I.T. Investment Effectiveness in Education

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Abstract

Governments and school communities are heavily investing in information technology (IT) assuming that this will prepare their children for the workforce and in future life. This research aimed to establish an IT investment effectiveness model in the educational domain easily applicable to schools in assessing whether their IT investments were effective. Literature research revealed a dearth of information on IT investment effectiveness in the area of education and it was therefore deemed necessary to implement an interpretive approach. Consequently a qualitative combined research methodology involving literature research, interviews, and a modified Delphi Survey was undertaken. An initial starting point investigated the extensive business literature in IT effectiveness and IT investment particularly in small business, as most schools due to their size and budget can be categorised as thus. The information gleaned from the literature assisted in establishing a questionnaire for the interviews. Participants were selected from thirteen Victorian State, private and Catholic secondary schools that were perceived as expert in the area of IT. An in-depth three stage analysis of the interview data revealed twenty-four initial key issues. These key issues were then circulated to the participants who were requested to rate each issue using an interval scale. They were also asked to add or delete any issues, giving a rationale for their action. Participants underwent a two round process of highlighting and reassessing the key issues and the Delphi Survey was found to be valid as two new issues not identified from the interview process were raised. Based on their responses ten key issues were derived: the Principal, teachers, curriculum and IT planning, technical support, the students, the actual use of IT, training and personal development, the school council, budget, and the Learning Technologies Committee. These key issues revealed themselves as indicators or determinants of IT investment effectiveness exhibiting organisational or individual perspectives. The analysis of previous research, together with the current research findings, enabled the development of a functional Model of IT Investment Effectiveness which can now be used by schools to assess their IT investment effectiveness. Finally the schools surveyed were utilising the best business IT practise and were treating IT as a strategic issue with their IT goals closely aligned and based upon the goals of the school.
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Declaration

- This thesis contains no material that has been accepted for the award to the candidate of any other degree or diploma, except where due reference is made in the text of the thesis.
- To the best of my knowledge this thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis.
- I acknowledge that this thesis has not been professionally edited.
- Previous Publications:
  

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Chapter 1- Introduction

Introduction

The issue of effectiveness of investment in information technology (IT) in the education arena is a multi-faceted problem. There are three areas which need to be addressed to fully explain the complexity of this problem.

These are:

- Governments and schools are currently investing considerable amounts of money into the area of IT on the assumption that it is necessary to prepare students for the workforce and for living in the world of the future.
- Governments in many countries are imposing school-based management and economic rationalism on the schools under their jurisdiction.
- Schools are unable to look to business for guidance in the areas of IT effectiveness and investment in IT as there is a lack of consensus on any model / methodology to address these issues.

Government and School Investments in IT

Currently school communities and governments are investing heavily in IT on the assumption that this will prepare their children for the needs of the workforce and for living in the world of the future. Closely allied with this heavy investment by governments, in IT has been the changing role of schools in Australia, Canada, Hong Kong, Singapore, New Zealand, UK, Ireland and USA where schools are expected to become more efficient and to provide value for money. (Townsend, 1995; Blackmore et al, 1996; Thomas 1996; Caldwell Brian, 1997; Levacic and Glover, 1997; Thomas et al 1998; Low, 1999; Pollak, 1999)

IT is perceived as a source of equity in education. “Technological literacy has become as fundamental to functioning in society as the 3Rs” (Rodrigues, 1997). Those who do not have up to date IT facilities in their schools are concerned that their students are disadvantaged. Page (1998) found that the less privileged of America have been left behind not only in access to up-to-date technology but in the ways that they are using it. He urged school districts to ensure equitable learning of new
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technologies. Similar findings by Mohammad (1998) reveal that Afro American schools have a ratio of 1:11.3 computers to students, well below the national average of 1:5.

"Many parents equate technology with opportunity and private schools have excelled in the area." (Ryan, 1997, p.2).

Emmison and Frow (1998) reiterate Ryan’s sentiments and find that IT is another form of “cultural capital” where those with access to and familiarity with IT are advantaged.

In the United Kingdom (UK) the government has been criticised for failing to equip children with skills needed to survive in a world where IT is part of nearly all jobs. This lack of skills is costing business opportunities.

"The chronic shortage is adversely affecting businesses, adding 10% to their IT costs" (Anonymous, 1997, p.58).

This shortfall is evident in other countries. In Australia it is estimated that there will be a 200 thousand shortfall of skilled IT workers by 2004 (Foreshew, 1999). Currently in USA there are 350,000 unfilled programmer, systems analyst and computing scientist positions (McGee and Mateyaschuk, 1999, Kolbasuk, 1999), this is perceived as threatening its economic viability (Cruver, 1999). Michael Martin the Irish Minister of Education has used arguments by business and industry about this skills shortage to persuade the government to treat education as an investment rather than as a cost, for example the creation of a Technological Investment Fund used to bring IT to all levels of education (Pollak, 1999).

In the USA the largest academic problem facing small colleges has been quoted as the cost of technology, (Mitchell, 1997). In spite of the overwhelming belief by

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governments and school communities in the value of IT in education, there is little evidence of the effectiveness of IT in education. Skinner (1997) bemoans "the spotty state of research" into the effectiveness of IT in education. Others refer to the fact that the amount spent on IT in the educational sphere is not necessarily reflected in improved performance by students. Rodrigues (1997) was concerned that even though K-12 students in the USA have ready access to computers in schools, European students are more computer literate.

Governments and particularly school communities have finite resources. The assumption is that principals and the school community have the expertise to make decisions on the best technologies in which to invest. It is important that investments in IT in education are made in areas where they are to be effective, otherwise a lot of money will be wasted. However, of more concern is the fact that students may well be irrevocably disadvantaged in their future academic and economic opportunities as a consequence of poor investments made by their schools. School communities make investments with the best intentions but they are not necessarily effective because the expertise required to make these investments is not available. Consequently the school with the most money to invest in IT may not necessarily be providing the best opportunities for their students.

The research is needed, as there is a dearth of research into the area of IT investment effectiveness in education. It is also timely as there is a current need by schools to better understand how they can maximise investment effectiveness in IT.

School Based Management and Economic Rationalism

In recent years there has been a steady trend in many countries throughout the world towards self management in schools, this pragmatic approach replacing the bureaucratic, centralised management of education with a more autonomous one. The rationale behind the movement towards school based management is that effective education is best provided by those closest to the students in their care. A survey done by Gamage et al (1996) in Victoria in 1993 gave a historical perspective of this
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"democratic devolution" resulting in findings of more effective decision making and increased autonomy, flexibility, productivity and accountability within schools.

Recent developments have seen this idea of self-management extended to include the concept of economic rationalism. School communities, led by the principal, are now responsible, not only for the educational management of their students, but also for the full management of the school, including staffing, maintenance, purchases, funding and finances. The emphasis is on the achievement of “value for money” in education of the students, and the school’s public accountability in providing the efficient management of educational resources (Levacic and Glover, 1997). Symes (1999) maintains that schools have developed an advertising culture devising sophisticated promotional strategies in their prospectuses as a result of the marketisation of education. Hesketh and Knight (1998) view education as just one more commodity to be sold to the consumer with schools attracting not only pupils but the right sort of pupils.

This change in focus from schools as learning centres to schools as businesses has proved extremely difficult for those involved, especially the principals, who are trying to relate educational objectives to spending, and to assess the cost effectiveness of spending and use of resources. The role of the principal has taken on a similar status to that of Chief Executive Officer (CEO) in businesses, they have to

“adopt corporate cultures, corporate structures and corporate processes”
(Chadbourne and Ingvarson, 1998, pp. 63).

The principal’s workload has increased up to 60% with many working more than 60 hours per week (Townsend, 1996). School communities and ultimately their principals are now held publicly accountable for the way that they administer their schools and the equity of educational opportunities available to their students. The concern with regard to these can be found in the Victorian context as a new magazine for educational administrators, “Leading and Managing”, was released in 1995, two
years after the move towards an economic rationalist model. School based management and economic rationalism have altered the educational perspectives from education as a benefit to a cost, from schools as service agencies to businesses, from parents as partners to customers (Townsend, 1996).

In 1994 Brian Caldwell (1996) undertook a review of educational developments in Australia, Canada, Hong Kong, New Zealand (NZ), USA and UK. He found that reform in education involved the self-management of schools, the downsizing of regional agencies, and the establishment of a strategic core “steering the system”.

He identified five themes throughout these various education systems as:

- efficiency and effectiveness in delivery of services,
- the market mechanism as a means of improving outcomes,
- equity in the allocation of scarce resources,
- empowerment of the school community,
- research on school effectiveness and improvement.

Thomas (1997) referred to the focus on an equitable, efficient and effective education system as requiring a new theory of educational needs with the possible emergence of

“a different 3Rs - a resourced, redistributed and relevant school system for all our children.” (Thomas, 1997, pp. 45)

Ainley (1995) states that there is a need for research into effectiveness in education in the Australian context, as many policy initiatives are based on untested beliefs or on overseas research.

“The building of an Australian research base on school effectiveness constitutes an important challenge for the future.” (Ainley, 1995)

This research project takes Ainley's challenge and is directing the research to the
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effectiveness of investment in IT in the educational context.

