

**An integrated model for the delivery of
IT content in an accounting curriculum**

Thomas Tam
(Corresponding author)
Faculty of Business
Manukau Institute of Technology
Private Bag 94006
Manukau 2241
New Zealand
Email: thomas.tam@manukau.ac.nz
Tel: +64(9)968 7252
Fax: +64(9)968 7709

Andy Godfrey
Associate Dean – Postgraduate Students
Faculty of Business and Law
Postgraduate Office
Level 8, 42 Wakefield Street
Auckland University of Technology
Private Bag 92006
Auckland 1142
New Zealand
Email: andy.godfrey@aut.ac.nz
Tel: +64(9) 921 9846
Fax: +64(9) 921 9990

Abstract

Rapid advances in information technology (IT) have produced significant changes to the ways in which businesses are operated. Accountants are involved in wide-ranging roles in business and it is important for them to possess IT knowledge and skills relevant to their roles to provide competent and professional services. This raises the questions: What kind of IT knowledge and skills do accountants need? What are the entry-level IT skills and knowledge that accounting educators should provide?

The objective of the research is to produce a holistic set of IT knowledge and skills relevant to accounting graduates and to develop a model for the delivery of IT content in an accounting curriculum. The study identified 18 IT topics for accounting graduates categorised into varying degrees of importance. The findings of this study also led to the development of a model for delivery of IT content named as the INDUCTION-DIFFUSION-ASSIMILATION model.

Key words

Accounting curriculum;

Accounting education;

Graduate employability;

IT knowledge and skills for accountants;

IT content delivery;

Delphi method

1 Introduction

Developments in information technology (IT) have produced major changes to the ways in which businesses operate. Almost all businesses today use computers of some form in their day-to-day operations. With the use of computers, business is conducted in a way quite different from that in which it was conducted in the past. Accountants are involved in wide-ranging roles in business and it is important for them to possess IT knowledge and skills relevant to their roles to provide competent and professional services. However, the scope of IT is broad and not all IT knowledge and skills relate to an accountant's role. This raises the questions: what kind of IT knowledge and skills do accountants need? What are the entry-level IT skills and knowledge that educators should provide? Educators "grapple with these issues constantly" (Cytron and Tie, 2001).

The objective of this research is to identify the relevant IT knowledge and skills required by New Zealand accounting graduates. The motivation for this research originates from the researcher's desire to seek guidance on the kind of IT knowledge and skills that should be covered in an accounting major programme so as to enhance the employability of accounting graduates. The guidelines from a number of professional accounting bodies on IT competencies for accountants, however, are found to be either unspecific or too ambitious, making them difficult to follow and implement. The researcher also has doubts as to the relevance to an accounting major graduate of some of the IT knowledge and skills listed in the guidelines and studies. These factors have motivated the researcher to embark on this study with the active participation of accounting practitioners.

This study comprised of a pilot study and a main study. The pilot study employed six experts in the accounting field using the Delphi method to develop the questionnaire for the main study. The questionnaire was then sent to 23 accounting practitioners prior to interviewing each participant individually. The study has identified 18 IT topics for accounting graduates categorised into varying degrees of importance. Of these 18 topics, spreadsheet, accounting systems/software, Internet tools and research ability stand out as the most important and most used IT tools for accounting

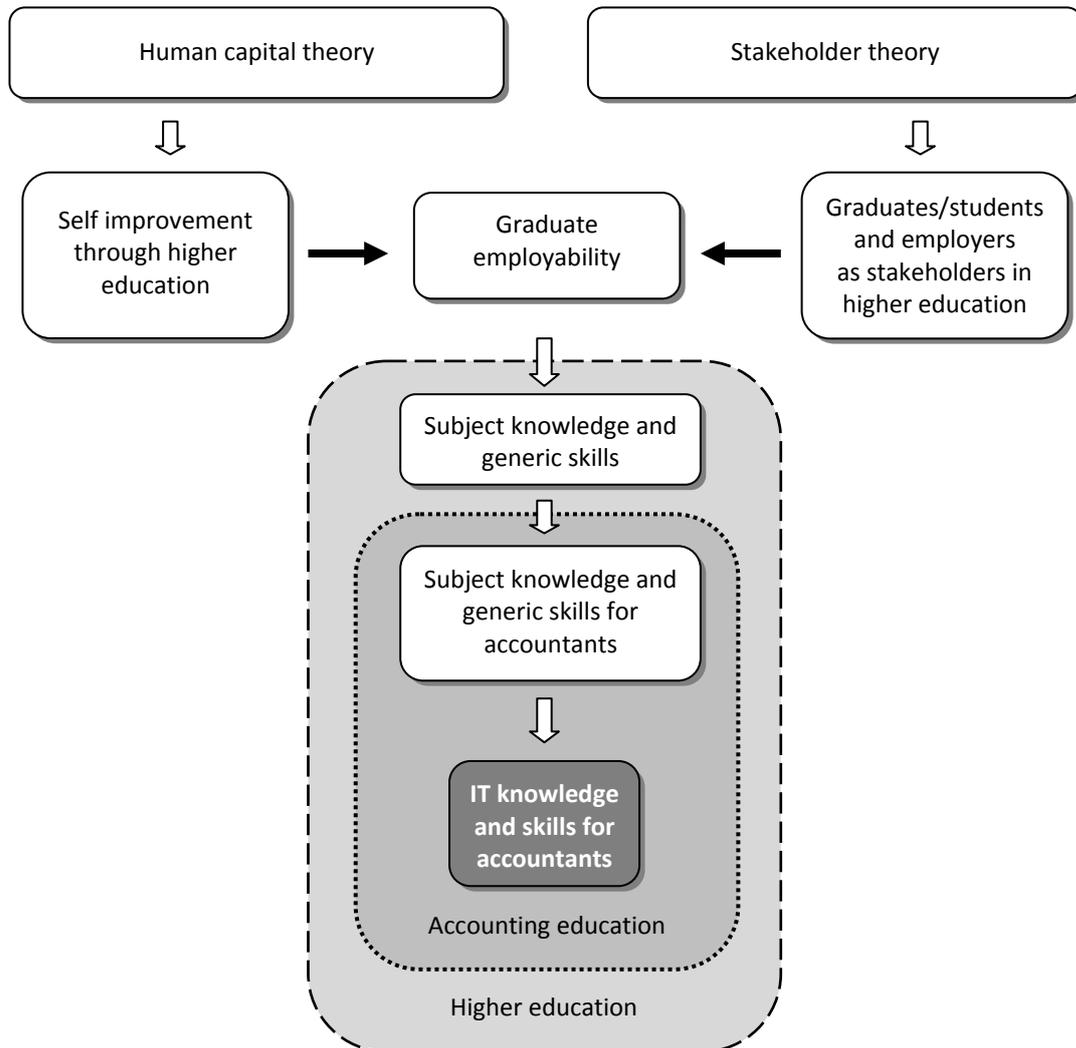
practitioners. The findings from this study also led to the development of a model for delivery of IT content named as the INDUCTION–DIFFUSION–ASSIMILATION model. These findings, together with the proposed model are expected to contribute to accounting education literature and provide in-sights to curriculum design for accounting faculties. Professional accounting bodies may also use the results of this study to reflect on their IT guidelines for accounting professionals.

The remainder of this paper is organised as follows. Section 2 discusses the study's theoretical background and provides a review on IT knowledge and skills from accounting literature. Section 3 discusses the research design of this study. Section 4 presents an analysis of the data collected and Section 5 presents the study's conclusions, identifying the limitations and scope for further research.

2 Theoretical background and literature review

The theoretical background of this research is based on human capital theory and stakeholder theory. Human capital theory suggests that individuals would pursue further education to improve their standard of living and a way to achieve this is to be employable in positions that provide higher income (Walters, 2004). Stakeholder theory suggests that an organisation is successful if it can satisfy the demands of its stakeholders (Dellaportas et al., 2005). Students/graduates are one of the stakeholders of higher education institutions. In order to be successful, higher education institutions must recognise that employability of their graduates is a key stakeholder objective. Figure 2.1 shows how human capital theory and stakeholder theory are linked to graduate employability and how graduate employability is dependent on the different levels of graduate knowledge and skills.

Figure 2.1 Theoretical framework



Governments in some developed countries are turning their attention to the employability of graduates from higher education institutions of their own countries. There is increasing pressure on Australian universities to accept responsibility for graduate employability, and systems such as graduate destination surveys are in place to hold Australian universities accountable for graduate success in gaining employment (Franz, 2008). The Japanese Ministry of Education collects information on the employment status of higher education institutions on an annual basis (Teichler, 1999). Similar surveys are undertaken regularly in the United Kingdom and a few other countries in Europe (Ibid.). The Ministry of Education of New Zealand, like other governments, is also paying much attention to this issue and has published

statements of intent on skills and employment (see Ministry of Education New Zealand, 2012; New Zealand Government, 2012).

