Effective Organisations need Effective IS Graduates

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Abstract
This research exercise was undertaken in response to concerns relating to the relevance of the current Information Systems (IS) curriculum and the drive to change IS courses to address those concerns. As part of that exercise IS skill and knowledge requirements have been identified using a variety of instruments and techniques from four perspectives, academia, market, competitor and research. The findings from each perspective have been compared and evaluated. The results reveal similarities between the requirements of competitors and academia and significant differences between the market and the academia. The findings from the research source complement the findings from all three sources.

Keywords: IS Graduates**,** Curriculum Development, Industry, IS Knowledge, IS Skills

Introduction

According to the LTSN (2003), "Producing employable graduates is becoming more complex and more important. Graduate numbers are expanding faster than the market for traditional graduate jobs and graduates are more diverse in age, social background and motivation." This view is supported by Benbasat & Zmud (2003) who report on the tightening of the IT job market and question the viability, contributions and lack of identity of the IS discipline. Against this backdrop maintaining an effective, up to date curriculum in IS at University level is reported by, Becker et al, (1994), Richards & Pelley, (1994) and Schenk et al (1998) to be a major challenge. To overcome this challenge, Kim & Surendran (2002) subscribe to the need for a systematic approach in the design of a curriculum for new or emerging occupations associated with the IS domain such as Information Security Management and the need regularly to update educational content. Johnson et al (2002) suggest that in preparation for teaching, the faculty members may well ask, "What do I include in my course syllabus and does the curriculum meet stakeholder needs?"

The objectives of this study are therefore threefold:

1. To establish mechanisms for the determination of course content

2. To evaluate the effectiveness of identifying key themes in terms of currency and the timescales involved in for the fact findings technique.
3. To develop a framework for the development of future IS courses to provide academic course developers with a template for the rapid development of leading edge courses.

Initiatives have been undertaken to address concerns over the composition of the IS curriculum for example, FRISCO (Framework of Information System Concepts)[1], 'IS 97' (Davis et al, 1997) and 'IS2002' (Gorgone et al, 2002), however some aspects, particularly the 'IS 97' initiative, are described by Johnson et al (2002) as complex and difficult to understand.

Several studies have also been conducted to examine the skills and knowledge required of specific IS job roles and reported on their experiences of abstracting information from one or more sources. For example, Kim and Choi (2002) in their study focus on two specific IS professions in the field, Information Systems Managers and Information Security Systems Developers and how requirements as suggested by information security professionals may map to those professions. Specific professions were also the focus of a study by Kim & Surendran (2002). Their technique involved an examination of the relationship between key words as taken from job descriptors and educational content. Similarly, in a study by Todd et al (1995) a content analysis was performed on IS job advertisements from two US and two Canadian newspapers to establish the skill requirements for programmers, systems analysts and IS managers. Similar techniques were also used by Evans (2004) in a study aimed to examine the attributes of a business and systems analyst. However, the results from the content analysis were then used to inform a questionnaire. Lee et al (2002) in their study aimed to gauge the perception of both IS practitioners and academics with regard to the IS knowledge/skills required by an IS professional in their daily jobs.

To aid the curriculum design process Logan (2002) suggests course offerings are reviewed by practitioners. Comparisons are then made between existing University programmes and the content of programmes from private certifying organisations and proprietary sources, including vendors of products. Similarly, for the development of an internet security course, Armstrong and Jayaratna (2002) examined a range of similar international higher education programmes. Cockcroft (2002) developed their course to compliment their teaching and research strengths, which were IS control and audit. The course was then reviewed in terms of existing literature, the common BOK established for security professionals and the job market into which the students would be expected to graduate. Equally, Koong and Lui (2002) based their study on the IT requirements of organisations

It has been further agued that research could produce knowledge that today's IS professional can apply in their daily work (Benbasat and Zmud, 1999). Several

[1] The FRISCO task group was established in 1988. Some ten years on a report was published by Falkenberg et al (1998), this report has subsequently been updated with a draft report in January 2001 edited by Verrijn-Stuart.

researchers, for example, Senn (1998), Benbasat and Zmud (2003), Breu and Peppard (2003) and Fitzgerald (2003), have examined the relationship between research and practice. They debated the view that practice often precedes theory in the IS field, who the beneficiaries of research output might be and the adoption of methods that might in some instances influence what practitioners do. If research could and indeed should influence practice, future trends and hence IS skill and knowledge requirements may be determined by an examination of indicative articles in publications, calls for articles, special issues and conferences. Publications and conferences do however differ in range of content and quality. For example, conferences can be found on topics such as Security (Computer Security Conference (CSI)[2] and those that address the broader IS domain, which could include a security theme. Quality is an important benchmark for publications and conferences and efforts have been made to classify the standing of a particular journal or conference, however, this has not been a prerequisite of this particular exercise.

