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What does an Information Systems Graduate need to know? A focus on Business Analysts and their role in sustainability

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Abstract

Information Systems graduates play a vital role in bridging the gap between business needs and technology solutions. But how much business or technology does a graduate need to know? In this paper we focus on the Business Analyst (BA) as a key role currently in high (unmet) demand in Australia. This paper presents the results of an Information and Communication Technology industry-based survey conducted in Australia to determine what knowledge and skills are needed by a BA. The survey is based on prior studies of information systems educational requirements and the internationally-developed Skills Framework for the Information Age (SFIA) that has been endorsed by the Australian Computer Society. From the literature we identified three types of skills: soft, business and technical. With the increasing importance of GreenIT and the pivotal role that the BA could play in green decision making, we added a fourth type of skill: sustainability. The survey considers 84 skills, their importance, the level of attainment of that skill, skill gaps and types of skills. Results show that technical and business skills are in almost equal demand and knowledge gaps are small. Soft skills were found to be the most important, with the smallest knowledge gap. Sustainability skills, however, were perceived to be of least importance and the area with the largest knowledge gap.

Keywords

Australia, business analysts, education, sustainability, IT skills

INTRODUCTION

> *"Education is the most effective means that society possesses for confronting the challenges of the future."* (UNESCO 1998, paragraph 38)

The challenge, among others, facing Learning and Teaching (L&T) in the Information Systems (IS) field is the dynamic and cross-disciplinary nature of the material to be taught. Due to a rapid change in technologies, L&T in this field must find a balance between teaching the fundamentals which are stable and core and changing course content and delivery to meet the current and future needs for knowledge and skills in the industry. Also, it is essential that the program is coherent, broad, and yet have sufficient depth so that the IS graduate can take on careers requiring them to understand the needs of business, turn those needs into a computer based solution and convey the design of that solution to the technical team.

With sustainability high on the agenda in many nations, graduates who will act as communication bridges between technology specialists and businesses will play a vital and leading role in ensuring a sustainable future for our planet. The Business Analyst (BA) (also called Business Systems Analyst, Business Systems Planner, Solutions Architect), as one example, plays a key role in making sustainable choices, providing direction to business and influencing demand for specific technologies. The definition of the role of a business analyst is elusive. Alexander (1999) argues that this is the least defined IT role. Some find that a business analyst is "largely expected to 'protect' the users and IT staff from each other" (Vashist et al. 2010, p. 2). Others may perceive that business analysts "are responsible for the business and technical analysis and design of the business solution and to manage the soft issues arising from the relationship" (Evans 2004, p. 2). Evans also suggests that there might be some confusion of the title, role and required knowledge of a business analyst.

According to the Australian Computer Society (ACS) (2011), the role of a business analyst is to "assess the overall business and information needs of an organisation. They co-ordinate the design of new IT solutions to improve business efficiency and productivity"[i]. For this paper, and since the study is based in Australia, we adopt the definition established by the Australian Computer Society which we explore further in the next

section. According to recruiters, skills shortages in ICT are becoming critical with "The most in-demand ICT roles nationally are network engineers (in all states), project managers, business analysts and developers"[ii]. This shortage of BAs is also being experienced in other countries such as the UK[iii]. Identifying the educational needs of BAs is therefore an important strategy in addressing this shortage.

This study contributes to researchers, educators, employers and practitioners to identify relevant sets of skills enabling professional BAs in the modern technological driven business environment. Via the literature and an industry based survey we seek to identify skill sets and the alignment between the perceived importance of these skills and their knowledge level. Subsequently, our research questions are:

R1: Which skills are viewed by industry as important for BAs?
R2: Do they have knowledge of and competence in these skill sets?
R3: Is there a difference between their perception of importance and knowledge?

To answer these questions, the next section draws upon the literature to develop a potential set of skills needed by the BA. Our methodology section outlines the survey instrument to measure the importance and knowledge for each of those skills. Our results and discussion follow, concluding with limitations and future research.

LITERATURE REVIEW

First, we consider an initial definition of the BA role in the Australian context. According to the Australian Computer Society (ACS) (2011), a BA may need to:

- "evaluate business needs, and contribute to the design and development of a business solution;
- work closely with developers and end users to ensure technical compatibility and user satisfaction;
- ensure timelines and budgets are met, and oversee the implementation of a new system;
- write user manuals and provide or co-ordinate training to users of a new system"[i].

While we could not find industry-based research to understand the skills needed specifically by a business analyst, there has been some research concerning the skills that an IS graduate must have when entering the working environment both in Australia and other countries. These studies can be divided into three categories: (1) industry surveys, (2) faculty and students' survey, and (3) job advertisements studies. We cover each of these areas in the next sub-sections.

Industry Surveys

Though universities have tended in the past to concentrate on technical skills to prepare their graduates, research has found that personal characteristics, or "soft skills," are often considered by employees to be more valuable than technical skills. Fang et al. (2005) surveyed 51 U.S. recruiters and found that interpersonal skills (e.g. teamwork, communication) and personal traits (e.g. critical thinking, personal motivation) were regarded as more valuable than IS skills and organizational knowledge.