The term ‘employability’ can be used to refer to a person’s ability to gain employment. It is often associated with the skills that allow the employee as well as the employer to benefit from the employment (Franz, 2008). Numerous terms have been used in the discussions on graduate employability skills. These include ‘core skills’, ‘generic skills’, ‘personal skills’ and ‘personal competencies’ which are used to describe skills not related to a particular field of study. Studies on generic skills and attributes for accounting graduates have identified that communication, problem solving, time management and decision making are important attributes (see De Lange, Jackling, and Gut, 2006; Kavanagh and Drennan, 2008).

Most of the skills and attributes identified in recent studies on employability belong to ‘soft skills’ which are generic in nature as opposed to ‘hard skills’ which are discipline-specific skills. Franz (2008) observed that the notion of employability is moving away from discipline-specific hard skills to generic soft skills. However, the opinion that generic skills should be given prevalence over specific technical skills is not shared by everybody (Nicolescu and Paun, 2009). Teichler (1999) observed that studies of graduate employability skills tend to over-estimate the importance of generic and personal skills and under-estimate the cognitive skills and knowledge for specific fields. De Lange, Jackling and Gut (2006) found that despite the use of computer software in accounting courses, students still perceived they were not well prepared for the workplace. They called for further investigations in the types of computing skills valued in the workplace. The following sections review the literature on IT knowledge and skills for accountants.

2.1 IT knowledge and skills for accountants

IT skills are one of the subsets of the employability skills that are increasingly important in the higher education agenda (Stoner, 2009). However, a strong warning that accounting education may be failing came from Albrecht and Sack (2000). The authors published a landmark report positing that accounting education does not meet

the needs of the future accounting professional due to the failure to meet the changing requirements of the profession as a result of the advances in IT (Albrecht and Sack, 2000; 2001). The results of a United Kingdom study show that accounting education does not equip the students with enough IT skills for their role after graduation in their employment and that a gap exists between IT skills learned in tertiary education institutions (TEIs) and what accountants practise in the professional environment (Ahmed, 2003).

Studies on IT knowledge and skills required by accountants have been conducted by various academics. A list of critical IT skills required by accountants was compiled by Wessels (2005) based on a literature review of major publications and studies which included the Institute of Chartered Accountants Australia, Canadian Institute of Chartered Accountants, Institute of Chartered Accountants in England and Wales, American Institute of Certified Public Accountants, South African Institute of Chartered Accountants, Chartered Institute of Management Accountants, Institute of Management Accountants, International Federation of Accountants, Theuri and Gunn (1998), Hostrom and Hunton (1998), Coenenberg, Haller and Marten (1999), Boyse (2004) and Greenstein and McKee (2004). The study produced a list of 34 critical IT skills for professional accountants with the aim of providing a guideline for TEIs and workplace training. Appendix 1 shows the 34 IT skills compiled by Wessels (2005) in alphabetical order.

A study conducted by Burnett (2003) sought the views of employers of accounting graduates on the technology skills that are considered important for new hires to possess. It reported the top four technology skills for accounting graduates as 1) spreadsheet software, 2) Windows, 3) word processing software and 4) World Wide Web. Topics that ranked from 5 to 10 were 5) information systems planning and strategy, 6) database software, 7) communications software (e.g. Outlook), 8) project management, 9) presentation software and 10) technology security and control.

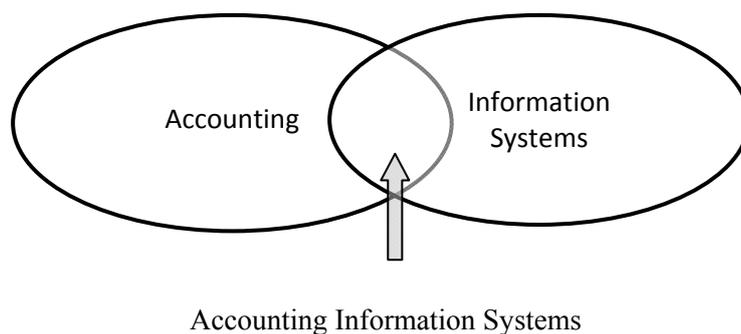
A subsequent study on knowledge and skills development of accounting graduates in Ghana (Awayiga, Onumah, and Tsamenyi, 2010) revealed similar trends. The study surveyed graduates as well as the employers of the graduates on their opinions on the

importance of skills and knowledge for entry-level accountants. Technology skills identified in order of importance included 1) spreadsheet package, 2) database package, 3) presentation software, 4) technology management and budgeting, 5) word-processing package, 6) communications software (Outlook), 7) electronic commerce, 8) World Wide Web and 9) Windows. The results of this study are remarkably similar to those of the Burnett (2003) study.

2.2 The Accounting Information Systems (AIS) course

The AIS course developed by TEIs in countries including Australia, New Zealand, the United Kingdom and the United States is in specific response to the inability of many students to grasp the fundamental principles of information systems in accounting (Van Meer and Adams, 1996). It is the primary course that accounting students take in which accounting information is intertwined with technology (Theuri and Gunn, 1998). In many institutions, the AIS course is taught within the accounting faculty and is the main avenue through which accounting students receive IT education and training (Chang and Hwang, 2002). Bagranoff, Simkin and Norman (2008) suggest that AIS stands at the intersection of two disciplines – accounting and information systems as illustrated in Figure 2.2.

Figure 2.2 The AIS course



Source: Bagranoff, Simkin and Norman (2008)

Numerous studies have been undertaken in an attempt to develop a set of standard topics to be covered in the AIS course. The first notable AIS syllabus study was conducted by Wu (1983) followed by Van Meer and Adams (1996), the latter being the only notable study of AIS syllabus conducted in New Zealand. A review of topic coverage of AIS textbooks was conducted by Bain, Blankley and Smith (2002). The study examined 12 current AIS textbooks and a number of on-line AIS syllabi, summarised them into 30 topics and surveyed AIS educators and accounting practitioners for the importance of the topics. Appendix 2 shows the top 10 topics ranked by educators and by practitioners. The authors concluded that introduction to systems, internal control and transaction cycles were the most important topics to be covered.

2.3 Guidelines from professional bodies

2.3.1 The New Zealand Institute of Chartered Accountants (NZICA)

NZICA has issued Statement of Learning Outcomes (SLOs) to provide a benchmark for evaluating courses in tertiary reviews of TEIs in New Zealand. Appendix 3 shows the details of SLO-5 – Accounting Information Systems which provides guidelines for coverage of IT knowledge for accountants. The five learning outcomes of SLO-5 closely match the AIS topic categories identified in prior studies. In August 2009, NZICA issued SLO-CA6 to replace SLO-5. Appendix 4 shows the details of SLO-CA6. It has four learning outcomes instead of five in SLO-5.

2.3.2 The International Federation of Accountants (IFAC)

IFAC is a global organisation for the accounting profession. It works with 163 member organisations in 120 countries to encourage high quality practices by the world's accountants (IFAC, 2006a). The IFAC Education Committee has issued various education guidelines to assist member bodies to prepare professional accountants to work in the information technology environment (IFAC, 2003). In October 2007, International Education Practice Statement 2 (IEPS 2) was published. Some member bodies commented that it contains too many detailed and technical topics which are required only by specialist IT practitioners. Others said it is

impossible for accounting students to learn such a vast number of topics (IFAC, 2006b). However, IEPS 2 does provide the most exhaustive guideline on IT knowledge and skills for accountants found in the literature. Appendix 5 shows a summary of IEPS 2.

3 Research design

This research aims to evaluate the views of accounting practitioners on the IT knowledge and skills required by accounting graduates in New Zealand. From the literature, a number of credible sources have been identified as the basis for the questionnaire. These include IEPS 2 published by IFAC; SLO-5 and SLO-CA6 published by NZICA; the list of general IT skills by Wessels (2005); and the review of AIS textbooks and syllabi by Bain, Blankley and Smith (2002). However, IEPS 2 alone contains 174 main topics (see Appendix 5). If all topics from the above mentioned sources were included in the questionnaire, the research instrument would become untenable and participants would not be interested or might not have the time to complete it. If a partial list was selected from the sources by the researcher to include in the questionnaire, researcher bias would be introduced and the basis or criteria for the selection would be questionable.

3.1 Phase I – Pilot Study

Given the problems mentioned above, the design for this research comprised two phases. The first used the Delphi method in a pilot study to establish a workable questionnaire based on the opinions of experts from the accounting profession followed by the main study (see Appendix 6). The Delphi method has been used in a number of higher education research studies and is recommended by Boberg and Morris-Khoo (1992) as a preliminary step in the evaluation of higher education programs. It usually consists of multiple rounds of mailed questionnaires addressed to individuals who are considered experts in the field until a consensus is formed (Vázquez-Ramos, Leahy, and Hernández, 2007).

Phase I of the research involved designing a questionnaire and inviting individuals from a cross-section of the accounting profession who could represent their profession as ‘experts’ to rate the importance of the IT knowledge and skills in the questionnaire until a consensus or near-consensus was formed. The research instrument for Phase I was based on the sources identified from the literature review. In total, there were 266 questions for Phase I (see Appendix 7). A Likert scale of 1 to 6 was used to capture the experts’ opinions on the importance of IT knowledge and skills required by accountants (1 = not relevant/not required, 2 = awareness only, 3 = minimum understanding, 4 = good understanding, 5 = full understanding and 6 = able to use and apply). Topics with mean scores equal to or greater than 4 would include those regarded by the respondents as requiring ‘good understanding’, ‘full understanding’ or ‘able to apply and use’. These topics were used as the basis for developing the questionnaire for Phase II of the research. Topics with mean scores less than 4 (minimum understanding, awareness only and not relevant/not required) were discarded.

