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In this issue:

Skills Learnt During a Systems Development Course: Graduate Perceptions of Skills Transfer and Industry Alignment

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Skills Learnt During a Systems Development Course: Graduate Perceptions of Skills Transfer and Industry Alignment

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Abstract

There is currently much debate on the adequacy of Information Systems courses in preparing students for systems development work. To address this need, this paper's purpose was to determine whether the skills that students learnt during a systems development course were applied in the workplace. The investigation was performed during 2004 from students who had attended the third year systems development course at the University of Cape Town during 2000 to 2003. This course has as its outcomes various technical, interpersonal and business skills. The research approach adopted was to determine graduate's usage and importance rating of these skills in the workplace, satisfaction of industry representatives with student skills as well as the extent to which graduates felt these skills had been learnt during the systems development course. Quantitative analysis of questionnaires completed by graduates and evaluation forms completed by industry representatives was performed. The results confirm the high usage and importance of interpersonal, project management, business analysis and general business skills by IS graduates in the workplace, justifying their incorporation in system development courses. Overall, the systems development course studied was found to have prepared students well and skills transfer to industry occurred. The course was found to be well aligned with workplace requirements and relatively well aligned with the recommended IS curriculum (Computing Curricula, 2004). Gratifying to the researchers was general satisfaction from industry representatives with the skills being applied by graduates, in contrast to previous similar research. The relative skills needing more emphasis are discussed.

Keywords: capstone experience, curriculum, course alignment, skills transfer, systems development

1. INTRODUCTION

Preparing students for the job market necessitates an investigation into the skills learnt during undergraduate studies and the alignment of these skills with industry requirements. Ultimately it becomes important to investigate those practices that encourage the transfer of skills and knowledge into the workplace and enhance employer satisfaction with Information Communication and Technology (ICT) graduates. This has been the focus of several studies over the last two decades (Becker *et al*., 1994; Hogan *et al.,* 2005; Scott, 2004; Simpson *et al*., 2003).

The third year systems development (SD) course is the capstone course of the IS degree programs at the University of Cape Town (UCT). In this course, students need to demonstrate the skills learnt in their previous courses. While a previous study by

Scott *et al.* (2002) measured the alignment between the level of skills possessed by students completing this course and the level of skills demanded by companies performing software development, the actual transfer of skills by graduates in the workplace could not be determined. To address this need, the purpose of this research was to determine whether there was skills transfer between the course and industry as well as the alignment between the SD course and industry.

The Draft Computing Curricula 2004 Overview Report (Computing Curricula, 2004) recommending the weightings of skills in the IS curriculum was recently published. In this paper, alignment between the weightings of some of these skills in the IS curriculum and the outcomes of the SD course studied was determined. Some of the skills analyzed for relative industry importance and usage in this research are not specifically listed in the curriculum document as their categories tended to be broader because of the curriculum document's interdisciplinary focus. Weightings provided in this research will be useful to faculty involved with IS curriculum design and teaching SD courses.

2. BACKGROUND

The advent of information technology (IT) changed the workplace and initiated a continuous demand to restructure processes for acquiring, manipulating and applying information (Benamati and Lederer, 2001; Smits *et al.*, 1997). Information systems (IS) professionals are thus challenged to keep abreast of these demands and are furthermore faced with the daunting prospects of recruiting, training, motivating and retaining their professional staff (Smits *et al*., 1997). Gallivan *et al.*, (2004) produced a study to examine advertised jobs for IT professionals over a period of 17 years. Their investigation of trends in job titles advertised and required skills at three intervals during this time period, established the importance of life-long learning skills for both the IT practitioners and academia.

