



MAKE IT STUDIES COUNT:

TIME TO ACKNOWLEDGE SCHOOLS' INITIATIVES IN IT CURRICULUM

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The current edition of Australian Educational Computing provides a snapshot of the variety, quantity and quality of Information Technology Studies courses in senior high schools across the nation. Studying about Information Technology (IT) is obviously important to the thousands of school-age students and their parents who participate in formal courses of study in schools with hundreds of teachers. It is interesting to compare this enthusiastic grassroots acceptance of IT studies in schools, to reactions from Governments and systems who have omitted it from their agendas, policies, strategic plans and initiatives.

This paper draws attention to the national imperative to acknowledge the contribution of school-level information technology courses to Australia's hopes for an IT-led economic recovery. Recently, Governments have been extensively analysing global economic and social contexts around information and communications technology, to develop strategic plans for boosting the IT industry in states and across the nation. They have

not recognised that the same forces have caused a steady growth of IT studies in Australian schools. This paper provides a framework for understanding the issues connecting IT studies in Australian schools to Australia's information economy future. This provides Governments with compelling rationales to initiate programs for IT studies in schools. The paper also points out how teachers, perhaps through their professional associations, might have to exert pressure on systems to attend more carefully to school level IT studies.

To develop the arguments for this paper, data was collected from an analysis of state and commonwealth strategic planning documents available in paper and on the web, by interviewing by phone at least one person in state systems who was the nominated spokesperson for IT studies, and by conducting an informal survey of Computer Studies teachers who were members of QSITE-cs and oz-csc, the two most prominent email-based communities of IT teachers. Data was also collected from the Queensland Board of Senior Secondary School Studies student database and from minutes of the subject advisory committee for computer studies.

DEFINING IT STUDIES

In this paper, Computer Studies or Information Technology Studies will refer to those subjects of study in Australian senior secondary schools where computer systems, information systems,

programming, multimedia, computer applications and implications are a subject of study in their own right. This activity takes the form of formal theoretical courses of study which contribute to tertiary entrance procedures, programs which deliver national vocational certification in IT, some internships and school-developed IT programs which meet local needs.

This paper is concerned only with teaching about information technology and related sciences and does not include activities that are often referred to as learning technology activities, computers across curriculum activities or computer literacy programs in subject areas. The discipline analysed in this document does not include subjects from the Technology Key Learning Area. That is, this paper is not referring to use of IT in subject areas like Design and Technology, Food Technology, Industrial Arts, Agriculture and Business Studies. IT studies deserve attention in their own right.

Information Technology Studies (or Computer Studies or Computing Studies) in senior high schools manifest into subjects whose titles reflect the discipline: Information Processing and Technology, Computing Studies, Information Technology Systems, Digital Media and Information Systems. This is often complemented by IT courses in years 8-10. Thus, the discipline in schools represents a substantial allocation of timetables, staffing and resources. Schools are beginning to develop Faculties of IT, though for some state schools which seem bound on accepting Key Learning Areas as the structural divisions which define faculties, recognition is more difficult and many computer studies programs are managed by Business Studies faculties, Technology KLA faculties or Mathematics faculties. This is a problematic outcome for state schools, directly caused by a lack of recognition of the value of IT studies in Government strategy.

WHY ARE IT STUDIES IMPORTANT?

A number of contexts surround the debate of IT studies in senior schooling.

The shortage of IT professionals, industry demands for IT literate workers, Government pursuit of smart state and smart country initiatives, development of knowledge economy goals and analysis of the impact of the globalisation on Australia's economic and cultural future swirl in a melting pot of debate without patterns for the interrelationships clearly emerging for any of the stakeholders. In the midst of political uncertainty and inattention by national and state systems, Australian students, parents and their school communities are increasing their participation in IT subjects in senior secondary schools.

WHY IS IT IMPORTANT FOR PARENTS AND STUDENTS?

