

Where have all the students gone?

IT Secondary Education in New Zealand

Jan Howard

Christchurch College of Education

jan.howard@gmail.com

Dr Clare Atkins

Nelson Marlborough Institute of Technology

clare.atkins@nmit.ac.nz

Abstract

Over the last two years there has been a significant increase in advertised IT jobs in New Zealand and a considerable drop in the number of students graduating with IT degrees. In 2004 tertiary IT enrolments were at their lowest in 15 years and it has been estimated that almost half of IT tertiary students drop out in the first year. This appears to be part of a global trend and anecdotal evidence and common sense suggests that the lack of a consistent IT curriculum in secondary schools could be a major contributor to this problem.

This research set out to explore the teaching of ICT in New Zealand schools. 312 secondary schools and their IT teachers were surveyed in 2005. While the response rate was not high, the results suggest that the absence of a common, nationally recognised definition of IT in secondary schools, exacerbated by the lack of a national IT curriculum, has resulted in confusion for staff and students, a lack of consistent standards, and the absence of a recognised pathway to tertiary study. The results also suggest that IT is not valued in schools as a legitimate, academic subject and that the majority of secondary IT teachers do not have any formal IT qualification. Intended to complement work being undertaken by the FIT initiative, this research appears to support some of the current anecdotal evidence and highlights some particular areas that need addressing.

Keywords: Computing education, secondary education, information technology, curriculum development.

1 Introduction

Overseas studies (e.g. Wills & Sutcliffe, 2005; Oates, 2004) suggest that there is a growing global shortage of IT graduates. They also suggest that the inability of businesses to hire professionals with IT skills is affecting the ability to complete projects on time, and having a broad impact on the global economy. This situation is mirrored in New Zealand and appears unlikely to be remedied in the near future. Otago University has forecast that there will be 125,000 New Zealand ICT jobs by 2012, compared to current levels of levels of about 41,000 (Business News, 2005).

This quality assured paper appeared at the 19th Annual Conference of the National Advisory Committee on Computing Qualifications (NACCQ 2006), Wellington, New Zealand. Samuel Mann and Noel Bridgeman (Eds). Reproduction for academic, not-for profit purposes permitted provided this text is included. www.naccq.ac.nz

The Dominion Post (Pullar-Strecker 2005) reported that in 2005, tertiary enrolments in IT were at their lowest in 15 years, that there was a 20 percent drop in the number of students graduating with an IT degree and that in 2004 there had been an 84% increase in IT vacancies.

In the same article, Judith Speight, former TUANZ chairwoman, commented that there is no IT curriculum beyond year 11 and no consultation with universities as to what sort of IT courses would be useful to facilitate this pathway (Pullar-Strecker 2005). It seems quite possible that the absence of a clear definition of IT in secondary schools is contributing to the scarcity of tertiary IT students and the lack of a definite IT pathway from secondary education into tertiary study and employment must be exacerbating this situation.

This research was designed to investigate the issues, attitudes and framework within which IT is taught in New Zealand secondary schools and it should be noted that for the purpose of this project the terms information technology (IT) and information and communication technology (ICT) are interchangeable. We begin with an overview of the background of the global and New Zealand IT skills shortage and education situation. The research method is then briefly described and the major results reported and analysed. In conclusion we highlight a number of significant concerns that the New Zealand education sector needs to address.

2 Background

2.1 Impact of IT skills shortages

The global shortage of IT graduates is having a significant impact on the availability of skilled IT workers, a situation of concern to both employers and governments. The shortage however will affect far more than just the technology companies. It has been estimated that 92% of IT workers in the US are employed by non-technology businesses (Wills & Sutcliffe 2005). A UK study found that 76% of 3,200 companies had problems filling IT vacancies and, as a result, delayed launching new products and services (Oates 2004). In addition, a number of experienced people are leaving the industry, taking a career break, or retiring. It is predicted that the UK will need to find between 156,000 and 179,000 new IT professionals a year (Oates 2004). There is also a concern that a considerable number of employees lack essential IT skill and studies suggest many companies are not addressing this problem. For example, Lowles (2005) found that one third of organisations are failing to address the IT skills development of their employees and it has

been suggested that unless the UK upgrades its employees' computer skills, catastrophic damage of the UK economy will occur (Contractor UK, 2004). In the US, it is estimated that the shortage of IT workers is impacting worker productivity by \$4.5 billion a year and reducing the entire economy by \$105.5 billion annually (Cisco, 2005).