The draft copy of the Computing Curricula 2004, a guide to undergraduate degree programs, reported that the IS discipline needed to "address a growing sphere of challenges" and focused on post 1990s needs. Computers now form an integral part of most organizations at all levels and IS professionals are faced with the complexities of managing large volumes of information effectively. Effective and efficient organization processes, communication and collaborative decision making increasingly depend on the proper use of technology and the manipulation of information. The IS specialist needs a sound understanding of both technical and organizational factors and plays a key role in requirements specification, design and implementation of information systems (Computing Curricula 2004). The information systems discipline bridges the gap between computing and business and thus the two most important topics within the focus area of this discipline are Information Systems Development and Analysis of Business Requirements (Computing Curricula 2004).

The SD course expects students to participate in a real-world systems developments project in industry. Groups, each comprising 5 students, find industry representatives that can provide them with a business problem. This problem should match the generic specifications provided for the systems development group project (Scott, 2004). In agreement with Hogan *et al.* (2005) the real world nature of the project is a key factor in increasing student motivation. The studio-based real-world projects not only provide students with deep learning but simultaneously also produce more experienced students as they are more likely to take ownership of the outcomes, resulting in a better appreciation of effective practices (Simpson *et al.*, 2003). Although Hogan *et al.* (2005) cautioned that the commitment to a live client is no minor feat, they confirmed that the development of an industry standard process and related infrastructure remain the most important prerequisites for an industry-oriented curriculum.

Scott and van der Merwe (2003) firmly believed that the project provided a unique opportunity to prepare students for the diverse character of the IS profession. The following section provides insights found in the literature on some of the prominent skills identified for IS professionals and demonstrated as part of the SD course.

3. IS SKILLS

In the IS curriculum, emphasis needs to be placed on a sound understanding of the business processes, the efficient capturing of systems requirements as well as good programming practice needed to develop and implement a reliable system (Computing Curricula, 2004).

The IS degree programs endeavor to equip students with a combination of technical, organizational and management skills and knowledge (Nash, 2004). In foundation courses students are exposed to diverse skills from a variety of courses in different disciplines as proposed by Phukan (2001) who is of the opinion that students need a 'base foundation' of skills and knowledge to ensure effective delivery of information and preparation for the IS profession.

In a SD course, students need to obtain experience in technical, business and interpersonal skills, skills that are enhanced through project management, the systems development and build process, team work and communication with real world users (Scott, 2004). Becker *et al.* (1994) concur that the ideal capstone course requires full integration and implementation of all conceptual ideas and technological aspects of system development, thus encouraging deep learning and better preparation for solving real world problems.

In their paper "A Plan for a Comprehensive and Integrated Information Systems Curriculum" Becker *et al*. (1994) suggested an architectural plan to incorporate formal methods, technological team issues and organizational theory considerations toward the development of a fully integrated IS curriculum. To this effect, the IS curriculum separated the required topics for IS students into two categories, non-computing and computing topics. The authors did not find this separation useful as computing and non-computing skills can't be separated for many tasks. One must possess strong non-computing skills in order to succeed in computing skill-required jobs; they are inseparable. However, for the purpose of the literature review section which follows, skills are discussed within these two groupings.

Non-computing IS skills

The Computing Curricula (2004) rates Interpersonal; Project Management; Analysis of business requirements; Management of IS organization, Organizational behaviour and E-business as the top six non-computing IS topics. McGuire and Randall (1998) in their survey of graduates found teamwork, business knowledge, project management, change management as well as customer and quality focus to be of highest importance.

Over the last few years online job sites have become more popular than traditional advertisements in newspapers. An informal analysis of IT jobs advertised on a leading web-based job site indicated that while the emphasis was still on the technical skills, non technical skills received significantly more attention than they normally do in print-based advertisements (Gallivan *et al.*, 2004). Communication skills were most frequently listed in 48% of the non technical advertisements, with the ability to collaborate, leadership and interpersonal skills also represented, but to a lesser extent (Gallivan *et al.*, 2004). Employers are requiring better interpersonal and business skills from IS graduates, an Australian survey conducted over a broad spectrum of employers in 2001 indicated satisfaction with most ICT graduates skills, except for graduates' knowledge of project management and their understanding of business processes (Hagan, 2004).