In summary the curriculum developers were mainly informed by practitioner views, academic views, the market and competition to support their ambition to develop relevant IS programmes. Research although not used by the developers has also been identified a further source of curriculum content.

Methodology

With cognisance of the research methodologies used in previous studies the initial investigation will therefore comprise four perspectives, academia, market (to include the practitioner views), competitor and research. The respective instruments to support the views of each of those perspectives will include; 1. IS gurus and academics, 2. IS employers and IS adverts, 3. IS courses and associated content, 4. IS journal and conference calls. The main techniques to identify the skill and knowledge requirements comprised questionnaires and content analysis. However, to generate a set of ideas the first stage of the research exercise included an email to leading IS gurus, a focus group session and a seminar to bring together IS academics from a range of both old and new UK universities. (See figure 1 for an overview of the hybrid methodology). The following will discuss the individual techniques in more detail.

Techniques

To provide a starting point stage one involved an email circulated to leading IS gurus from institutions throughout the United Kingdom (UK) asking them for their views on the future direction of the IS curriculum. The resultant abstraction of topics was further complemented by the compilation of a set of views derived from a focus group session. The focus group comprised a set of nine academics from the IS subject group in the School of Information Management (IM). Focus groups were used to assist in the creation of a set of proposals for course content and as Robson (2000) suggests generate ideas about a new product (course). To gauge the views of a wider IS academic audience a seminar was organised and subsequently executed, specific to the discussion of "Visioning the future, IS Curriculum Development".

[2] CSI – Conference programme can be found at: http://www.gocsi.com/annual/30th/session