Research from Bullen et al. (2007) surveyed 77 companies in the U.S. and found that firms required capabilities in project management and the business domain over technical capabilities. Simmons and Simmons (2010) interviewed 20 IS professionals in Fortune 500 businesses, small-to-medium businesses, and non-profit organizations to conclude that an emphasis is placed on negotiation skills, time management, managing cultural differences, outsource management, and information assurance as well as technical skills. Aken and Michalisin (2007) developed a comprehensive survey to identify, from an employer's perspective the skills that Management Information Systems (MIS) graduates are lacking. They established four categories of skills: Soft, Business, Technical and Programming. Other researchers, such as Burns et al. (2004), Ferguson (2005), Doucek et al. (2007), Lee et al. (2008) and Litecky (2009) have also surveyed the industry to pinpoint the required skills. The skills they identified can be found in Table 1.

Faculty and Student Surveys

Academics and curriculum researchers have been interested in understanding the skills and knowledge that university faculty and students view as important for the work place. Weber, McIntyre, and Schmidt (2001) compared IS students with IS industry's perceptions of the importance of various skills. In general, they found that IS students' ratings of the importance of skill and competence were similar to those rated by the industry.

In another study, Medlin, Dave, and Vannoy (2001) surveyed students to understand their views on the importance of technical versus nontechnical skills for a successful IT career. Four categories of skills were included in this study: technical, organizational, creative thinking, and analytical skills. Overall, students rated communication skills the highest, followed by analytical skills, technical skills and organizational skills. The study results showed that the students and the practitioners' views were similar, which indicated that IS professionals need more than technical skills to be successful in the workplace. Csapo and Featheringham (2005) looked at IS alumni's experience once they entered the work place and found, that alumni view communicating skills as crucial to their future career success. Researchers that have compiled a comprehensive list of skills

required include Mutch (1996), Calitz (1997), Miertschin et al. (2006), and Beard et al. (2007). These skills are aggregated in Table 1 and used as part of our survey instrument.

Table 1. Set of BA skills based on the literature. See Legend below to identify authors.

Skills			1	2	3	4	5	6	7	8	9	10	11	12	Cnt
Soft	1	Ability to learn/lifelong						X				X	X		3
	2	Attention to Details		X			X	X							3
	3	Business Problem Solving						X				X			3
	4	Creativity		X	X			X			X				4
	5	Analytical /Critical / Logical				X		X	X	X	X		X		6
	6	General Problem solving		X				X		X	X	X		X	6
	7	Ability to innovate				X		X			X	X		X	5
	8	Conflict resolution			X			X							2
	9	Teamwork				X		X		X					3
	10	Leadership			X			X	X	X	X	X			6
	11	Self-esteem						X		X					2
	12	Negotiation Skills						X						X	2
	13	Customer-oriented									X	X			2
	14	Initiative/Motivation to work						X		X	X	X			4
	15	Integrity/Honesty/Ethics						X		X		X			3
	16	Professional Ethics						X		X					2
	17	Responsibility						X		X		X			3
	18	Time Management						X						X	2
	19	General Communication		X	X	X	X		X		X				6
	20	Written Communication						X		X		X			3
	21	Oral Communications						X		X		X	X		3
	22	Training others									X				2
	23	Organization Skills							X	X	X				3
Business	24	Domain/industry specific					X		X		X				3
	25	Enterprise/organization				X	X		X		X				4
	26	General Business Skills		X	X				X						3
	27	Accounting						X		X		X	X		3
	28	Business Process Design /Re-						X	X	X		X			5
	29	Contracting and legal				X		X	X						3
	30	Finance						X		X		X			3
	31	Marketing						X		X		X			3
	32	Supply Chain Management						X				X			2
	33	e-Commerce									X		X		1
	34	Management theory and							X						2
	35	Change Management						X							1
	36	Outsourcing Management						X					X	X	2
	37	User/3rd party Relationship						X							2
	38	Working in global or virtual					X	X			X		X		3
	39	Project	X			X	X	X				X		X	7
	40	Project Risk Management						X							1
	41	Business Intelligence						X							1
	42	Business Strategy			X			X				X			3
	43	Project Integration						X				X	X		2
	44	IT Service Management (e.g.											X		1
	45	IT Governance											X		1
	46	Technology Auditing											X		1
	47	Asset and Human Resource											X		1
	48	SDLC/development				X		X	X		X		X		5
Technical	49	Requirement specification												X	2
	50	Analysis	X		X	X		X	X		X		X		6
	51	Design	X					X	X		X				4
	52	Implementation			X		X	X	X		X		X		5
	53	Testing						X				X		X	4
	54	Integration and deployment									X				1
	55	Software quality assurance									X	X			2
	56	CASE tools						X	X		X		X		3
	57	User-Interface Design						X							2
	58	Web-based Application						X					X		1
	59	Programming						X			X	X			4
	60	Applying IT to Business		X				X							2
	61	Customer Relationship						X							1
	62	DSS/GDSS						X							1
	63	Enterprise Resource Planning						X				X			2
	64	Transaction Processing						X					X		1