Computing IS Skills

The Computing Curricula (2004) rates Human-Computer Interaction (HCI), Database Practice and IS Development as the top three computing IS skills. Software Modeling and Analysis, System Design, Development and Data Communication are skills demonstrated in the SD project and are rated average and above in the list of IS computing topics (Computing Curricula, 2004).

Confirming the inclusion of database skills as one of the top IS computing skills, Gallivan *et al.* (2004) in their study of Changing Patterns in IT Skill 1988-2003 showed that database administrators are amongst the three job titles showing the largest proportional gains.

Skills Transfer

While courses can place emphasis on and assess the learning of certain skills, this is in no means a guarantee that the skill is applied in the workplace. To confirm that skills transfer has taken place, the graduate needs to acknowledge that the skill was learnt at university and that the same skill is currently being used in the workplace.

4. RESEARCH METHODOLOGY

Three data sets were used in this quantitative study, a graduate survey, industry evaluation data and weightings in the Computing Curriculum (2004).

Table 1. Skill groupings and skills surveyed.

Skill Grouping – Skill
Interpersonal - Teamwork **Interpersonal** - Verbal Communication **Interpersonal** - Technical Writing
Project Management - Project Management
Business - Specific Business Knowledge **Business** - General Business Understanding **Business** - Feasibility Analysis
Database - Developing Database Structures **Database** - Database Relationships / Normalization
Analysis - Business Analysis **Analysis** - Systems Analysis **Analysis** – Software Modeling
Design - HCI Design **Design** - System Design **Design** - Prototyping
Development - Programming Fundamentals **Development** - Object Oriented **Development** - Client-Server **Development** - Data-Access **Development** - Test Case Design **Development** – Testing **Development** - Debugging / Error Trapping
Data Communication - Network Communications **Data Communication** - Developing System Security

From the literature review of required outcomes for IS graduates and the stated outcomes of the SD course studied, a list of skills and skill groupings was determined and is listed in Table 1. While the Computing Curricula (2004) grouped these skills under computing and non-computing topics, this study used different skill groupings. In particular, the Analysis grouping contained Business Analysis (a non-computing skill), and Systems Analysis and Software Modeling (computing skills). The skills listed in Table 1 were included in the graduate questionnaire. During questionnaire completion, graduates rated each skill in terms of its usage in the workplace (Use), its importance in the workplace (Importance) and the extent to which the SD course prepared them for the particular skill (SD Preparation). All ratings were performed using a five point Likert scale. The IS graduate target population sampling frame consisted of the SD course lists from 2001 to 2003 comprising 424 graduates.

Industry evaluation data was collected through the completion of evaluation forms by representatives of companies who had sponsored the 39 system development projects in 2003. The evaluation was completed after the complete system had been delivered and the system, business case, user requirements and system specifications had been presented. The skills that were included on the evaluation forms were a sub-set of the skills listed in Table 1 as only skills that were demonstrated by students during the SD course and could be separately evaluated by the industry representatives were included.

Data Collection Techniques

The graduate questionnaires were made available online with results being stored in a backend database. Online data validation, integrity and completion testing was performed. One follow-up email was sent to all individuals who did not respond and individuals were contacted telephonically if their email could not be delivered. The duration of the survey was from the 1st August 2004 to the 13th August 2004. A 23% response rate comprising 95 responses was obtained for the graduate questionnaire. Included in the analysis were all 39 (100%) completed industry evaluation forms.

Demographic Profile of Graduate Respondents

The demographic information of respondents is presented in Appendix Table 5. Positions were categorized into the job types used by

Gallivan *et al.* (2004) in their IT job coding. The "Other" group included student, unemployed, trainee and assistant positions.

