Towards a Profession of Information Systems and Technology: The Relative Importance of "Hard" and "Soft" Skills for IT Practitioners

Rodney Turner

School of Information Systems, Faculty of Business & Law, Victoria University of Technology, Australia, rod.turner@vu.edu.au

Glenn Lowry

MBA Programs, College of Business and Administration, United Arab Emirates University, UAE, g.lowry@uaeu.ac.ae

ABSTRACT

This research reports some further findings of an ongoing investigation into conceptual, academic, and soft skills that IS/IT practitioners regard as important in new graduates. The results confirm the work of others indicating that soft skills such as teamwork are seen as far more important that the hard skills such as programming. Surprisingly, skills in traditional business subjects such as accounting and economics were rated relatively lowly. The research findings reported here present some evidence that "business subjects" such as those mentioned above do not equate to the business skills that employers of IS graduates are seeking in new hires. An explanation for an apparent conflict with anecdotal views and current findings is suggested.

INTRODUCTION

It is often asserted that the preparation of IS professionals should cover studies in the body of technical skills laid down by various professional bodies [Underwood, 1997; Gorgone, 1999; Cheney, 1990]. It is also often held that employers are seeking a more rounded graduate who has well-developed soft skills in addition to a sound technical repertoire [Trauth, 1993; Van Slyke, 1997]. This stated desire for business skills is often interpreted by academics to mean that more business subjects such as accounting, economics, business finance, and marketing should be taught alongside traditional hard skill subjects such as systems analysis/design and programming in particular languages. Somehow the other "soft" areas such as teamwork, communication skills and others are "picked up" in transit through an unspecified osmotic process.

The findings reported here present some evidence that "business subjects" such as those mentioned above do not equate to the business skills that employers of IS graduates are seeking in new hires. We present some evidence that IS practitioners see lesser value in the more formal business subject areas that often form the core of a business IS degree and more value in "soft skills".

The research presented here looks only at the perceptions of IS practitioners. It is part of an on-going project that investigates the views of other major stakeholders including employers, currently enrolled students, and academics. (Turner & Lowry, 1999; 2000; 2001)

METHODOLOGY

A multipart questionnaire was devised that solicited views on the importance of academic areas that are included in the curriculum of many IS degrees along with a number of others that may be regarded as useful or adjunct subjects in an IS degree programme. Demographic data including age, gender and aspects of employment were also gathered.

Web-based survey distribution was used. Mehta & Sivadas (1995) demonstrated that e-mail based surveys generated response rates comparable to those of postal surveys but significantly faster, at lower cost and of a higher quality. On the other hand Tse *et al* (1995) in an internal survey of Hong Kong University staff, experienced a much lower return rate for e-mail surveys (6%) compared with conventional mail (27%) that they attribute to the possibility of participant identification with e-mail Comley (1996) found comparable response rates from the two methods. Comley also indicated that electronic data collection methods are often self-selecting due to recipients irregu-

larly checking email messages and consequently have the potential to introduce bias. He points out however that although this is a problem for representative samples it is less of a problem for targeted groups as in the case of the present research.

The questionnaire was set up using Microsoft FrontPage 2000. Data were captured using Microsoft Access 2000. Electronic surveys have the advantage being pre-coded and free of ambiguity of response in that only one response per item can be selected. They have the disadvantage that they risk missing those who do not have access to computers and the web. This was not seen to be a problem for the group being surveyed. During the first half of 2001, invitations to participate were sent by email to 1008 IS professionals throughout Australia who had attended job fests in the previous twelve months. Twenty-eight unusable responses were eliminated from the analysis. A total of 136 usable replies were received and this represented an overall response rate of 13.5 percent – acceptable for unsolicited surveys of this type but lower than was hoped for. Analysis of the data was carried out using SPSS R10.

Respondents were classified into one of two groups depending on the likely level of "people contact" they normally encounter in in their job. This was selected from the principal work function and was classified higher or lower people contact.

The instrument contained two sections pertaining to academic preparation of graduates. These two sections separately covered the technical areas of an IS business degree and the other academic areas that are not specific to IS. A seven point Likert scale (1= irrelevant through to 7 = essential) was used to measure the response for each question. For each group mentioned above, mean scores and the standard deviation for each question was computed as shown in Table 2.

A third section in the survey investigated the importance of a range of so-called "soft skills" and these results are presented in Table 3. Comparisons between the 'higher' and 'lower' people contact groups were made. In all cases, Mann-Whitney U tests were used to establish any statistical differences between the two classifications.

RESULTS

Table 1 shows the distributions by the respondent's principal work function and their perceived level of people contact in their work.