Skills			1	2	3	4	5	6	7	8	9	10	11	12	Cnt
	65	Data Mining				X		X	X				X		4
	66	Data Warehousing				X		X	X				X		4
	67	Database Administration						X				X		X	4
	68	Electronic Data Interchange						X							1
	69	Online Analytical Processing						X					X		1
	70	Business Continuity Planning						X							2
	71	Operating Systems				X		X	X		X				4
	72	Web Application Servers				X					X	X		X	4
	73	Web Servers						X			X	X	X		3
	74	IT Architecture / Standards				X		X	X		X		X		5
	75	Network administration				X			X		X			X	4
	76	Security						X			X	X	X	X	4
	77	Client-Server Architecture				X			X		X	X			5
	78	Printer/Storage									X				1
	79	Voice/Data Telecom				X			X		X		X		3
Green	80	Sustainability Strategy											X		1
	81	Sustainability Management of													1
	82	Training for sustainability											X		0
	83	Sustainability Assessment											X		1
	84	Sustainability Engineering													2

Job Advertisement Studies

To examine the development of IS job skills from the early 1980s to the late 1990s, Todd, McKeen, and Gallupe (1995) analysed the number of technical, business and systems phrases in 1,234 job advertisements from four leading newspapers. Three types of IS jobs were included: programmers, systems analysts, and IS managers. The results showed that while the programmers' job requirements had changed very little over the 20 year period and the IS managers' job category remained relatively stable; the systems analysts category showed the greatest change.

More recently, however, Liu, Liu, Koong, and Lu (2003) analysed 300 IS job ads posted on job advertising websites such as Monster and Hot Jobs and suggested that the types of skills is changing. Contemporary programming languages and web development skills had increased in importance. Lee and Han (2008) analysed 837 systems analysts job advertisements posted on the website of 230 Fortune 500 organizations between 2001 and 2003. They found that an equal emphasis was required with regards to skills in design, software development, business and social understanding.

Huang et al. (2009) looked at 241 job ads posted in Monster.com between April 2008 and June 2008 and concluded that there is an overall increase of demand of capabilities in business, specifically in project management, financial analysis, and communication skills. Conversely, Kennan et al. (2007) found that in Australia, job advertisements focused more on technical skills. However, communication skills were mentioned in close to 75% of the ads.

Importance of Skills

The reviewed literature hints that there might be a misalignment between university and industry. In particular, there appears to be an emphasis on soft skills by industry, which tend to be treated as generic skills or graduate attributes by universities. For example, the ACS (2011) states the BA "career would appeal to people who:

- have an ability to conceptualise and think creatively;
- have excellent oral and written communication skills;
- effective negotiation and customer management skills;
- sound administrative skills and good analytical and reporting abilities;
- effective time management and personal organisation skills;
- an understanding of user needs and a business outcome approach;
- can articulate visions;
- and a logical approach to problem solving and an investigative and inquisitive mind"[i].

Csapo and Featheringham (2005) estimate that "employees spend more than 75 percent of their time communicating in interpersonal situations, as well as on a variety of other levels within the organization and externally" (p. 1). The researchers suggest that this may be a reason why communication and other soft skills may be seen by recruiters as important.

Generally, research has attempted to identify the skills that are needed by IS graduates overall. In addition, a previous study by Rai, Vatanasakdakul and Aoun (2010) investigated the alignment between which IS skills are perceived as important to accountants and their knowledge levels of such technologies.

It is interesting to note that none of the literature surveyed included green-related skills. In other areas of business these issues and indeed the skills and knowledge required to assist the organisation to be sustainable and maintain levels of corporate social responsibility are a part of the curriculum at undergraduate and postgraduate levels. Other studies, shown on Table 1, suggest the BA is a key communicator, requirements gatherer and solutions architect. The authors believe BAs will potentially play a vital role in decisions around environmental sustainability and will need to be educated in this area. In this study, we wanted to test whether current practitioners held such a view. Table 1 shows the skills and competences and authors that have studied these.

METHODOLOGY

There has been no research that attempts to study the BAs perspective and map the alignment between IS skills importance and knowledge. Therefore, in order to fully understand the skills needed by BAs in Australia, it is important to investigate both knowledge and importance of skills. By identifying a gap between knowledge and its perceived importance, the research will help educators and practitioners to recognize any deficiencies in IT skills needed by BAs. To achieve this objective, we have identified 84 factors based on the set of skills reported in the literature and aligned them with those established by the Skills Framework for the Information Age (SFIA) (2011) guidelines which has been adopted by the ACS for defining employment and educational requirements. Also, informed by the literature, we divided these factors into four categories: Soft, Business, Technical and Green skills. The first three correspond to Aken and Michalisin's (2007) four categories; we have combined their Technical and Programming categories into one.

This study adopts a quantitative survey approach. Preceding the data collection, a pilot survey was carried out to ensure the reliability of the survey instrument. This pilot was conducted by a total of 6 academics, students and business analysts. Their feedback was used to polish the survey and identify any ambiguous skill or trait terminology. The online survey was made available in the month of June 2011. An invitational email was sent to members of the Australian Computer Society (ACS). It was distributed initially to the NSW branch to be further distributed by other states. The survey targeted experienced business analysts, those who had been business analysts, and those that managed business analysts, but it was also open to others working in ICT. The first part of the survey captured biographical data such as gender, age, experience and their relationship to the BA role.