The impact in New Zealand is no different. As early as 2002, the Minister for Industry and Regional Development suggested that the technical skills shortage was one of the greatest problems faced by the New Zealand economy (Anderton, 2002). In 2005, Deutsche Bank's senior economist Darren Gibbs, commented that the primary issue facing the New Zealand economy was the lack of skilled technical labour (Massey News, 2005) and the computing industry in New Zealand is already suffering with The Dominion Post reporting that businesses such as Vodafone and Oracle are affected by the skills shortages (Pullar-Strecker 2005). The wider economy in New Zealand will not be exempt. As new technologies are introduced "everyone, including the people installing the technology in homes, is going to have to have a whole new range of skills than they need today. We are going to need people to do systems integration in the home all the way up to the developers at the leading edge" (Milner 2005).

One New Zealand government response has been to actively encourage new migrants by including a number of IT skills in the Immigration Service's Long Term Skill Shortage List (NZIS, 2005). However, as the nature of the problem is global, not local, this does not constitute a long term solution. Ensuring that appropriate education is both available and encouraged for those New Zealanders who will enter the future job market would seem to offer a more sustainable strategy.

2.2 Education Issues

Globally, the education system is not producing sufficient IT graduates for the projected increase in job vacancies, both in the IT industry itself and in areas which require sophisticated IT skills. In the US, students enrolled in degrees in computer and information science are down 27% over the last five years (Cisco, 2005). Peterson (2005) comments that in the US there are "...smart people no longer even signing up to take introductory IT courses. This needs to be addressed or there will not be a U.S. work force in computer sciences." There may be a number of reasons for this situation, both in the UK and the US, but foremost among these must be that "...the educational infrastructure needed to meet future skill requirements is not yet in place" (Contractor UK, 2004).

As elsewhere, the education system in New Zealand appears deficient in preparing students for careers in IT. Speight has commented that schoolchildren are taught basic IT skills through years 1 to 11, but beyond that teachers "have to make it up as they go along". In addition, she comments that "when they get to year 11, there is no curriculum and no conversation with universities as to what sort of courses would be useful" (Pullar-Strecker 2005). That some core elements remain

missing from New Zealand's capacity to establish ICT career pathways, even though the Government has invested a significant resources, has been reinforced by the FIT NZ report which comments:

"There is currently no year 11-13 ICT Curriculum. While ETITO addresses the training needs of the Electronics Industry, New Zealand does not support an ITO for Information Technology or Telecommunications. Secondary and tertiary ICT educators and the ICT industry have no framework for consultation and the lack of understanding and communication around ICT as an educational or career option is leading to misperceptions by both community and industry." (FIT NZ Stocktake Report 2005, p. 5)

Governments, industries and educators worldwide have recognised the seriousness of this deficiency in pre-tertiary education and are moving to address the problem. A major initiative in the United States, the ACM K-12 Taskforce Model Curriculum for Computer Science proposes a model curriculum to incorporate computer science fluency and competency throughout primary and secondary schools. This has been in response to the need to provide academic coherence to the rapid growth of computing and technology, alongside the need for an educated public that can utilise that technology more effectively (ACM K-12 Taskforce, 2003). A similar UK initiative is run by Eduserv Chest, a non-profit organisation which acts as a co-ordinating centre for the supply of software, data, information, training materials and other IT related products to educational institutions in the UK and abroad. This initiative was motivated by the need to increase access to information technology for all students (Eduserv Chest 2005).

The first ICT strategy to build infrastructure and school capability for New Zealand schools was released in 1998. This was followed in June 2002 by the new strategy Digital Horizons: Learning through ICT, which focused on integrating ICT into the curriculum (MoE, 2002). However, while these initiatives addressed ICT provision in school and encouraged the use of ICT across the subject range they did nothing to assist in the development of IT as a discrete subject or to provide an IT career pathway. The ICT industry, tertiary institutions, secondary schools and Government are now involved in the Fluency in IT New Zealand (FIT NZ) initiative which is focusing on developing a technology curriculum for school children, in years 11-13 and a new national IT training organisation (FIT NZ, 2005).

3 Research Method

To explore some of the issues around the teaching of IT in New Zealand secondary schools, a survey instrument was designed that included two surveys. One survey was intended for the principals of the 312 selected secondary schools and the other, for those who taught information technology in these schools. Small area schools were excluded from this research. The surveys contained a selection of both closed and open questions, allowing for measurable statistics, while also allowing room for

comment on relevant issues based on the experiences and observations of the participants. The survey instrument was developed using the issues identified by the literature and was piloted with a local school. The final version of the surveys was emailed to the selected schools on the 25 August 2005, to be returned by the 18 September 2005.

