many years of experience as IS practitioners, employers, and educators, the writers have often heard employers express a desire for students to possess the wider breadth of knowledge and skills valued by students as they seek their education. The authors are preparing additional studies aimed at achieving a better balance between the aspirations of students (and academics for their students) and employer requirements and at exploring alternatives to improve curriculum delivery.

We are currently conducting a pair of follow-up surveys of students and employers of their perceptions of the value of these same information systems and business subjects and personal attributes and attitudes **five years following graduation**. We anticipate that the result of that study will reveal a closing of the gap between what employers want and what new professionals bring to the workplace as those new people move toward becoming managers and employers themselves.

We are currently preparing to conduct a modified version of the employer survey amongst the large group of co-operative education employers with whom the Department has worked over many years. We anticipate contrast between co-op and non-co-op employers, with the attitudes of co-op employers more nearly approaching those of students and academics. Findings from that study should provide an interesting basis for contrast with non-co-op employers, perhaps leading to some guidelines for new graduates to use in helping to evaluate prospective employers.

REFERENCES

- Ang, A. Y. (1992) "Australian Information Systems Curricula: A Comparison Between the Views of Universities and TAFE Colleges." *Information Systems as Organisational Processes: Proceedings of Third Australasian Conference on Information Systems, 5-8 October 1992*. Wollongong, New South Wales, Australia: Department of Business Systems, University of Wollongong. pp. 747-758.
- Ang, A. Y. and Jiwahhasuchin, S. (1998) "Information Systems Education in Thailand: A Comparison Between the Views of Professionals and Academics." *Journal of Global Information Management*. 6 (4): 34-42.
- Burn, J. M.; Tye, W. M., *et al.* (1995) "Paradigm Shift - Cultural Implications for Development of IS Professionals." *Journal of Global Information Management*. 3 (2): 18-28.
- Cafasso, R. (1996) "Selling Your Soft Side Helps IT." *Computerworld*. 18 (35): 60-61.
- Lee, D. M.; Truath, E. M., *et al.* (1995) "Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation." *MISQ*. 19 (3): 313-340.

- Lowry, G. R. (1995) "Software Engineering Curriculum Design: Methodologies, Formal Methods, and Life Cycle Models, Part I -- Methodologies and Life Cycle Models." *IEEE Software Education Conference*. Dunedin, New Zealand: IEEE Computer Society Press. pp. 339-343.
- Main, R. (1995) "Telstra Winnows the Best and Brightest Graduates." *Computerworld*. 18 (12): 36.
- Morgan, G. W. and Lowry, G. R. (1996) "Software Engineering Process Improvement: Aligning Curriculum and Industry Requirements." *1996 International Conference on Software Engineering: Education and Practice*. Dunedin, New Zealand: IEEE Computer Society Press, Los Alamitos, CA. pp. 378-385.
- Slaughter, S. and Ang, S. (1996) "Employment Outsourcing in Information Systems." *Communications of the ACM*. 39 (7): 47-54.
- Snoke, R. and Underwood, A. (1998) "Generic Attributes of IS graduates - a Queensland study" *Proceedings of the Ninth Australasian Conference on Information Systems* Sydney Australia pp. 615-623
- Stewart, G. (1997) "The Perceptions of Professional Practice by IT Students." *Eighth Australasian Conference on Information Systems*. Adelaide, South Australia: Australian Computer Society & ACIS Executive. pp. 739-744.
- Turner, R. & Zheng, W. (1998) "Data collection Using Microsoft Excel" *Occasional Paper #3* Department of Information Systems, Victoria University of Technology, Melbourne, VIC, Australia.
- Usoff, C. & Feldmann, D. (1998) "Accounting Students' Perceptions of Important Skills for Career Success" *Journal of Education for Business*. 73(2) 215-220.
- Waterman, R. H.; Waterman, J. A., *et al.* (1994) "Toward a Career Resilient Workforce." *Harvard Business Review*. (July-August): 87-95.
- Young, J. and Keen, C. (1997) "The Emerging Importance of Broader Skills and Personal Attributes in the Recruitment of Australian IS Professionals." *Eighth Australasian Conference on Information Systems*. Adelaide, South Australia: Australian Computer Society & ACIS Executive. pp. 682-692.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support of the Faculty of Business and Law and of the Department of Information Systems of Victoria University.

COPYRIGHT

Rod Turner and Glenn Lowry, © 1999. The authors assign to ACIS and educational and non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive licence to ACIS to publish this document in full in the Conference Papers and Proceedings. Those documents may be published on the World Wide Web, CD-ROM, in printed form, and on mirror sites on the World Wide Web. Any other usage is prohibited without the express permission of the authors.