Following the biographical section, the questionnaire listed the many skills under investigation. These skills were gathered from the literature, and covered the questions and categories as per Table 1. The categories were not identified in the survey, and thus participants were not aware which questions belonged to which category. The research aimed at understanding the importance of each of the skills listed. Importance ratings for each of the skills was on a 4-point Likert scale (0= No importance to 3=Very important). This scale was chosen to eliminate the neutral or undecided answers. The survey also aimed at understanding if the respondents perceived that they possessed these skills. Respondents were asked to self-report their attainment of this skill and we have given this the label of 'knowledge' in the tables. For this answer, a 4-point Likert scale was used (0=No skill to 3=Highly skilled).

RESULTS AND DISCUSSION

Respondents

Out of the 144 IT professionals who began to fill out the survey, 108 completed and provided valid responses. Partially completed surveys were not used in the study. The sample size is 108, unless specified otherwise. Respondents were asked about their company's industry, age, gender, and years of work experience. We did not collect data about which state they worked in as this was not considered a variable that would contribute to our understanding. Table 2 shows the profile of the respondents. The Technology, Public and Education and the Financial and Banking sectors represent close to 80% of the industries covered in the survey. Other industries include Manufacturing and Construction, Non-profit, Retail and Distribution. The majority of surveyed IT executives worked in companies of less than 500 employees, closely followed by those that worked in a company whose employees were between 501 and 10,000. The largest population of respondents was between the ages of 30 and 39 (28%), followed by those between 40 and 49 (25%). The majority of the respondents were male (77%) with female (22%). The average number of years of experience was 13.26. Of those surveyed, 27% were currently Business Analysts and 20% worked with Business Analysts. Close to 15% aspired to be Business Analyst and 14% had previously been a Business Analyst.

Table 2. Respondents' Profile (n=108)

Industry	Percent
Information Media and Telecommunications	32
Finance and Management Services	28
Public Sector and Education	19
Other	8
Manufacturing and Construction	6
Non-profit	3
Retail and Distribution	3
Healthcare	2
Utility	1

Age	Percent
18- 24	9
25-29	22
30-39	28
40-49	25
50 and above	12

Sex	Percent
Male	77
Female	22
Undisclosed	1

Company Size	Percent
Less than 500	36
501 to 10,000	32
More than 10,000	22

Years of Experience	Percent
Less than 10	39
11 to 20	39
21 and over	22

Job role	Percent
I am a Business Analyst	27
I work with Business Analysts	20
I want to be a Business Analyst	15
I have been a Business Analyst	14
I manage Business Analysts	9
None of the above	16

Empirical Results

An exploratory analysis was conducted for each variable to test for normality. Both the Kolmogorov- Smirnov and the Shapiro-Wilk showed significance for variables of importance of skills ($p<0.001$) and for variables on perceived attainment of skill ($p<0.001$). Due to the data being non-normal, the Mann-Whitney U test was used.

Perceived Importance and Knowledge

In order to illustrate the gaps between the perceived importance and the perceived knowledge, each of the sets of skills is presented in Figure 1. This figure shows the average score of the perceived importance and knowledge of all skills within each category; Soft skills comprising 23 sub-skills, Business skills comprising 25 sub-skills, Technical comprising 31 sub-skills and Green comprising 5 sub-skills. A further analysis of individual skill items, including the mean values and the ranks of all the skills studied are shown in Table 3. In terms of perceived importance, the Soft skills were perceived to be the most important, with a mean score of 2.55. This is followed by Business skills (1.90), Technical skills (1.86) and Green skills (1.76). In addition, the scores of perceived knowledge also show in a similar manner that Soft skills are the highest (2.45), followed by Business skills (1.76), Technical skills (1.75) and Green skills (1.24).

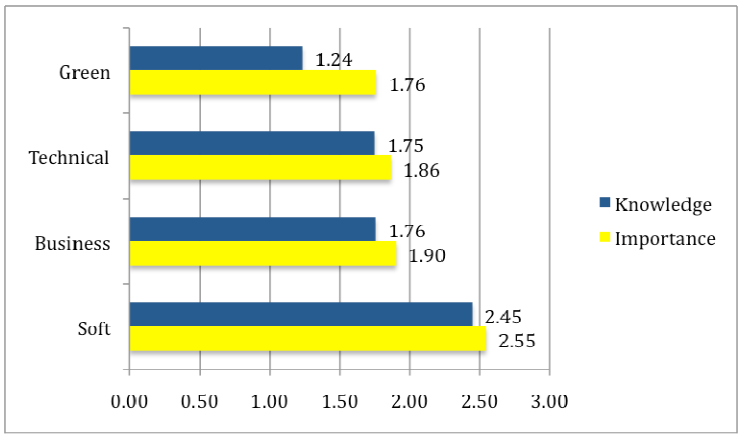

Figure 1. Bar Chart of Importance and Knowledge of Sets of Skills

Moreover, to understand if there is a difference in perception of importance of skills between those that manage BAs, work as BAs or have been BAs and those that are not, a Mann-Whitney test was conducted. Results are shown in Table 3. Results from this test show that for the skill sets of Business, Technical and Green, there is a significant difference between those people directly involved with the BA role and those that are not. No difference can be observed in the knowledge of those that are and those that are not Business Analysts.

