2001

E-SKILLS FOR THE IS PROFESSIONAL

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Abstract

A common theme that appears in the literature is that many large organisations around the world are positioning themselves to take advantage of the new internet economy. But what does this "positioning" entail? Is it the purchasing and implementation of the right technology? Is it the redesign of business processes? What skills are needed by these organizations? Recently there has been call in the Australian marketplace for information systems (IS) professionals to possess skills that can handle the move into E-business and E-commerce. In accordance with this we sought the views of information systems professionals employed in the Australian and New Zealand marketplace about the skills mix necessary in the "E" world. The main results of this survey showed that the teamwork and deadlines dominated the business skills whilst knowledge of E-business/commerce models dominated the technical skills. The second phase of this research is to develop a more comprehensive list of business and technical skills.

Keywords

IS Skill Requirements, Research, IS Training & Development

INTRODUCTION

In the age of E-business will a new set of E-skills emerge? At a recent conference, Chris Bennett, Managing Director of SAP Australia in the keynote address quoted the following research

> "*Nearly one third of the IT skills in the market today have only emerged in the last year. Sixty seven of the one hundred and thirty three internet related skills are totally new*".

A crucial question for enterprises will be the management of their staff and their ability to keep "on deck" skilled, capable and motivated staff. The move to E-Business will require all enterprises to manage the broader information chain within the E-business supply chain (Chung, 2000). E-business differs from e-commerce in that it relies on the integration of business processes and the supporting technologies to gain competitive advantage across the extended supply chain (Allen 2001). It is more strategic in nature and requires greater skill sets than e-commerce due to the front-end back-end integration. Enterprises will need to decide if their workforce and or consultants will be able to take this next step in the E-world. A recent survey of 350 senior executives worldwide found that 50% of the respondents considered that the lack of e-business skills of their employees was the main obstacle to their e-business strategy implementation. Training and education in technical, change-management, Business Process Re-engineering (BPR) and inter/intra department communication skills will be crucial for the success of large E-business projects. Just as a viable skills base is important for the organisation to succeed so to for the information systems professional. The IS professional may need to ask several questions; to follow consultancy versus full-time employment, to pursue degree versus certification education, undertake continuous versus just-in-time training? Training as an implementation issue is undergoing stress both from the rapidly developing content being delivered as well as advances in delivery technology.

Large Scale IS Implementations

The implementation of large scale IS software is a major issue facing businesses. The implementation of software is often complex and has a major impact on the business (Trunick, 1999). The complexity of large scale IS implementations have resulted in projects becoming longer and more expensive and often not delivering the expected benefits (Bell 2000; Cameron et al, 1998). Trepper (1999) proposed that if a project team did not possess the required business, interpersonal and technical skills then the chances of project implementation success are negligible. The ISCC'99 report suggested that a contributing factor to the failure of medium to large systems is the failure of universities to prepare their graduates as to the complexity of these systems (Lidke et al 1999). Maxwell (1999) believed that part of the blame can be attributed to the complexity of large scale E-procurement or E-business systems, but much of the blame lies squarely with change management and the confusion, resistance and redundancies that can be created. Additionally consulting firms ignore the internal politics surrounding a large-scale implementation. Few businesses are flexible enough to change their processes

to suite to business models and achieve the implementation on time (Lucas, 2000; Davenport, 1998). Large-scale projects are particularly challenging and require careful planning of time and budget to avoid project disaster. This has resulted in businesses adopting alternative implementation methods (Ross, 1998). The purchase (Davenport, 1998) and implementation of an application is just the beginning of a large investment in IT, and the E-projects are often different to other kinds of projects that the business has implemented.

Information Skill Sets

In 2000 the U.S. Departments of Commerce, Labour and Education released the 21st Century Skills report(Stuart, 1999) which described a vision of the specific competencies that will be required by 21st century workers. These included the ability to understand complex systems including social, organisational and technological systems. Described in this report are the skill sets of the personnel that handle information within organisations. Broadbent et al (1992) and Opie (1994) found that the numbers of users actually utilising data and information are increasing, and proposed that the skills required by information managers included networking and project management on the technical side, and business redesign and quality management on the business side. The 21st Century Skills report (Stuart, 1999) identified basic technical, organisational and company specific skills as being crucial for workers into the 21st Century. The ISCC'99 submission was a collaboration between industry and academia in an endeavour to identify the skills required in developing and supporting large and complex systems. It recommended that the appropriate skills (table 1) could be delivered using an inverted curriculum approach which allowed students to experience and analyse real application systems from the beginning of their course (Lidtke et al 1999).