The increasing participation rate of students and schools offering IT studies programs (see reports this edition), indicates that students, parents and their school communities have internalised rationales which link IT studies in years 11 and 12 with the career opportunities in an information economy future. In Queensland this year for example, 261 schools and 5211 students study Information Processing and Technology, 253 schools offer Computer Studies to 5456 students and 14 schools offer Information Technology System in a trial situation, to 365 year 11 students. Given there are 362 senior secondary schools in Queensland and some schools offer more than one program, 330 schools (91%) offer at least one formal course of study in IT with a gradual increasing participation rate; 23,345 students from 84,802 students. That is in Queensland, a third of students choose formal studies of IT, 1355 of whom choose to simultaneously study in more than one formal course of study.

There are many reasons why students might choose IT studies. Most would stem from the increasing community awareness of the much publicised shortages in IT fields and the realisation that knowledge industries have growth employment patterns (Meridyth, Russell, Blackwood, Thomas and Wise,

1999, Tanner, 1999). Others would also have internalised that every industry and profession and all fields of study, use IT. Some may have also considered the links between high performance on standardised key competency tests and results in IT subjects (Allen 1998). The commonalities between the Mayer Key competencies (Australian Education Council 1992), now inherent in the Common and Agreed Goals of Schooling (DETYA 1999) and the skills, knowledge and aptitudes demanded by hi-tech and knowledge work industries (NBEET 1995a p. 40, NBEET1995b, Commonwealth of Australia 1999, Queensland Department of Strategic Development and Technology 2000, Tanner 1998, Neilsen and von Hellens1999, p.222), do predict a correlation between the skills of students who achieve in IT subjects and the skills required by innovative and enterprising knowledge workers. For many Australian parents, encouraging their children to undertake studies of IT, is common sense.

The following diagram puts the view that for students and their parents, IT studies have a causal effect on employment prospects and subsequent growth in IT industries. This is consistently reinforced in Queensland where 80% of students choose the primary computer studies subject, Information Processing and Technology because of its relationship to future work. (Peckman1990, Peckman1991, A16 SAC 1997). Students may not understand the global contexts which place value on IT skills and aptitudes. NBEET (1995) report that students "give little indication of being knowledgeable about the factors affecting economic development and prosperity in Australia." (p. 6.) and that the larger context of the economy and globalisation are not part of decisions to select subjects or select careers (Schools Council, 1995).

LINKAGES FROM THE PERSPECTIVE OF STUDENTS AND THEIR PARENTS.

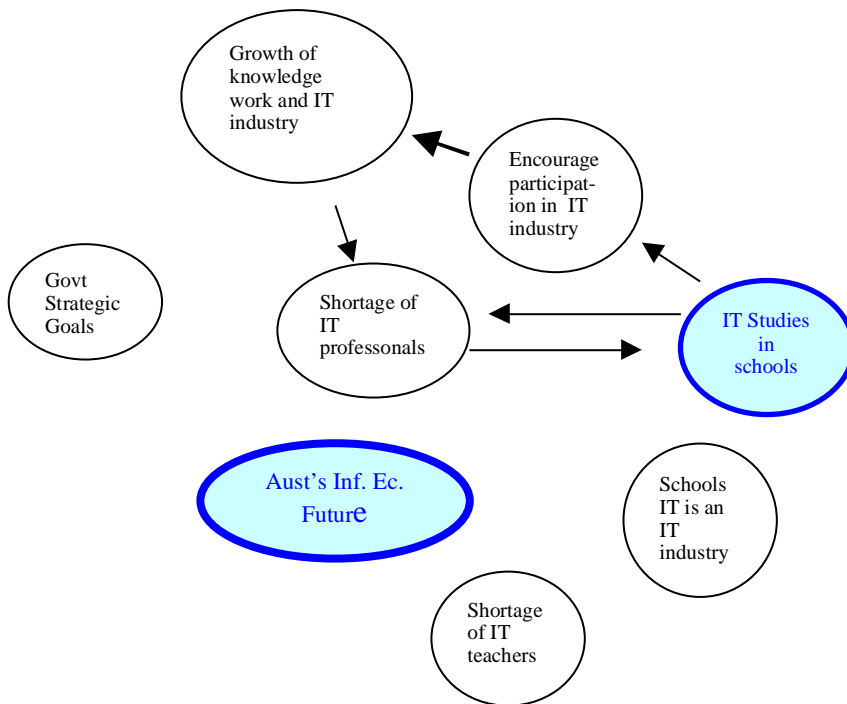
related desire for expansion in IT and knowledge industries. Research reports contain claims similar to:

Globally, there is a world wide shortage of communications and information technology professionals. This represents 30,000 unfilled of communications and information technology positions in Australia. ... This is expected to increase."