Table 3. Mann-Whitney Results of comparison of different job roles

	Soft – Imp.	Soft – Know.	Business – Imp.	Business – Know.	Technical – Imp.	Technical – Know.	Green – Imp.	Green - Know.
Mann-Whitney U	1340.50	1218.50	1095.50	1358.50	1070.50	1255.50	937.50	1244.50
Z	-.723	-1.473	-2.229	-.612	-2.382	-1.245	-3.232	-1.329
P	<.05	<.05	>.05*	<.05	>.05*	<.05	>.001*	<.05

A further analysis of individual skill items including the mean values and the ranks of all the skills studied are shown in Table 4. Soft skills are rated as one of the most important skills to have as a Business Analyst. The five most highly rated skills are: Ability to Learn/Lifelong Learning, Analytical / Critical / Logical Thinking,

Integrity / Honesty/Ethics, Business Problem Solving, and Responsibility. Soft skills are considered to be of such high importance that they comprise the first 15 ranked skills, with one exception the technical skill of Requirement Specification which is ranked 10th.

In terms of perceived knowledge, the respondents rate their knowledge as very high in the Soft skill area. The top 15 rankings of knowledge are in Soft skills with the exception of Applying IT to Business Problems, which is ranked 14th. The first five skills in which respondents perceived themselves to be stronger were: Integrity/Honesty/Ethics, Professional Ethics, Responsibility, Analytical /Critical / Logical Thinking and Customer-oriented Outlook/Service Oriented. In addition, the top three skills considered important to the respondent's careers were (by category): 1. Technical: Requirement Specification, Applying IT to Business Problems, Requirement Elicitation; 2. Business: Stakeholder Relationship Management, Organization Skills, Business Process Implementation; and 3. Green: Sustainability Management, Sustainability Strategy, Training for Sustainability Awareness.

The largest gap between perceived knowledge and importance was found in the Green knowledge category, with all sub-skills constituting the top 5 rankings (average gap 0.52). There was a tie for the highest ranking between Sustainability Engineering and Sustainability Assessment. Third ranking was for Training for Sustainability Awareness, 4th for Sustainability Management of IT and 5th for Sustainability Strategy.

In the Soft skills category the biggest gap was in Business Problem Solving (0.33) followed by Ability to Learn/Lifelong Learning (0.31) and were ranked 9th and 12th respectively. In the Business skills category, Business Planning was ranked 7th overall (gap score 0.36) followed by Stakeholder Relationship Management at 10th (gap score 0.33). In Technical Skills the biggest gap was in Requirements Specification (0.37) and Requirement Elicitation (0.36), ranked 6th and 8th respectively, with Continuity Management ranked 11th.

Some skill gaps were negative, meaning that respondents saw themselves as having the skills but not needing them for the BA role. Skills with small negative gap values, in increasing order, (<0.07) include: General Problem Solving; Integrity/Honesty/Ethics; Self-esteem; Software Implementation; Research Skills; Web Servers; Accounting; and Management Theory and Practice. Other skills even less utilised included (in ascending order); Client-server Architecture; Network Administration; Database Administration; Printer/Storage; and Training others (-0.31).

In summary, to answer research question 1 (i.e. the skills viewed by the industry as important), we have identified the sets of skills that are important to BAs. The results are quite clear that Soft skills such as Ability to Learn and Analysis are perceived as important attributes to BAs. The results are in line with previous research, particularly the Analytical /Critical / Logical Thinking skills which are the skills most frequently identified by recent IS studies, refer to Table 1 (e.g. Doucek and Novotný 2007, Beard et al. 2007 Kwoon-Lee et al. 2008, SFIA 2011). Interestingly, the most important Technical skill is Requirement Specification and is ranked in the top 10 of all skills. In previous research the importance of this Technical skill has been considered less important, instead the emphasis was on System Analysis and Implementation (See Table 1). Nevertheless, this finding is similar to the recent study by Simmons and Simmons (2010) in addressing the importance of the Requirement Specification skill for IS graduates. The authors suggest that academics and curriculum developers should place greater emphasis on the learning and teaching of this skill in the IS curriculum for modern BAs.

Responding to research question 2 (i.e. do they have the knowledge of and competency in these skills), the findings are mixed. BAs perceive that they have higher ability in the Soft skills compared to either the Business, Technical and Green skills. Respondents ranked their knowledge highest in Integrity/Honesty/Ethics and Professional Ethics. This finding is consistent with the previous studies by Aken and Michalisin (2007), Beard et al. (2007) and Litecky et al. (2007). The perceived least knowledgeable areas are the Green skills.

This leads us to consider research question 3 (i.e. the difference between perceptions of importance and knowledge), the biggest gap between IS importance and knowledge is also in the area of Green IS. This has confirmed our findings and recommendation for IS academics to include Green related topics in IS curriculum. Green IT content could replace content relating to those skills that showed a negative gap. Alternatively, educators need to make students more aware of how and where these skills can be applied and also some education of employers is required to make them aware of the untapped skills of their employees. Noteworthy gaps between importance and knowledge can be found within all skill categories including: Requirement Specification, Requirement Elicitation (Technical skills); Business Planning and Stakeholder Relationship Management (Business skills); Business Problem Solving (Soft skills). Recognition of the gap between importance and knowledge in the Requirement Specification and Elicitation area has confirmed our suggestion that we should devote more attention to Requirements in an IS curriculum, perhaps with a unit dedicated to Requirements Engineering. Additionally, BAs are expected to have knowledge in the Business domain, not just in the Technical area, and they are also required to interact with multiple parties as part of the requirements gathering process and design of systems. Hence, to address their demands and reducing these gaps, we encourage IS researchers and academics to include training in the Business Planning, Stakeholder Relationship