Data Analysis and Results

Graduate perceptions of SD preparation, were analyzed by calculating and then ranking the means for all skills. Similarly, for skills within the Business, Interpersonal and Project Management skill groupings, graduate perceptions of importance to job and implementation of skills were analyzed by calculating and ranking the means. For the remaining skills, importance to job and implementation were only analyzed for respondents who had indicated that they worked in an ICT field. This was done to prevent skewing of data by respondents not working in ICT. The ranked mean values are represented for each skill grouping in Table 2 and for each skill, in Appendix Table 4. Within each skill grouping, t-tests were performed between the ratings for the different skills to determine significant variations. Correlation between the mean values of SD preparation, Importance and Implementation, across all skills, was performed and is shown in Table 3. To test skills transfer and alignment, ratings of importance and usage within the workplace were compared to graduate perceptions of preparation they received during the SD course (SD Preparation).

To validate the graduate perceptions of SD preparation against industry evaluation of student skills, independent t-tests were used and the results are shown in Appendix Table 6. Graduate perceptions of importance were then compared to the recommended IS Curriculum weightings provided in the Draft Computing Curricula 2004 Overview Report (Computing Curricula, 2004). The results are shown in Appendix Table 7.

5. DISCUSSION OF RESULTS

Demographics

Appendix Table 5 shows that the majority of respondents (77%) were working in ICT with the major grouping being programmers and analysts (35%), management (21%) and consultants (14%). These percentages are significantly higher than programmers and analysts (24%), management (9%) and consultants (3%) listed by Gallivan *et al.* (2004) in their survey of 2001 U.S. IT jobs. These differences are explained by IS jobs being dominated by programmers, systems analysts and IS managers (Hardin *et al.*, 2002). It appears that many of the UCT graduates are accepting informal consulting positions as well as starting their own companies. Contracting is a popular choice in South Africa, with 12% of the national 2005 IT professionals being surveyed, being contractors (IT Web, 2005). Their positions were mainly within the IT (43%) and Finance and Insurance (18%) sectors.

Table 2: Mean values of questionnaire responses per skill grouping.

Skill grouping	SD Preparation: 2-Basic 3-Average 4-Very Good	Skill grouping	Importance: 3-Average 4- Very Important 5-Vital	Skill grouping	Use: 2-Seldom 3-Often 4-Very Often 5-Extensive
Interpersonal	3.80	Interpersonal	4.34	Interpersonal	4.22
Project Management	3.55	Project Management	4.18	Project Management	3.86
Database	3.48	Database	3.97	Business	3.58
Analysis and Design	3.38	Business	3.88	Database	3.39
Business	3.15	Analysis and Design	3.73	Analysis and Design	3.29
Development	3.00	Development	3.63	Development	3.02
Data Communication	2.47	Data Communication	3.28	Data Communication	2.75

The high levels of employment are pleasing to the researchers, with only two graduates who indicated their position as "pilgrim" and "traveler" and were classified as unemployed. This should however not be seen as representative of the total sample as unemployed graduates might have chosen not to complete the questionnaire or might have been harder to contact. Similarly, the unusually high percentage of graduates in the country should not be seen as representative of the sample but rather as a result of a skewed response rate. The ICT brain drain is acute in South Africa, with several hundred skilled ICT professionals leaving the country annually (Mohammed and Miller, 2002).

Industry Alignment

The relative importance attributed to the different skill groupings by graduates working in industry is shown in Table 2. All the skill groupings were rated above 3 and hence above average importance. In support of previous research, Interpersonal and Project Management skills were rated as between very important (4) and critical (5), while Database and Business skills were rated as very important.

Table 3. Correlation Test Results. Marked correlations are significant at p < .05000 (N=24, Casewise deletion of missing data).

Perceived SD Preparation – Perceived Importance	r=0.7887, p=.000
Perceived SD Preparation – Perceived Use	r=0.7996, p=.000
Perceived Importance – Perceived Use	r=0.9538, p=.000

Analysis of correlation between graduates' perceptions of SD preparation, importance and usage (Table 3), reveal that perceived SD preparation is correlated to perceived usage and importance of skills in industry. This is gratifying as it confirms that the course is putting correct emphasis on training the skills that are important and well used in industry. As expected, use and importance within the workplace are highly correlated, adding confidence to the reliability of the results.