(Queensland Department of Communication and Information, Local Government and Planning 1999, p.17).

In recognition of this, Governments, the industry through the Australian Computer Society (ACS), other industry bodies, and all sectors of education are striving to attract students into the IT and knowledge industry professions and keep them there (ACS 1988, IgnITe 2000). However industries do not understand schools' IT Studies. Secondary IT students are obviously a market place for universities, TAFEs and private provider students. Not only are they expected to invent the future of the IT, multimedia and communications industry, they must in the long term, fill the current demands for specialised personnel. For schools though, experiences in IT programs provide awareness of the differences in the various activities of the IT industry, enable students to make appropriate choices about further study options and directly prepare students to contribute to the industries. Authentic experiences in computer studies programs are more likely to help students choose appropriate careers and accelerate students through post-secondary education and training, than the career CDs and online databases usually considered the solution to attracting students into IT careers. The relationship of IT studies to Australia's information economy future should be more obvious to the IT industry.

Secondly, IT studies is offered in most schools in Australia creating a large marketplace where turnover of goods and



WHY IS IT IMPORTANT FOR SCHOOLS?

The data presented in state reports in this journal indicates that schools believe it is important to meet the demand for IT or computer studies subjects from society, industry and their school community. For some schools, offering IT subjects and allocating the resources to do so, enables them to effectively compete for students, perhaps from international markets and Internet markets. Schools understand the marketability of IT studies as they answer Government calls for the education industry to reinvent itself in a global knowledge economy context and to develop competitive attractive programs (Commonwealth of Australia 1999). Interestingly, Governments refer to IT resources in schools as components of a marketable product, and also market that general curriculum use of IT will supply IT-literate workers (EdNA 2000). Schools know they help to develop IT workers and IT-literate workers and citizens (Queensland Department of State

Development and Trade (1999), ACS 1998), while meeting socio-cultural and community agendas though computer studies offerings as well as computing in curriculum programs. IT or computer studies has been important to schools since the early 80's when computers first became available in schools.

WHY IS IT IMPORTANT FOR THE IT INDUSTRY?

The IT industry calls on the education sector to support three demands: supply of school graduates willing to pursue IT professions, supply of school graduates with positive attitudes to technology and knowledge work, and to be a marketplace that both purchases IT and knowledge products, and develops markets in IT education. Schools which offer IT Studies (and most do) are thus a part of the IT industry and should be recognised for their contributions.

Firstly, they are responding directly to shortages in the IT industry and the

services contributes significantly to IT industry growth. In most secondary schools, the size and complexity of the network system, the level of services which are served by those networks to teachers and students, the surrounding infrastructure and the resource commitment, is considerable and comparable to large industry installations. It is not evident that the industry itself recognises this contribution of IT studies to the IT market. The systems in place not only are industry standard, but so are the teachers who build and develop such networks, administer large teams of workers and teach Australian students about the industry.

Thirdly, IT teachers are selling educational programs in IT to Australia's youth in complex environments. The sophistication of their activity, knowledge and the level of project management which is part of the everyday duties of these teachers, makes them very knowledgeable and experienced IT professionals. Further they express knowledge and skills through the theoretical development of a broad selection of subject matter in their courses. There is unfortunately little evidence that the industry respects IT

teachers and admires the programs of study in Australian High schools. For example, ACCE has not yet been successful in convincing the Australian Computer Society about the high level of professional expertise and knowledge of IT teachers and school network managers. The ACS will not yet accept IT teachers as members unless they have knowledge and industry experience from outside of the education field. It is not surprising that Governments have marginalised the significance of IT studies in strategic plans when the industry itself has not been proactive.