3.1.1 Selection of Delphi panellists

Six individuals in the accounting profession representing different sectors of the profession were identified and invited to be the panel for Phase I. Selection was made through connections in the accounting profession and industry and referrals from colleagues. The panellists selected included a partner from a small CA firm, an accounting lecturer from a university, an accountant from a government agency, a chief accountant from a medium sized commercial firm, a treasury accountant from a large commercial firm and a business advisory consultant from a large CA firm. All panellists were based in Auckland, New Zealand and had strong background and long working experience in the accounting profession. With the exception of the accounting lecturer, all panellists were Chartered Accountants of NZICA. Table 3.1 shows the brief credentials of the Delphi panellists.

Table 3.1 Brief credentials of Delphi panellists

Panellist	Brief credentials
D01	Joined the current CA firm in 1985 after working as assistant accountant in a large New Zealand company for five years. Became a partner of the CA firm in 1990. Mainly involved in business advisory and management services.
D02	Lecturer of a university specialising in AIS. Started teaching career in 2000 and was a PhD candidate at the time of the survey. Between 1994 and 2000, she worked as assistant accountant, auditor and business analyst in various companies in New Zealand.
D03	A chartered accountant with B. Com degree from a New Zealand university. Prior to joining the government agency where he is currently working as the chief accountant, he has held various accounting roles in industry which included five years as a financial controller of a large international manufacturing group.
D04	Chief accountant of a medium sized freight and transportation company. He holds an MBA degree and has worked in a government agency before his current job.
D05	Currently working as treasury accountant at one of the largest New Zealand companies for three years. Qualified as chartered accountant while working with a large CA firm in New Zealand, after which he worked for an investment banking group in London where he completed his MBA before joining the current company.
D06	A total of seven years of experience working for two large CA firms in the Business Advisory Services specialising in IT general control assessments.

3.1.2 Results from Phase I

The panellists independently rated the topics in the first round. The results from the first round were collated and the mean score and standard deviation of each topic computed. Adopting the Delphi method, the panellists were asked to rate the topics again in a second round where they were shown how the others had rated including the mean score, the standard deviation and the scores of the other five panellists of each topic. The results from the second round were collated and compared with the scores from the first round and were found to show good and acceptable degrees of agreement. A third round was not therefore carried out. Twenty-two topics had mean scores of 5 or above and 42 had mean scores of between 4 and 4.9. These 64 topics were combined into 18 topic categories and became the questionnaire for Phase II of the research. Appendix 8 shows the categorisation of the 64 topics.

3.2 Phase II – Main Study

Phase II of the research used a mixed method approach comprising a questionnaire followed by interviews. The questionnaire was developed from Phase I as described

in section 3.1. Respondents were asked to rate the importance of the IT topics in the questionnaire using a Likert scale of 1 to 6 (1 = not relevant, 6 = essential) before the interviews took place. A weakness of this method is the possibility that IT topics required by accountants could be eliminated in the pilot study resulting in an ineffective questionnaire for the main study. This weakness was overcome by the design of interview questions which asked participants in the main study to articulate on IT topics not included in the questionnaire. The interviews also allowed in-depth discussions on the use and skill levels of IT topics expected by the participants. Table 3.2 shows the interview questions.

Table 3.2 Interview questions

IQ1	Of the IT topics you have rated in the questionnaire, do you use any of them regularly in your day-to-day work?
IQ2	Of the IT topics you have rated in the questionnaire, do you use any of them occasionally in your day-to-day work?
IQ3	What additional IT knowledge and skills other than those in the questionnaire will allow you to perform better in your job?
IQ4	If you were going back to study/ (or if you are still studying), what IT topics would you want to learn to improve your IT competency in your job?
IQ5	What other IT knowledge and skills do you think are needed if you are promoted to a higher position in your company?
IQ6	What other IT knowledge and skills do you think are needed in five year's time?

Non-probabilistic sampling was used to select participants who were practitioners in the accounting profession. The sample was drawn from two sources. One source was from recent graduates of TEIs where accountants with less experience were expected to exist in this sampling frame. The other was from professional accounting bodies where practitioners with more working experience were expected. A list of past and present accounting students was obtained from a TEI in Auckland, New Zealand. E-mails were sent to a selected list of students who had graduated in the last three years or were in their final year of study, inviting them to participate in the research. The criterion for participation in the study was that they must be currently employed at the time in an accounting capacity. This resulted in 13 current and past students meeting the criterion and accepting the invitation. An additional two students were recruited

through referral from the participants. The second sampling frame was members from professional accounting bodies. Contacts were made with NZICA, the Institute of Internal Auditors New Zealand, and the Chartered Institute of Management Accountants New Zealand and resulted in six participants agreeing to participate in the research. Two additional participants were recruited as a result of referrals from two of the participants.

In total 23 participants were recruited and were separated into two groups. Those who had no supervisory responsibilities were regarded as “Juniors” and were coded J01 to J14. Those who had at least one person reporting to them were categorised as “Seniors” and coded from S01 to S09.

Data collection for Phase II took place between October and December of 2009. All interviews took place at the participants’ work place and took on average one hour. Voice recordings from the interviews were transcribed into text by professional transcribers. Each voice recording was played and listened to by the researcher while reading the corresponding transcript, making corrections to errors made by the transcribers while listening and reading. At the same time, the main points from the interviews were noted and typed in a table form for each and every participant. The corrected transcripts were read a second time and analysed with reference to the interview questions.

4 Data analysis and findings

4.1 Results from questionnaire

The 18 topics in the questionnaire are sorted in descending order of the overall mean score and are listed in Table 4.1 showing the mean score, rank and the standard deviation of each topic. The topics with an overall mean score of ≥ 5 are categorised as Band 1, those between 4 and 4.9 as Band 2 and those with mean score < 4 as Band 3.

Table 4.1 Overall mean scores of IT knowledge and skills (n=23)

	Topic	Rank	Details	Mean score	Std dev
Band 1	1.1 Spreadsheet	1	Use of spreadsheet software	5.91	0.288
	1.2 Accounting systems	2	Understanding business systems, ERP, CRM, GL reporting cycle, Revenue cycle, Purchasing cycle, HR/payroll cycle	5.48	0.665
	1.3 Word processor	3	Use of word processing software	5.43	0.896
	1.4 Accounting software	4	Use of MYOB, Great Plains, SAP, Oracle, Tax return software, Electronic working papers, Time management and billing systems	5.35	0.885
	1.5 Values	4=	Ethical standards	5.35	1.027
	1.6 Internet tools	6	Use of e-mail, web browsing, SMS	5.09	1.083
Band 2	2.1 IT controls	7	Internal control, computer fraud, IT audit, controls to personal computers	4.61	1.373
	2.2 General systems knowledge	8	Understanding transaction processing system, end-user computing	4.57	0.992
	2.3 Presentation software	9	Use of presentation software	4.43	1.308
	2.4 Database concepts	10	Understanding database concepts	4.35	1.265
	2.5 Database software	11	Use of database software, database search and retrieval	4.26	1.176
	2.6 Research tools	12	Able to use research tools	4.09	1.443
	2.7 E-commerce	13	Understanding electronic data interchange, B2B, B2C e-commerce	4.04	1.224
Band 3	3.1 Documentation tools	14	Understanding System flowcharts, Document flowcharts, Data flow diagrams	3.96	1.331
	3.2 Internet knowledge	15	Understanding communications technologies, firewall software/hardware	3.83	1.466
	3.3 IT audit software	16	Use of IT audit software, CAAT	3.48	1.592
	3.4 Data security	17	Able to perform backup and recovery	3.30	1.490
	3.5 Operating systems	18	Use of utility software, anti-virus software	3.13	1.290

Table 4.2 shows the comparison between the mean scores from the Juniors and the Seniors. The topics are placed in the appropriate Band based on the mean scores from the participant group. However, it has to be emphasised that the main aim of these comparisons is for descriptive statistics purposes only and not intended to show that there are significant differences between the participant groups. The number preceding the topic indicates the position of the topic from the overall rating as shown in Table 4.1. For example, 1.4 Accounting software indicates that the topic was in the

fourth position in Band 1 based on the overall mean score (n=23). The number in brackets following a topic indicates the mean score of that particular participant group. Using the same example, 1.4 Accounting software (5.71) in the Juniors column indicates that this topic had a mean score of 5.71 from the Juniors (n=14). In the Seniors column, this topic fell into Band 2 because the mean score from Seniors (n=9) was 4.78.