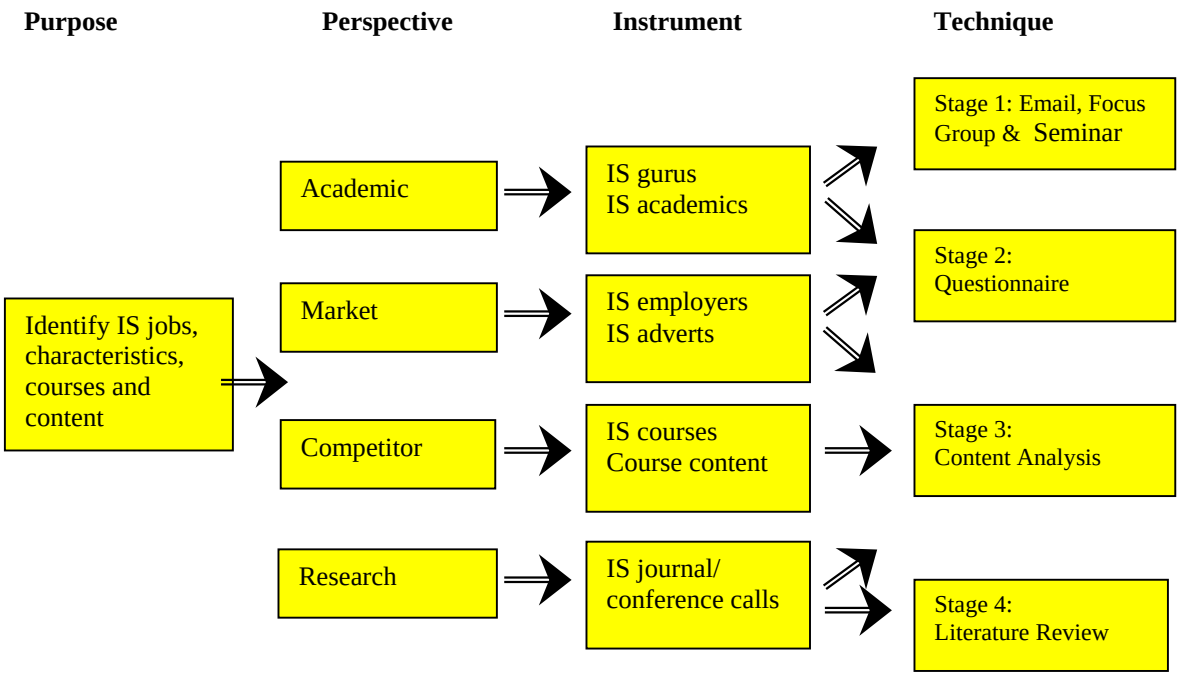

Figure 1. Hybrid Methodology

The second stage of this research exercise involved the development and distribution of two questionnaires, one to academia and one to IS employers (Howell, 2005). This technique enabled the systematic collection of information (Thomas, 1996), from a large number of anonymous respondents (Birley & Moreland, 1998), with no interviewer bias and relatively straightforward analysis (Gillham, 2002). To support the development of reliable and valid questions the questionnaire for both populations was developed with reference to a number of studies relating to IS curriculum, for example, Lee et al (1995), Srinivasan, Wright & Guan (1999), Doke (1999), Gorgone et al (2002), Mathiassen & Purao (2002), Davis (2003) and Liu et al (2003).

Cognisance of key text in the field for example, Ashley & Padgett (1998), Wilkins & Noll (2000), Benson & Standing (2002), Lee et al (2002) and Yager, Schrange & Berry (2002) supplemented the questionnaire development process. The questionnaire comprised seven main sections (or clusters); Interpersonal and management skills, organisational knowledge, systems development knowledge, specialist knowledge, technical knowledge (software suites and groupware), web applications and databases. Each of the clusters comprised a range of associated attributes and respondents were asked to rank each attributes on a five point Likert (1932) scale from "extremely important" to "not important". The respondents were also asked to specify any programming languages they felt would be important to an IS graduate and for any additional comments.

The questionnaire to be completed by the IS academics and industry contained the same questions with the exception of some initial profiling information. For example, the

industry questionnaire sought to establish the industry sector, the number of IS or Information Technology (IT) professionals employed by the respondent organisation, the respondents job title and the job titles of the IS or IT professionals employed by the organisation.

The questionnaire to be completed by IS academics was distributed in paper based form to 60 attendees of the seminar, resulting in 19 (32%) usable responses. The questionnaire to be completed by industry was distributed by post to 276 organisations in the Yorkshire region of the UK, resulting in 54 (20%) usable responses.

The responses from the questionnaires were input into SPSS with a value range from 1 for "extremely important" to 5 for "not important". Mean values have been calculated and ranked in order of importance within each cluster for each set of respondents and comparisons made between the views of industry and academic within those clusters and overall. For interpretation purposes the lower the value the more important the respondents deem the attribute or skill to be.

To further identify skill and knowledge requirements of the market the third stage involved a content analysis of job adverts as taken from graduate and IT recruitment web sites (see table 5 for a summary). Content analysis was used to identify possible patterns and themes (Leedy & Ormerod, 2001). The technique involved an examination of text and the counting of a mentioning as described by Bailey et at (1995). To determine the direction of competing institutions this stage also involved an examination of the type and content of IS courses. The technique comprised a search of the UCAS website[3] for courses which include the words "Information" or "Systems" in their title. To establish current and more importantly future IS issues a further element of the third stage involved a content analysis of conference calls. As suggested by Birley & Moreland (1998) the results from all three content analysis exercises have been tabulated and analysed for frequencies. As a further complementary technique the final/fourth stage involved a literature review.

Findings

This section will first discuss the findings from each of the four stages. This will be followed by an evaluation of the techniques used in terms of effectiveness and the timescales involved in the fact finding exercise. .

Stage one

Stage one comprised three techniques as follows, email, focus group and seminar. The email sent to leading members of the IS academic community provided a valuable set of responses. The following is an abstraction of those responses:

- Needs to focus more on business needs. …there is an important role in managing systems development, project management and managing sourcing.

[3] UCAS search – http://search.ucas.co.uk

- Managerial competence in the use of IS/IT – knowing how to decide what IS systems are needed. E-Commerce. IS variants of MBA programmes. Undergrad a good future for joint degrees (Accounting with IS is clearly going to be a crowd puller)
- Systems can only be developed in the 'context' in which they are intended to be exploited (due to culture, management, politics). Environments such as the NHS, local government, financial services)
- IS Practitioners should have a range of skills including some technical and some managerial…the modern IS practitioner should have specialisms e.g. management, education or criminology.
- Three components; an understanding or organisations; personal and interpersonal skills; the ability to learn and update technology skills.

Generally, the views of the leading IS academics is a move towards some form of specialism be it criminology and IS or IS in the NHS. They also supported the need for Interpersonal and Management skills. It should also be noted that respondents indicated the need to align IS courses to business needs.