Business Models / Methodology for Effectiveness of IT Investment

IT has been used in business for many years. It would be reasonable for school communities to find assistance in maximising effectiveness in investments in IT from business sector models. However, business has failed to achieve consensus as there are many models available and in use for assessing the effectiveness of IT investment. Additionally, the assessment of business investments can involve both quantitative and qualitative aspects. Qualitative measures are difficult to measure because they represent core business objectives. Thus it is possible for a firm to obtain gains from investments in IT without these translating into higher profits, or other quantifiable benefits.

“If the benefits can be represented in a core business objective, and the information technology project is directed toward the fulfilment of that objective, these factors are sufficient justification of the project.” (Ferguson et al, 1996, p212)

Information Technology (IT) Effectiveness

Fink and Tjarka (1994) define Effectiveness in the business context as “doing the right things” stating that this reflects business expectations because it recognises that organisational goals need to be achieved. Scultheis and Sumner (1995) concur with this definition and add that effectiveness is doing the things that need to be done to achieve important business results. Iivari et al (1994) state that Information System (IS) effectiveness is the change in the effectiveness of an organisation that occurs as the result of IS introduced and used.

Many researchers have sought to identify some criteria of IT effectiveness. DeLone and McLean’s (1992) IS Success Model with its six interdependent constructs of system quality, information quality, use, user satisfaction, individual impact, organisational impact is used by many researchers as a basis for further analysis.
Particularly prominent amongst these are voluntary System Usage and User Satisfaction (US) some researchers even evaluating US as a proxy for IT effectiveness. The rationale for this is that previous measures of effectiveness were really measures of efficiency based on financial and productivity gains / losses which are too distant from the business alignment variables of relevance, quality, usefulness (Roberts, 1996). Bailey and Pearson (1983) developed a 39-factor instrument to measure US. Li (1997) combined Bailey and Pearson’s 39 User Satisfaction question instrument with DeLone and McLean’s system oriented model, by adding two new constructs Conflict Resolution and Organisational Impact yielding an eight construct model.

An assumption underlying much research into IT effectiveness has been that businesses are large and consequently have separate IT departments with specialist IT staff. The emphasis in this research has naturally concentrated on the quality of the system and the information produced, how users interact with and use the system, and the impacts the system has on the individual user and the organisation. Considerable emphasis has been placed on US (User Satisfaction) as a means of measuring IT effectiveness. Palvia (1996) argues that the use of US as a means of measuring IT effectiveness is not applicable to small business because the small business environment is quite different where the small business owner / manager deals with the entire spectrum of IT and deals with external entities. Also the data processing environment is quite different from that based on traditional MIS and end-user satisfaction. Palvia then set about developing, testing, modifying, and finalising a Small Business User Satisfaction with Information Technology (SBUSIT) measure. This model has three distinct components:

- end user computing
- aspects of the traditional DP environment
- special small business (SB) computing characteristics

Other researchers are also concerned with the differing IT needs of SB where computers are predominantly used for operational or administrative tasks. The key
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issues for the adoption of IT are:

- the need for a strategic focus,
- the resource implications,
- a short term increase in complexity,
- the opportunity for learning and improvement opportunities,
- the use of external expertise,
- the importance of the manager (Fuller, 1996)

The move towards small business management and economic rationalism in education has forced school communities and principals to move away from the traditional educational focus towards a small business focus. The SBUSIT and key issues mentioned above could well provide a useful basis for this research project into IT effectiveness in investment.

Many businesses are making investments in IT purely to maintain competitive parity, ie to keep abreast of the competition rather than to gain competitive advantage (Hitt and Brynjolfsson, 1996). With this “levelling of the playing field” an interesting development has emerged, the move towards cooperation instead of competition by businesses. In the USA sixteen Chief Information Officers (CIO) have joined together over the past three years to place contracts for outsourcing worth $60 billion. These “CIO with Clout” had three goals:

- to share information
- to discuss emerging trends and issues
- to improve efficiency and effectiveness (Calwell Bruce, 1997)

Worldwide spending for IT is currently at $700 billion annually and estimated to be $1 trillion by the year 2000. Worldwide trade in information services and goods is growing five times faster that trade in natural resources. USA companies are spending more on IT products than all other capital equipment combined (Taninecz, 1996). Mahmood and Mann (1993) reported that IT expenditure by business is 50% of
their total capital investment and 4% of total revenue. In business there is a widespread questioning and uncertainty that IT/IS investments are paying off. There is also a lack of understanding of IT as a major capital asset. Not surprisingly CEOs are expressing concern and are requiring justifications for IT, especially as a large proportion of budgets are spent on IT and there is no clear methodology available to validate these investments. It is estimated that less than one fifth of businesses have a process in place to justify investments in IT or to establish whether long-term benefits will be obtained (Taninecz, 1996). One of the major reasons given for this lack of accountability is that many of the investments in IT involve infrastructure improvements which are shared across the organisation and so cannot be directly charged back to the departments using them. Another difficult aspect is getting management to accept the "soft benefits" of IT realtime, online, improved productivity etc.

The widespread questioning and uncertainty whether IT investments are paying off is related to a lack of understanding of IT as a major capital asset in organisations. Practitioners maintain that this failure is a result of the lack of easy to use management tools to evaluate, prioritise, monitor and control IT investments (Wilcocks, 1994). Successful organisational users of IT are twice as likely to have formal targets for ROI (Return On Investment), performance measures for new IS systems, senior management informed of IS installations, and clearly defined responsibilities in IS projects (Hochstrasser, 1994). Wills and Freyberg (1996) recommend that there is a need to develop a set of variables for evaluating the business value of IT and for parallel research be undertaken in a single industry sector.

This research provides the potential for developing such a set of variables to evaluate the business value of IT in a single industry sector, the secondary school arena. Historically the focus in the school sector is on qualitative measures; those measures that reflect the core business objectives of the school, to educate students. Hence the time is appropriate for such research to be conducted.

It is noted here that the term IT Effectiveness is an all encompassing term covering
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Earl’s (1989) three levels of Information Strategy, Information Technology Strategy – the technological policies deciding how things are done, Information Systems Strategy – aligning the IS development with the organisations requirements deciding what things are done, and Information Management Strategy – concerns the role and structure of IT deciding the ‘wherefores’. Consequently IT refers to all three aspects of IT, IS and IM. The only time these terms are specifically referred to is in relation to specific research, eg. the early research almost exclusively refers to IS.

Aims of the Research

The following are the overall aims of the research:

Whether intrinsic criteria exist and are used in the school sector for managing the effectiveness of IS / IT investments.

In particular:

- What criteria are used / recommended to ensure successful IT investments.
- Whether there is consensus on the most effective approach for making detailed investment decisions.
- What criteria are used / recommended for evaluation of pre / post investment effectiveness.
- Whether there is consensus as to the effectiveness of existing and recommended criteria.
- Why some criteria are considered more effective than others.

By addressing these aims it is anticipated that a model for use in the educational sector to evaluate the effectiveness of investments in IT will be developed.

Research Approach

This research is implemented using an Interpretivist Approach. This is quite different from the Positivist Approach frequently used in research, where a hypothesis is expounded and tested by the researcher. It was decided that this approach was not suited to the current research, as there is not a body of research that could be used as a
basis for developing a hypothesis. The use of an open-ended questionnaire is used as a means of tapping into the degree of existing knowledge. The knowledge thus gained is then used as a basis for an initial set of key issues relating to IT investment effectiveness in education, specifically the secondary school arena.

Even though the research group was small, with only 13 participants, a modified Delphi Survey was considered the most appropriate method of establishing effectiveness criteria for IT / IS investment in Victorian schools. The rationale for this was that the Delphi Survey has proved useful in obtaining a group view, even consensus, from perceived experts in their fields. It has previously been used in the IT area to establish key information system management issues by Watson (1989), Doukidis et al. (1992) and Pervan (1993).

One problem encountered in this research was that there were no clearly established experts in IT management in Victorian schools. An initial task was to obtain the names of schools which have a reputation for excellence in IT / IS. Many sources were used to obtain names of suitable “expert” schools to participate in the project. The names were ranked according to the frequency of recommendation. Initially 13 of these were selected to participate in the project.

Perhaps the most difficult task of the whole research project was the construction of the questions to use when interviewing the “experts” from each school. It was considered vital that the questions were open-ended thus maximising the participants’ responses. The questionnaire was tested and revised until the interviewer was satisfied that the questions were interpreted in the same manner by all interviewees, thus obtaining content validity. The finalised interview questions were used on all participants by the same researcher, thus ensuring context validity. The process of developing the questions was undertaken concurrently with the canvassing for the “experts”.

Once the names of suitable participants were obtained, the principal from each of the schools selected was approached for approval to conduct the interviews and to
participate in the Delphi Survey. The Delphi Survey is lengthy and so it was vital that the staff member be a willing participant. It was recognised that “selling” the project and obtaining agreement from the schools to participate in the whole Delphi process may be a difficult task. More emphasis was placed on the fact that all participants would receive a report of the findings, thus providing them with valuable information for decision making on investment in IT. After consent was obtained from the participants an interview time of one hour was organised.

A rigorous and thorough analysis of the interview data was used to elicit an initial set of twenty-five key issues of IT investment effectiveness in education in the secondary school arena. These were then used in a two round Delphi Survey, resulting in the identification of ten key issues.