A review of the Table 1 indicates that roles involving higher contact with people account for 56% of the responses, with roles involving lower personal contact with users at 44%. As the Web De-

Table 1: Principal work function

	Frequency	Lower People Contact Percentage	Higher People Contact Percentage
Applications Programming	34	25.0%	
System support	32		23.5%
Systems programming	4	2.9%	
Network administration	10	7.4%	
Project administration	13		9.6%
IT sales	2		1.5%
IT staff supervision	6		4.4%
Education/training	5		3.7%
Web development	12	8.8%	
Recruiting/staff placement	2		1.5%
Consulting	16		11.8
Total	136	44 %	56%

Table 2: Importance of academic subject areas—mean scores (N=136)

	Low (l) mean (SD)	High (h) mean (SD)
Communications & Report Writing	5.82 (1.27)	6.18 (0.81)
Analysis & Design	5.82 (1.16)	5.91 (1.05)
Database design	5.65 (1.27)	5.47 (1.24)
Business Applications	5.62 (1.04)	5.68 (1.17)
Client server applications	5.60 (0.99)	5.72 (0.86)
Use operating systems	5.52 (1.03)	5.66 (1.15)
Apply OOPs	5.45 (1.03)	5.12 (1.39)
Management	5.43 (1.11)	5.63 (0.96)
Knowledge of PC apps	5.40 (1.21)	5.46 (1.24)
E-Commerce/E-business development	5.23 (1.44)	5.41 (1.04)
Project Management	5.10 (1.07)	5.70 (1.17)
Web design/development	5.05 (1.71)	4.88 (1.39)
LAN & Data Communications	5.02 (1.27)	5.38 (1.25)
Large System experience	4.92 (1.23)	5.28 (1.15)
Apply 3GLs	4.87 (1.31)	4.57 (1.47)
Business Ethics	4.85 (1.68)	5.24 (1.48)
Data mining/Data warehousing	4.78 (1.38)	4.74 (1.35)
Organizational Behavior	4.68 (1.42)	5.08 (1.38)
Mathematical Modeling	4.38 (1.40)	4.14 (1.48)
CASE applications	4.38 (1.11)	4.61 (1.47)
ERP implementations & operations	4.32 (1.31)	4.61 (1.45)
Knowledge base/Expert systems	4.25 (1.48)	4.67 (1.35)
Operations Research	4.22 (1.15)	4.34 (1.35)
Marketing	4.18 (1.64)	4.47 (1.41)
Business Finance	4.10 (1.50)	4.46 (1.48)
Business Statistics	4.00 (1.43)	4.32 (1.38)
International Business	3.98 (1.66)	4.43 (1.51)
Accounting	3.98 (1.51)	4.25 (1.58)
Psychology	3.63 (1.73)	3.75 (1.79)
Business or Commercial Law	3.62 (1.54)	4.42 (1.48)
Economics	3.38 (1.50)	3.83 (1.48)
Foreign Languages	2.78 (1.83)	3.45 (1.68)
N=	60	76
* significantly different at 0.05% level		

velopment role is arguably a role involving higher client contact, the percentage of roles involving lower people contact would decline to only 35%, with those requiring higher contact growing to 64%. Either view is consistent with the view expressed by Ang in 1992 that the importance of technology-oriented roles would decline while IS/IT roles involving client interaction would grow in importance, a view borne out by the data in Table 1.

Academic Subject Areas

Table 2 shows the respondents' views of the importance of academic subject areas. The data clearly indicate that core business subjects such as Accounting [3.98 (lower), 4.25 (higher)], Economics [3.38 (l), 3.83(h)], Law [3.62 (l), 4.42 (h)] and Statistics [4.00 (l), 4.32 (h)] rate rather low in importance amongst practicing IS professionals. With a score of 4 being the midrange and representing a neutral response, these "core" business subjects are seen as less important by practitioners in the discipline of IS. Management [5.43 (l), 5.63 (h)], Ethics [4.85 (l), 5.24 (h)] and Organizational Behavior [4.68 (l), 5.08 (h)] rate closer to five or higher indicating these are somewhat more important – especially Management which rates in the fairly important to very important range.

In all cases, respondents in higher people contact roles rated these areas as more important than did those in positions that involve lower people contact. Overall, these results are unexpected given the popular claims that IS graduates need more understanding about business. Communications and Report Writing, often regarded more as a 'soft' skill rather than an academic discipline in its own right, was rated the most important [5.82 (i), 6.18 (h)] of the academic areas, supporting many anecdotal reports that employers value and seek these skills. It should also be noted that a subject entitled "Communications & Report Writing" has been included in some business degree programmes in the past.

Of the academic disciplines covered in the survey, only three were significantly different at the 0.05% level. These include Project Management, Business or Commercial Law and Foreign Languages. Not surprisingly the 'higher people contact' group rated these areas as significantly more important than the technology-oriented respondents.

Even for respondents in low client contact roles though, only 13 subjects achieved a rating of 5.0 or more, with 19 subjects rated at between 4.92 and 2.78 on the 7-point Likert scale. Respondents in high client contact roles rated 15 subjects above 5.0, with 17 subjects failing to achieve a rating above 4.88.

Some of the subjects that failed to achieve a rating of 5.0 included technical areas such as large system experience, data mining/data warehousing, applying 3GLs, CASE applications, ERP implementations & operations, and knowledge base/expert systems. Clearly, the respondents were not seeking additional technical knowledge but value the soft skills of Communications and Report Writing (5.82) highest of those considered.