The focus group discussed how courses used to be designed and how the emphasis once again was now being placed on streams, e.g. systems, business and IT. The group then agreed six existing themes, which should be included in the systems stream as follows:

- Systems concepts/theory
- IS development/information technology
- Business and management
- Society/environment
- Behaviour
- Communication

Additional areas discussed were critical thinking, sense making and how the School is moving towards newer areas like information society, for example, the impact of technology on society and vice versa, ethics. The group then considered the principle of an IS core with a sub-theme, for example, IS and Health Care, Marketing, Society, Security, Politics, Hospitality, Finance, QA, Mobile Computing or E-Business.

The seminar session comprised five presentations and a plenary session and generated a further complimentary set ideas and themes to take forward. The following is an abstraction of those ideas and themes.

- Course subject area: Information Warfare or Security.
- Creativity, innovation, people who could think out of the box is a recipe for employability.
- Over time the emphasis of IS has shifted and there is a need more options
- Modularization is over and a need to bridge the industry academic gap
- Questioned the lack of innovation in IS
- Standardise or diversify (sort out the core and option mix)

- Is IS and appropriate undergraduate subject
- Influence on other subjects
- Clarify what an IS person is.
- More than "skills" – knowledge based.

The session also provided an opportunity to distribute the questionnaire to IS academics. (The questionnaire results can be found in a later section)

Stage Two

Stage two comprised the distribution of a questionnaire to IS academics and IS employers (industry). The following presents a summary of the results from the respondents of those questionnaires (Howell, 2005).

The industry questionnaire first sought to establish the sector, see table 1 for a summary. Therefore, it is probably to be expected that the majority, 32 (60%) employed less than 25 IT/IS professional and the majority 40 (74%) of respondents employ Technical/End Use Support. It is also of no surprise that the respondents reported Network Engineers and Database Administrators in joint second place with 35 (65%) of respondents employing IS/IT professional in those roles. However, a significant number of respondents employ Computer Programmers, Database Designer/Developers and Project Managers.

	Count	%
Manufacturing	16	30%
Other	8	15%
Wholesale & Retail Trade	7	13%
Information Technology	6	11%
Education	5	9%
Health & Social Work	4	7%
Construction	2	4%
Electrical/Electronics	2	4%
Financial/Banking	2	4%
Electricity, Gas and Water Supply	1	2%
Transport, Storage & Communication	1	2%

Table 1: Industry sector

The first main cluster of the questionnaire asked both sets of respondents to rank the importance of a range of interpersonal and management skills. Generally the academic and industry respondents indicated the attributes to be "very important" and many similarities were found between the views in relation to the importance of a given attribute. Both sets of respondents also agreed that overall interpersonal and management skills are the most important clusters of attributes for IS graduates (see table 2 for a summary).

	Academic Respondents		Industry Respondents	
Interpersonal and Management Skills	**Mean**	**Rank by Mean**	**Mean**	**Rank by mean**
Analytical Skills	1.60	**1**	2.04	**3**
Oral Communications	1.85	**2**	1.91	**1**
Written Communications	2.00	**3**	2.26	**4**
Collaborative Skills	2.05	**4**	2.39	**5**
Teamwork	2.05	**5**	2.00	**2**
Organisational Skills	2.10	**6**	2.47	**6**
Project Management	2.35	**7**	3.02	**10**
Presentation Skills	2.40	**8**	2.83	**7**
Setting Goals	2.80	**9**	2.87	**8**
Formulate Strategies	2.90	**10**	3.11	**11**
Supervisory Skills	3.23	**11**	3.45	**12**
Ability to Teach Others	3.55	**12**	3.00	**9**

Table 2: Interpersonal and management skills

The second part of the questionnaire asked the respondents to rank the importance of a range of organisational knowledge attributes. Overall, both sets of respondents found these to be less important than the previous cluster. However, academic respondents viewed business functions and environment, ethical, legal and privacy issues as "very important". Noteworthy differences of opinion include, "ethical issues", which industry respondents ranked with considerably less importance in comparison to the academic respondents.

The third section of the questionnaire asked the respondents to rank the importance of a range of systems development knowledge attributes. In the majority of cases the academic respondents found these to be "very important". Again, the industry respondents viewed the attributes with less importance with most seen as "somewhat important" to "important". Of major interest is the very different view the two sets of respondents placed on Entity Relationship (E-R) modelling, prepare and conduct interviews, Human Computer Interaction (HCI) and Computer Aided Software Engineering (CASE) tools. All of which were generally seen by the academic respondents to be "very important" in contrast to the industry view of "somewhat important" (see table 3 for a summary).