As the completed surveys were returned it became apparent that some of the principals had passed their surveys directly to the staff who taught IT. It is known that at least 7 surveys were completed by a member of staff other than the principal. As a result, it is not always clear whether the responses on the principals' survey come from teaching staff or from the principals themselves. A follow-up email sent to non-responding schools asked principals to return incomplete surveys, as the information would still be of value. Consequently some incomplete surveys were returned. One other, anticipated, issue was that the exact numbers of staff who teach IT in secondary schools is difficult to ascertain. Thus, there is no way to determine what percentage of the total number of IT teachers is represented.

Most responses were received in printed form although some were sent by email. The original copies of all forms were retained as received and the data was entered into a spreadsheet to allow for statistical analysis. Freeform comments were also captured on the spreadsheet and were subject to some qualitative analysis.

4 Research Results

Two shortcomings of the survey became evident as the first responses were received. Firstly, a definition of Information Technology had not been offered in the surveys, as it was incorrectly assumed that all schools would have a common understanding. Secondly, only information regarding unit standards had been sought but it became clear that some level one achievement standards in text and information management (TIM) were being offered. Although future work should rectify these omissions, both inadvertent mistakes, yielded interesting results which are discussed later. It has not been possible to reproduce all the results from the research in this paper; however, the full results are available from either of the authors.

4.1 Principal's Survey

4.1.1 Principals – on their schools

Twenty five respondents replied to the principals' survey which represents an 8% response rate from a variety of schools ranging from 100 to 2000+, with decile ratings ranging from 1-7. One of the objectives of the principals' surveys was to discover how IT was structured within the schools. There were significant variations in where IT was situated. Only 6 schools saw it as a subject in its own right, five placed it under technology (alongside woodwork, metalwork, and cookery) while five placed it under text and information management. Five schools structured it partly as a subject in its own right and partly under either Technology or TIM (see Table 1). The two respondents that responded 'other' commented

respectively, that "IT is integrated into all curriculum areas – it can be taken at senior level as computer science, NCEA achievement and unit standards course..." and "Vague question - "TIM/Geo/Eng/Tech/BAD/etc all use IT somehow..." We can only presume from these responses that IT, unlike Computer Science, was not understood as a subject in its own right in these schools.

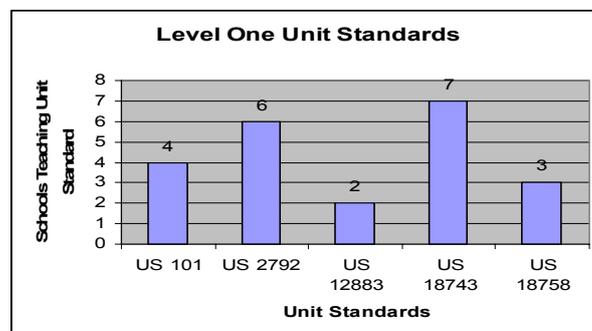
Table 1 The structure of IT within responding schools

Where IT sits	Schools	%
Under Technology	5	20
Under TIM	5	20
Subject in its own right	6	24
A subject in its own right and under Technology	3	12
A subject in its own right and under TIM	2	8
Under Technology and TIM	2	8
Other	2	8

4.1.2 Unit Standards and other Qualifications

Twenty responses included a list of the unit standards (US) being taught while two also volunteered information on level 1 achievement standards for TIM, derived from the School Certificate typing. The content of the unit standards on offer in the responding schools is more application than IT based (see Figure 1). For example, while US18758 involves demonstrating navigation skills using a browser, the other four are all TIM based

Figure 1 Level 1 Unit Standards



US 2780 and 2781 are compulsory for students studying National Certificate in Computing Level 2 and 3 and are taught by the majority of the responding schools. The next popular are US 2784, 2786 and 2788 which are core application based units; spreadsheet, database and desktop publishing respectively (see Figure 2).

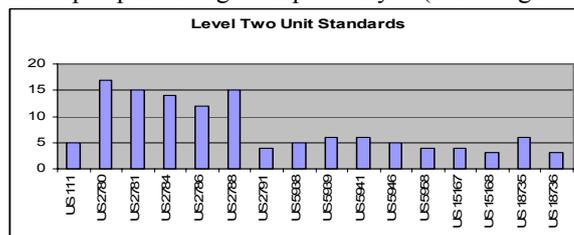


Figure 2 Level 2 Unit Standards > 3 Schools

US offered by less than four schools have not been included.