Soft Skills

Table 3 shows that 'soft' skills in the main are rated substantially higher than 'hard' academic skills. Although the higher people contact grouping tended to rate these soft skills above the rating by the lower people contact grouping, only one (Problem definition skills) was rated significantly higher by the more client-oriented respondents. Only one 'soft' skill, "Able to prepare multimedia presentations", was rated lower than 5.0 by both groups. ALL other 'soft' skills were rated

Table 3: Importance of soft skill—mean scores (N=136)

	Lower		Higher	
	mean	(SD)	mean	(SD)
Work as a team	6.47	(0.70)	6.57	(0.62)
Work under pressure	6.42	(0.74)	6.42	(0.80)
Problem solving skills	6.38	(0.56)	6.49	(0.58)
Meet deadlines	6.37	(0.66)	6.34	(0.70)
Independently acquire new skills	6.32	(0.72)	6.38	(0.71)
Quickly acquire new skills	6.32	(0.62)	6.41	(0.66)
Work independently	6.30	(1.03)	6.25	(0.87)
Time management	6.23	(0.79)	6.20	(1.06)
Handle concurrent tasks	6.15	(0.73)	6.17	(0.87)
Written communication skills	6.10	(0.86)	6.25	(0.83)
Client focused service ethic	6.07	(0.92)	6.24	(1.06)
Able to interact with people of different background	6.05	(0.72)	6.20	(0.73)
Willing to undergo ongoing professional dev.	6.03	(0.94)	6.29	(0.85)
Problem definition skills	6.03	(0.71)	6.30	(0.75)
Able to work with people from different disciplines	6.03	(0.71)	6.05	(0.76)
Think creatively	5.93	(0.99)	6.20	(0.80)
Accept direction	5.87	(1.03)	6.16	(0.73)
Place organizational objectives first	5.72	(0.87)	5.74	(1.01)
Oral presentation skills	5.70	(0.93)	5.86	(1.17)
Information seeking skills	5.68	(1.02)	5.95	(0.91)
Business analysis skills	5.63	(0.86)	5.62	(1.15)
Leadership potential	5.08	(1.09)	5.25	(1.07)
Good sense of humor	5.00	(1.30)	5.26	(1.39)
Able to prepare multimedia presentations	4.52	(1.44)	4.89	(1.05)
N=	60		76	

* significantly different at 0.05% level

at 5.0 or higher by **both** groups. This suggests there is little significant difference in the responses overall for the two groupings.

All but one 'soft' skill achieved a mean rating exceeding 5 for both groupings. Seventeen (out of 24) of the 'soft' skills was rated in excess of 6 by the 'higher people contact' group of practitioners and 15 of the 'lower people contact' group rated these higher than 6. Closer inspection of Table 2 and Table 3 reveals that the highest rated IS area, Analysis & Design, rated below all but seven of the soft skills in Table 3. Teamwork, problem-solving skills, ability to work under pressure and ability to quickly acquire new skills independently, are each rated very highly, close to essential, by IS practitioners irrespective of the level of people contact their work activity involves. Only one soft skill, ability to prepare multimedia presentations, rated relatively lowly and it could be argued that this is not a true soft skill.

DISCUSSION

Overall, the data indicate that IS/IT practitioners perceive soft skills as very important whilst hard skills, especially some of the more traditional core business subjects such as accounting or economics, are rated lower, perhaps expecting a satisfactory level of technical skill as a given. An attempt has been made to control for the various roles IT practitioners can occupy. The data in Table 1 indicate there are reasonable representations from those areas that require differing types and levels of hard and soft skills, thus increasing the confidence that the observations reported here are real.

This does not imply that the results presented here are in conflict with other studies. Rather, we argue that the traditional business subjects are not the business skills primarily sought in studies of the IS marketplace. Does the IS marketplace really want practical business skills and appreciation of business processes in addition to those provided in these traditional core areas? The high level of response to the importance of Business Applications (overall mean = 5.65) may be an indication of a widespread but unrealized desire for 'soft skills' not normally developed in core business courses. Further clarification will be sought in subsequent work. This may suggest that in reality it is not more core business subjects that are needed but an appreciation of

business processes and activities that are not always covered in IS degree programs. Analysis of the data is continuing and comparisons with other stakeholder groups are currently underway.

Finally, some caution should be adopted when generalizing the results presented here. Electronic surveys, by their nature are accessible only by those with access to the appropriate technologies. Whilst we would expect that this problem would be lower amongst IS/IT professionals than in the general population because of the nature of the work they do, there is a prospect of survey bias being introduced.

The results suggest the soundness of moves by some Information Systems educators to include 'professional development' activities and material in the already crowded IS / IT curriculum. Perhaps the growing recognition of the importance of 'soft' skills by information systems and information technology practitioners is an indication that what began as a fundamentally technology-oriented discipline is, indeed, evolving into a technology-based profession.

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