	Academic Respondents		Industry Respondents	
Systems Development knowledge	***Mean***	**Rank by mean**	***Mean***	**Rank by mean**
Define Scope & Objectives of Projects	1.85	**1**	2.74	**2**
Evaluation Feasibility	1.90	**2**	2.94	**4**
E-R Modelling	1.95	**3**	3.58	**15**
Systems Development Lifecycle	2.10	**4**	3.09	**5**
Prepare & Conduct Interviews	2.25	**5**	4.79	**21**
Structured Analysis & Design	2.35	**6**	3.19	**7**
Systems Implementation & Testing Strategies	2.35	**7**	2.66	**1**
Data Flow Diagrams	2.45	**8**	3.17	**6**
Data Dictionary	2.50	**9**	3.50	**12**
Prototyping	2.50	**10**	3.32	**8**
HCI	2.58	**11**	3.79	**17**
CASE Tools	2.60	**12**	3.96	**19**
Systems Operations & Maintenance	2.63	**13**	2.85	**3**
RAD	2.65	**14**	3.58	**16**
DSDM	2.85	**15**	3.79	**18**
OO Methods	2.90	**16**	3.48	**11**
Decision Tree/Table	3.00	**17**	3.38	**10**
Legacy Systems	3.10	**18**	3.58	**14**
Structure Charts	3.10	**19**	3.53	**13**
RUP	3.15	**20**	4.08	**20**
Structured English	3.15	**21**	3.36	**9**

Table 3: Systems Development Knowledge

Conversely industry respondents viewed systems implementation and testing strategies as the most important attribute in contrast to the academic view of 7th place. These differences could be due to the profile of the industry respondents.

The fourth section of the questionnaire asked the respondents to rank the importance of a range of specialist knowledge attributes. Academic respondents viewed the attributes with less importance than systems development knowledge and again industry respondents tended to view the attributes with less importance than the academic respondents. However, this category of the questionnaire reflected less disparity between the views than the previous cluster (systems development knowledge). Of interest in this cluster is the lack of importance expressed by some industry respondents to aspects which the academic respondents view with significantly more importance, for example, Customer Resource Planning (CRP), Enterprise Resource Planning (ERP) and Decision Support Systems (DSS). Conversely, disaster prevention/recovery, quality assurance and

risk management were viewed by the industry respondents with significantly more importance. Significant rank differences include the higher level of importance placed by industry respondents on disaster prevention/recover and quality assurance (see table 4.for a summary).

	Academic Respondents		Industry Respondents	
Specialist Knowledge	***Mean***	**Rank by mean**	***Mean***	**Rank by mean**
Information Security	2.55	**1**	2.92	**1**
CRP	2.60	**2**	3.58	**8**
ERP	2.60	**3**	3.54	**7**
DSS	2.80	**4**	3.79	**11**
Knowledge Management (KM)	2.80	**5**	3.58	**9**
Data Mining/ Warehousing	2.85	**6**	3.43	**6**
Disaster Prevention/ Recovery	2.95	**7**	3.06	**2**
Risk Management	2.95	**8**	3.31	**4**
Telecommunications	3.00	**9**	3.33	**5**
Multimedia Design	3.10	**10**	4.00	**15**
Quality Assurance	3.11	**11**	3.13	**3**
Wireless	3.20	**12**	3.71	**10**
Statistics	3.30	**13**	3.80	**12**
E-Learning	3.55	**14**	3.83	**14**
Encryption	3.60	**15**	3.91	**13**
Artificial Intelligence	3.65	**16**	4.35	**16**

Table 4: Specialist Knowledge

The fifth category of the questionnaire asked the respondents to rank the importance of a range of technical knowledge attributes. Unsurprisingly Microsoft Office was found by both academic and industry respondent to be "extremely important". Surprisingly the only major difference in opinion between the two sets of respondents related to the Macromedia Dreamweaver attribute, with the majority of industry respondents, 36 (68%) viewing the attribute as "somewhat important" to "not important" in contrast to the majority of academic respondents, 10 (59%) viewing the same attribute as "important".

The sixth section of the questionnaire asked the respondents to rank the importance of a range of web development attributes. Academic respondents viewed all the attributes within the cluster as "somewhat important" to "important". The industry respondents again viewed the attributes with less importance than the academics with the majority of attributes viewed as "not important". However, this cluster revealed the highest level of agreement of the order of importance. Overall web development was viewed by both sets of respondents as one of the least important clusters.