The most frequently offered US at level 3 were 2785, 2787, 2789 and 5940, all of which are core application based units, spreadsheet, database and desktop publishing respectively. Unit Standards offered by less than four schools have not been included in this table.

Figure 3 Level 3 Unit Standards > 3 Schools

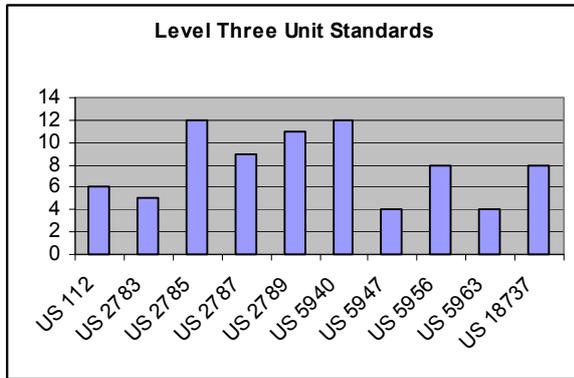


Table 2 Other offered qualifications

Qualification	No of Schools	Comments
ICDL (International Computer Driving Licence).	7	1 commented that this would not be offered after 2005 as these types of qualifications were outside the framework
None or unknown.	3	1 felt other qualifications were too industry driven & skill based – not “thinking-driven” or written for adolescents.
Wintec Certificate in Computer applications (Wintec Active)	3	
Level 3 National Certificate in Computing	2	
CCNA1	2	
Technoetz Certificate	1	
Technocutz web training	1	
CCNA2, CCNA3, CCNA4	1	
CICSO qualifications	1	

One of the questions asked principals whether they felt that the current available unit standards allowed their staff to adequately meet the IT education needs of their students. Of the 24 responses, 58% (14) said yes, 13% (3) said no but 29% (7) were unsure. When asked to elaborate on their response, a common observation was that the current IT standards were insufficient or poorly written and needed rationalising. A number also commented on the disadvantage to some students of the inability to reward merit or excellence for IT. A range of

other qualifications were offered by the responding schools and these have been summarised in Table 2.

4.1.3 Principals – on their staff

Of the 74 IT teachers in the responding schools, 42% (31) were reported as having no identifiable IT qualification, 24% (18) did. However, 34% (25) had some variety of teaching degrees or diploma of which the IT component was unclear. Interestingly, only 31% of principals indicated that they would prefer to recruit a new staff member with an IT qualification. Nevertheless, 87% of principals felt that their staff had sufficient knowledge to teach the available unit standards. Of those with overall responsibility for IT teaching in the school, only 23% (5) had an identifiable IT qualification and three schools had no individual with overall responsibility for IT.

4.1.4 Principals – on their resources

Less than half the respondents (45%) felt that their school was adequately resourced for IT, with 18 respondents saying that they would like more hardware. This included 10 who stated that they would like more up-to-date computers and 11 who said that they would like more software, including industry standard packages such as Dreamweaver, Corel, Flash, Freehand, VB, the Macromedia Suite and Photoshop. Nine respondents (38%) said they would like more teachers, with most stating that they require more teachers with IT qualifications.

4.1.5 Principals – on their students

Fifteen of the 25 respondents provided optional comments on why, they believed, more students were not continuing to IT tertiary study. The mostly commonly identified reason was that it was not considered to be an academic subject (37%) and mostly seen as a tool, not a subject in its own right (19%). However 13% commented that it was seen as too difficult or ‘nerdy’. Other reasons given included the lack of an obvious career pathway, and the lack of a separate curriculum or lead-in subjects. One respondent felt that students thought they already had enough skills in the area. However, one respondent commented that many students move directly into IT related jobs and received on-the-job training, while another stated that students who studied IT at the school did move on to further IT study. Nevertheless, there was an overwhelming implicit acceptance that students did not generally see tertiary IT study as a fruitful path.

The remaining comments were varied and too diverse to summarise or include here. However, there are two that we feel make a significant contribution to our understanding. One respondent commented:

“We have battled the MOE for a number of years about the dismal situation of computing. We have to daily live the reality of trying to teach and encourage students into our subject against a brick wall of no curriculum, no suitable qualifications, no acknowledgment of the situation from the MOE in spite of many attempts.”

Another said:

“The Education Department needs to make Computing/ICT a separate, legitimate subject, not under the umbrella of Technology, as Technology is not an approved subject, but computing is! There are no Achievement Standards for Computing, only Unit Standards so this puts students off taking computing at senior level and for further study at tertiary level”.