INDUSTRY-DEFINED ATTRIBUTES OF AN ISCC'99 GRADUATE		
Personal Skills	• Systemic-thinking skills • Problem-solving skills • Critical-thinking skills • Risk-taking skills	• Personal-discipline skills • Persistence • Curiosity
Interpersonal Skills	• Collaborative skills • Conflict resolution skills	• Communication skills (oral, written, listening, and group)
Technical Knowledge and Skills	• Information abstraction, representation, and organization • Enterprise computing architectures and delivery systems • Concepts of information and systems distribution • Human behavior and computer interaction	• Dynamics of change • Process management and systems development • Information Systems domain knowledge • Use of computing tools to apply knowledge

Table 1: Skills of an Industry Ready IT Graduate (Information Systems Centric Curriculum)

Australian Governments have commissioned studies (DSDreport, 2000; QldITpolicy,2000) into the IS skills shortage. The Australian Federal government launched the Innovation Action Plan (IAP) worth A$2.9 billion in January 2001. The plan focussed primarily on the supply side of the Information and Communication Technologies(ICT) skill shortage by developing a range of immigration initiatives that would bolster the number of ICT workers. Locally additional funds will be provided for University places but these will not come on-line until 2005. This reliance on buying-in ICT workers negates arguments on building programs where developing skills shortages are identified and addressed within education and training processes in Australia. The IAP program recognises the emerging skill shortage but specifying where the skills gap exists is less clear. The Digital Planet 2000 report (DP2000) forecasts a global market for ICT of US$3 trillion by 2004. The pace of ICT change will be affected by several factors including; continued expansion of the internet with new "on ramps", the emergence of new ICT markets including China, India and Brazil, and the transformation of business models with the global adoption of E-business based on exchanges, auctions and integrated supply chains. Given the emergence of E-business what skills will be required by the E-worker? The Deloitte (1999) report mapped E-skills into 9 super-types;

- Internet & multimedia,
- Application development,
- Web development tools,
- Operating systems,
- Internetworking,

- LAN administration,
- System software and support,
- Database management,
- Communications installation and maintenance.

Within each of the super-types are sub-types and the report went further and reported the shortages of skills in Australia and then in each state. A report by the New South Wales Government delivered in the Premier's ICT Skill Forum reported the shortages as;

- Java & C++ developers,
- Communications specialists (radio, mobile, telephony, satellite),
- Real time systems developers,
- Advanced Web designers.

Several European countries have developed Government and Industry consortia to explore and map skill shortages. The Skills Framework for the Information Age (SFIA, 2001) is a consortium between the British Government and several large IT vendors like Oracle, Microsoft and IBM. The SFIA had developed a matrix of 71 skill descriptors for the information age. They have also developed E-skills into Business, (e-SkillsNTO, 2000), where a tool is to be developed that will map and match SME's with the E-skills together with training pathways required to achieve business goals.

Skills Matrix Research

There is very little industry-based research into skill set development and progression in the E-business area. The availability of historical data concerning E-Business in this emerging area is limited. This lack of historical data is even more critical when applied to Australian experiences. The collection of such information could assist in project management of E-projects and system implementations and accordingly prevent some of the documented pitfalls that have plagued previous projects.

METHODOLOGY

The primary objective of the study was to survey a range of information system professionals and seek responses to issues including the importance of a range of both business and technical skills and the relevance that these skill sets have upon their own professional practice. The first part of the study as presented in this paper will provide an analysis of the views of 23 IS professionals. This analysis will then be developed into structured questions for use in the second stage of this project.