Table 4.2 Mean scores by Seniority

Note: Numbers in brackets are the mean scores from the participant group

Band	Juniors (n=14)	Seniors (n=9)
1 Mean score ≥ 5	1.1 Spreadsheet(6.00) 1.4 Accounting software(5.71) 1.2 Accounting systems(5.57) 1.3 Word processor(5.57) 1.5 Values(5.14) 1.6 Internet tools(5.14)	1.1 Spreadsheet(5.78) 1.5 Values(5.67) 1.2 Accounting systems(5.33) 1.3 Word processor(5.22) 1.6 Internet tools(5.00)
2 Mean score between 4 and 4.9	2.2 General systems knowledge(4.57) 2.1 IT controls(4.43) 2.5 Database software(4.36) 2.3 Presentation software(4.29) 2.4 Database concepts(4.21) 2.6 Research tools(4.07)	2.1 IT controls(4.89) 1.4 Accounting software(4.78) 2.3 Presentation software(4.67) 2.2 General systems knowledge(4.56) 2.4 Database concepts(4.56) 2.7 e-commerce(4.22) 3.1 Documentation tools(4.22) 2.5 Database software(4.11) 2.6 Research tools(4.11) 3.2 Internet knowledge(4.00)
3 Mean score < 4	2.7 e-commerce(3.93) 3.1 Documentation tools(3.79) 3.2 Internet knowledge(3.71) 3.4 Data security(3.71) 3.3 IT audit software(3.43) 3.5 Operating systems(3.14)	3.3 IT audit software(3.56) 3.5 Operating systems(3.11) 3.4 Data security(2.67)

4.2 Analysis of interview data

Semi-structured interviews were conducted to capture in-depth and richer responses from participants and to triangulate the results from the questionnaire. The following sections discuss selected responses from the participants.

4.2.1 Band 1 topics

All participants mentioned Spreadsheet as the most used and important IT topic. Spreadsheet is ranked number 1 among all other IT knowledge and skills based on the overall mean score from the questionnaire. The following are selected verbatim from participants.

J01	What I have found in all the accounting roles I have done so far be the heavy reliance on spreadsheet usage and knowledge.
J05	User [<i>sic</i>] spreadsheet is very important. I recommend at least the advanced level.
J13	... I have been involved in the recruitment process for other areas that use those skills and use them most definitely actually test for that they do competency test. Some of them include whether they have any spreadsheeting [<i>sic</i>] skills.

Most Juniors acknowledged the importance of a thorough understanding of accounting systems and agreed that it is a pre-requisite for being an accountant even at a junior level. They mentioned the need to understand the relationship between journal entries and the various sub-systems such as the accounts receivable, accounts payable, general ledger, etc.

J01	... you have all of your subsystems - your account payable subsystems, your debtor subsystems. If you do the general ledger entry you won't necessarily accept debtors, but if you do a debtors journal you accept debtors in the general ledger. So it is understanding those concepts.
J12	For any accounting graduate, just graduated or going through the studies ... and getting into the workforce, it doesn't matter what the software programme is, they are going to be 100% involved in various aspects of it. They are going to have to know how to process orders or accounts payable and accounts receivable ... If they don't know that part of it, then it's not going to be very effective.

Seniors share the views of Juniors that a good understanding of accounting and business systems is paramount for the ability of their assistants to solve problems when things go wrong. They were of the view that this is a weak area for accounting graduates.

S03	... people coming and doing Financial Auditing often would struggle with their business process cycles. How the accounts payable process works, how accounts receivable process works. People do struggle.
-----	--

Almost all Juniors stated that they use accounting software on a daily basis. There is a wide range of different accounting software installed. Participants from the commercial and Gov/Edu groups mentioned MYOB, EXONET (also known as MYOB EXO), Microsoft Dynamics, BPICS, PeopleSoft, Oracle, SAP and in-house developed software. Participants from CA firms mentioned MYOB Accountants Office, MYOB Accountants Enterprise and Xcede Professional Accounting which are software designed for CA firms to process accounts and tax for their clients. There are varied views on how many and which accounting software packages should be taught in an accounting programme. Some Junior participants would like to learn a large accounting/business software such as SAP, Oracle or PeopleSoft in addition to an entry-level package.

J05	Probably, because now, MYOB and Great Plains [Microsoft Dynamics], are used like probably in a smaller firm, ... but I think now, because of so many organisations with big turnover are using SAP Oracle or Peoplesoft I think basic understand of SAP or Oracle would be useful.
-----	--

The topic on Word Processing did not generate much discussion from the interviewees. Most participants were of the opinion that basic knowledge on how to use word processing software would be adequate. They also confirmed that word processing is not used on a daily basis.

“Values” refers to ethical standards, although it is not strictly a technical IT topic, it was based on one of the sources (Bain et al., 2002) of the topics for the pilot phase questionnaire. Values is ranked fourth equal to Accounting software and has an overall mean score of 5.35. All participants who responded to this topic opined that it is important for accountants to possess high standards of ethical behaviour.

Internet tools refer to the use of e-mail, web browsing and short message service (SMS). It is ranked sixth and has an overall mean score of 5.09 but did not attract much discussion. One conjecture could be that these skills have become universal and are regarded as tacit skills for any individual working in a commercial office environment.

S05	Internet tools well, of course when you've got to do research and look stuff up well, use of e-mails is essential otherwise you'll never get anywhere in business nowadays.
-----	---

4.2.2 Band 2 topics

IT controls are described as understanding the concepts of internal control, computer fraud, IT audit, and controls to personal computers.

Junior participants were of the opinion that they were not at the level where they can initiate the implementation of internal controls for their organisations.

J12	Internal control. All good companies should have good internal control processes and I guess some of the company things that have gone down because their internal process weren't up to scratch. That's important. But I don't think it's necessarily something that an accounting graduate or anything like that would, they need to be aware of. But it's not something they would implement it while a company controls sort of thing.
-----	--

General systems knowledge refers to the understanding of transaction processing systems and end-user computing. Although most of the discussions were on end-user computing, it appears that participants did not fully understand the meaning of the term. They seemed to relate end-user computing to ordinary users of computer systems. Perhaps this should be given more attention in an accounting systems course so that students know the true meaning of end-user computing. The following are some comments from participants.

J05	End User computing. This is important. Very essential. General systems knowledge. Transaction processing system. That is like journal entry.
S07	End-user computing we've a lot of daily problems people not understanding the system. What to do where to go. That's actually what I do a lot of cause people coming to me asking where they go, what is that.

As with word processing, presentation software did not generate much discussion. Most were of the opinion that this is used only occasionally, for example, for monthly presentation of results. Juniors said they had little opportunity to present and a Senior participant confirmed this.

J07	Yeah, sometimes. Normally we just use power point. That is very useful I think. I don't have much chance to present normally.
-----	---

Database concepts and Database software are two separate topics in the questionnaire and are regarded as two individual items for this study. However, during the discussions with interviewees, these two items have become inseparable and were often associated with each other.

Almost all participants were of the view that accountants need only to have an understanding of what a database is, know how to retrieve data from databases, and not how to design and create databases.

J01	I feel that you as the end users shouldn't need to understand what goes into designing the data. You should only know what a data base is, and what data goes in and how it's presented. So you really shouldn't need to go into the depth of building a data base unless you are going to become a business analyst.
-----	---

“Research tools” refers to the ability to use tools to search for information. Because of the availability of powerful Internet search engines and the ubiquitous web sites provided by commercial firms and government departments, most participants associated this topic with the ability to use the Internet to search for information.

J13	We all do research as part of our job and to know that is very important.
S01	Is their ability to do research quickly on the Internet. As the knowledge now becomes electronic. You really need to know how to draw that out.

E-commerce includes understanding electronic data interchange and business-to-business (B2B), and business-to-consumer (B2C) e-commerce. Most participants regarded it as unimportant since they were not involved in this area.

4.2.3 Band 3 topics

Documentation tools include understanding systems flowcharts, document flowcharts and data flow diagrams (DFD). Some participants said they had used document or procedure flowcharts on an occasional basis when there was a need to draw up procedures or policies but had never used DFDs. Most were of the view that the need is more on understanding how to read the flowcharts rather than how to draw the flowcharts themselves.

Internet knowledge refers to communications technologies and firewall hardware/software that are used in Internet infrastructures. This topic is quite technical in nature and most participants regarded it as the responsibility of the IT department or IT supplier. This is represented by the comment made by J02, a financial analyst of a commercial firm who said that communication software, firewalls and passwords are the responsibility of the IT department.

J02	... communication software, all like a firewalls and passwords that is IT responsibility
-----	--

IT audit software refers to the use of computer audit software and computer assisted audit techniques (CAAT). Participants working for commercial firms and the Gov/Edu sector were of the opinion that they do not need this knowledge.

The audit manager of a government department (S02) had more comments on this particular topic than other participants. He was of the opinion that this is a highly specialised area and he did not expect accounting graduates to arrive with knowledge on IT audit software or CAAT when they start their career. He also mentioned that many internal audit departments outsource the audit work to CA firms because of the specialised nature of the work and the difficulties in keeping up to date in the area.

S02	I wouldn't think a new graduate would often come with ACL [Audit software] experience or use that type of software. It's fairly uncommon. It's normally training on the job type of thing. ... the work is often out sourced. You'll find most Internal Audit shops if you like, do outsource that area. Because they would say it's quite difficult to keep up to date.
-----	--

Data security refers to performing data backup and recovery. The majority of participants who responded to this topic said they were not required to perform backup and recovery as this is an IT responsibility.