Finally the ten key issues, as identified by the group in the Delphi Survey, were analysed in the context of the current literature. A Model of IT Investment Effectiveness, was derived from this analysis. It is anticipated that this model will provide a basis for further research into investment effectiveness in IT in education. Recommendations are included in this submission for further research.

Organisation of this Thesis

This section describes the chapters that follow with a brief description of what each contains.

Chapter 2 - Literature Review

This chapter contains a review of literature currently available in the areas relating to the research aims. These include IT Effectiveness, IT Effectiveness in Small Business, IT Investment, IT in Education, and Effectiveness in Education in areas pertaining to management and Investment.

Chapter 3 - Research Methodology

This chapter analyses the interpretivist philosophical research perspective, and the qualitative approach used in the research. It explains why the Case study approach was not suitable and the validity of the Delphi Survey. The rationale for using the
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combined approach including a literature search, interviews and the Delphi Survey is discussed. Similar research in a comparable domain for identifying Key IT Issues is identified. The research phases are explained including the rationale behind the use of open ended questions and the sources of the questions used in the interviews. The approach to selecting the participants, the actual interview process, and its analysis, the use of the modified Delphi Survey in each round, and the rating process are also addressed. The chapter concludes with the approach taken to identify the group’s key issues, and the final key issues.

Chapter 4 - Research Results

This chapter discusses the results of the interview data, and the findings of Round 1, and Round 2. The twenty-five key issues from the interviews are identified for use in the initial stage of the Delphi Survey. An explanation of the amended set of key issues for each of the subsequent rounds follows. Finally the group’s ten key issues are explained.

Chapter 5 - Analysis of Results

This chapter analyses the research findings from both the interviews and the Delphi Survey as they relate to the work of other researchers referred to in the literature. This is followed by analysis of the research questions. Finally a Model of IT Investment Effectiveness in Education is revealed.

Chapter 6 - Conclusions and Recommendations

Conclusions arising out of the research are elucidated. The limitations of this research are discussed and recommendations for further research are proposed.

Bibliography

Contains the details of all references used in the preparation of the thesis.

Appendix

A collection of all the research instruments used in this thesis.
Chapter 2 - Literature Review

Introduction

The purpose of this research is to develop a model for use by secondary schools to assess the effectiveness of their investments in IT. As outlined in the previous chapter a qualitative research approach is undertaken as there is no foundation of previous studies for hypothesis proposition and quantitative comparisons. In fact there is little if any research into the area of IT investment effectiveness in education. The dearth of literature on which this research could be based necessitated a search for a domain with an established tradition in IT investment effectiveness. Business provided this domain as it has a well-developed research tradition in IT in both the areas of investment and effectiveness. Consequently an extensive review of business literature is undertaken from which relevant information can be transposed to the education domain. The literature is analysed carefully and the models and findings by previous researchers in business are used to develop appropriate questions for interviewing the participants. The data from the interviews is collated to elicit the key issues for the Delphi Survey; again the literature research is used as a focus for identifying aspects most relevant to IT investment effectiveness in education.

The literature review conducted in this chapter focuses on three major categories:

- **IT Effectiveness**
  Aspects covered in this section include: the strategic alignment of IT to business goals; models developed for measuring IT effectiveness; qualitative measures of IT effectiveness; the concept of IT effectiveness as a multi-dimensional construct; previous researchers’ measures of IT effectiveness relating to user satisfaction, organisational impact and individual impact; and the specific aspects small business raise in relation to IT effectiveness.

- **IT Investment**
  This section opens with a discussion of the current findings and implications of research into IT investment. The frameworks researchers have proposed for justifying IT investments follow. Finally the implications of IT infrastructure
investment are examined.

- *IT in Education*
  The research by educators is reviewed to find similarities and differences from those in the business area. IT effectiveness involves comparative discussion of the strategic alignment of IT in education, measuring business outcomes of IT, IT effectiveness in education, measures of IT effectiveness in education, and IT effectiveness in Small Business – Education. IT Investment in education is similarly treated and includes the justification of IT investments in education, and infrastructure investments in education.

**IT Effectiveness**

In the absence of previous research establishing a sound base in understanding of IT effectiveness in education (Thomas, 1997; Ainley, 1995) it is necessary to seek out areas where there is a large body of IT effectiveness research to be used as a basis in the current research. Business has been undertaking studies into IT effectiveness for many years and from this there are models on which much subsequent research has been based eg DeLone and McLean’s IT Success Model (1992). Reviewing the literature into IT effectiveness in business is regarded as a necessary first step towards gaining an understanding of the key features of IT effectiveness which are then interpreted into the educational domain.

The definition of IT Effectiveness for this research is established by combining the definitions of Fink and Tjarka (1994), Scultheis and Sumner (1995) and livari (1994). Effectiveness is “doing the right things”, those things necessary to achieve important business results that reflect the business expectations and recognise the organisational goals. IT Effectiveness is the change in the effectiveness of an organisation that occurs as the result of the introduction and use of IT.
Chapter 2 - Literature Review

Strategic Alignment of IT

Fink and Tjarka (1994) quote innumerable authors to compare and contrast efficiency and effectiveness. They maintain that efficiency refers to the operational level of an organisation, "doing things right", performing tasks well, whereas effectiveness involves the managerial level "doing the right thing" by deciding which tasks should be performed. Effectiveness better reflects business expectations because it recognises that organisational goals need to be achieved.

"the evaluation of IS effectiveness requires the consideration of two separate but related areas: the linkage of IS strategy to business goals and the contribution of IT to organisational effectiveness". (Fink and Tjarka, 1994, Page 692)

Berger et al's (1988) Enterprise Level Measurement is an early attempt to align business strategy with IT, with the aim of achieving increased market share, new market penetration or lower production costs. This approach involves the organisation defining its business goals and objectives, which are then studied to ascertain whether IT is needed. If IT is needed an IT strategy is formulated to support those goals and objectives.

Strategic alignment of IT effectiveness and organisational goals is also of concern to Fitzgerald (1993), who states that there has been very little significant research into measuring ISSP (Information Systems Strategic Plan) effectiveness. The major reason for this is that there is no suitable measuring instrument. Previous researchers approaches are goal centred (meeting objectives eg Berger et al (1988)), comparative (to competitors), normative (comparing to an ideal), improvement assessing the positive or negative degree of change, and impact (on organisation). Fitzgerald finds all of these to be inadequate because of their reliance on subjective judgement. citing research undertaken in Australia, UK and USA where ISSP is rated by 40%-53% as "less than successful" and by 32% as "not worth doing".
Chapter 2 - Literature Review

Singh (1993) concurs with this view, his Comprehensive Organisational Preparedness Environment (COPE) framework. (See Figure 1: Comprehensive Organisational Preparedness) is developed in response to the weaknesses of previous models reviewed in his research. The models Singh studies and rejects are:

- **Growth Stage Models** – which focus on the ability of the organisation to learn and mature through evolutionary stages to the ultimate IT effectiveness model

- **Planning Models** – use IT to assist management decision making by addressing issues at the strategic and operational levels.

- **Project Management Models** – effectively implement IT projects by highlighting issues, especially risks, at the tactical and operational level.

- **Composite Models** – integrate strategic, tactical and operational planning with project management.

![Diagram](image)

Figure 1: Comprehensive Organisational Preparedness

The COPE framework implements an iterative approach whereby feedback occurs throughout the six phases of origination, strategic planning, tactical planning, project planning, implementation / control, and evaluation. The business strategy of the
organisation closely aligns to, and maximises the benefits gained from effective use of IT.

Strategic alignment of IT to business goals is perceived by the aforementioned researchers as vital to the success of the organisation, and the effective use of IT is important to the organisation's well being.

A successful example of the alignment of business and IT strategies is achieved by the mbanx virtual banking division of the Bank of Montreal. Revell (1997) maintains that this successful alignment is dependent on having senior executive involvement, a formal governance structure in place both at the IT and corporate levels, good communication of successes and failures, education to ensure a common understanding of IT and business plans, a business value focus, and joint ownership of planning and strategy by IT and business sectors. Similar results are revealed by Larsen et al (1998) in their comparative research of high and super growth medium sized companies in the UK. The majority of companies undertook strategic planning at least once a year, and use a one to three-year planning span. The main purpose is to clarify goals and organisational policy. In super growth companies greater importance is placed on improving the allocation of resources, measuring the company's performance, and maximising profits. In 14 out of 15 of the super growth companies strategic planning is led by the CEO who uses the mission statement as a symbol of leadership and a means of communicating the company’s beliefs.

Research undertaken in Australia by Falconer and Hodgett (1996) finding that a number of large companies (those with more than five hundred employees) do not undertake strategic planning at all raises concerns in the context of the current research. This lack of strategic planning increases to sixteen percent in companies employing less than one hundred employees.

If it is accepted that the alignment of strategic planning to IT is essential to the evaluation of IT effectiveness, as is indicated by the mbanx and UK examples, how is
it possible to establish IT effectiveness where no such benchmark exists? Most schools have fewer than one hundred employees, this is compounded by the fact that this research is conducted in Australia where lack of strategic planning is rife. Two issues are highlighted of concern to the current research. Is this lack of strategic plans reflected in the educational sector? If this is confirmed, what approach is needed to establish IT effectiveness in education?

Zhara et al (1999) propose a new perspective of strategic planning which

"builds on the dynamic interplay between a company's competitive strategy and technology" (Zhara et al, 1999, Page 188).