The diagram below suggests relationships between issues and illustrates that IT teachers are not given sufficient attention by the IT industry.

WHY IS IT IMPORTANT TO THE NATION?

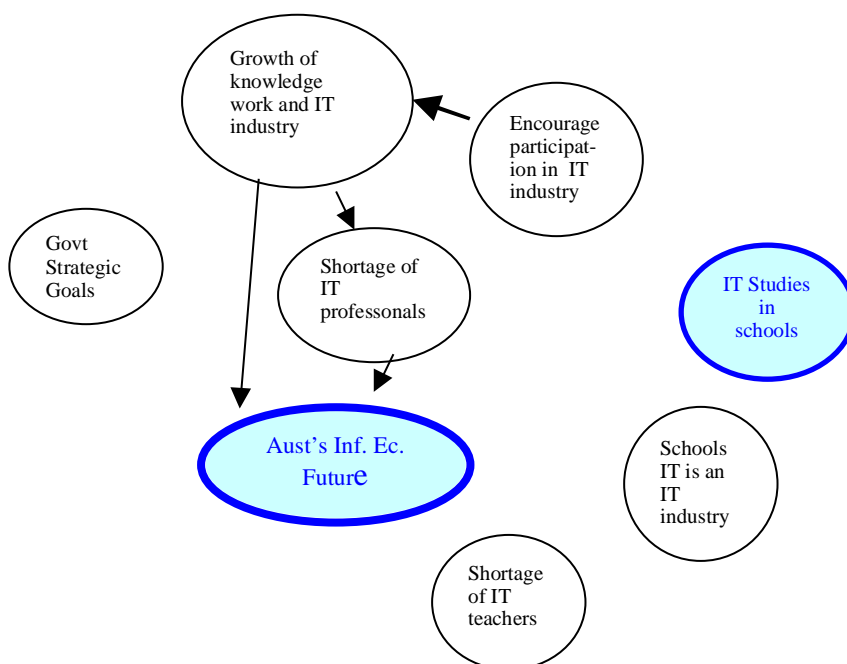
There is currently a rush of strategic IT planning from national, state and local Governments who define how to achieve a stronger economic and thus cultural and social future for Australia (Commonwealth of Australia 1999, Queensland Department of Communication and Information, Local Government and Planning 2000, Department of School Education NSW 2000. The forewords to their documents articulate rationales from the relationship

between globalisation of economic, political, cultural and social themes, the interconnectivity afforded to us by the Internet, changing lifestyles and work, and the need for initiative and creative thinking. These documents consider the development of new industries, the changing links between industries, altered work practice and a broadening of community practices as well as contextualising the supply-demand issues for IT professionals, knowledge workers and the IT literate citizens. Developing an information economy within the context of global connectedness is the key priority in the documents.

The National Board of Education, Employment and Training (NBEET 1999) released a report which indicated that Australia may have already missed the boat with respect to gaining a place in a globally connected information economy. This report pointed the bone at Government policy, Australian attitudes with respect to initiative and creativity, and education and training in the IT sector and in schools. Two things were strongly emphasised in the report: that Australia's geographic isolation from the northern hemisphere's centres of commerce and IT had created a "she'll be right" attitude in Australian business and community; and that the shortage of IT expertise would continue to ensure an Australian minor-player position in information economy games. The National Office for the Information Economy (NOIE) released a "Strategic Framework for an Information Economy" assuring the IT industry of government support for development in IT and knowledge industries (Commonwealth of Australia 1999). It served also to convince the global marketplace, that Australia was in an action-state in respect of information industries.

Both reports emphasised that homes were a significant market place and that there were important roles for information-literate consumers in Australia's economic future. They also pleaded for development of new industries and new initiatives in the information industry and particularly that information services and global industry information services were a potential growth area, enabled by connectivity. States have responded to such demands by producing strategic plans which describe how states

LINKAGES IMPORTANT TO THE INDUSTRY



will invoke their "multiplier effects" (Queensland Department of Communication and Information, Local Government and Planning 1999, p.10.) of Government policy, community collaboration and IT industry expansion to "contribute to the shared commitment to an information-driven future" (Queensland Department of Communication and Information, Local Government and Planning 1999, p.7).