4.2 Staff Survey

4.2.1 Staff – on themselves

32 staff members from 30 schools responded to the staff survey. This represents a 10% response rate from a variety of schools throughout New Zealand. 62% of the respondents were female but as a result of the low response rate, it is not possible to assess the true ratio of male to female IT teachers.

Staff were asked to assess which, if any, of their qualifications had been most useful to them in teaching IT. Many respondents gave multiple answers with only 23% (16) rating their tertiary qualifications, with 26% (18) identifying their self taught skills. In addition, 20% (14) found short courses most useful and 19% (13) cited industry experience. Only seven of those who marked ‘tertiary qualification’, specifically mentioned an IT qualification degree or diploma. The short courses included those run by CETA and NatColl. A common observation was that there were not appropriate in-service training courses in IT for teachers.

Staff were also asked to comment on their perception of the priority that IT was given in their school. 65% rated it as medium with only 19% seeing it as high. Only, one respondent identified the different interpretations of IT reporting that while office skills were given a high priority - computer science was not. This distinction raises the question of how the other respondents had interpreted the question.

This same staff member also responded in two parts to the following question which asked how well they were able to meet the needs of their IT students. This staff member reported confidence in teaching office skills but not computer science. Other variations came with respondents confident in teaching senior students but unsure for juniors. Overall 49% felt that they were able to meet their students’ needs but 45% did not (35% said ‘no’ and 10% ‘unsure’). This was in stark contrast to the confidence of their principals.

As a follow on to this question, staff were asked to identify some of the ways in which they felt unable to meet the needs of their students. Nine respondents marked ‘curriculum restrictions’ and the predominant theme in their answers was that there is no IT curriculum. Secondly, was that the more academic students are not attracted to a course assessed by unit standards. One respondent commented “...our subject is on a second foot compared to the other subjects students are choosing...” while another remarked:

“There is no curriculum! Only ancient guidelines from the 1980’s that everybody ignores anyway. The subject is not taken seriously by the MOE and was chucked in with technology (read: the too hard basket), meaning that students now get credits for doing screeds of paperwork rather than for knowing how to run computers and programs.”

Another respondent highlighted a worrying possibility if it were to become a trend:

“ICT is not a core subject at year nine level anymore. Next year our year nines will receive information literacy training during the orientation week at the beginning of the year. At year 10 it is an option, therefore some students may not receive any ICT teaching during their school years. Instead they may receive a token amount through the technology curriculum”.

Those who answered ‘other’ included comments about the speed of the network, lack of pathways leading to university and issues with lack of NCEA credits.

We had expected that on-going training might be an issue for practising teachers and had asked staff to identify what they received. Half responded that they received no training (11%) or that it was self-organised (39%) while a few said that they received learning through a cluster, or from other staff members and only one said that their training was staff professional development. In addition 70% of respondents identified peer support (44%) or friends and family (26%) as their most likely source of professional IT support.

4.2.2 Staff – on the IT curriculum

Two questions were asked specifically related to the IT curriculum. Firstly, participants were asked how they viewed the existing curriculum. 31 of the 32 replied and a few gave more than one answer. The predominant theme from all respondents was that the current IT curriculum was inadequate, fragmented, too generic, and too easy and that a “nationally recognised curriculum” was required. A significant number of the respondents disagreed with the current practice of including IT under the technology umbrella and felt that it should be a subject in its own right. In addition, only 26% felt that the curriculum was satisfactory with 46% feeling that it was either not challenging enough (13%), not comprehensive enough (10%) or not clear enough (23%). Of those who gave other reasons, most re-iterated that there was no curriculum to comment on. For example:

“There is no curriculum. We make up courses as we feel and choose US and AS to assess the students” and “...Doesn’t exist! There is no curriculum for either information management or computing. We’ve been lumped under the technology curriculum as ICT.”

In fact this was an area that many staff felt passionate about, one remarked, “despite government rhetoric on the importance of ICT in schools there is NO IT curriculum. Schools are inventing their own programmes depending on the strengths/interests of their staff and what is offered outside...” and another strongly objected to

“ICT being under Technology. Computing should be a subject in its own right and not be watered down into a strand under ICT. Computing and IT degrees can be studied at university but schools do not give it as much status as other subjects because computing is only Unit Standards and ICT is under the umbrella of technology, not a separate subject”.

The second question asked where the content of their IT programmes came from and 49% stated it was from their own or other teachers’ experience and knowledge. Those who gave details in their response also implicitly highlighted the differences in understanding of what IT education might be. As one respondent noted, “...level one information management came from typing and doesn’t lead anywhere really...”.