The results of the graduate survey and the comparison of graduate perceptions with industry representatives and IS Curriculum weightings are discussed under each skill grouping to determine specific skills transfer and alignment.

Interpersonal and Project Management Skills: Gratifying to the authors was graduates' high relative rating of preparation in the Interpersonal and Project Management skill groupings and skills, aligning well with their high perceived importance and usage. Graduates rank teamwork and verbal communication skills as extremely important and extensively implemented, significantly more than technical writing. Industry evaluation of teamwork and verbal skills also correlated well with student's perceptions of preparation, as shown by t-tests. This is in contrast to the 2001 Australian survey of perceptions of potential employers of university ICT graduates, in which employers indicated dissatisfaction with ICT graduates' project management skills (Hagan, 2004). Graduates' rating of importance of these skills is consistent with the IS curricula weighting.

Business Skills: Business skills usage was ranked higher than their importance and in turn higher than preparation. This indicates that graduates feel that more emphasis needs to be placed on these skills within the course. However, graduates could be underplaying their skills. While they rated their business skill preparation as average, industry representatives evaluated students' business knowledge and understanding as very good.

Graduates rated usage and importance of General Business Understanding significantly higher than feasibility analysis and specific business knowledge. Their preparation for general business understanding and feasibility analysis was significantly higher than their preparation for specific business knowledge showing that the training emphasis across skills correlates well with industry requirements.

Database Skills: Preparation of database skills was ranked equally to importance and slightly more than usage showing good emphasis on the course. The Computing Curricula (2004) does not list database design as a separate topic; it is contained within the database practice grouping. Graduate's rating of importance of database design is consistent with the IS curriculum weighting for the database practice grouping. Developing

database structures was seen as significantly more important than database relationships and normalization. However, SD preparation for these skills was similar, justifying changing the relative emphasis of these skills on the course. A study by Scott *et al.* (2002) indicated a large skills gap between industry and students prior to 2002 with regard to database skills. Since 2002 the SD course changed, with a clear focus to bridge some of the existing gaps. This could have contributed to the improved preparation expressed by graduates.

Analysis & Design Skills: Graduates rated the preparation of analysis and design higher than their importance and use showing that they felt well prepared in this skill grouping. Industry representatives evaluated students' HCI Design skills significantly higher than graduates rated their preparation showing that students might even be under-rating their course preparation. This is still in line with the previous study of Scott *et al.* (2002) where it showed that students seemed to be more skilled in systems analysis and design and business process re-engineering.

Graduates rated their preparation across the skills similarly with the exception of prototyping for which they felt poorly prepared. To justify the low importance in the course, the importance and usage of prototyping was also rated poorly.

Of the other skills within this grouping, business analysis was rated as significantly more important and more heavily used than any of the other skills. Graduate's rating of importance of these skills is consistent with the IS curricula weighting with the exception of System Design which was rated as more important by graduates; and business analysis, which the IS Curriculum gave a maximum rating to. These results all point to increasing the emphasis on business analysis in the course.

Software Development Skills: In terms of ranking, graduates rated skills in the development skills grouping equally across course preparation, importance and usage, showing good alignment of the course with industry.

Interestingly low usage of object oriented development; programming fundamentals and test case design was reported. In contrast, there seems to be high importance and usage attributed to testing, data access and debugging. While graduate's rating of importance of distributed development and programming fundamentals is consistent with the IS curricula weighting, testing was rated as more important by graduates. To satisfy these demands, programming fundamentals should be de-emphasised on the course. While graduates feel that testing should get more emphasis this is not consistent with the recommended IS curriculum. The corresponding grouping in the Computing Curricula (2004) is software verification and validation which was given a minimal weighting between 1 and 2 for IS. These results question the relatively low importance of testing in the IS curriculum.