Management and Problem Solving skills for future BAs**.**

Table 4. Importance of each skill, participants' level of competency (knowledge) and the gap, by skill type

	Imp.		Know.		Gap	
Soft Skills	μ	R	μ	R	Diff	R
Ability to learn/lifelong learning	2.82	1	2.51	9	0.31	12
Analytical /Critical / Logical	2.81	2	2.63	4	0.18	35
Integrity/Honesty/Ethics	2.76	3	2.78	1	-0.02	72
Bus. Problem Solving	2.75	4	2.42	15	0.33	9
Responsibility	2.73	5	2.72	3	0.01	69
Written Communication	2.73	6	2.55	8	0.18	36
Attention to Details	2.72	7	2.48	11	0.24	25
Professional Ethics	2.72	8	2.72	2	0	70
Teamwork	2.71	9	2.57	6	0.14	43
Oral Communications	2.67	11	2.45	13	0.22	30
Time Management	2.66	12	2.41	16	0.25	23
Initiative to work	2.65	13	2.57	7	0.08	58
Customer-service oriented	2.61	14	2.58	5	0.03	65
Questioning Skills	2.6	15	2.33	19	0.27	19
Working under pressure	2.5	18	2.48	12	0.02	66
General Problem solving	2.48	19	2.49	10	-0.01	71
Conflict resolution	2.45	20	2.16	30	0.29	13
Negotiation Skills	2.39	22	2.21	26	0.18	37
Self-esteem	2.37	25	2.4	17	-0.03	73
Creativity / Innovation	2.31	27	2.3	21	0.01	67
Ability to innovate	2.26	29	2.19	28	0.07	61
Research skills	2.22	32	2.27	23	-0.05	75
Leadership	2.18	36	2.24	24	-0.06	77
Training others	1.97	63	2.28	82	-0.31	84

	Imp.		Know.		Gap	
Business Skills	μ	R	μ	R	Diff	R
Stakeholder Rel. Mgt	2.41	21	2.08	33	0.33	10
Organization Skills	2.39	23	2.35	18	0.04	63
Bus Proc Imp/Reengineering	2.38	24	2.1	31	0.28	18
Domain/industry spec. knowledge	2.35	26	2.24	25	0.11	51
Enterprise/org. specific knowledge	2.28	28	2.19	29	0.09	57
Project Mg/ Plan/Budg/Scheduling	2.26	30	2.06	34	0.2	33
Business Planning	2.22	33	1.86	48	0.36	7
Risk Management	2.2	34	2.02	36	0.18	38
Business Strategy	2.19	35	1.91	45	0.28	17
Change Management	2.18	37	1.95	40	0.23	27
Working in global/ virtual teams	2.17	38	2.02	35	0.15	42
Business Intelligence	2.12	40	1.89	46	0.23	28
Project Integration	2.06	41	1.8	53	0.26	21
IT Governance	2.03	47	1.74	55	0.29	16
IT Service Management	2	49	1.71	57	0.29	14
Mgt theory and practice	1.86	55	1.93	42	-0.07	79
e-Commerce	1.83	59	1.82	50	0.01	68
Asset and HR Management	1.69	68	1.58	63	0.11	52
Supply Chain Management	1.67	69	1.55	66	0.12	48
Contracting and legal	1.63	70	1.51	70	0.12	49
Outsourcing Management	1.62	72	1.52	68	0.1	54
Finance	1.59	73	1.46	74	0.13	45
Technology Auditing	1.59	74	1.52	69	0.07	60
Marketing	1.56	76	1.44	75	0.12	47
Accounting	1.5	79	1.56	64	-0.06	78

	Imp.		Know.		Gap	
Technical Skills	μ	R	μ	R	Diff	R
Requirement specification	2.7	10	2.33	20	0.37	6
Applying IT to Business Problems	2.58	16	2.45	14	0.13	46
Requirement Elicitation	2.56	17	2.2	27	0.36	8
Software Analysis	2.24	31	2.09	32	0.15	41
Customer Rel. Mgt	2.17	39	2	38	0.17	40
User-Interface Design	2.06	42	1.81	52	0.25	24
Software Testing	2.04	43	1.96	39	0.08	59
Integration and deployment	2.04	44	1.95	41	0.09	56
Software quality assurance	2.04	45	1.83	49	0.21	32
IT Architecture / Standards	2.03	46	1.92	44	0.11	53
Continuity Management	2.01	48	1.69	58	0.32	11
Information Security	1.99	50	1.73	56	0.26	22
Software Design	1.98	51	1.88	47	0.1	55
Software Implementation	1.98	52	2.02	37	-0.04	74
Transaction Processing Sys	1.9	54	1.78	54	0.12	50
Data Mining and Analysis	1.86	56	1.62	61	0.24	26
Enterprise Resource Planning	1.85	57	1.64	60	0.21	31
Data Warehousing	1.81	61	1.58	62	0.23	29
Online Analytical Processing	1.77	62	1.48	73	0.29	15
Web-based App. Dev	1.76	64	1.49	72	0.27	20
CASE tools	1.72	66	1.54	67	0.18	39
Client-Server Architecture	1.71	67	1.82	51	-0.11	80
Electronic Data Interchange	1.57	75	1.43	77	0.14	44
Operating Systems	1.56	77	1.93	43	-0.37	85
Database Administration	1.52	78	1.65	59	-0.13	29
Web Application Servers	1.49	80	1.44	76	0.05	62
Voice/Data Telecom	1.4	81	1.36	80	0.04	64
Network administration	1.38	82	1.5	71	-0.12	81
Web Servers	1.37	83	1.42	78	-0.05	76
DSS/GDSS	1.36	84	1.17	84	0.19	34
Printer/Storage	1.31	85	1.56	65	-0.25	83