State Governments have generally then asked each of their departments, including state education departments, to support the strategic goals. Most state Governments responded by developing strategic objectives which focused on raising the awareness of IT careers and at best, developing knowledge, skills and attitudes so students become competent users of information technology. This was predicably interpreted into learning technology initiatives in state school systems. Given the proportion of students in IT studies in state schools, the irony is that meeting skills shortages and contributing to the development of skilled personnel has been directed to the university and TAFE sectors to achieve (Qld strategy, NSW strategy from the web). School-level computer studies perhaps has the most opportunity to contribute to Australia's future and yet it is omitted from the agenda.

The importance of school-level IT studies is more evident in the thinking of new economic strategists who are beginning to define the kinds of new industries which will determine Australia's connected future and the skills which knowledge workers require. E-business, the information flows between businesses (The Economist 1999), e-commerce as the market strategy to homes and small business (Kelly 1998) and Infomediatries leading online information and other services as the biggest growth sector (Williams 1999) tell a story about new industries and skills. One could be forgiven for thinking they were describing the subject matter of IT syllabuses: information literacy skills, communication skills, team work, enterprise and organisational skills, problem solving and IT skills. The spirit of their arguments are deeply embedded in the objectives and outcomes of all Australian IT syllabuses. It

is extremely likely that students from IT courses will have demonstrated evidence of the skills IT strategists claim are vital to the specialised workforce required to develop Australia's IT future. Moreover, the development of the information systems and networks which underpin such industries are the subject matter of IT studies in Australian senior secondary school studies.

Students in school level IT studies are at a distinct advantage in Australia's future. Recently, writers have begun to distinguish between the attitudes of Australians who will be users of ICT services from those who will create them. They claim that proactive innovation and a creative determination to invent future work, are important distinguishing characteristics. Bagnall (1998) implored young people to stand outside of traditional career paths and options and to construct their own. November (2000) says students should aim to invent their work rather than find jobs. He claims that critical thinking, problem solving, information literacy skills and IT skills are the toolbox for knowledge work inventors. Others predict that enterprise is the distinguishing factor

between those who thrive and grow in the information age and those who merely exist (Tanner 2000, Kelly 1998).

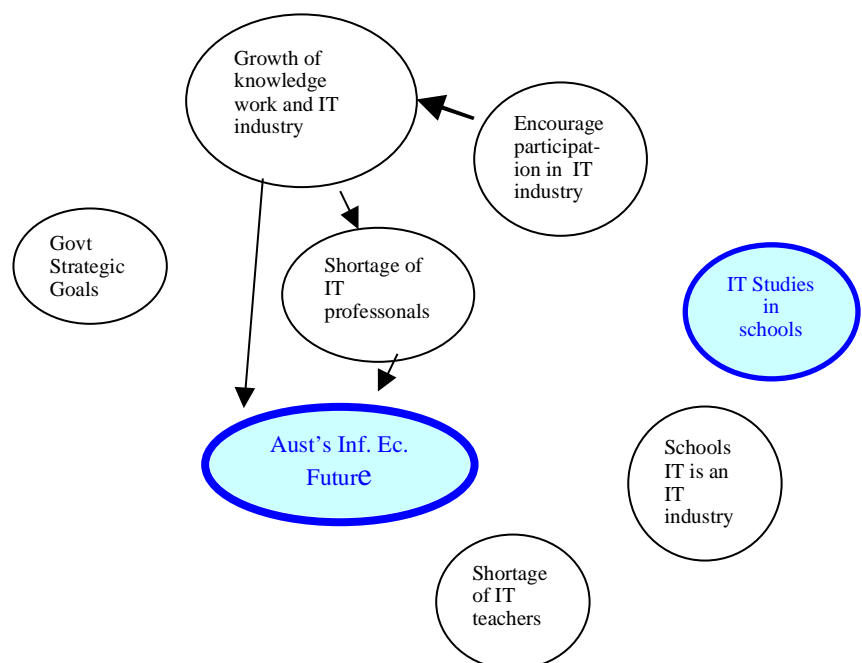
The lack of enterprise studies at schools, TAFE institutions and universities, is one of the reasons why there is not a strong culture of innovation in Australia

(Queensland Department of Communication and Information, Local Government and Planning 1999, p.31.)