Data Communication Skills: Graduates reported low usage of and gave low relative importance to the data-communication skill grouping. They did not perceive that the SD course prepared them with these skills. In terms of the specific skills, graduates placed significantly more importance and reported higher usage in developing systems security than network communications. While, graduate's rating of importance of network communications is consistent with the IS curricula weighting the definitions are quite different. The Computing Curricula (2005) lists Network Communications under Net Centric Use and Configuration and includes the organizational activities associated with selection, procurement, implementation, configuration and management. In retrospect, the definition of this term on the questionnaire which listed setting up and configuring physical networks, needs revision. For this reason, the result should not be used to confirm SD preparation or to reduce the emphasis of this skill on the course. These results do show a need for more emphasis on system security in the course.

6. LIMITATIONS AND FUTURE RESEARCH

This study was performed using graduates from the University of Cape Town and the response was skewed towards graduates who had remained within the country. For this reason the results can not be readily generalized to other job markets. The authors did try to get employees of graduates to give feedback but only 4 responded. Future research might include interviews with the major employers. The authors were

hampered in their research by the lack of readily available Alumni contact information which their University is currently addressing.

7. CONCLUSION

In support of previous research (McGuire and Randall, 1998), IS graduates surveyed in this research rated non-computing skills highly. Interpersonal and project management skills were rated between very important and critical to their jobs, whereas database and business skills were rated as very important. Analysis, design, software development and data communication skills were rated above average importance.

The results show that overall the SD course studied prepared students well for industry. Skills transfer happened and the course is well aligned with workplace requirements. The course prepared students well in all the skills surveyed except for Data Communication where students felt ill-prepared. The relative preparation in terms of business skills was lower than the perceived importance and use and therefore this skill needs more emphasis on the course.

In terms of the relative emphasis of subskills, Business Analysis, Developing Database Structures and Security need more emphasis on the course, while Database Relationships / Normalization and Programming Fundamentals need de-emphasis. Graduates felt that more emphasis was needed on testing, but this was not consistent with the Computing Curricula (2004) weightings.

For skills that could be matched against those in the Computing Curricula (2004), the relative importance was mostly consistent. The authors found that some of the interdisciplinary categories within the Computing Curricula (2004) were too broad to be used to determine the relative weighting of skills within a SD course.

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Appendices

Table 4: Mean values of questionnaire responses per skill.

Skill grouping – Skill	SD Preparation: 2-Basic 3-Average 4-Very Good	Skill grouping – Skill	Importance: 3-Average 4- Very Important 5-Vital	Skill grouping – Skill	Use: 2-Seldom 3-Often 4-Very Often 5-Extensive
Interpersonal - Teamwork	4.11	Interpersonal - Teamwork	4.42	Interpersonal - Teamwork	4.31
Interpersonal - Verbal Communication	3.66	Interpersonal - Verbal Communication	4.37	Interpersonal - Verbal Communication	4.29
Analysis - Business Analysis	3.63	Interpersonal - Technical Writing	4.22	Interpersonal - Technical Writing	4.06
Interpersonal - Technical Writing	3.63	Analysis – Business Analysis	4.19	Analysis - Business Analysis	3.93
Project Management - Project Management	3.55	Business – General Business Understanding	4.19	Business - General Business Understanding	3.90
Database - Database Relationships / Normalization	3.52	Project Management - Project Management	4.18	Project Management - Project Management	3.86
Design - HCI Design	3.52	Database - Developing Database Structures	4.08	Analysis - Systems Analysis	3.58
Analysis - Systems Analysis	3.50	Development - Testing	3.89	Database - Developing Database Structures	3.46
Design – System Design	3.47	Database - Database Relationships / Normalization	3.86	Business - Specific Business Knowledge	3.43
Database - Developing Database Structures	3.44	Analysis – Systems Analysis	3.82	Business - Feasibility Analysis	3.42
Analysis - Software Modeling	3.43	Analysis – Software Modeling	3.82	Analysis - Software Modeling	3.32
Business - General Business Understanding	3.35	Design - System Design	3.80	Database - Database Relationships / Normalization	3.32
Development - Data-Access	3.31	Business - Feasibility Analysis	3.79	Design - System Design	3.27
Development - Programming Fundamentals	3.26	Development - Debugging / Error Trapping	3.68	Development - Testing	3.26
Business - Feasibility Analysis	3.23	Business – Specific Business Knowledge	3.66	Development - Data-Access	3.22
Development - Debugging / Error Trapping	2.96	Development - Data-Access	3.66	Design - HCI Design	3.01
Development - Testing	2.94	Development - Client-Server	3.64	Development - Debugging / Error Trapping	3.01
Development - Client-Server	2.89	Development - Test Case Design	3.61	Development - Client-Server	3.00
Business - Specific Business Knowledge	2.85	Data Communication - Developing System Security	3.52	Development - Programming Fundamentals	2.93
Development - Object Oriented	2.84	Design - HCI Design	3.52	Development - Test Case Design	2.93
Development - Test Case Design	2.80	Development - Programming Fundamentals	3.51	Data Communication - Developing System Security	2.89
Design - Prototyping	2.77	Development - Object Oriented	3.44	Development - Object Oriented	2.75
Data Communication – Network Communications	2.56	Design - Prototyping	3.23	Design - Prototyping	2.66
Data Communication – Developing System Security	2.38	Data Communication - Network Communications	3.04	Data Communication - Network Communications	2.60