Research Methodology

The best method for gathering data was determined to be a survey of those information systems professionals listed as working within a cross-section of the Australian marketplace. A leading Australian vendor of enterprise resource planning systems provided two customer data files. The first was the customer file, this contained client name, contact, implementation date and type. The second file contained name, go-live date and module information. The two files were combined into a database. This datastore provided contact details of about 500 information systems professionals that have worked on large Information systems from 1995. The initial survey instrument was developed based on the fields that were identified in the literature and used email as the delivery platform. Several studies (Dillman, 1998; Comley, 1996; Mehta, 1995) have compared email versus mail information collection methods and have that email surveys compared favourably with postal methods in the areas of cost, speed, quality and response rate. The use of an email directing the respondent to a web site was also investigated but was thought to introduce an additional step in the sampling process. The survey was sent to a random sample of 200 IS professionals with one follow-up reminder. It was necessary to preen the email address book to remove and amend email that had bounced back.

RESULTS

Survey Instrument

The survey instrument had 30 questions covering three areas, demographics, IS history and business & technical skills importance. Both open and closed questions were used along with Yes/No and five point Likert scale responses. Any response was cross-referenced with the original email master listing allowing organisational type data to be incorporated. Business issues were derived from the IDC (1999) report and included project management, client skills, personal skills, communication skills and internal business skills. Technical issues derived from the IDC report included E-systems development, modelling and middleware systems skills. Both

business and technical skills used Likert rating for importance as well as importance to the current and future prospects of the IS professional.

Responses

The original email listing contained a random sample of 200 potential respondents from the master file of 387 Australian and New Zealand organisations. It contained multiple email addresses from the organisations and was a historical listing containing information up to 4 years old. A number of emails were undeliverable due to members of the cohort moving positions, having incorrect email addresses, having changed email addresses or automatic out-of-office responses. The overall response rate once removing the undeliverable addresses was 20%. The response rate is presented in Table 2.

Issue	Number	Undeliverable	Answered	Rate
First e-survey	200	35	19	
Second e-survey	149	27	8	
Total	138	62	27	27/138=20%

Table 2: Response Rate %

Demographics

Responses were received from 27 IS professionals and the data were analysed to present position, company type, company size and IS history. Responses for the whole cohort are presented in Table 3. Respondents were predominantly high in the organisational structure being either an IS or business manager. They were mainly from large organisations and the organisations spanned most sectors of the Australian marketplace.

Position	No	Org type	No	Org Size Revenue	No
IS Managers	11	Public Admin	6	Large(emp>1000)	17
IS Consultants	3	Retail/Whole	1	Med-Large(500-1000)	5
Business Managers	3	Mining	2	Medium(50-500)	5
IS Admin	8	Utility	1	Small(<50)	0
IS Support	2	Finances	0		
		Manufacturing	6		
		IT Services	4		
		Transport	3		
		Comm Services	4		

Table 3: Demographic Breakdown of respondents (N=27)

IS History

Respondents indicated the extent of work time spent on IS systems by selecting a value from 1 to 5, with 1 representing 1-20% and a 5 representing 81-100% of work time. Table 3 shows the extent that the respondents were IS occupied as well as the reporting structure they operate within. Respondents were heavily occupied with IS workload and were either 1 or 2 levels from the CEO. There was a significant number of respondents that were at the very top of the IS structure within large Australian organisations. Whilst the sample size is small the position of the respondents shows them to be IS decision makers within major Australian organisations.

IS Workload	No	Report To	No
1-20%	1	CEO	8
21-40%	0	CFO	1
41-60%	1	IS Manager	14
61-80%	5	Bus Manager	4
81-100%	20		

Table 4: Respondent IS History (N=27)

Business Skills: Importance to E-business/E-commerce

Respondents indicated the extent and rating of differing business skills by selecting a value from 1 to 5, with one representing Very Low and a five representing Very High. Table 5 shows the means and standard deviations for the importance of Business skill of the cohort.