The strategic knowledge gained by this interplay is exploited to make more effective use of the organisation's technical resources. Previous strategic planning perspectives were determined either by the company's hierarchical structure and internal capabilities, or by using technology as one of the organisation's vital strategic weapons. Which, if any, of these three strategic planning perspectives is in use in schools?

Willard (1999) advances an interesting and challenging idea in relation to strategic management. She asserts that the short time frames, monthly or even weekly when conducting business via Internet and ECommerce, have relegated previous approaches to strategic management as no longer viable. However she does not suggest any possible solutions to this controversial notion.

**Models for Measuring Effectiveness of IT**

The assertion that IT is strategically aligned to business outcomes results in researchers developing models for measuring IT effectiveness. Initially researchers' models relate to the firm's "bottom line" and attempts to ascertain the strategic value of IT employ measures which focus on economic criteria.
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The economic measures of Cost Benefit Analysis (CBA), Net Present Value (NPV), and Internal Rate of Return (IRR) although useful in establishing the actual quantifiable savings have proved inadequate. IT costs are often difficult or even impossible to ascertain as many of the costs relate to infrastructure investments where the benefits are spread across the whole organisation and are therefore not easily delineated. This led researchers to endeavour to find other means of measuring the effectiveness of IT.

Information Economics (IE) (Parker and Benson, 1988; 1989) is an effective investment justification tool, as it extends, but does not replace, traditional Cost Benefit Analysis (CBA) by including intangible benefits. It identifies and evaluates alternative investment candidates by scoring and ranking their respective values and risks. The respective risks and values relate to business and technology factors. The business factors include strategic match, competitive advantage, competitive response, management information support, and organisational or project risk. The technology factors are the strategic IT architecture, definitional uncertainty, technical uncertainty, and infrastructure risk. Perhaps IE’s greatest strength is that it explicitly recognises and involves both the business and technology justification in every project consideration. Wiseman (1992) labels this strength of approach as The Seven Cs - comprehensiveness, consistency, clarity, communications, confidence, consensus, and culture. When evaluating alternative investments the comprehensiveness of the IE approach appears to have merit, especially when researching a service sector such as education.

Traditional financial and accounting measures like Return On Investment (ROI) and Earnings Per Share (EPS)

“worked well in the industrial era, but they are out of step with the skills and competencies companies are trying to master today”. (Kaplan and Norton, 1992, Page 71)
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In a yearlong research project they devised the *Balanced Scorecard*. This set of measures for senior management use gives a fast and comprehensive view of the business and its key success factors. The success factors include financial measures and the operational measures of customer satisfaction, internal process and innovation, and improvement. The researchers' rationale for limiting the number of measures is that it forces management to focus on the few measures most critical to the organisation's success. The organisation's mission statement is therefore translated into specific time, quality and performance measures. The Balanced Scorecard creates a fundamental change in performance measurement from a backward looking and financially controlled direction to a forward looking and operational focus.

The Balanced Scorecard appears to be relevant to the current research's aim of establishing the effectiveness of IT in the education sector. The emphasis on interpreting critical success factors in terms of time, quality and performance leads naturally to the service sector focus of education. However the expectation of the Balanced Scorecard is that the organisation has a "mission statement" for interpretation, without it this instrument may well prove of little value. Do schools have mission statements, which will enable the use of the Balanced Scorecard?

**Qualitative Measures of IT Effectiveness**

In the 1990s there has been a move towards assessing IT Effectiveness based on qualitative rather than quantitative measures. An excellent example of this change of focus is seen in the *Computerworld's Premier 100* ranking of IT effectiveness (Sullivan-Trainor 1993). It is one of the few secondary sources in IT. It therefore generates much interest amongst researchers and IT practitioners. Researchers use it in their attempts to find relationships between IT and business success. IT practitioners justify budgets by benchmarking themselves against the Premier 100 ranking.

Computerworld uses a weighted additive model to rate the Fortune 500 organisations
(America's most wealthy companies) on their information system effectiveness. The top 100 are referred to as the Premier 100. In using the Fortune 500 organisations the sample is biased towards large organisations and the effects of this bias are not known.

The initial weighted additive model, 1988, uses IT executives as its data source measures the percentage of revenue for IT budget (30%), the processor market value (15%), the percentage of IT budget spent on staffing (10%), and training (25%), the number of PCs / terminals per employee (15%), and the five year average profit increase. These components stay constant until 1991 when the previously dominant weighting for IT budget / revenue is halved and peer assessment (15%) is included as a measure. Factors relating to competitiveness with peers include integrated strategy, bottom line advantage, and cost-effectiveness. In 1992 the peer rating is increased to a dominant 30%.

The measuring instrument is again altered in 1993; the data source changes with peers and CEOs joining with the IT executives. The weighting for IT budget / revenue, processor value / revenue, IT budget for training, PCs / terminals / employee percentages are all set to 10%, and peer assessment to 20%. This enables the inclusion of CEO (10%) and IT Managers (10%). A significant move towards a more subjective or qualitative approach is indicated by the factors Computerworld uses in the assessment including:

- user satisfaction, training, spending and feedback
- strategic plans and corporate goals
- application quality
- risk management
- IT investment
- re-engineering
- CIO reporting level and top management perceptions
- systems development and integration
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- strategic alignment and compatibility of IT with corporate goals
- IT research and development budget
- Staffing for maintenance.

In 1994 the selection criteria are dramatically altered focussing on productivity based on the Paul Strassman's Information Productivity Index, and Stern, Stewart and Company's EVA (Economic Value-Added) measure. This allows objective measurement of input and output. The rationale for this change is that the amount an organisation spends on IT has no correlation to the organisation's financial performance, and consequently factors relating to profitability and heavy IT expenditure are removed.

**IT Effectiveness a Multi-Dimensional Construct**

Since the 1980s, there is a general belief that IT should contribute to the performance of the organisation, that it is strategically aligned to an organisation's success. Many researchers attempt to develop models for measuring the effectiveness of IT to the organisation, however there is no clearly defined IT effectiveness measure against which comparisons can be made. The earlier research is mainly single purpose with the selected effectiveness measure reflecting, the organisational context, the aspect of the IT under study, the independent variable under investigation, or the purpose of the study. An example of this single purpose type model is Strassman's (1985) *Return On Management (ROM)* which isolates the contribution by management. The rationale is that management, not capital, is the limited resource and the real benefit of IT can be obtained by improving the productivity of management.

\[
ROM = \frac{\text{Management Value Added}}{\text{Management Cost}}
\]

DeLone and McLean (1992) recognise that much of this early research can be classified as speculative, and undertake to develop a Dependent Variable in management information systems (MIS) research. They do this in response to the challenge made by Peter Keen in 1980, at the inaugural meeting of the International
Conference on Information Systems (ICIS), that there are “five issues needing to be resolved for coherent MIS research” of which the dependent variable is one.

DeLone and McLean’s major purpose is to reduce the multiplicity of variables used by researchers to a more manageable classification, thus enabling the comparison of results and a consequent development of a “cumulative body of empirical research”. This longitudinal study, 1981-1987, reviews articles from seven IT publications. The six categories for classifying these articles are based on earlier classifications developed by Shannon and Weaver (1949) and Mason (1978). DeLone and McLean findings of these measures are:

- System Quality observes the information system and measures the performance and utilisation of the engineering oriented characteristics of that system.
- Information Quality focuses on the output of the system.
- Use is easiest to quantify and is the most objective. However this measure is not considered valid unless the use of the system is voluntary.
- User Satisfaction is the most widely used. Three reasons are given for this measure’s popularity: its face validity, the empirical weakness of other measures, and the reliability of the Bailey Pearson (1983) measuring tool.
- Individual Impact has the largest number of studies. However it is the most difficult to clearly define because of its inward looking nature, measuring the effect of the information system on the behaviour of the individual.
- Organisational Impact is an emerging area of IT research which is measuring the real world effects of the system on the organisation. Further research is needed in this area because it assess the business value of IT.

DeLone and McLean (1992) ascertain that IT is “a multidimensional construct” and should be measured as such. They stress that the six success factors are not treated as independent items but are considered as interrelated and interdependent. A comprehensive IT Success Model indicating the interdependencies between the six categories of IT success is developed. (See Figure 2: I/S Success Model).
Figure 2: I/S Success Model

They recommend that this model is used for further research because its coherence gives a comprehensive view of IT success. The rationale is twofold. Firstly, their research indicates areas of previous research. Secondly, the I/S Success Model makes conflicting research results more understandable, allows the work of previous research to be built on, and indicates areas where research is lacking. They maintain that by studying the items and their interrelationships a clearer picture of an information systems success can be obtained.

The interdependencies of the I/S Success Model provide a vehicle whereby the effectiveness of IT is assessed. This research is attempting to develop criteria for assessing the effectiveness of IT investment in Education. The I/S Success Model can assist in the development of the questionnaire for the interviews, in that the questions included should address all six aspects. The evaluation of the responses by participants can be mapped to the model to ascertain if all aspects are addressed, what aspects are omitted, and what, if any interrelationships exist.