The penultimate question on the questionnaire asked the respondents to rank the importance of a range of database applications. Academic respondents found Access to be the most important application overall, Oracle a close second and SQL server and My SQL close behind. Again, the industry respondents viewed the attributes with less importance than the academic respondents, with significantly higher proportions viewing the attributes as "not important". Oracle received very mixed results with 19 (35%) of industry respondents viewing the attribute as "not important" and 12 (22%) as "very important".

The final question on the questionnaire asked the respondent to specify any programming languages they felt to be important for an IS graduate to possess. Industry respondents reported Java and C++ to be the preferred programming language. Generally, academics viewed programming with less importance and provided the following explanations, "lower level languages are more appropriate for computer science" and "any just the notion of what programming is."

The questionnaire also provided an opportunity for both academic and industry respondents to add further comments. The following comment from an industry respondent suggests more pragmatic requirements, "Main attributes for graduate: - Reliable – turns up for work consistently; Discreet – can handle office situations; Realistic – is in the 'real world'; Trustworthy – and leave him to get on with job unsupervised"

Stage three

Stage three comprised a content analysis of IS job adverts, IS courses and IS conference calls. To identify IS jobs in the UK and the Yorkshire region of the UK, a job search associated to the search string "Information" and "Systems" was performed. The search revealed a total of 2,464 UK jobs and 221 regional jobs on one given day from five of the main job search sites (see table 5).

Organisation	Location	Search	No of jobs UK	No of jobs Yorkshire
CW Jobs	www.cwjobs.co.uk	Information Systems	496	22
Graduate Link – jobs in Yorkshire and Humberside	www.graudatelink.com	Computing	-	39
Jobsite	www.jobsite.co.uk	Information Systems	1086	63
Workthing	www.workthing.com	Information Technology	872	87
Graduate Recruitment Bureau	www.grb.com	Information Technology	10	-

Table 5: IS job search results

Based on the findings from the Yorkshire region it was possible to generate a list of job titles and perform a content analysis of the job adverts typified by those titles. (See table 6 for an example of typical IS job titles and skills required)

Graduate Link	
ASP Developer	Dreamweaver Ultra Dev, Access, SQL, Photoshop, Flash, ASP shopping Carts
IT Graduate	Flash, Java
Web Database Programmer	Relational Database Schemas, Advanced SQL within ASP code, Coldfusion, .NET.
Programmer/Developer	Visual Studio 6.0, .NET, SQL Server 2000, WinCE
Application Developer	PHP, MySQL, Linux/Unix, Apache, Perl, HTML
Jobsite	
Quality Systems Administrator	Excel, Word, Access, PowerPoint
Lead Systems Analyst	Systems Development life cycle, solid systems analysis, design and testing, MS SQL, managing a team, CASE tools, Visual Basic.
CW jobs	
Citrix Administration and operations support	Qualified as CCEA, Citrix Meta XP Presentation Server, Citrix NFuse/Web Interface, Citrix Security Gateway, Team work.
Senior Systems Tester	IS concepts, leading teams, Test Director, WinRunner, SSADM, RUP
Java Developer	Java/J2EE to develop CRM, MIS systems
GIS Technician	GIS, Relational Database Design, Windows 98, Microsoft Office Prof, Microsoft Access.
Business Analyst	Full development life-cycle, ASP, VBScript, JavaScript/HTML, Transact SQL, MSSQL Server 2000, ODBC, ADO
Embedded Systems	Embedded software/hardware – PIC & 80C51, DSP (TMS320) & 16/32 bit Windows development.
Oracle Senior Systems Analyst	SQL, PL/SQL, Oracle Development tools – Forms 4.5-6i, Oracle Designer or Rational Rose CASE tools.
Workthing	
IS Developer	Visual Basic, SQL Server 2000 and Visual Studio
NHS Information Analyst	SQL Server, Oracle database, data migration techniques, query and reporting skills
Intranet Portal Support	Websphere, intranet/internet, organised, good with people, good understanding of how technology fits together
Business Analyst	Web publishing using VB and SQL

Table 6: Content analysis of IS job search

The content analysis revealed a need for systems development knowledge for example structured analysis and design, CASE tools and RUP, technical knowledge for example Microsoft office, HTML editor, Dreamweaver and Coldfusion, web development skills for example Java, ASP/VB script, Flash, Microsoft.Net, Perl and PHP, and database knowledge for example Oracle, SQL server, My SQL and Access. Conversely, limited

content could be found to support the need for organisational knowledge, specialist knowledge and interpersonal and management skills. However, Customer Relationship Management (CRM) and teamwork should be noted. The lack of findings for the latter knowledge and skills domain could be attributed to either, graduate jobs do not support the need for these skills or job adverts per se do not provide this type of requirement.