It would seem that in a global context where IT and connected industries determine Australia's information economy future and our national welfare, enterprise and innovation from young people is vital. This paper is suggesting that IT students from senior secondary schools are very likely to meet the agendas and demands. Unfortunately, Governments must disagree. They have not recognised the contribution of IT studies to the national strategic picture.

It might be argued that state and national systems understand the issues differently. The National Office for the Information Economy recognises the need to "address the shortage of people with

GOVERNMENT'S VIEW OF IT STUDIES IN THE NATION'S FUTURE



specific, high levels in computing and information technology" (p.13) and asks the various agencies of the education sector to respond to the challenge. Unfortunately, the school sector following state thinking, saw that such goals might be achieved through learning technology approaches in schools. Williams (2000), conducted an analysis of the School Sectors response to the NOIE Action plan, helping the schools sector readdress some priorities.

This Action Plan articulates some new goals for modern education that now need to be adopted into the soul of educational initiatives. Some goals pave the way for new emphases in the use of IT in schools.

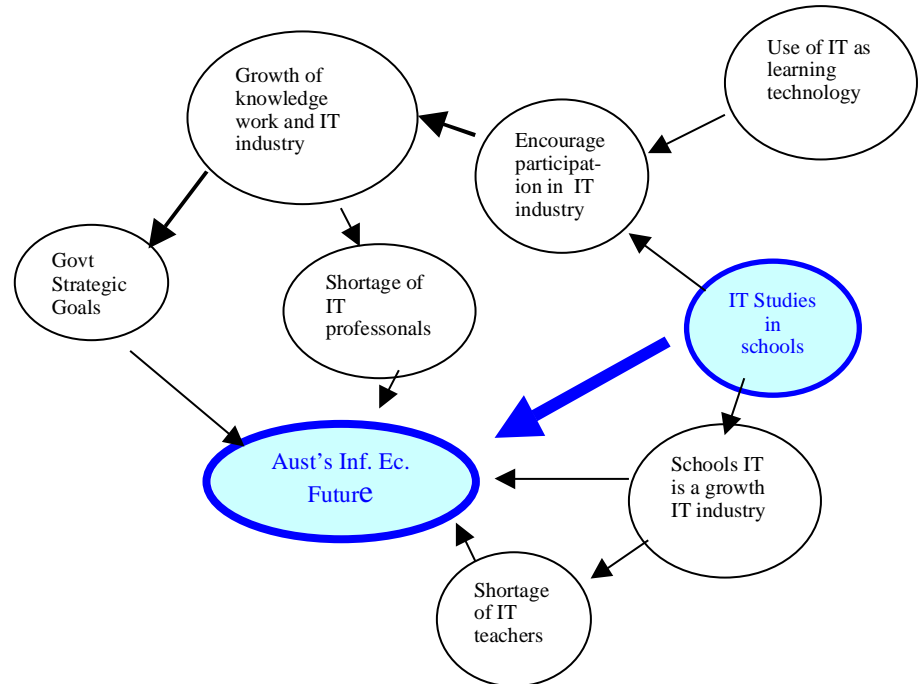
The first goal is that, "All students will leave school as confident, creative and capable users of new technologies including information and communication technologies." (p.3). This resonates well with the primary ISTE goal that "students should become capable IT users" (ISTE 2000, p.1). There seems to be agreement that it is okay to help students learn to use technology and to have learning about computers back on the school agenda along with learning technology agendas. This subtle shift is also enabling computer studies to be recognised as a valid discipline in Australian schools and hopefully points the way to seriously funding this significant contribution to Australian information economy goals. NOIE will celebrate this and so will the parents of the thousand of Australian students, who study IT in schools. However, recognition of IT studies and IT teachers must become more explicit in debates and discourse (and budget strategy).