Grover et al (1996) use DeLone and McLean's (1992) idea of individual and organisational measures for IT effectiveness, to develop their Construct Space for IS Effectiveness Model. (See Figure 3: The Construct Space for IS Effectiveness), stating that both models imply IT effectiveness is multi-dimensional in terms of measures and levels of analysis. Grover et al (1996) maintain that a benchmark for evaluating the IT function can be obtained by establishing the contribution IT assets make to the performance of the organisation, thus enabling management to make informed decisions on the purchase, design and delivery of IT in their organisation. This
emphasis on evaluation of assets is particularly relevant to this research into IT effectiveness of educational investments.

Their model is designed to achieve effective decision making by management. They attempt to synthesise the disparate array of previous research approaches and effectiveness measures through three definitional dimensions: the Evaluative Referent, the Unit of Analysis and the Evaluation Type.

![Diagram of the Construct Space for IS Effectiveness]

**Figure 3: The Construct Space for IS Effectiveness**

_The Evaluative Referent_ refers to the perspective taken when assessing the effectiveness of IT performance. Grover et al (1996) distil three evaluative judgements comparative, normative or improvement. Comparative referents compare the organisation against other organisations. Normative referents compare the organisation to an ideal. Most previous studies utilise either the comparative or
normative referents. The third referent, Improvement, is rarely used in research, and indicates how the organisation has evolved or been improved.

*Unit of Analysis* is used to build a complete picture of IT effectiveness from both the individual (Micro) and organisational (Macro) perspectives. The Macro View observes the organisation’s competitiveness against others. The Micro View observes the socio-technical provision of information to the user. Most previous studies into IT Effectiveness use the Micro View.

*Evaluation Type* refers to the way the organisation evaluates its IT effectiveness. The three types of evaluation are process, response and impact. Process assumes that workers are efficient if resources are limited. Response gauges the reaction of the individual or organisation to a service or product. Impact assesses the effects implementation of IT has on individuals and the organisation, this is the most difficult to evaluate.

When the evaluation is focused towards the macro, organisational level, process evaluation refers to the infusion of IT throughout the organisation, response is to the market of customers, and impact is the economic response of financial productivity. The focus of the micro, individual evaluation has process referring to usage, ie the extent, access and motivation to use the system, response is the perceptual user attitudes, perceptions and beliefs, and impact is the influence and enhancement of productivity.

"Effectiveness must be assessed from an explicit viewpoint" (Grover et al, 1996, Page 183)

Grover et al further urge researchers to consider the context of the study when assessing IT effectiveness. The contexts highlighted for consideration are the Evaluation Perspective and Domain of Study. The Evaluation Perspective refers to the necessity to consider how the evaluation is affected by the differing views of the
participants, namely the users, IT personnel, management, customers and suppliers. The Domain of Study limits the possibility of contradictory or inaccurate results by clearly specifying the technological context of the system.

Grover et al’s Construct Space for IS Effectiveness is extremely useful as it gives the researcher a mechanism for establishing the type of evaluation perspective, and the technological context used by an organisation when assessing the effectiveness of IT. It enables the researcher to gauge the evaluation criteria in use. Further it allows the researcher to observe the organisational and individual response to IT, and the impact IT has on them, and the IT process involved. The beauty of the model is that even though it is readily understandable it enables comprehensive analysis of the IT system’s effectiveness. This effectiveness tool is able to be utilised in both IS and IT and thus could prove eminently useful to the current research study.

Scott (1995) is also concerned that

“we do not yet have an adequate measuring instrument for information system effectiveness”. (Scott, 1995, Page 55)

She recommends representing IT effectiveness as a “multidimensional construct” which is part of a causal model. She uses structural equation modelling to try to validate the measuring instrument used by Computerworld for its Premier 100. This is undertaken as a result of her concern that no attempt has ever been made to validate Computerworld’s ranking as measures of IT quality and effectiveness. Her findings are that the use of the reflective model by Computerworld raises doubts as to the reliability of the ranking, and that the content and construct validity are also suspect. She considers alternative models to use as a measuring instrument, finally recommending that the MIMIC (Multiple Indicators and Multiple Causes) model (See Figure 4 : MIMIC Model) is the best choice if the rating criteria used are standardised.
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The rationale for recommending this model is that it indicates both antecedents and resultants, enabling a more comprehensive view of IT effectiveness. Budget, value, staff, training and PCs/terminals are perceived as determinants of IT effectiveness, interestingly peers, CEO and management are viewed as reflectors, not determinants, of IT effectiveness.

Scott’s (1995) model is heavily influenced by the criteria used by Computerworld, as her original aim was to validate the Computerworld measuring instrument. It will be interesting to observe if the participants in this research use a similar criteria to evaluate their IT effectiveness in the educational context.

These three research studies and their associated models indicate that IT effectiveness cannot easily be measured, nor is it dependent on a single factor, rather it is a “multidimensional construct”. All three have suggestions as to the way that IT effectiveness can be explained using the models they have developed. DeLone and McLean (1992) suggest six categories for evaluating IT effectiveness. Grover et al (1996) give a means for evaluating the individual / organisational perspectives, and the technological contexts within which IT effectiveness is established. Scott (1995) provides a series of causal factors for IT effectiveness and the factors which reflect the resulting IT effectiveness. Segars’ (1998) research study concurs with this view.
of IT effectiveness as a multidimensional construct and develops a measurement model for strategic information systems success which tests the independent variables of alignment, analysis, cooperation and improvement.

Measures of IT Effectiveness

Fink and Tjarka (1994) assert that of DeLone and McLean’s (1992) six success factors only four, use, user satisfaction, individual impact and organisational impact are actually measures of IT effectiveness. They conclude that traditional attempts to measure IT effectiveness have three severe limitations. The scope is too restrictive; they suffer definitional problems, and are ad hoc in their application. It is therefore deemed necessary to more closely scrutinise previous IT effectiveness research in the areas of Use, User Satisfaction, Individual Impact, and Organisational Impact.

Use

Handzic (1996) finds that IT usage and effectiveness depends upon the characteristics of the user and the demands of the system. The way the system is presented has a significant effect on the use of the system but not on its effectiveness. The homogeneity of information has no significant effect on either the system’s use or the system effectiveness.

Aver (1998) conducts a Case Study to assess the skill level in using microcomputer software packages and to understand the role of skills in an organisational context. His findings are that:

- IT abilities are alarmingly low even though IT usage appears active.
- It is more important to have overall high abilities than a few expert users.
- Existing software use should be maximised.
- New software may not be beneficial if usage is low.

Bajaj and Nidumolu (1998) concur with Aver. They find that organisations face a
considerable risk that new IT will not be used. The best way to positively influence IT usage attitudes is to ensure that it has ease of use. Another important factor is that past usage significantly influences current usage. Pinsonneault and Rivard (1998) research add a further dimension claiming that the organisational context must be included in any study of usage by understanding how the usage is related to the work and its context will “untangle the productivity paradox”.

User Information Satisfaction (UIS)

User Information Satisfaction is the most widely used measure for IT effectiveness. One of the reasons given for its popularity is the reliability of the Bailey Pearson (1983) measuring tool. This tool developed by Bailey Pearson identifies 39 factors influencing Users IT satisfaction which are used to assess IT effectiveness. Li (1997) is concerned that IT effectiveness is measured holistically. He maintains that DeLone and McLean’s (1992) six dimensions of measurement for IT effectiveness only deal with the system aspect of IT effectiveness and overlook the human aspect. The Bailey and Pearson’s (1983) thirty-nine factor UIS instrument is combined with DeLone and McLean’s IS Success dimensions. This reveals that the Bailey and Pearson instrument covers five of the six DeLone and McLean dimensions, with the omission of the organisational aspect. However the human aspects of service quality and conflict resolution are added. Li overcomes Bailey and Pearson’s lack of organisational impact by adding three additional factors: productivity improved by computer based IT, efficiency of systems, and effectiveness of systems. His final model includes eight IT dimensions and has 46 ITS factors.

Li recommends that the IT evaluation process should collect the importance and satisfaction ratings of the 46 IT factors from every functional area, end user area, and IT personnel area. The questionnaire should have two separate sections:

- The importance rating questionnaire, the results of which can be used to prioritise corrective actions and allocation of IT resources.
- The satisfaction rating questionnaire, which identifies specific IT factors of dissatisfaction which can be handed onto management.
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The ratings should be done periodically. IT management and staff should be trained to interpret and analyse results and develop strategies and maintenance activities to deal with these. Li’s analysis is interesting because it combines the two most respected and utilised measures of IT effectiveness to produce, on face value, a superior product than either of the previous models on which it is based. It will be interesting to observe whether Li’s measurement tool will become more popular than either of its predecessors. It seems very useful to the current research in designing the questionnaire, as it can be used to establish what areas are covered and those areas omitted.

Most UIS researchers tend to concentrate on a single aspect of the DeLone and McLean model. Gaittin (1994) is one of these. He undertakes a systematic effort towards construct validation of User Information Satisfaction (UIS) as a measure of system effectiveness. He looks at how the UIS quality perspective directly impacts on decision performance and efficiency. His research finds that UIS has construct validity as a measure of information systems effectiveness because there are statistically significant relationships between UIS information quality and decision performance support, efficiency, and personal variables in direct users.

Iivari (1994) also uses UIS, as a means of establishing an organisation’s IT effectiveness. He undertakes a field study of twenty-one information systems in a public sector organisation using factor analysis and applies it to a subset of the Bailey Pearson instrument. The results show that UIS may be useful in predicting whether IT can be implemented, and an indicator of the effectiveness of IT.