J05	The data security. The back-up and recovery is done from the IT Department. So we personally don't do it,
-----	---

“Operating systems” is about the use of utility software and anti-virus software on personal computers. This topic generated very little discussion with only one notable comment made by J02 who said that even though she was not really involved, it is important to have some knowledge in this topic.

4.2.4 Summary for interview results

Based on the response from the interviewees, the IT knowledge and skills are classified into three categories and summarised in Table 4.2:

- Category 1 – Essential / Used daily / Need advanced knowledge and skills
- Category 2 – Important / Used occasionally / Need basic knowledge and skills
- Category 3 – Not involved / Too technical / Awareness only

Table 4.2 Summary of findings for interview

Category	Topic	Summary of findings
Category 1	Spreadsheet	Most important and used daily. Need advanced skills and graduates are expected have knowledge of this when they start work.
	Accounting systems	Essential knowledge for accounting graduates. Must have thorough knowledge of accounting and business systems.
	Accounting software	Important and used daily. Need good knowledge of accounting systems to complement skills in accounting software. Preferable to learn more than one accounting software at school.
	Values	Important for accountants.
	Internet tools	Accountants expected to know how to use these tools.
	Research tools	Frequent use of Internet and web sites to find information. Easy to use with powerful Internet search engines and user-friendly web sites.
Category 2	Word processor	Used occasionally. Need only basic level skills.
	IT controls	Important to be aware of but not for Juniors to implement.
	General systems knowledge	Important to understand the concepts.
	Presentation software	Used occasionally. Need only basic skills. Juniors do not have much opportunity to present.
	Database concepts	Important to know what a database is and how to retrieve data from a database. But not necessary to know how to design and develop a database.
	Database software	
	Documentation tools	Occasional need to read and understand procedures or document flowcharts. Never seen data flow diagrams. No need to draw diagrams.
	Operating systems	Good to know.
Category 3	E-commerce	Most participants not involved. Not important.
	Internet knowledge	Technical in nature. IT department's responsibility. Not for accountants.
	IT audit software	Only for auditors. Even then, graduates not expected to start career with such knowledge.
	Data security	IT departments' responsibility unless working in a small company.

The categorisation of topics based on the interviews is compared with the band classification based on the questionnaire results and is shown in Table 4.3. If participants had been consistent in scoring the topics and describing them in the interviews, the interview categories should match those with the questionnaire bands.

However, there are some exceptions and they are highlighted with asterisks in Table 4.3. These exceptions are:

- Research tools classified as Category 1 (Band 2 in questionnaire).
- Word processor classified as Category 2 (Band 1 in questionnaire)
- Documentation tools classified as Category 2 (Band 3 in questionnaire)
- Operating systems classified as Category 2 (Band 3 in questionnaire)
- E-commerce classified as Category 3 (Band 2 in questionnaire)

Table 4.3 Comparison of interview with questionnaire

Interview findings	Questionnaire ranking
<p><u>Category 1</u> Essential / Used daily / Need advanced knowledge and skills</p> <p>Spreadsheet Accounting systems Accounting software Values Internet tools Research tools *</p>	<p><u>Band 1</u> Mean score ≥ 5</p> <p>Spreadsheet Accounting systems Word processor Accounting software Values Internet tools</p>
<p><u>Category 2</u> Important / Used occasionally / Need basic knowledge and skills</p> <p>Word processor * IT controls General systems knowledge Presentation software Database concepts Database software Documentation tools * Operating systems *</p>	<p><u>Band 2</u> Mean score between 4 and 4.9</p> <p>IT controls General systems knowledge Presentation software Database concepts Database software Research tools E-commerce</p>
<p><u>Category 3</u> Not involved / Too technical / Awareness only</p> <p>E-commerce * Internet knowledge IT audit software Data security</p>	<p><u>Band 3</u> Mean score < 4</p> <p>Documentation tools Internet knowledge IT audit software Data security Operating systems</p>

The above differences could have a number of reasons. First, participants could have changed their minds during the interviews. Second, two-way communication between

the researcher and the participants gave them the opportunity to express and discuss the importance of each topic in the interviews.

4.3 Other findings

4.3.1 Other IT topics

Interview questions 3 to 6 (see Table 3.2) probed participants to think of the IT knowledge and skills required under different situations – to perform better in their current job; if they return to study; if promoted; and in five year’s time. Some participants repeated the topics in the questionnaire but said that advanced skills for these topics are required. Topics mentioned that were not in the questionnaire include basic computer programming; expanding their IT vocabulary; managing IT suppliers; SQL; XML; etc. Appendix 9 shows these additional knowledge and skills.

4.3.2 Need for more practical IT work

Junior participants expressed the need for more IT practical work in accounting major programmes.

J05	Not enough practice. Application. I think I lacked application. Like hands on approach.
J09	I think there needs to be a mix of both, but I think that you need to have some practical. You definitely have to have some practical skills because it’s kind of hard because you go from a very theoretical ... to kind of practical.

This finding agrees with the comments made by Burnett (2003, p. 132):

With respect to technology skills, a single accounting systems class along with one or two generic computer courses may not be adequate. A better approach might be to require more technology applications, particularly spreadsheets, in all other accounting classes, in addition to the accounting systems class.

One of the ways to achieve this is to require the use of IT software/tools in different papers in the accounting programme. For example, a management accounting paper

would require students to create complex spreadsheets for budgets and costing systems and using what-if analyses. A tax paper would ask students to make use of formulae to compute taxes, etc.

4.3.3 Timing of IT courses

Some participants were of the opinion that it is easy to forget the things they learned in early courses in the programme. This is especially true for the entry level IT course which is usually taught in the first semester of an accounting programme to prepare students to use computers in their further studies. There is a long lapse in time between the entry level IT course to the time when students graduate.

J03	But that's the first paper in IT and many students will choose that in the first year. And by the time when they graduate they have forgotten.
-----	--

If a refresher course in important IT skills is available as one of the last papers before graduation, graduates could be 'IT productive' immediately when they join the workforce. An exit IT competency course is not only a good way to provide a refresher for the basic IT skills but also to teach some advanced skills. Students taking this course would finish the programme with fresh memories of the IT skills they need to start working productively. Brigham Young University in the USA has successfully implemented a capstone IT skills course with excellent results. Graduates of the University regarded this course to be more effective than the AIS course (Jackson and Cherrington, 2002).

5 Discussions and conclusion

This study has identified 18 IT topics regarded as important by accounting practitioners. These 18 topics are categorised into varying degrees of importance. Of these topics, spreadsheet stands out as the most important and most used IT tool. This is followed by accounting systems, accounting software packages, values, Internet

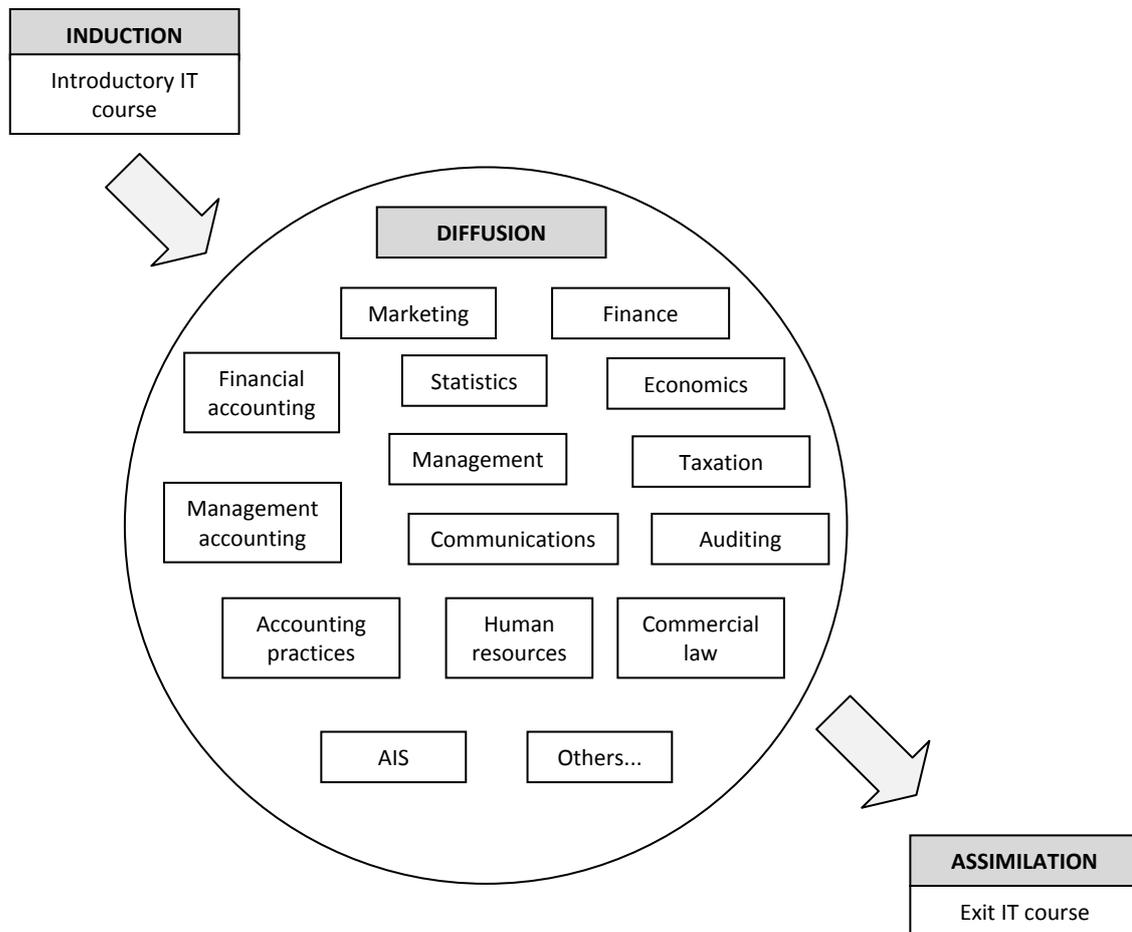
tools and research tools. TEIs may find this useful in designing their course contents for IT related courses.