	Imp.		Know.		Gap	
Green Skills	μ	R	μ	R	Diff	R
Sustainability Mgt of IT	1.84	58	1.32	81	0.52	4
Sustainability Strategy	1.82	60	1.38	79	0.44	5
Training for sust. awareness	1.77	63	1.22	82	0.55	3
Sustainability Engineering	1.74	65	1.18	83	0.56	1
Sustainability Assessment	1.63	71	1.07	85	0.56	1

FUTURE DIRECTIONS & CHALLENGES

The goal of this study is to determine what should be included in a program of study in Australia aimed at Business Information Systems students and with a specific graduate destination in mind, the BA. Hence this

study focussed on Australia with participants being recruited via the ACS and therefore there may be some limitations on the generality of the findings to a broader global context. In particular, the high ranking of Integrity/Honesty/Ethics and Professional Ethics may reflect the Code of Conduct established by the ACS and be a key reason which attracted the individual to become an ACS member, though we noted our findings were similar to other studies. The skills measured in our survey were derived from international frameworks (i.e. SFIA) and other skills found relevant by researchers. However, to provide more internationally validated results, and to determine if differences exist, in the future we may replicate the study drawing on the Association of Information Systems (AIS) or the International Institute of Business Analysis (IIBA). Certainly our study would benefit from increased participant numbers. We observed that earlier questions were (on average) ranked higher than later questions indicating a potential bias. Future studies would need to ensure that the list order is rotated to account for this error Also, we had to discard one-third of our participants because of non-completion which we think may be due to an exhaustion factor given the large number of questions, however this would need to be tested with by researching a smaller subsection of completed and not completed surveys. An option may be to reduce the number of questions by removing those skills that were seen to be unimportant in this study. Finally, we have some concerns whether our participants understand what was meant by sustainability. Perhaps use of the term GreenIT would have been more meaningful. Sustainability is often associated with organisational viability related to competitiveness, not related to preserving the environment. In any case, we believe our findings demonstrate the current lack of agreement, awareness and emphasis in this area that needs to be addressed.

Empowering students with the knowledge, desire and confidence to be drivers of sustainability cannot be done in isolation from the rest of the curriculum. The literature review and survey presented seek to identify what knowledge and skills are required to ensure that they will be successful their careers and responsible citizens. It is important to design a curriculum to allow those identified knowledge and skills to be learned and constructed, progressively via a process of experience and reflection throughout their studies. Gaining a deep appreciation of sustainability and the role the student can play, cannot be done using traditional teaching methods only and may require alternative teaching strategies such as those suggested by the UNESCO (1998) project on Teaching and Learning for a Sustainable Future: experiential learning, storytelling, values education, inquiry learning, appropriate assessment, future problem solving, learning outside the classroom and community problem solving.

CONCLUSIONS

The emphasis on graduate attributes (also known as graduate capabilities and formerly better known as generic skills) for IS graduates, particularly in the role of BAs, is noteworthy. Through the use of an industry based survey, this study identified skills relevant to the current BA role and compared respondents' perception of the importance of and their ability in each of these skills. Eighty four (84) skills were identified and categorised into four skill sets: Technical, Business, Soft and Green skills. Soft skills were perceived to be the most important and the knowledgeable area for BAs, followed by Technical, Business and Green skills. Responding to a public debate on sustainability and green issues, our research confirms that there is currently a lack of awareness of the future role the BA is likely to play in this area. Our research also shows there is a need for training to improve their understanding about these skills and the implications in their careers. Consequently, exploring the area of green IS curriculum could be a potential area for future research.

We suggest that the set of BA skills and knowledge gaps identified in this study can be used by other researchers, teachers, employers and even students to challenge and change current curricula so that Information Systems graduates are better equipped to carry out their pivotal decision making role in a world in which business and technology will continue to change rapidly and a world in need of sustainable solutions.

REFERENCES

Aken, Andrew and Michalisin, M.D., 2007. "The impact of the skills gap on the recruitment of MIS graduates". In *Proceedings of the 2007 ACM SIGMIS CPR conference on Computer personnel research: The global information technology workforce*. SIGMIS CPR '07. New York, NY, USA: ACM, pp. 105–111.

Alexander, S., 1999. "What's in a job title? Less and less, some say". *InfoWorld*, 21(21), p.94.

Australian Computer Society, 2011. Australian Computer Society - Business Analyst. Available at: http://www.acs.org.au/ictcareers/index.cfm?action=showandconID=businessanalyst [Accessed 15-7-2011].