It is unbelievable that IT studies is so absent from the decision making processes of school sectors and that state and federal systems of Government do so little to pressure school sectors to support state and national strategic goals.

THE COMPLETE PICTURE

The contribution of this paper is to aggregate school-level IT studies into commonly held views of information economy goals, Australia's future, and the

THE COMPLETE PICTURE OF INTERRELATIONSHIPS



IT industry and to ask educational systems in particular to consider this holistic understanding of the contribution of IT studies to strategic and future vision. It is not appropriate to continue to omit IT studies from strategic initiatives, consultative debates and networks and funding proposals.

It is not surprising that state systems and commonwealth education authorities do not consider IT studies as a priority. In collation of data for this paper, it was discovered that no educational system in the country has a dedicated section, division or personnel to support IT studies in schools; an amazing revelation given the participation rates reported in this journal. Typically state system curriculum divisions are organised by key learning area, following the national definitions of KLAs which have for more than ten years caused the marginalisation of computer studies in policy terms. Usually Technology Studies divisions incorporate Food Technology, Design and Technology, Industrial Technologies and Agriculture omitting IT Studies completely from practice, if not policy. In one state the senior policy officer for technology curriculum said " I have nothing to do with IT. We deliberately ignore it because it gets too much attention from other divisions."

She was referring to learning technology initiatives within the state. Thus, when the Commonwealth develops schools-level working groups and representative committees with people only from state systems, issues about IT studies continue to be omitted from the agendas because it is not part of members' responsibilities. Thankfully, the Boards of Studies in each state do not omit IT studies from their agendas. The above diagram represents how IT studies is interrelated with the factors contributing to the national agenda for development of Australian information economy future.

This paper has clearly articulated why IT Studies in schools contributes directly to the viability of an Australian IT future and how it also indirectly contributes to future growth. This diagrammatic representation illustrates the interrelationships and in doing so aggregates the views currently held by schools, the industry and Governments. This complex representation draws attention to a significant issue for the future of schools-level IT studies: that there are not sufficient IT teachers to meet demand and that IT teachers are not being encouraged to renew knowledge and develop both IT knowledge and new teaching skills.

THE IMPORTANT LINK - TEACHERS

School-level IT studies may become a numbers game and a national shame. The number of students wishing to study IT in schools is increasing. The number of schools is increasing. The imperative to use schools' IT studies to attract young people into the IT industry to both satisfy existing demand and develop the future of the IT industry, is not diminishing. Amidst this, the number of teachers available to teach high-level IT courses as well as industry-level courses in schools is dropping. Readers of Australian Educational Computing will deduce that the numbers do not balance.

The IT community has some explanations of the shortage of computer studies teachers. During online surveys and follow up email, IT teachers revealed that these highly skilled teachers are attracted to network management responsibilities in their own schools or districts. Many have left to work in the IT industry attracted by better salaries, better conditions and new exciting opportunities which seem so attractive to a tiring 20-year experienced teacher. Others teachers typify the increasing trend to leave education for alternative lifestyles and careers. A few progress through the educational system to administrative roles. Some teachers cited that having to teach IT studies, run the schools network and act as support person for administration and colleagues simultaneously, was too taxing. This is compounded by an aging teacher population where retirements will soon increase. The problem of sustaining IT teacher numbers is becoming severe.

Preservice education is not supplying graduates at a sufficient rate to balance the tide. Very few universities provide programs of study which directly aim to supply computer studies teachers at undergraduate or postgraduate level. Those that do, have small numbers and struggle hard to encourage these teachers to take up the profession. Supply of these few pre-service teachers will not be enough. In Queensland, in 2000 for example, there will be less than thirty IT teachers supplied from six Queensland

university campuses; two of which have no IT teachers to supply. At one university where eight students will graduate, only five intend to teach in schools with all of these intending to apply to non-state schools who are already asking for their applications.