Professional accounting bodies may also use the results of this study to reflect on and refine their IT guidelines. IEPS 2 from IFAC has 174 IT topics deemed necessary for accounting professionals. This study has provided empirical evidence to show that a large number of these topics are considered not relevant for accounting graduates. However, it has to be mentioned that IEPS 2 is designed for professional accountants and therefore justifiably contains more than what an accounting graduate would need. The IT topics in SLO-5 of NZICA were found to be unspecific and as a result were eliminated in the pilot study. NZICA may review the SLOs and make them more specific and helpful for accounting educators.

5.1 The IDA model

Based on the findings, a model for delivery of IT content in an accounting curriculum was developed and is named as the INDUCTION–DIFFUSION–ASSIMILATION (IDA) model. The IDA model proposes that students entering an accounting major programme be introduced to computer concepts in an introductory computer course where they will be taught the basic concepts and skills for them to be able to use these computer concepts and skills in subsequent courses. This is the INDUCTION phase. As they continue to take other courses, project assignments will be given that will explicitly require the use of various IT tools to complete the assignments. This is the DIFFUSION phase where the learning of appropriate IT skills is distributed among other courses whenever the use of IT software is applicable. Finally, in the ASSIMILATION phase, an exit IT competency course in the last semester of the programme would provide a refresher for IT knowledge and skills they have learned in the entire duration of the programme as well as some advanced functions and data analysis skills before they graduate. Figure 5.1 depicts the IDA model. The courses in the diagram are only examples of those in a typical accounting major programme.

Figure 5.1 The INDUCTION–DIFFUSION–ASSIMILATION model



The model proposes to distribute the learning of IT knowledge and skills among different courses in the accounting programme. However, to implement this model, it is necessary for accounting faculties to review their current accounting programme policies and make changes as required. Issues regarding lecturer competence in IT, computer access and course design need to be reviewed. If lecturers teaching in these papers are not proficient in these IT software and tools, they will be reluctant or unable to build such IT assignments into their courses. If there is inadequate computer access, students will be hindered from doing their computer assignments. Accounting faculty management may have to assess the IT capabilities of their teaching staff and provide training if necessary. They would also need to play an active part in promoting, supporting and monitoring the state of IT diffusion in the curriculum. The

IDA model also proposes to include an exit IT course towards the end of an accounting programme where more advanced IT topics can be taught. The IDA model may be of interest to TEIs in curriculum design.

5.2 Limitations and further research

There are some limitations to this study. Firstly, this research sought opinions from accounting practitioners in Auckland, New Zealand. Although it is not expected that the IT knowledge and skills requirements of an accounting graduate in other cities of New Zealand would differ from those of Auckland, the findings should be read with this limitation. It will be interesting to compare the findings between different countries. Researchers can replicate this study in other countries and compare their findings to those of this study.

The second limitation is that the participants in this study were accounting practitioners, some of whom were part-time students working in an accounting capacity. The views of accounting academics are most likely to be different from those of practitioners. This study can be modified to collect opinions from academics and would provide interesting comparisons on the extent of the differences between practitioners and academics.

References

- Ahmed, A., 2003, The level of IT/IS skills in accounting programmes in British universities, *Management Research News* 26, 20-58.
- Albrecht, S. W., and R. J. Sack, 2000, *Accounting Education: Charting the course through a perilous future*, Sarasota, FL: American Accounting Association.
- Albrecht, S. W., and R. J. Sack, 2001, The perilous future of accounting education, *The CPA Journal* March, 17-23.
- Awayiga, J., J. Onumah, and M. Tsamenyi, 2010, Knowledge and skills development of accounting graduates: The perceptions of graduates and employers in Ghana, *Accounting Education: an International Journal* 19, 139-158.
- Bagranoff, N. A., M. G. Simkin, and C. S. Norman, 2008, *Core concepts of accounting information systems* (10th ed.), Danvers, MA: John Wiley & Sons.
- Bain, C., A. Blankley, and L. M. Smith, 2002, An examination of topical coverage for the first accounting information systems course, *Journal of Information Systems* 16, 143-164.
- Boberg, A. L., and S. A. Morris-Khoo, 1992, The Delphi Method: A review of methodology and an application in the evaluation of a higher education program, *The Canadian Journal of Program Evaluation* 7, 27-39.
- Boyse, G., 2004, Critical accounting education: Teaching and learning outside the circle, *Critical perspectives on Accounting* 15, 565-568.
- Burnett, S., 2003, The future of accounting education: A regional perspective, *Journal of Education for Business* 78, 129-134.
- Chang, C. J., and N.-C. R. Hwang, 2002, Quests on building IT-relevant accounting curricula, *Journal of Contemporary Accounting* 3, 1-20.
- Coenenberg, A. G., A. Haller, and K. Marten, 1999, Accounting education for professionals in Germany - Current state and new challenges, *Journal of Accounting Education* 17, 367-390.
- Cytron, S. H., and R. Tie, 2001, A CPA's guide to the top issues in technology, *Journal of Accountancy* 191, 71-77.
- De Lange, P., B. Jackling, and A.-M. Gut, 2006, Accounting graduates' perceptions of skills emphasis in undergraduate courses: An investigation from two Victorian universities, *Accounting and Finance* 46, 365-386.
- Dellaportas, S., K. Gibson, R. Alagiah, M. Hutchinson, P. Leung, and D. Van Homrigh, 2005, *Ethics, governance and accountability: A professional perspective*, Milton, Qld: John Wiley & Sons.
- Franz, J., 2008, *A pedagogical model of higher education/industry engagement for enhancing employability and professional practice*, Paper presented at the Proceedings Work Integrated Learning: Transforming futures, practice...pedagogy...partnerships, Manly, Sydney.
- Greenstein, M., and T. E. McKee, 2004, Assurance practitioners' and educators' self-perceived IT knowledge level: An empirical assessment, *International Journal of Accounting Information Systems* 5, 213-243.
- Hostrom, G. L., and J. E. Hunton, 1998, New forms of assurance services for new forms of information: The global challenge for accounting educators, *International Journal of Accounting* 33, 347-358.
- IFAC, 2003, *International education guideline 11: Information technology for professional accountants*, NY: IFAC.
- IFAC. 2006a. Retrieved 5 Oct., 2006, from <http://www.ifac.org/About/>

- IFAC. 2006b. *Comments on Exposure Draft: Proposed International Education Practice Statement 2.1 - Information technology for professional accountants*, Retrieved 14 Mar, 2007, from <http://www.ifac.org/Guidance/EXD-Comments.php?EDID=0056&Group=All+Responses>
- IFAC. 2007, Oct 2007. *International Education Practice Statement 2: Information technology for professional accountants*, Retrieved 11 June, 2008, from http://www.ifac.org/Members/DownLoads/IEPS_2_IT_for_Professional_Accountants.pdf
- Jackson, R., and O. Cherrington, 2002, IT instruction methodology and minimum competency for accounting students, *Journal of Information Systems Education* 12, 213-221.
- Kavanagh, M., and L. Drennan, 2008, What skills and attributes does an accounting graduate need? Evidence from student perceptions and employer expectations, *Accounting and Finance* 48, 279-300.
- Ministry of Education New Zealand. 2012. *Skills and employment*, Retrieved 19 July, 2012, from <http://www.minedu.govt.nz/theMinistry/PublicationsAndResources/StatementOfIntent/SOI2012/ForewordMinisterTertiaryEducation.aspx>
- New Zealand Government. 2012. *Education targets to boost skills & employment*, Retrieved 19 July, 2012, from <http://www.beehive.govt.nz/release/education-targets-boost-skills-amp-employment>
- Nicolescu, L., and C. Paun, 2009, Relating higher education with the labour market: graduates' expectations and employers' requirements, *Tertiary Education and Management* 15, 17-33.
- NZICA. 2006. *SLO-5: Accounting Information Systems*, Retrieved 14 Nov, 2006, from <http://www.nzica.com/StaticContent/download/ira/slo5.doc>
- NZICA. 2009. *Statements of learning outcomes (SLOs) for the academic requirements for admission to the College of Chartered Accountants*, Retrieved 30 August, 2009, from http://www.nzica.com/AM/Template.cfm?Section=Statements_of_Learning_Outcomes
- Stoner, G., 2009, Accounting students' IT application skills over a 10-year period, *Accounting Education: an International Journal* 18, 7-31.
- Teichler, U., 1999, Research on the relationships between higher education and the world of work: past achievements, problems and new challenges, *Higher Education* 38, 169-190.
- Theuri, P. M., and R. Gunn, 1998, Accounting information systems course structure and employer systems skills expectations, *Journal of Accounting Education* 16, 101-121.
- Van Meer, G., and M. Adams, 1996, Accounting information systems curriculum: An empirical analysis of the views of New Zealand-based accounting academics and practitioners, *Accounting Education* 5, 283-295.
- Vázquez-Ramos, R., M. Leahy, and N. E. Hernández, 2007, The Delphi method in rehabilitation counseling research, *Rehabilitation Counseling Bulletin* 50, 111-118.
- Walters, D., 2004, The relationship between postsecondary education and skill: Comparing credentialism with human capital theory, *The Canadian Journal of Higher Education* 34, 97-124.