4.2.3 Staff – on their students

Staff were also asked to comment on why, they believed, some students chose IT at secondary school. Almost half identified that students had a genuine interest but for many (33%) it was seen as an easy option. Staff also identified that in a number of cases, students were forced to choose IT as there was nothing else for them to do. As one staff member remarked IT is “...often seen by Deans as a place for difficult students to go!” Another remarked:

“...many non-academic students are pushed into taking IT by schools when they don’t fit into the other option boxes in the timetable. They are told “anyone can pick up IT” and you don’t need prior knowledge like some of the other subjects eg science, maths.”

As in the principals’ survey, staff were also asked to comment on why, they believed, students were not choosing IT as a subject for tertiary study. Again, the primary reason was identified as IT not being seen as an academic subject (24%), with the lack of well defined career pathway (9%) and the lack of an IT curriculum (16%), being contributory factors. There was also a perception that it was too difficult (16%) or that students believed they already had all the skills they needed (6%). A number of other reasons were also quoted including, a perceived “lack of job opportunities” and a feeling that “the majority are not interested in sitting in front of a computer all day”. Some believed that students “mostly see it as a tool not a vocation” and another remarked that “...if they don’t get encouraged into it at school and enjoy it they are unlikely to study it at tertiary”. Once again the lack of clarity over the meaning of IT also surfaced with one respondent commenting with frustration that “wrong areas (are) taught at secondary. Students are taught typing and DTP – not IT.” One response in particular summarised much of what many of the staff appeared to be thinking:

“There is no set curriculum past Year 11 – Information Management, which offers achievement standards. Our programme offered in yr 12 is based on Unit Standards – most of the more able students [are] moving into more specific areas such as – Physics, Chemistry, Calculus. For 3 years we had a qualified IT teacher with qualifications and extensive knowledge in computer systems,

operations, networking, etc. Attempts to set up senior classes in these areas were generally unsuccessful as the number of students able to cope at this level were few and those Unit and Achievement standards offered at level 2 and 4 require discipline in the planning process as much as the final product – students struggled with this aspect. When this teacher left last year there were 2 students (yr 12) left without someone to meet their needs – both were interested in pursuing IT careers. One of these students is choosing to gain early acceptance to a Polytech next year (instead of Y13) to do this. Luckily his parents are able to foot the bill for his study as he will not be eligible for a student loan.”

Interestingly some of the responses to this question seemed to highlight the attitudes and misconceptions of some staff members’, as much as their students:

“IT is getting very complicated and [its] very stressful in IT now. The hours are not user-friendly, the pressures in the industry immense. To be honest I’ll be recommending to my children – both boys – to stay away from university and do a trade”.

Another commented that “there is only programming type courses at Universities and they feel (perhaps) that skills they have from TAC are enough to get them by.”

Finally staff were asked what they felt could be done to encourage students to study IT. 29 respondents answered, some in considerable detail. Half the respondents identified the need for a separate curriculum for IT and/or a clear academic pathway to tertiary study, while 20% felt that raising awareness, amongst both staff and students, of IT career paths and employment opportunities would be beneficial. Other strategies ranged from making IT compulsory at Year 9 to writing “literature in a more child friendly way and relate the course content to something the pupils could relate to” and from ensuring that hardware and software was up to date, to arranging field trips to universities and polytechnics. Only one respondent seemed to feel that there was no problem commenting that “IM is sufficient for the students at school. Apart from the one [student mentioned] above no-one is interested.” However again, one respondent clearly articulated the apparent thoughts of many when he wrote:

“Government [need] to provide a common curriculum with resources, exemplars and common standards rather than the hotchpotch of Unit Standards that are used by schools to make up programmes. [Need to ensure] professional development for teachers in this area is provided – ESPECIALLY for the secondary sector – NOT day courses learning how to use PowerPoint!!!!”

Staff were invited to conclude the survey with their own comments and observations and although it is not possible to discuss all these comments here, all of the themes mentioned above were repeated in various forms. In addition, it was identified by several respondents that students are often not taught the use of packages until Year 11 by which time they are expected to use them

across a range of subjects. Several identified the need to clearly distinguish between computing skills for general use and IT as a subject area in its own right and one commented further on the impact of not doing this, on staff morale: “Without a curriculum IT is becoming “ICT” – an across-the-curriculum tool with no real substance, no specialisation in its own right as a worthwhile career. Also – low morale (especially if G3 equivalent teacher now having to do the DISS) has impact on performance”. Another observed that it is

“...really hard to construct a course when there are no National guidelines, eg I know of a school which runs a Level 3 (Year 13) computing class and they basically only do graphics and Desktop publishing – does this give students a good idea of what is involved in Tertiary IT????”.