Retraining existing teachers to be IT teachers has been an important activity for universities in the last decade. However entrants and graduates are declining. Higher and higher fees, the lack of financial incentive for teachers to gain any new qualifications and increasing demands on teachers mean that teachers are unlikely to retrain. Queensland initiated a retraining scheme in 1996, though the interest has waned for both teachers and the system. In collecting data for this paper, the system cited that retraining in other areas like behaviour management was a system priority and also that they were not keen to pursue training teachers who inevitably left to teach in private schools or to take up industry positions.

The shortage of IT teachers is a major issue for the future of IT studies in schools and is also an issue impacting on Australia's information economy future. It is imperative that commonwealth and state systems consider strategies to encourage IT teachers into the profession, to retain the ones that are available and to offer incentives for teachers to retrain as IT teachers. This problem is broader than state schools. Many non-state schools struggle to obtain and retain their IT teachers. However, they have the advantage of offering better salary packages which include professional development options and often do not expect their computer studies teachers to develop and maintain a network, manage the networking project and staff, as well as support learning technology initiatives in the school. The movement of state IT teachers to non-state schools will continue unless systems begin to make sensible decisions.

The shortage of teachers is compounded by the total lack of professional development available for IT teachers. In schools most teachers are

encouraged to obtain professional development about using computers as learning technology. Some systems have mandated minimum competencies for learning technology and this consumes professional development budgets and the energy of the IT teacher who usually delivers such programs. It is ironic that these leaders of IT receive no professional development for their professional growth. Further, it means that at system level, professional development for IT teachers is omitted from policy and budgets and at school level, IT teachers can not access funds for their own development. Given the significance of IT to the Australian economy, it is ironic that IT teachers have so little support.

Professional development of IT teachers is usually restricted to that offered by Boards of Study about syllabuses and assessment, that which occurs informally at teacher meetings around assessment panels, and self-study. Most of this professional development is about the business of teaching and assessing IT studies. It is unlikely that teachers have access to professional development about the content they teach. In data collected for this paper, 70% of respondents claimed that they had no formal professional development about the subject matter of their programs. Some had attended some networking workshops because they were also network managers and a few had participated in short industry courses offered by private providers; mostly in multimedia. About half of the respondents claimed they self-studied and kept an eye on the Internet, but that it was generally hit and miss. This pattern of sustaining knowledge is not sufficient if the content of IT studies in schools should remain relevant and accurate. At a meeting of state and district assessment panel members in Queensland, teachers thought that most IT teachers did not have up-to-date knowledge across the topics of the syllabuses. This paints a dismal picture for Australia's information economy future and the future of IT studies in Australian schools.

CONCLUSIONS

School-level IT studies is an important contributor to the future of the Australian economy and our future society. The numbers of students engaged in senior secondary IT studies at several levels, indicates that schools and families think so. The omission of policy, budget and dialogue about schools-level IT studies indicates that educational systems do not agree. Education departments are not being proactive in drawing attention to school IT studies to Governments whose strategic plans all but omit IT studies from the agenda. Such complacency can not continue if the community is serious about helping the current and future generations of students pursue IT careers and become IT leaders and IT literate citizens. The industry itself needs to develop a proactive role to encourage educational systems and governments to add computer studies to the national and states' agendas.

This paper provided a model which systems and teacher communities could use to build rationales for providing resources to this strategic area of schools curriculum. This model demonstrates that each stakeholder group omits schools' computer studies from their view, but when aggregating views, schools-level computer studies has several intertwining contributions to the Australian future. The aggregated picture also reveals that the shortage of computer studies teachers threatens Australia's future.

It is now appropriate that the computer studies teachers community begins to agitate for attention, resources, training and professional renewal. Through Computer Education Groups, Boards of Study's networks, teacher's unions and systems, computer studies teachers can draw attention to their needs and to the needs of their students. It is vital then, that grassroots determination is matched by systemic will, so that this area in schools can continue to contribute to Australia's information economy future.

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