Skills	Mean Rating (μ)	Standard Deviation (σ)	Ranking	Respondent Level (μ)
Deliver Business Solutions	4.3	0.7	2	3.1
Project Management	4.3	1.1	4	3.2
Client Negotiating	3.9	1.1	8	3.3
Meet Deadlines	4.3	0.8	3	4.0
Client Consulting	4.1	0.9	6	3.6
Team Work	4.6	0.9	1	4.5
Change Management	4.2	1.0	5	3.9
Personal Communications	4.1	1.0	7	3.4
Sales & Marketing Skills	2.8	1.5	10	2.4
Internal Business Politics	3.4	1.2	9	3.3

Table 5: Business Skills Importance to E-bus/E-comm (N=27)

Team-work scored the highest approval with a very tight standard deviation. Solutions, deadlines and projects scored equal second followed by change management. The least favoured business skill was the need to have sales and marketing skills. This skill also showed a high standard deviation. A knowledge of business politics was not favoured being ranked ninth out of ten. The respondents rated their current level of skill in personal communications and project management considerably below the importance level to industry.

Technical Skills: Importance to E-business/E-commerce

Respondents indicated the extent and rating of differing business skills by selecting a value from 1 to 5, with one representing Very Low and a five representing Very High. Table 7 shows the means and standard deviations for the importance of technical skill of the cohort.

Skills	Mean Rating (μ)	Standard Deviation (σ)	Ranking	Respondent Level (μ)
Java	3.2	1.2	9	1.6
XML	3.6	1.2	8	1.8
ASP	2.9	1.1	11	1.8
OOE	3.0	1.4	10	2.0
Web Design	4.0	1.2	3	2.4
Security Firewalls	4.1	1.1	1	2.7
SQL/Oracle	3.7	1.1	6	3.3
Software Engineering	4.0	1.0	2	2.2
E-bus/E-comm models	3.9	1.2	4	3.9
Network Skills	3.7	0.9	5	3.0
Process Modelling	3.6	1.2	7	2.9

Table 7: Technical Skills Importance to E-bus/E-comm (N=27)

The technical skills were grouped into two clusters. Security, software engineering, Web design and knowledge of E-models all recorded a high mean rating. ASP and object engineering recorded average mean rating. Knowledge of E-models was the only technical skill where respondents felt their current knowledge matched their rating of the importance to the industry. Every other technical skill was rated lower.

DISCUSSION

E-skills? - The Balance

There has been a surfeit of reports from the USA, UK, European Council and every Government here in Australia pointing to the current shortage of IS skilled professionals. Many countries, Australia included, are relaxing immigration quotas to get a better share of the pool of IS staff globally. This is reflected in a recent IT&T report (Deloitte, 1999) predicting that Australian will rely upon recruitment or poaching of skilled professionals rather than developing in-house trained professional. The report indicates that this will lead to increased "churning" and an escalation of the price of IS professionals. Reports from the US (Stuart, 1999) and the European Commission (European Council, 1998) all point to the need to improve and expedite training of IS professionals to pave the way into the emerging E-Business marketplace. So there is an accepted shortage of IS

professionals, the question is what skills are in short supply and how do we get them. The main source of skill shortages is the changing business process mix that organisations are seeking to exploit for advantage. It seems that any system that has an "E" placed in front of it; e-procurement, e-supply chain, e-business, e-commerce and even the newer m-commerce are driving the development of new skills. Never before have new skills appeared at such a rate. Just as the newer e-skills are driving change in recruitment what of the business skills that organisations require. Are these "soft" skills also changing in tune with the change in the move to E-systems? This is reinforced in a Forrester report (Overby et al 2000) that concluded companies should identify employees by their behaviour rather than focussing on their hard skills. What they refer to as identifying key players by their "behavioural DNA". They further recommended that these "soft" skills should be fostered within the organisation.

This study was a starting point and hopefully will provide a foundation for other researchers as there are still many issues that need to be addressed. Is the acceleration of the metabolism of Business and the resultant information systems having an effect on the business skills of IS professionals? Does the reality of the IS skills mix match the career path of IS professionals. Can we definitively state the business and technical skills mix that IS professionals require. Who will supply these skills? Will Tertiary institutions fill a role here and what role will virtual training be able to take here? How will the technical, inter-personal and business skills of IS professionals change into whatever comes after E-business? The second phase of this research will seek to develop a mechanism for better defining the required skills mix of IS professionals. Selected IS professionals will be interviewed to ascertain how they expect to fill their e-business skill gaps.

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