Saarinen (1996) criticises the use of UIS by researchers because it only indirectly measures IT effectiveness and relies on “subjective judgement and surrogate measures”. In spite of this criticism he uses it as a basis for his research rationalising it as the most promising measure of IT effectiveness. UIS is extended to include items for measuring the four constructs of:

- The development process – directly measures success through the investment costs and efficient use of resources.

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- **The impact of IT on the organisation** – gauged by the benefits of investments, measured in quantitative and monetary figures.

- **Use process** – measured in terms of IT services provided to end-users.

- **IS product quality** – assessed on the users’ perceptions of the system.

The latter two are UIS constructs. He ascertains that this measuring instrument provides IT researchers with an effective dependent variable, however further research is needed to verify its content validity.

Roberts (1996) selects user satisfaction with information provided by MIS (Management Information Systems) as an indicator of the match between business strategy and MIS scope, and also to ascertain whether the set of policies and procedures employed by an organisation to manage its IT resources affects the closeness of the MIS strategy alignment. UIS is chosen by Roberts because it

"is probably the most widely used proxy for IS success in IS research" (Roberts, 1996, page 584).

Previous measures of effectiveness relate to performance criteria such as ROI, profit cash flow, cost control, new product development, sales, market share and personnel development. Roberts perceives the problem with these performance criteria is that they are too distant from the alignment variable. However user satisfaction with the relevance, quality and usefulness of information provided by MIT, are precisely what is to be found in information which matches and is aligned with business strategy.

Yuthas and Scott (1998) criticise the use of the substitute measures of User Satisfaction and System Usage to establish the IT effectiveness of materials management decision making (using computers to make important inventory decisions.) They maintain that it is more appropriate to measure the direct outcomes of materials decision making in terms of performance resulting from those decisions.
viz turnover, fill-rates, and inventory costs.

UIS is not specifically to be addressed in the current research, however Li’s tool may well prove useful in ensuring that all aspects of IT are covered. The perspectives addressed by him may assist in developing a comprehensive questionnaire. The UIS literature can provide insights into the biases brought into the interviews by the participants. The researcher can therefore minimise the bias effects of the participants in the study.

Organisational Impact

The *organisational impact* of IT refers to the real world effects IT have on the performance of the organisation, the business value of IT.

"Both research and field experience suggest that many general managers remain dissatisfied with the value their businesses are getting from information systems." (Macmillan, 1997, Page 21)

In the USA many organisations are spending more than 50% of budget on IT. Although the expenditure on IT is larger than any other country, productivity keeps falling. IT business value is one of the major concerns of CEOs in USA and Europe. Research to date has failed to find direct relationships between IT expenditure and organisational performance, because the measurement contribution of IT to the quantity or quality of the organisation is extremely difficult to establish (Mahmood and Mann, 1993; Cronk and Fitzgerald, 1996). IT business value is poorly understood and ill defined with little agreement on what should be measured. However there is agreement that the focus should be on IT business value and how / why it adds value to an organisation. The literature reveals the following problems:

- there is no complete model
- inconsistency in definitions make comparisons difficult
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- there is little understanding of the dimensions of business value
- the answers provided by previous research are too simplistic.

There needs to be more emphasis on understanding the role played by IT in the organisation.

Hitt and Brynjolfsson (1996) attempt to pinpoint the right questions regarding IT value and explicitly define an appropriately grounded hypothesis. Microeconomic theory and business strategy provides a useful foundation for assessing the benefits of IT. They separate business value into three dimensions: IT effects on productivity, business profitability, and consumer surplus. They find that IT expenditure alone is not a determinant of success. It is possible for firms to realise productivity benefits without translating this into higher profitability. Consequently managers need to utilise product position, quality and customer service as strategic levers rather than productivity. Macmillan (1997) suggests three principles whereby managers can improve the value of IT to the organisation: Firstly to have an understanding of the way investments in IT relate to the business priorities. Secondly to facilitate effective communication between business and specialist IT personnel. It is critical to ensure that the head of the IT department is able to interact effectively with both business managers and the CEO. Thirdly choose providers of IT services carefully by selecting the most appropriate source from contract staff, outsourcing, or inhouse expertise.

Recent research indicates that the role of IT is changing dramatically with the ongoing changes in the technology, and organisations need to maximise the new emerging global and time related opportunities. Ferioli and Migliarese (1996) maintain that the new role for IT is one of relational support, acting as a tool in facilitating the creation of the network organisation. This is achieved in three ways: by fostering the constitution of semi-autonomous nodes; creating the relation between nodes; and fostering organisational relations. They cite the organisation Benetton as an example of a successful network organisation, based around a central node, in Treviso, Italy, using IT as the relational support tool for its worldwide relations.
Feeny and Wilcocks (1998) also refer to Benetton, amongst others, as succeeding in the global marketplace of short production cycles, specific customer demands, and more rigorous standards. However the emphasis on core competencies, those IT competencies crucial to an organisation’s business success, are cited as the reason for the organisation’s success. The focus on core competencies involves the assessment of, and adjustment to business strategies and IT in response to three “challenges”: the strategic alignment of business and IT, the cost-effective delivery of IT, and the selection of an appropriate IT platform (See Figure 5: Enduring Challenges in IT Exploitation).

Nine core competencies are discussed: leadership, business system thinking, relationship building, architecture planning, making technology work, informed planning, contract facilitation, contract monitoring and vendor development. To achieve these core competencies, technical, business and interpersonal skills, time horizons, and motivating values are necessary. Feeny and Wilcocks map these skills to the core competencies providing organisations with a mechanism to gain business advantage by utilising IT.

![Diagram: Enduring Challenges in IT Exploitation](image)

**Figure 5** : Enduring Challenges in IT Exploitation

Palvia (1997) develops a model called GLITS (Global IT Strategic) to measure the impact of IT on internationally competing organisations. GLITS is an expansion of the ten variable “domestic” strategic impact model developed by Mahmood and Soon (1991) and consists of sixty items grouped under twenty variables. Palvia maintains...
that GLITS provides organisations with a measurement model for assessing an organisation’s global competitiveness, which can also be used for conducting industry, cross sectional analysis. He maintains that it

“signifies major progress towards the creation of a standard IT impact measurement model and instrument” (Palvia, 1997, Page 240)

The organisational impact of IT is most significant to the current research into IT Effectiveness in Investment in Education. Much of the research into Organisational Impact of IT has been conducted in large organisations with separate IT functions. In the school sector where there are few, if any, separate IT functions it will be interesting to observe the relevance of these business-based findings. Where does the education sector place the organisational impact of IT? Are schools recognising the business value of IT in terms of productivity or profitability? Will schools be aware of the global implications of IT? Will relational support be provided to enable schools to become network organisations? Will it use IT to focus on its Core Competencies? Do schools mimic business approaches or is an entirely different scenario in place?

**Individual Impact**

Individual Impact refers to the effect information has on the way individuals behave. DeLone and McLean (1992) maintain that individual impact is the most difficult to clearly measure as it not only involves improvements in performance but includes difficult to define aspects relating to decision making perceptions, contexts, and productivity. Most studies into the individual impact aspect of IT effectiveness are undertaken as laboratory experiments because of the increased rigour provided to researchers.

Handzic (1996) undertakes research into whether IT utilisation and effectiveness is dependent on the characteristics of the user and the demands of the system. She investigates the effects of the mode of presentation and homogeneity of information of individual use, and the decision task context on decision performance. The results
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indicate that the mode of presentation has a significant impact on the use of the system but not on its effectiveness. The homogeneity of information has no significant effect on either system use or system effectiveness. Similarly the decision task context has no significant effect on decision performance. Handzic maintains that these research findings have major implications for the design of information systems, particularly in relation to the optimal number of displays in system design. However she stresses the need for further research into other subjects and environments to ensure the ability to generalise.

Wierenga and van Bruggen (1998) critically evaluate Creative Support Systems (CSS) which are computer-based tools to enhance managers’ creative decision making processes. Outputs from CSSs have both qualitative and quantitative aspects, which need to be measured as dependent variables in establishing IT effectiveness. However studies of CSSs have neglected to determine what occurs between cause and effect. A process approach is recommended to assist in determining how CSSs impact on the decision making process and what creativity aspects are involved.

Several authors refer to the problems confronting individuals resulting from rapid changes in IT. Clark et al (1997) and Benamati et al (1997) stress the need for managers to be aware of these problems and to develop change readiness strategies for their employees and themselves to cope. Without these change strategies individuals can become active or passive resisters to IT and this creates considerable unplanned for problems to the organisation. It will be interesting to observe whether teachers when confronted with rapid changes in IT are perceived by the IT specialists in the schools as having a negative impact on the effectiveness either by active or passive resistance. The impact of IT on the individual is relevant to the current research into the educational sector. It is anticipated that the recent dramatic push for educators to be involved in IT will create reactions from individuals in schools. Most previous research in individual impact has been in laboratory experiments however their findings may well be relevant. For example do schools encourage users to be involved in the development of IT? If so does this affect the way that it is accepted? Are business-oriented tools such as CSS in use? Do schools use direct measures of
effectiveness or are they using secondary sources such as user satisfaction?

IT Effectiveness in Small Business

Traditional research into IT effectiveness focuses on large organisations with MIS and end user environments, frequently using UIS as a surrogate measure for IT effectiveness.