The second content analysis to examine the competitor perspective involved a search of the UCAS website for courses which included the word "Information", a staggering 1730 were found. Similarly, a search for courses which included the word "Systems" produced 1389 courses. Although the listing included course names which would not normally be associated to a course in the IS domain a large proportion could be closely if not precisely related. It should also be noted that both lists could contain the same courses if the name of the course title included, "Information" and "Systems". (See table 7 for a summary of findings)

Course name	No. of Courses
Information Systems	562
Business Information Technology	341
Geographical Information Systems	170
Business Information Systems	109
Computer Information Systems	43
Distributed Information Systems	8
Business Information Technology Systems	4
Information Systems Accountancy	3
Management Information Systems	3
Accounting Information Systems	2
Financial Information Systems	2
Global Information Systems	2
Information Systems Analysis	2
Internet Information Systems	2
Environmental Information Systems	1
Media Information Systems	1
Total	**1255**

Table 7: UCAS IS courses

Following an examination of specific University web sites and the content of the IS and Business Information Systems (BIS) courses they offered, Marketing, e-Marketing, e-

Business, e-Commerce and Digital Information were found as additional themes. On close examination of related IS courses a content analysis revealed Project Management, HCI, Database Design and Strategic issues continue for form part of the IS curriculum. Content specific topics include Marketing, Human Factors, Oracle, Java, Visual Basic, OO, Perl, RAD and SSADM.

To establish current research in the field of IS the final element of the third stage comprised a content analysis of the major IS conferences. The conferences used for this abstraction were, The European Conference on Information Systems (ECIS)[4]; European Mediterranean Conference on Information Systems (EMCIS)[5]; International Conference on Information Systems (ICIS)[6] Hawaii International Conference on System Sciences (HICCS)[7]; United Kingdom Academy of Information Systems (UKAIS)[8] and ISOneWorld[9]. Topic areas were colour coded to assist in the identification of future IS issues. Colour coding revealed 12 topic areas that appear more than once per conference. (See table 8 for a tabulation of those topics)

Topic	ECIS 2004	EMCIS 2004	HICCS 2005	ICIS 2004	UKAIS 2004	ISONEWORLD 2004	Total
E-Government	1	1	3		1	1	5 (7)
KM	1		2	1	2	1	5 (7)
Supply Chain Management (SCM)		2	1		1	2	4 (6)
Security		1	2	1	2		4 (6)
Data Mining/Warehousing		1	1	1		1	4
ERP	1	1	1			1	4
Health	1		7			1	3 (9)
Business Intelligence		1	1		1		3
CRM	1	1	1				3
EAI		1	1				2
HCI		1		3			2 (4)
Media	1		1				2
Outsourcing		1	1				2

Note: The total column contains the sum of one occurrence per conference and the parenthesis contains the total number of occurrences

Table 8: Research topic matrix

[4] ECIS 2004 – conference themes and tracks can be found at http://www.ecis2004.fi/tracks/
[5] EMCIS 2004 – Call for papers can be found at: http://disc.brunel.ac.uk/emcis
[6] ICIS 2004 – Conference overview can be found at: http://www.terry.uga.edu/conferences/ICIS2004
[7] HICSS 2005 – Call for papers can be found at: http://www.hicss.hawaii.edu/
[8] UKAIS 2004 – Conference overview can be found at: http://www.ukais.gcal.ac.uk/
[9] ISOneWorld 2004 – Engaging Executive IS Practice Conference can be found at: http://isoneworld.org/ISOW/tac.htm

E-Government and KM rank top, closely followed by SCM, Security, Data Mining/Warehousing and ERP. It is also worth noting that the HICCS 2005 conference call (the most recent call) included topics such as E-Logistics, Mobile computing, Genres of Digital Documents, Digital Library Applications, E-Democracy, E-Marketing, M-Systems Development, Open Source Software Development, IT in Criminal Justice and Wireless.

The final stage involved a literature review of current research articles. For example, a special issue on Enterprise Systems Education[10] suggests that corporations world-wide are focusing on Extended Enterprise Systems such as CRM, SCM, Strategic Enterprise Management and Business Intelligence. They go on to state that several Universities have formed alliances with ERP vendors to expand classroom capabilities of integrating ERP software into their curriculum.