Table 5. Graduate Demographic Data.

Demographic Group		Count	Percent	Demographic Group		Count	Percent
SECTOR	Education	4	4%	POSITION	Consultant	13	14%
	Finance & Insurance	17	18%		Software Engineer	3	3%
	Government	2	2%		Programmer/Analyst	33	35%
	IT	41	43%		Sales/Education	6	6%
	Manufacturing	2	2%		Project Leader	3	3%
	Other Services	5	5%		User/Tech. Support	7	7%
	Trade	6	6%		Management	20	21%
	Other	18	19%		Other	10	11%
In South Africa		69	73%	Work In ICT Field		73	77%
Not in South Africa		26	27%	Do not work in ICT Field		22	23%

Table 6. T-test for Independent Samples.
Marked differences are significant at p < .05000.

Skills	*SD preparation*			*Industry evaluation of student skills*			t-value	p
	Mean	Std.Dev.	N	Mean	Std.Dev.	N		
Teamwork	4.11	1.18	95	4.00	0.87	39	0.5036	0.615
Verbal Communication Skills	3.66	1.23	95	3.85	0.78	39	-0.8625	0.390
Business Knowledge and Understanding	3.09	0.86	95	3.95	0.82	39	-5.2919	0
Analysis, Development and Design	3.34	0.75	94	4.14	0.87	39	-5.3209	0
HCI Design	3.52	1.13	95	4.01	0.85	78	-3.2135	0.002

Table 7. Comparison of Graduate perceptions of importance with recommended IS Curriculum Weighting (Computing Curricula, 2004). IS Curriculum weighting is expressed as minimum to maximum, differences are marked.

Skill	*Graduate perception of Importance*	*IS Curriculum Weighting*
Interpersonal - Teamwork/Verbal	4.4	3-5
Project Management	4.2	3-5
Database Design & Develop / Database Practice -	4.0	4-5
Analysis - Business Analysis	4.2	5-5
Analysis – Systems Analysis / Analysis of Technical Requirements	3.8	2-4
Analysis – Software Modeling	3.8	3-3
Design - System Design / Software Design	3.8	1-3
Design - HCI Design	3.5	2-5
Development – Testing / Software verification and validation	3.9	1-2
Development - Client-Server (Distributed)	3.6	2-4
Development – Programming Fundamentals	3.5	2-4
Data Communication – Network. / Network use and configuration	3.0	2-4