Beard, D., Schwieger, D. and Surendran, K., 2007. "Incorporating soft skills into accounting and MIS curricula". In *Proceedings of the 2007 ACM SIGMIS CPR conference on Computer personnel research: The global information technology workforce*. SIGMIS CPR '07. New York, NY, USA: ACM, pp. 179–185.

Bullen, C., Abraham, T. and Galup, S.D., 2007. "IT Workforce Trends: Implications for Curriculum and Hiring". *Communications of the Association for Information Systems*, 20(1), p.34.

Burns, J., Hopper, T. and Yazdifar, H., 2004. "Management accounting education and training: putting management in and taking accounting out". *Qualitative Research in Accounting & Management*,1(1),pp.1-29.

Calitz, A.P., Watson, M.B. and de V de Kock, G., 1997. "Identification and selection of successful future IT personnel in a changing technological and business environment". In *Proceedings of the 1997 ACM SIGCPR conference on Computer personnel research*. SIGCPR '97. New York, NY, USA: ACM, pp. 31–35.

Csapo, N. and Featheringham, R.D., 2005. "Communication skills used by information systems graduates". *Issues in Information Systems, VI (1)*, pp.311–317.

Doucek, P. and Novotn•, O., 2007. "ICT Education and Requirements for ICT Graduates in the Czech Republic" In *Proceedings of the 2007 Computer Science and IT Education Conference*. pp. 215–31.

Evans, N., 2004. "The need for an analysis body of knowledge (ABOK): Will the real analyst please stand up." *Journal of Issues in Information Science and Information Technology*, 1, pp.314–329.

Fang, X., Lee, S. and Koh, S., 2005. "Transition of knowledge/skills requirement for entry-level IS professionals: An exploratory study based on recruiters' perception" *Journal of Computer Information Systems*, 46(1), p.58.

Ferguson, E., 2005. "Changing qualifications for entry-level application developers". *Journal of Computing Sciences in Colleges*, 20, pp.106–111.

Huang, H. et al., 2009. "Synthesizing IT job skills identified in academic studies, practitioner publications and job ads". In *Proceedings of the special interest group on management information system's 47th annual conference on Computer personnel research*. SIGMIS CPR '09. New York, NY, USA: ACM, pp. 121–128.

Kennan, M.A. et al., 2007. "IS Early Career Job Advertisements: A Content Analysis". *PACIS 2007 Proc*, p.51.

Lee, C.K. and Han, H., 2008. "Analysis of skills requirement for entry-level programmer/analysts in Fortune 500 Corporations". *Journal of Information Systems Education*, 19(1), p.17.

Litecky, C. et al., 2009. "Skills in the MIS job market". *AMCIS 2009 Proceedings*, p.255.

Liu, X. et al., 2003. "An examination of job skills posted on internet databases: Implications for information systems degree programs". *The Journal of Education for Business*, 78(4), pp.191–196.

Medlin, B.D., Dave, D.S. and Vannoy, S.A., 2001. "Students' views of the importance of technical and non-technical skills for successful it professionals". *Journal of Computer Information Systems*, 42(1), pp.65-69.

Miertschin, S.L. et al., 2006. "Developing information technology specializations in growing IS environment areas". In *Proceedings of the 7th conference on Information technology education*. SIGITE '06. New York, NY, USA: ACM, pp. 65–70.

Mutch, A., 1996. "Information management: A challenge for business education". *International Journal of Information Management*, 16(6), pp.445-455.

Rai, P., Vatanasakdakul, S. and Aoun, C., 2010. "Exploring perception of IT skills among Australian accountants: An alignment between importance and knowledge." In *Proceedings of AMCIS 2010* Paper 153.

SFIA Foundation, 2011. Skills Framework for the Information Age. Available at: http://www.sfia.org.uk/ [Accessed July 15, 2011].

Simmons, C.B. and Simmons, L.L., 2010. "Gaps in the computer science curriculum: an exploratory study of industry professionals". *Journal of Computing Sciences in Colleges*, 25, pp.60–65.

Todd, P.A., McKeen, J.D. and Gallupe, R.B., 1995. "The evolution of IS job skills: a content analysis of IS job advertisements from 1970 to 1990". *MIS quarterly*, pp.1–27.

UNESCO, 1998. Educating for a Sustainable Future: A Transdiciplinary Vision for Concerted Action. Available at: http://unesdoc.unesco.org/images/0011/001106/110686eo.pdf [Accessed July 15, 2011].

Vashist, R., McKay, J. and Marshall, P., 2010. "The Roles and Practices of Business Analysts: A Boundary Practice Perspective". *ACIS 2010 Proceedings*. Available at: http://aisel.aisnet.org/acis2010/50.

Weber, J.E., McIntyre, V.J. and Schmidt, M., 2001. "Explaining IS student and IS industry differences in perceptions of skill importance". *Journal of Computer Information Systems*, 41(4), pp.79–83.

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[i] http://www.acs.org.au/ictcareers/index.cfm?action=show&conID=businessanalyst
[ii] Australian, May 28th, 2011, Skills shortage to become critical, http://www.theaustralian.com.au/careers/skills-shortage-to-become-critical/story-fn717l4s-1226063877709, accessed 16-7-11
[iii] KPMG, July 8,2011 http://news.globalcareerlink.com/united-kingdom-news/business-analyst-skills-shortage-continues-as-uk-it-job-market-grows/