5 Analysis

Four major themes emerged from the survey and while we are not able to claim any statistical significance for our results, we believe that these themes are likely to be endorsed by many in the sector.

5.1 Lack of cohesion

It became evident that the respondents’ understanding of IT varied considerably; some seeing it as a separate discipline, others equating IT with computer science at one end of the spectrum or TIM at the other. Others considered it solely as the use of a computer as a tool and believed that the integration of ICT across the curriculum was sufficient. We had, naively as it appears, assumed that the participants would have a common understanding of IT and our first reaction was annoyance that we hadn’t been more specific in our definitions. However, while this omission has caused us to question some of the results we found, it nevertheless yielded some interesting results as respondents, either implicitly or, occasionally, explicitly provided their own definitions. From this, the considerable diversity of interpretation of ICT within the secondary sector became clear. Most disturbing perhaps is that there appeared little understanding of what Information Technology, bridging as it does, the two areas and functions of TIM and computer science, should or could be. Consequently the teaching of IT is fragmented and inconsistent, both within schools and across the sector.

The lack of any formal, nationally recognised curriculum is both further evidence of, and a result of, this lack of cohesion. It is unclear whether the lack of such a curriculum has allowed the fragmentation to occur or whether the lack of a common understanding has proved too difficult an obstacle for national curriculum development to overcome. Which came first, however, is perhaps less relevant than addressing the issue with speed and determination.

However, we recognise that this is less straightforward than it might appear. Some responsibility for the lack of clarity of what IT is or should be, must also rest with the IT industry and tertiary institutes who often appear to have cloudy definitions themselves.

5.2 Lack of credibility

A large number of respondents commented on the lack of academic credibility afforded to IT. For many this was evidenced by the non-existence of achievement standards and the lack of recognition given to IT secondary education by the tertiary sector. As one respondent commented, “...we do not teach courses for those who would like to enter IT/Computer science courses at university because the available courses for yr 12/13 are not recognised by universities.”

The creation of appropriate achievement standards will be an essential part of developing a pathway to tertiary study and attracting students with the academic ability and motivation to study IT at a higher level. Teachers do not feel they can support their academic students in following a course of study they consider to be inferior and which ultimately leads nowhere. The importance of creating this academic pathway was clearly of concern to almost all of our respondents. As one staff member remarked:

“Until there is clear pathways for IT/Computer science, New Zealand will continue to struggle to fill its needs. There are many students wanting such pathways that are being brain washed to commerce and other career pathways.”

In many respects, IT now shares characteristics with other subjects considered fundamental to the education of every citizen, Mathematics and English. Skill levels in these areas are both required and developed across all subjects and yet both are also recognised as being worthy of tertiary study in their own right. Therefore, while all students are expected to become numerate and literate, provision is made for academic students to pursue higher level academic study in these areas. We would argue that in the 21st century, computer, or information, literacy has joined this exclusive club.

Our results also highlighted a lack of understanding of the career opportunities available to those who study IT. Students, staff and careers advisors need to be made aware of what opportunities exist in the employment arena in the field of IT and the likely impact of the graduate shortage on employment options in the near future.

5.3 Lack of resources

It was expected that schools would identify the need for additional resources to support the teaching of IT. What was not expected was the type of resources that were evidently required. Sustainable access to high quality, industry standard hardware and software continues to be difficult for most education providers but after the requirement for a national curriculum, it is the requirement for teachers qualified in IT and the means to support them in their teaching that appears to be the greater need. Teaching resources, professional support, in-service training in IT education and consistent support for professional development were all identified by a number of respondents as being badly needed. More than perhaps any other subject taught at secondary level, IT requires teachers to spend a significant amount of time in

gaining and retaining relevant, up-to-date knowledge and skills. Once again we meet the chicken-and-egg conundrum, summarised by one teacher as:

“Until the subject becomes a part of the recognised core curriculum it will not attract senior students and until qualified teachers are available to teach the necessary level and fields that the industry wants, students will move into other areas”.

5.4 Lack of priority

This question was one of those most impacted by the inconsistent definition of IT. While less than 20% of staff believed that their school gave IT a high priority, it is unclear what form of IT this related to. Nevertheless, it is disturbing that 80% of teachers considered IT to only have medium or low priority. Both nationally and globally, the lack of IT skills at all levels is considered to be one of the most important issues we face. Competing as it must with so many other claims on staff and students time, both government and society must make it clear that IT education is a priority.