- Wessels, P. L., 2005, Critical information and communication technology (ICT) skills for professional accountants, *Meditari Accountancy Research* 13, 87-103.
- Wu, F. H., 1983, Teaching accounting information systems: A synthesis, *Issues in Accounting Education*, 132-145.

Appendix 1 – Critical IT skills (Wessels, 2005)

Critical IT skills
Accounting software
Agent technologies
Anti-virus software
Application service providers
Audit modules
Audit software
Back-up and recovery
Client/server environment
Computer-aided systems engineering tools
Data warehousing and data mining
Database search and retrieval
Database software
Digital communications
Electronic data interchange
Electronic working papers
Encryption software
Firewall software/hardware
Flowcharting/data modelling
Image processing software
Internet service providers
Internet tools
Intrusion detection and monitoring
Knowledge work systems (groupware, workflow systems, expert systems)
Network configurations
Operating systems
Presentation software
Research tools
Simulation software
Spreadsheets
Tax return preparation software
Test data
Time management and billing systems
User authentication
Word processing

Source: Wessels (2005)

Appendix 2 – Top 10 AIS topics (Bain, Blankley & Smith 2002)

Ranked by educators

Topic	Ranked by educators	Ranked by practitioners
Internal control	1	1
Transaction cycles	2	3
Systems documentation	3	22
Computer fraud	4	10
Database management systems	5	15
Database/File architecture	6	20
E-commerce	7	18
Ethics	8	4
End user computing	9	6
EDI	9=	12

Source: Adapted from Bain, Blankley and Smith (2002)

Ranked by practitioners

Topic	Ranked by practitioners	Ranked by educators
Internal control	1	1
Internet	2	11
Transaction cycles	3	2
Ethics	4	8
Software	5	17
End user computing	6	9
Communications topics	7	12
File organisation and access	8	14
Client/server networking	9	22
Computer fraud	10	4

Source: Adapted from Bain, Blankley and Smith (2002)

Appendix 3 – SLO-5: Accounting Information Systems (NZICA 2006)

Learning outcomes	Details
Internal control in accounting/business systems	<p>Select factors that must be considered when developing controls for information systems.</p> <p>Describe the control environment and plan to meet control objectives.</p> <p>Identify and compare general controls and application controls for information systems.</p> <p>Assess the effectiveness and efficiency of control compliance monitoring.</p> <p>Evaluate and design internal control systems.</p> <p>Demonstrate an understanding of the contribution that internal controls make to achieving organisational objectives, that is, their value-adding role.</p>
Development standards and practices for accounting/business systems	<p>Describe database management systems and identify the advantages of different types of database systems.</p> <p>Define the requirements of a database accounting system.</p> <p>Describe the process and documentation requirements of the systems development life cycle (SDLC).</p> <p>Describe the system verification and validation process.</p> <p>Explain how emerging technologies influence the design of accounting information systems.</p>
Management of IT adoption, implementation, and use	<p>Discuss strategic considerations involved in planning information systems, including an appreciation of the importance of project management.</p> <p>Demonstrate an awareness of security, back-up, and recovery procedures.</p> <p>Evaluate development acquisition alternatives.</p> <p>Discuss systems maintenance and control policies.</p> <p>Discuss the importance of ensuring end user support.</p> <p>Explain the principles of managing change.</p>
Evaluation of computer-based accounting/business systems	<p>Describe the impact of legal, ethical, and auditing influences on AIS.</p> <p>Describe evaluation objectives, methods, and techniques.</p> <p>Document a system using flow charts and a control matrix.</p> <p>Discuss the effects of rapid change on evaluation of existing systems.</p>
The practical use of technology	<p>Demonstrate the theoretical application of information systems technology e.g. database design or project management implementation of AIS.</p> <p>Apply information systems/technology to solving business/accounting problems.</p>

Source: NZICA (2006)

Appendix 4 – SLO-CA6: Accounting Information Systems (NZICA 2009)

Learning outcomes	Details
Accounting/business information systems architecture	<p>Identify and discuss the common components of AIS and their interrelationships, including hardware, software, communication networks; and features of internet commerce.</p> <p>Demonstrate an awareness of data organisation, access methods and transaction processing, including database management systems; and their application in business, e.g. enterprise systems.</p>
Planning and management of IT acquisition, implementation and use	<p>Demonstrate an awareness of the IT strategic planning process, including the need for alignment with entity strategy, and the implications of emerging technologies on the entity's business model.</p> <p>Demonstrate an awareness of how the IT function and IT resources are managed within an entity.</p> <p>Describe the process and documentation requirements of the systems development life cycle (SDLC) and evaluate its application in specific AIS-related issues.</p> <p>Describe the link between planning processes and the requirement to establish internal control in IT systems.</p>
Internal control in accounting/business systems	<p>Define an internal control system, including its objectives, and discuss the interrelationships between its components.</p> <p>Demonstrate an awareness of the interrelationship between internal control and IT risk management.</p> <p>Demonstrate an awareness of contemporary control frameworks, such as COSO and COBIT.</p> <p>Design and evaluate internal control systems for specific AIS-related cases.</p> <p>Document and evaluate AIS using appropriate methods.</p>
The practical use of technology	<p>Demonstrate the application of conceptual approaches to accounting information systems technology, e.g., database design or project management implementation of AIS.</p> <p>Apply information systems/technology to solving business/accounting problems, e.g., computerised accounting applications, databases, spreadsheets.</p>

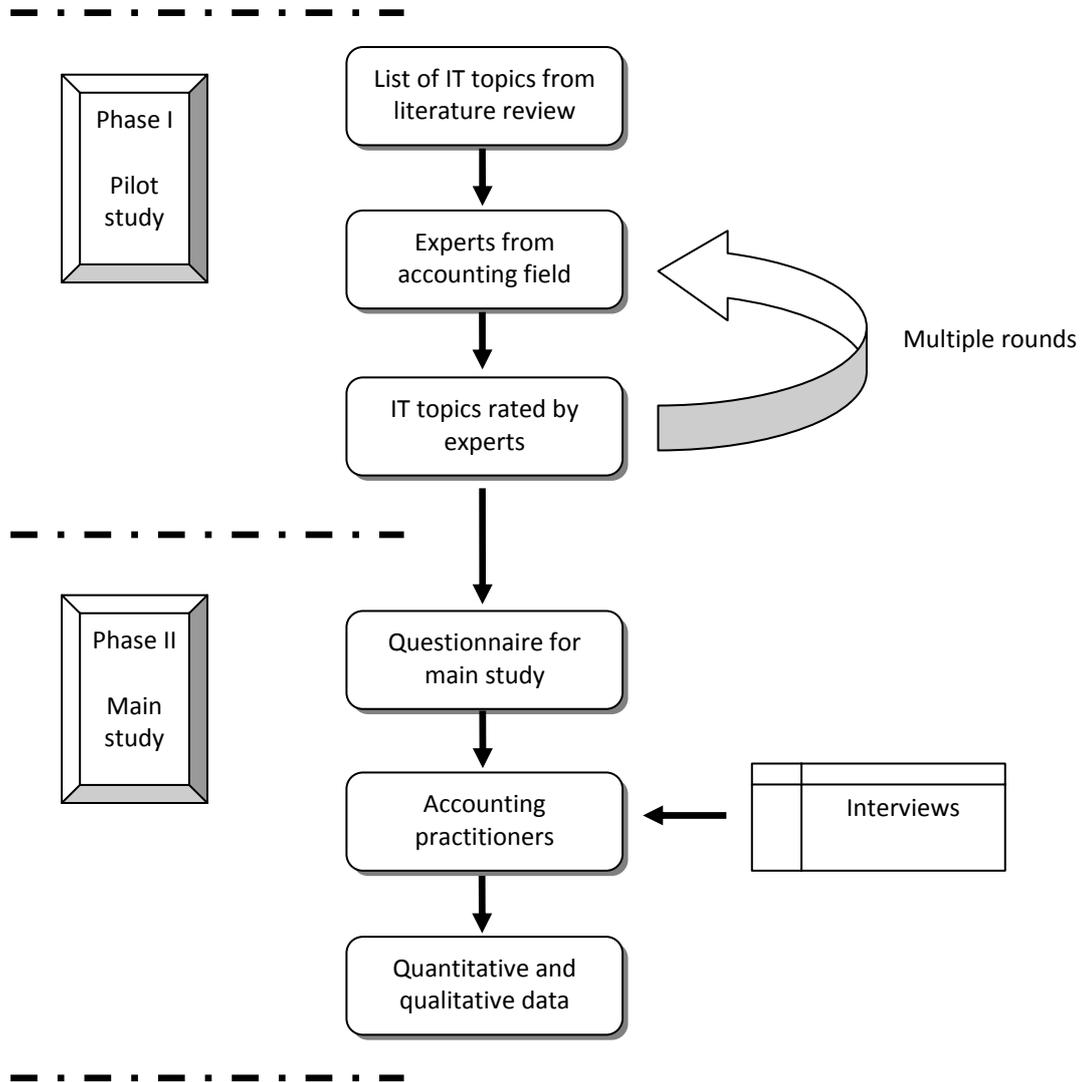
Source: NZICA (2009)