"small businesses face different issues and need to adopt different strategies from large businesses in order to manage their computer related problems."

(Thong et al, 1996, Page 263)

Wirszczyz (1999) concurs with this view stating that IT suppliers have focussed on the needs of large businesses. Small businesses have different IT requirements as they mainly use IT for automating repetitive tasks and for administration. He stresses the necessity for small businesses to provide IT suppliers with a better understanding of their requirements and recommends that this is facilitated by government intervention.

Thong et al (1996) maintain that small businesses have much simpler highly centralised organisational structures having few political problems and with the Chief Executive Officers (CEOs) making most of the critical decisions. Small Businesses (SBs) have short-range management perspectives in relation to IT implementation; frequently choosing the lowest cost IT, even though this is invariably inadequate. The time and effort required for IT implementation is often underestimated. SBs employ generalists rather than specialists, and rarely have in-house expertise. Operational procedures are not formalised or written down. SBs have resource poverty and a lack of professional expertise, and are susceptible to external forces.

The number of employees, the fixed assets, and the annual sales are the criteria Thong et al (1996) use to define a SB. They specify that the number of employees in a SB is no more than 100, fixed assets are less than US $7.2 million, and annual sales should not exceed US$9 million. The Small Business Association of America restricts its membership to organisations with 500 employees or less. Palvia (1996) finds this number of employees (500) too high and instead categorises small businesses as those
with 100 employees. He justifies this number by stating that five out of six pay cheques in the USA come from firms with less than 1,000 employees, and of those two thirds come from firms with less than 100 employees. Similarly Falconer and Hodgett (1996) limit SBs to those with less than 100 employees. Dutta and Evrard’s (1999) European study of small enterprises classifies a small enterprise as one with less than 50 employees. They find that 90% of the European Union (EU) businesses are able to be classified as small enterprises providing up to 80% of the employment and accounting for 25% of the EU turnover. In the education sector, schools rarely have more than one hundred employees, fixed assets are in the low US $ millions, and they have negligible annual sales. Consequently it is anticipated that the literature on small business IT effectiveness will be more appropriate to the current research.

Palvia (1996) states that the small business owner / manager has to deal with the “entire spectrum” of IT, as the IT specialist, the end-user, the system analyst, the programmer and the operator. Besides having the dual role of end-user and system expert, the owner / manager has to deal with “external entities”. Pineda et al (1998) also refer to the fact that SB managers operate across several functional areas in business, without the support of functional specialists. Palvia develops a Small Business User Satisfaction with Information Technology (SBUIT) measure of IT effectiveness, with three distinct components: end user computing (based on the Bailey Pearson Model), the traditional data processing environment (from the DeLone and McLean model), and special Small Business characteristics. The two goals of the SBUSIT measure are to provide comprehensiveness in measuring the impact of IT on a range of SB; and to provide rigour in measurement.

Thong et al’s (1996) research in Singapore into personal computing acceptance factors in small businesses, uses Partial Least Squares statistical testing methodology which reveals that vendor support is more closely related to user satisfaction, organisational impact, and overall IT effectiveness than either owner / manager support or external IT consultant effectiveness. They maintain that the organisational theories and practices applicable to large businesses are not appropriate to SB because they have simpler highly centralised organisational structures, limited political
problems with the top manager as the key business decision maker. A lack of top management support may be compensated by external IT consultant expertise. However management support on its own is not sufficient to ensure success, if the IT experts are ineffective the implementation is still most likely to fail. This conflicts directly with Palvia’s (1996) findings that management support was the most critical factor.

Igbaria et al’s (1997) research into the key factors affecting personal computing acceptance in small businesses in New Zealand findings were inconsistent with those previously undertaken in large organisations. Small businesses are confronted with considerable problems and risks because they cannot afford to have in-house IT expertise. Short-range management perspectives create risks and problems by providing insufficient financial support and resources, including inadequate hardware and software, and recruitment difficulties. There is an inability to establish internal information centres because of the lack of in-house computer knowledge and expertise, consequently there is an undue reliance on external expertise. Lang et al (1998) concur with this view maintaining that SBs either do not have, or have less sophisticated, MIS; their information gathering is done by one or two individuals; there is a low level of information gathering resources; and the quality and quantity of environmental information is poor. They found no relationship between internal support and perceived ease of use and usefulness. Like Palvia (1996), the importance of management support is most significant to IT effectiveness in the following ways: ease of use, usefulness, encouragement, wider selection of software, educational programs, encouraging experimentation, and to applying IT to business tasks. Consistent with both Palvia (1996) and Thong (1996) external support is the other factor important to effective PC implementation in SBs having a direct positive effect on perceived ease of use and usefulness.

Concern with the roles of the owner/manager and of the external expertise provided by vendors / suppliers also features in research by Fuller (1996). It reveals that even though the use of IT by SBs provides the potential for competitive advantage very few achieve it.
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“The key problem appears to relate to the relatively poor degree of conceptual ‘fit’ between what software tools are offered and what is needed” (Fuller, 1996, Page 9)

Two reasons are given for this poor fit: the barriers to understanding created by the differing views of the software developers and the SB owner / managers; and the uneconomic requirements of SB for software developers and suppliers to provide small gradual changes to software and ongoing support. Fuller develops a Process Model to enable the owner / manager to recognise software as a business tool and not just a technical tool. The owner / manager therefore effectively communicates the SB’s needs to the software suppliers and developers who in turn design software which is meaningful to SB. This raises the questions relevant to the current research. Will this perceived lack of fit be visible in the education sector? Will the roles of the Principal (owner / manager) and vendors / external expertise / suppliers be as significant to the effectiveness of IT in schools?

Recent research refers to the impact of “globalisation” of IT resulting from the development of a user-friendly interface for the Internet. What has emerged is the changing role of SB, in this environment, where IT is no longer seen as providing competitive advantage to large businesses but providing competitive advantage to SBs who choose IT as a means of creating a niche market opportunity.

“The perception that small size may no longer be an economic disadvantage to either organisations or countries has become fairly widespread ................. they may actually have an advantage over larger competitors” (Ein-Dor et al. 1997, Page 61)

As mentioned above Dutta and Evrard (1999) concur with this view. Their Small Enterprise Information Technology (SEIT) model (See Figure 6: The SEIT Model) is used to investigate the strategic management of IT by SE in six European Union countries and regions. Their notion is that SE have to innovate from technological and organisational perspectives and build strategic partnerships with government agencies.
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to address existing opportunities and challenges. Their findings reveal a significant increase in IT investment anticipated to be up to 30% in the next few years and that SEs are currently using IT to reduce costs and improve productivity. They focus on the delivery of a high level of customer service and communication with distant customers and partners. The major challenge facing them is understanding what IT can do to assist their business and the main concern is keeping pace with progress in technology and the importance of training staff to use IT effectively. The two main enablers of this are quality management and management’s ability to obtain and deal with technological information.

Figure 6: The SEIT Model

The International Note (1998) maintains that the most important trend in this internationalisation is the development of cross border alliances, which can span countries but are bound together by localised common goals. The rationale for these alliances is that as technology becomes more complex no company, regardless of size, has the resources to be able to globally complete on its own (Parkhe, 1998). An example of such a strategic alliance is the International Information Technology Users Group, comprising of Chief Information Officers (CIOs) from sixteen major companies with US$60 billion worth of outsourcing contracts. This alliance has been formed to fulfil three goals: to share information; to discuss trends and issues; and to improve efficiency and effectiveness of IT, (Caldwell, Bruce, 1997). Global strategic alliances can be long term strategic goals or shorter-term tactical relationships. The International Note (1998) states that SBs should concentrate on clarifying their core
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strategies, doing the things that contribute to their competitive advantage, by sourcing globally for the best suppliers, and by engaging in joint ventures.

The importance of a technologically conversant workforce is discussed earlier in Chapter 1 of this thesis. In the UK the government is encouraging small firms to invest in IT and is recognising the importance of cross sector collaboration by establishing a project named “Future Focus” (Rana, 1999). Future Focus is aimed at meeting the lack of technological skills challenge and is using the firm ICL to provide online courses to small and medium firms at a cost saving of up to 70%.

Feeny and Wilcocks (1998) also stress the importance of organisations understanding their core strategies and provide a Core IT Capability Model as a blueprint for sustaining an organisation’s ability to exploit IT in the next decade of technological change. One of the main opportunities for small businesses, created by this information revolution, involve providing services. Education provides such a service, it will be interesting to observe whether any schools are using IT as a means of enhancing their IT effectiveness and competitiveness. Also will schools be forming strategic alliances with others to improve the effectiveness of their IT?

IT Investment

IT is promoted throughout the world as a means of providing equity in education (Noll, 1997; Riffel, 1997; Rodrigues, 1997; Ryan, 1997). Schools are now becoming self-managed and are increasingly under pressure to give value for money with the emphasis on economic rationalism (Levacic and Glover, 1997). There is an assumption that principals and the school communities have the expertise to make decisions on the most effective IT investments. However large expenditure on IT by governments has not resulted in effective IT utilisation by students (Rodrigues, 1997). There is a lack of research into IT investment in education. Business has a large body of research in the area of IT investment. In reviewing the work of business researchers it is hoped that strategies suitable for IT investment in education may be gleaned.
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Sethi et al (1993), Black (1998) state that expenditure on computer resources amounts up to 40% of capital investments made by businesses in USA, including 45% of business equipment spending on IT (Cissnna, 1998). In UK spending on IT by financial services companies is 20% (Black, 1998). However two thirds of the Fortune 500 CEOs believe that their organisations are not getting the most from their IT investments. In fact a survey by the London School of Economics for Compass finds that most CEOs cannot justify their increasing investments in IT, and only one third of the top 505 European and USA managers could measure the contribution IT makes towards profits (Black, 1998).