6 Conclusion

The general picture that emerges from our research is not unexpected but nonetheless concerning. The deficiencies we have identified support the FIT NZ anecdotal evidence that the current curriculum is inadequate. A nationally recognised IT curriculum which recognises all aspects of IT and which in turn provides a common understanding of the IT discipline is essential as is the creation of an academic pathway to tertiary study. Such provision would help to provide a clear, coherent, relevant framework within which teachers could work with confidence.

This research has also highlighted the need for more teachers with qualifications in IT and more in-service training to keep that knowledge timely and relevant. A national organisation could provide this support by providing resources and appropriate training, and also coordinate a virtual resource centre, whereby teachers could share experiences, knowledge and resources.

The themes we have identified, all interrelated and all negative: lack of cohesion, lack of credibility, lack of resources and lack of priority, come together to create a depressing view of New Zealand’s ability to meet the growing demand for skilled IT graduates in the near future. Most importantly however, is the compelling conclusion to which we are drawn - that if New Zealand realistically expects to compete globally in the ‘information age’, the issue of IT education needs to be addressed with a sense of real urgency, purpose and priority. As one of our respondents wrote:

“I hope your results can make the MOE/govt appreciate that despite their wonderful talk about [the] knowledge economy, computer studies has been treated by them as the poor relation for the past two decades, and that they will see reason to redress this imbalance ASAP”

We hope so too.

7 References

- ACM K-12 Taskforce (2003). *Model Curriculum for K-12 Computer Science*. Retrieved 10 Aug: <http://www.iist.unu.edu/~paddy/CSAct/k12final1022.pdf>
- Anderton, J. (2002). *Skills shortages holding back economic development*. Retrieved 22 Sept 2005: <http://www.beehive.govt.nz/ViewDocument.aspx?DocumentID=15288>
- Business News (2005), Boosting Research. *School of Business News*, University of Otago, June, p5.
- Cisco (2005). *Employment Based Immigration*. Retrieved 14 Sept: http://www.cisco.com/warp/public/779/govtaffs/people/issues/employment_base.html
- Contractor UK (2004). *IT Skills shortage to crash UK economy*. Retrieved 19 Sept 2005: <http://www.contractoruk.com/news/001792.html>
- Eduserv Chest (2005). *Software and information negotiation and licensing services for education and the public sector*. Retrieved 20 Sept 2005: <http://www.eduserv.org.uk/chest/>
- FIT NZ Stocktake Report (2005). Received 9 Sept from Hilary Carlile at FIT NZ.
- FIT NZ, (2005). Received 20 July from Hilary Carlile
- Lowles, T. (2005). *Is the UK facing another IT skills shortage?* Retrieved 20 September 2005: http://www.trainingreference.co.uk/skills/it_professional/it_skills_shortage.htm
- Massey News (2005). *Shortage of IT workers threatens industry*. Retrieved 22 September 2005: http://masseynews.massey.ac.nz/2003/press_releases/11_02_03.html
- Milner, M. (2005). *IT skills shortage looms*. Massey News. Retrieved 12 September 2005: http://masseynews.massey.ac.nz/2004/Massey_News/aug/aug30/stories/29-15-04.html
- MoE, (2002). *ICT Strategies in schools*. Retrieved 10 August 2005: <http://www.minedu.govt.nz/index.cfm?layout=index&indexID=6918&indexparentid=1024>
- NZIS (2005). *NZ Long Term Skill Shortage List – Information Technology (IT) Professionals*. Retrieved 12 September 2005: http://www.newzealandnz.co.nz/discussions/ultimatebb.cgi?bb=get_topic;f=49;t=000500;p=0
- Oates, J. (2004). *IT skills shortage threatens humanity*. Retrieved 15 September 2005: http://www.theregister.co.uk/2004/11/01/skills_shortage/
- Peterson, R. (2005). *Critical shortage of IT workers in coming years*. Retrieved 14 September 2005: <http://slashdot.org/article.pl?sid=05/05/20/0615225&tid=146&tid=187>
- Pullar-Strecker, T. (2005). *\$1m bid to tackle IT skills shortage*. Retrieved 10 August 2005: <http://www.stuff.co.nz/stuff/0,2106,3265785a28,00.html>
- Wills, M. and Sutcliffe, R. (2005).. *Secure your IT Staff*. Retrieved 12 September 2005: http://www.cit.ac.nz/smartbusiness/links_Aug05.pdf