Appendix 5 – Number of main topic coverage of IEPS 2

	No. of topics
IT strategy (Topic 1)	8
IT architecture (Topic 2)	46
IT as a business enabler (Topic 3)	7
Systems acquisition and development process (Topic 4)	26
Management of IT (Topic 5)	26
Communication and IT (Topic 6)	4
IT control knowledge (A2)	24
IT control competencies (A3)	12
IT knowledge required as a manager of IT (A4)	7
IT knowledge required as an evaluator of IT (A5)	3
IT knowledge required as a designer of IT (A6)	7
IT knowledge required as an audit professional (A7)	4
Total	174

Source: IFAC (2007)

Appendix 6 – Two Phases of the study



Appendix 7 – Number of questions in Delphi questionnaire

Source	Details	No. of questions	Question numbers
IFAC IEPS 2	IT strategy (Topic 1)	8	1.1 – 1.8
	IT architecture (Topic 2)	46	2.1 – 2.46
	IT as a business enabler (Topic 3)	7	3.1 – 3.7
	Systems acquisition and development process (Topic 4)	26	4.1 – 4.26
	Management of IT (Topic 5)	26	5.1 – 5.26
	Communication and IT (Topic 6)	4	6.1 – 6.4
	IT control knowledge (A2)	24	7.1 – 7.24
	IT control competencies (A3)	12	8.1 – 8.12
	IT knowledge required as a user of IT (IEG-11) (see Note 1)	14	9.1 – 9.14
	IT knowledge required as a manager of IT (A4)	7	10.1 – 10.7
	IT knowledge required as an evaluator of IT (A5)	3	11.1 – 11.3
	IT knowledge required as a designer of IT (A6)	7	12.1 – 12.7
	IT knowledge required as an audit professional (A7)	4	13.1 – 13.4
		Sub-total	188
NZICA SLO-5 (see Note 2)		5	14.1 – 14.5
Bain, Blankley & Smith (2002)		30	15.1 – 15.30
Wessels (2005)		34	16.1 – 16.34
Developed for this research		9	17.1 – 17.9
		266	

Note 1 – IT knowledge and skills as a user of IT is taken from IEG-11 which was replaced by IEPS 2

Note 2 – SLO-5 was chosen instead of SLO-CA6 because the latter has one less topic than SLO-5

The above decisions were made with the aim to make the questionnaire for the pilot study as comprehensive as possible.

Appendix 8 – Categorisation of topics with mean scores ≥ 4 from pilot study

Question number	IT knowledge/skills	Mean score	Topic category
5.21	Office software (spreadsheet)	6.0	Spreadsheet
9.3	Apply appropriate IT systems/tools to business/accounting problems (spreadsheet)	6.0	Spreadsheet
16.3	Spreadsheets	5.8	Spreadsheet
5.20	Office software (word processor)	5.7	Word processor
16.10	Accounting software	5.7	Accounting software
9.2	Apply appropriate IT systems/tools to business /accounting problems (word processor)	5.5	Word processor
9.10	Demonstrate understanding of business and accounting systems	5.5	Accounting systems
17.1	Accounting software (MYOB, Great Plains)	5.5	Accounting software
8.10	Appropriate IT systems/tools to business/accounting problems	5.3	Subsumed into spreadsheet, word processor, and presentation topics
9.11	Demonstrate understanding of business and accounting systems (ERP, CRM)	5.3	Accounting systems
15.6	GL reporting cycle	5.3	Accounting systems
16.2	Word processing	5.3	Word processor
5.19	Office software (Internet tools: e-mail, web browsing)	5.2	Internet tools
6.1	General means of communication supported by IT	5.2	Internet tools
6.2	Risks in communication supported by IT	5.2	Data security
9.5	Apply appropriate IT systems/tools to business /accounting problems (Internet tools)	5.2	Internet tools
5.22	Office software (Database management system)	5.0	Database software
15.3	Revenue cycle	5.0	Accounting systems
15.20	Internal control	5.0	IT controls
15.29	Ethics	5.0	Values
16.5	Internet tools	5.0	Internet tools
16.9	Database search and retrieval	5.0	Database software
2.11	Business documents, accounting records, control/management reports	4.8	Accounting systems
9.1	Apply appropriate IT systems/tools to business /accounting problems (Operating systems)	4.8	Operating systems
9.8	Apply appropriate IT systems/tools to business /accounting problems (Anti-virus software)	4.8	Operating systems

15.1	Introduction to systems	4.8	General systems knowledge
15.22	Communication systems and technology	4.8	Internet knowledge
16.4	Presentation software	4.8	Presentation software
16.11	Tax return preparation software	4.8	Accounting software
17.2	ERP systems (SAP, Oracle)	4.8	Accounting software
3.3	Effectiveness of the entity's business processes	4.7	Accounting systems
5.18	Office software (Presentation software)	4.7	Presentation software
9.4	Apply appropriate IT systems/tools to business /accounting problems (Database software)	4.7	Database software
15.4	Purchasing cycle	4.7	Accounting systems
15.7	HR/Payroll cycle	4.7	Accounting systems
16.12	Time management and billing systems	4.7	Accounting software
16.14	Electronic working papers	4.7	Accounting software
17.6	Database concepts	4.7	Database concepts
6.3	Benefits of IT to communication	4.5	Internet knowledge
8.11	Understanding of business and accounting systems	4.5	Accounting systems
9.7	Apply appropriate IT systems/tools to business /accounting problems (Presentation software)	4.5	Presentation software
15.2	Introduction to transaction processing systems	4.5	General systems knowledge
15.16	End user computing	4.5	General systems knowledge
15.21	Computer fraud	4.5	IT controls
15.28	IT audit	4.5	IT controls
9.14	Apply controls to personal system	4.3	IT controls
16.15	Audit software	4.3	IT audit software
16.27	Anti-virus software	4.3	Operating systems
2.6	Attributes of information	4.2	General systems knowledge
5.25	Computer-assisted audit techniques (CAAT) (Analytical tools)	4.2	IT audit software
7.19	Controls over information systems	4.2	IT controls
8.12	The application of controls to personal systems	4.2	IT controls
16.1	Operating systems	4.2	Operating systems
16.6	Research tools	4.2	Research tools

16.8	Database software	4.2	Database software
16.22	Electronic data interchange	4.2	e-commerce
5.23	Computer-assisted audit techniques (CAAT) (Accounting packages and CAAT)	4.0	IT audit software
9.9	Apply appropriate IT systems/tools to business /accounting problems (Utility software)	4.0	Operating systems
9.13	Demonstrate understanding of business and accounting systems (e-commerce)	4.0	e-commerce
16.29	Firewall software/hardware	4.0	Internet knowledge
16.32	Back-up and recovery	4.0	Data security
17.3	Documentation tools (System flowcharts)	4.0	Documentation tools
17.4	Documentation tools (Document flowcharts)	4.0	Documentation tools
17.5	Documentation tools (Data flow diagrams)	4.0	Documentation tools

Appendix 9 – Other IT knowledge and skills

IT knowledge/skills	IQ3 To perform better	IQ4 If going back to study	IQ5 If promoted	IQ6 In five years time
Ability to search information from relevant sources	•			•
Advanced spreadsheet (Macros, LOOKUP, pivot tables, graphs)	•	•	•	
Advanced word processing	•			
Basic computer programming		•		
Budgeting and forecasting software		•		
Data analysis and interpretation	•		•	
Database concepts	•	•		
E-commerce				•
Expand IT vocabulary			•	
Financial modelling, simulation	•			
Generate reports from accounting software		•		
IT controls	•			
Knowledge of different accounting software to advise clients		•	•	
Manage IT suppliers			•	
Open office software		•		
Operating systems (anti-virus, utility software)	•			
SPSS Statistics software		•		
Systems development life cycle	•		•	•
Understand accounting software better		•		
Understand accounting systems better	•			
Use and search data from database (SQL)	•	•		
XML language		•		