Technique Evaluations

Sending an email to IS academics was by far the most rapid technique to execute and provided an interesting starting point. Limitations included its inability to reach any firm conclusions as consensus not reached. The focus group was also relatively easy to execute and in contrast consensus could be easily reached. Although the seminar did not come up with a comprehensive set of answers, the technique provided an opportunity to move the debate forward.

The questionnaire to industry was very time consuming in relation to development, distribution and abstraction of results. However, it was effective in establishing up-to-date information on the needs of industry. It should also be noted that once a questionnaire is developed and the population identified, the time scales can be substantially reduced and additions or improvements can be made before subsequent distributions with the academic questionnaire being one such example.

The content analysis technique as performed on job adverts, UK IS courses and conference calls could all be completed in relatively short time scales. They were all relatively easy to perform with no constraints on when or where they were performed and with a constant readily available supply of information. Analysis of the conference calls enabled the abstraction of themes/tracks, which could be translated into a course or topic areas. The limitation of the content analysis as performed on the IS courses was its inability to predict the future (some courses may have been developed some years ago).

Conclusions

This study sought to develop a framework for the rapid development of IS courses and the provision of effective graduates. To meet that aim several investigation techniques have been used and evaluated in terms of the time it takes to perform them and the value they add to the development of courses. To facilitate the selection of the techniques a first stage was to develop a hybrid methodology from a range of sources, instruments and

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techniques. The hybrid methodology comprised academic, market, competitor and research sources, a complementary set of instruments and a range of techniques to include questionnaire, focus groups and content analysis.

The findings revealed similarities between the views of the academic and competitor sources, and between the two market sources. However, significant differences were found between the market and academic sources and hence market and competitor sources. The attribute which achieved the highest level of agreement was interpersonal and management skills. The majority of attributes to include systems development knowledge and web development skills were generally seen as less important by industry (the market). With notable differences associated to the number of IS/IT employees of the industry respondents, many of whom deemed the attributes as "not important".

If the industry respondents are representative of local market and if these courses are to support the needs of this market, a change in focus is required from the more technical aspects of IS to more generic interpersonal skills. The findings do however suggest some specialist areas, which may not be fully exploited in current IS courses, for example security, disaster prevention and recover, quality assurance and risk management. The research findings generally supported the industry view and suggested topics such as E-Government, SCM, data mining and Health, supporting the need to incorporate their views in curriculum development and hence the final development framework.

Based on these assertions the original hybrid methodology has been refined to only include the most effective perspective, instrument and techniques (see figure 2).

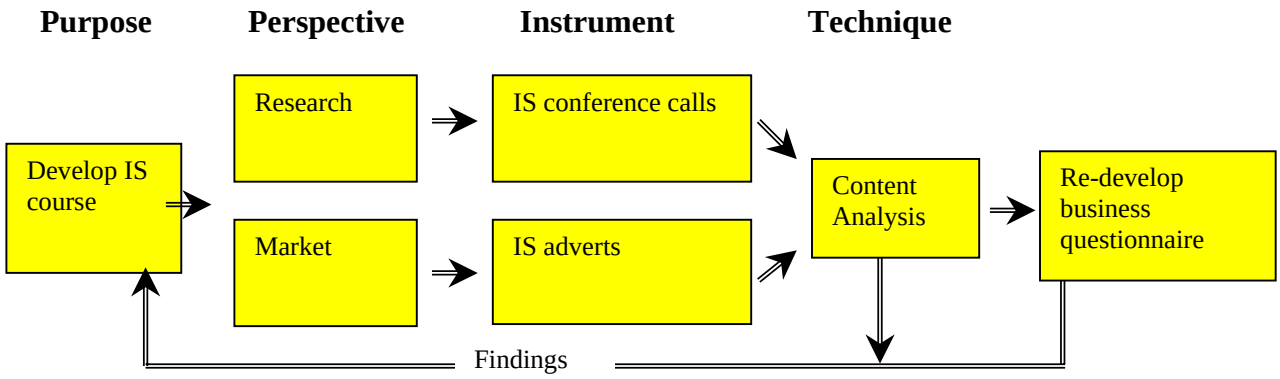

Figure 2. Curriculum development framework

Future Research

Studies have been conducted to establish the views of the potential student population, however, these studies did not form part of this research exercise. It would clearly be highly desirable to consider incorporating those views for any future investigations. Furthermore, for completeness the recommended methodology as represented in figure 2 should first be put into practice and the findings compared to those of the original industry questionnaire.

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