Brynjolfsson (1993) maintains that productivity is widely used to gauge the value of IT. Like Strassman (1995), he found that CEOs and managers are questioning the huge investments made into computers and related technologies. IT capital in the USA is currently about 10% of GNP (Gross National Product). Many executives expect it to take five years before the benefits of IT investments are realised. IT is an effective substitute for labour in the manufacturing area, but in financial firms, dominated by white-collar workers, IT is associated with a significant increase in employee numbers. Similarly, spending on IT does not result in clear productivity improvements in either the service sector or in manufacturing. A report by the General Accounting Office in USA states that even though government agencies have spent $145 billion over six years on IT the results have been disappointing creating a double loss, firstly in the loss of investment capital and secondly in the cost of lost opportunities (Thibodeau, 1998).

Mitra and Chaya's (1996) investigation of the cost factors affecting IT investments reveals that organisations investing large amounts on IT have higher overheads but lower production and operating costs. Larger organisations spend a higher percentage of their total revenue on IT. White-collar workers create higher IT budgets and overheads because these workers are the main users of IT. Investment in IT does not lower labour costs. They recommend that to be able to understand the gains achieved by IT investment there is a need for further research on assessing the impacts that information, control, and decision making have on IT, and quote Nobel laureate
Robert Solow

"we see computers everywhere except in the productivity statistics".

Interestingly Grover et al’s (1998) research attempts to broaden the understanding of the link between IT investment and productivity. Using non-economic assessments by informed sources, perceived process change as the intervening variable, alternative operational models, and assessment of individual technologies they find that there is a link. They suggest that previous studies have not discovered this link because there is a time lag involved.

Robson (1994) asserts that one of the greatest problems in judging information value is in recognising the distinction between tangible and intangible benefits, and in having a method of estimating the worth of intangible benefits. She quotes the 1991 finding, by Clark McKee Management Consultants, that in over 80% of organisations, 30% of the IT investments are intangible. Vowler (1999) concurs with the view that intangibles are a determinant of success, and are very difficult to measure. In spite of the widespread recognition of the impact of intangible benefits, traditional quantitative measures, such as ROI and Cost Benefit Analysis (CBA) still dominate IT investment decision making. Fad (1998) asserts that most IT investment decisions are based on ROI and

"conform to the 3/24 rule : expect to replace the newly installed system in three years and expect to derive fiscal benefits from the new system in 24 months" (Fad, 1998, Page 2)

There is little evidence that organisations are using Parker and Benson’s Information Economics (IE), Strassman’s ROM, or IBM’s Systems Effectiveness Study and Management Endorsement (SESAME).

Ward et al’s (1996) survey of sixty senior IT / IT and business managers, from organisations within the ‘Times Top 100’ in the UK, seeks to establish how they
realise the full benefits of IT investments. The aim is to develop a benchmark of industry norms and practices. The top three issues facing managers are:

- Alignment of IT to business strategy.
- Benefits to management, including such issues as lack of post-implementation measures, criteria to gauge success and delivery benefits.
- Costs and budgets.

They find that although 50% of organisations have methodologies in place for IT systems development, project management and investment appraisal, only a minority consider these adequate, in fact only 20% use all three. Many overstate the benefits of investments to get them approved. CBA and ROI are the most common appraisal techniques in use when making IT investment decisions. However these are deemed to be inadequate, as they do not take into consideration potential, especially intangible, benefits.

"the relationship between the investment in information systems (IT) and a firm’s performance continues to be important: conclusive evidence that information technology (IT) contributes to a firm’s effectiveness is rare.”

(Weber and Pliskin, 1996, Page 81)

Rai et al (1997) examines the relationship between IT investment measures and specific aspects of organisational performance in an attempt to find a solution to the productivity paradox.

Their findings are:

- IT investments are positively related to organisational output.
- IT reduces production costs and increases productivity of employees.
- There is no clear relationship between IT investments and business performance.
- IT neither reduces the cost of management nor does it increase management productivity. This concurs with Strassman’s finding that computers do not
improve bad management.

"Organisations failing to redesign management processes while increasing IT investment are likely to see administrative diseconomies of scale and rising overhead expenses without any concomitant increases in administrative productivity." Rai et al (1997, p 5)

They conclude that IT investments directed towards reducing labour costs and increasing organisational output should be justified using quantitative measures such as cost savings, Net Present Value (NPV) and Internal Rate of Return (IRR). However justification for investments to improve business performance must be based on simplification and redesign of management processes, otherwise increases in management costs and productivity are to be expected.

Similarly Gregg (1999) refers to the productivity paradox stating that there was only 1% ROI on IT from 1985-1995 and 70% of IT projects did not deliver anticipated benefits.

The above researchers indicate that higher expenditure on IT is not reflected in increased productivity and profitability. The reasons for this can be found in the difficult to measure intangible benefits. Decision-makers continue to use quantitative measures such as ROI and CBA, which are not suitable to measure the qualitative benefits often arising from the use of IT. There is little evidence indicating use of qualitative measures such as ROM and SESAME. Will the current research into educational investment effectiveness reveal the same lack of measurement? Also will there be management (principal) dissatisfaction that they are not getting value from their investment dollar?

**Justification of IT Investments**

IT managers are expected to show ROI as monetary or enterprise value (Fad, 1998). Santos (1994) found that justifying IT investments is a serious problem to
organisations. The reasons for this include: the difficulty in using traditional budgetary approaches; the fact that most managers make IT investment decisions based on how to maximise the value of the organisation; and IT investment justifications do not take the organisational perspective into consideration.

He asserts that financial analysis must be used to evaluate IT investments that have strategic impact on the organisation. These strategic systems are large and difficult to estimate. He shows how useful *Options Pricing Models* are for financially analysing strategic IT investments. IT investments can provide large returns by enabling development of new products, and by developing and maintaining current competitive advantages, citing SABRE airline and ATMs (Automatic Teller Machines) as examples of this.

However Kumar (1996) maintains that traditional options pricing models are not directly applicable to IT investments. He states that IT Investments are able to be viewed as either first stage or second stage. By undertaking first stage investments eg establishing a telecommunication network an investor acquires the right to the second stage investment eg obtaining the technology which uses the telecommunication network. The options value of second stage projects could increase or decrease depending on the rate of change differential of either the project benefits or the second stage project costs. Thus if options values are to be used to assess IT investments, it is necessary to examine whether the projects at risk increase or decrease the options values of that project.

Another framework for justifying IT investments is developed over three years at Kobler Unit Imperial College Research Centre (Hochstrasser, 1994). Guidelines to address the primary objectives of the system and second order effects on people and organisations working with IT are identified. These guidelines are then used as a basis to create an *IT Justification Framework*, which concentrates on Critical Success Factors (CSFs), risk assessment, Business Performance Indicators (BFIs), and strategic alignment. At the same time a mechanism to periodically monitor and evaluate investment is developed.
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The IT Justification Framework is a management tool with four modules for use in evaluating and prioritising non-infrastructure IT, ie those where quantifying cost benefit is not possible and management is concerned with the "soft benefits" to be gained.

The four modules specified:

- Corporate Standards to be adhered to, ie the CSFs to be addressed
- Awareness Raising of direct and indirect, human, costs of IT projects.
- BFIs for different types of project which are measured before at the pre-implementation stage, and concentrate on dynamics of change.
- Project Priority Value - the calculated value of new initiatives based on previous experience.

Taninecz (1996) states that currently $700 billion annually is spent world wide on IT, with estimates of spending of $1 trillion by the year 2000. World trade in information technology related goods and services are growing five times faster than trade in natural resources. Companies in USA spend more on IT products than all other capital equipment. However fewer that one fifth of all organisations have processes in place to justify, or determine any long term benefits of, IT investments. Berry (1999) concurs that only a small minority of organisations are making a sound business case for IT investments. The current situation in companies undertaking large system integration projects is that only 20% have founded them on a business case, of those only one third track the project’s performance throughout. Taninecz (1996) maintains that the reasons for this lack of justification are:

- managing ROI is difficult and controversial
- many differing opinions exist
- inconsistencies in practices
- ROI measurement is difficult. IT comes in so many forms, its costs are shared amongst many projects, and consequently it is difficult to identify individual IT costs.
Sweat (1998) maintains that measuring ROI is more "art than science" because the measuring tools are mainly subjective. Additionally IT investments are frequently made to remain competitive rather than for ROI reasons. First entrants frequently gain competitive advantage from IT investments, however latter entrants often have to invest in IT purely to retain their market position. Hitt and Brynjolfsson’s (1996) study into the value of IT’s effect on productivity, profitability and consumer surplus also found that organisations are making IT investments to maintain competitive parity rather than to gain competitive advantage. However IT investment can be a way of gaining cost leadership, if cost is the central issue.

Taninecz (1996) states that there is a need to look at a broader business perspective when considering IT investments, as most of the time IT is a facilitator, or essential element, of the new business process. Hitt and Brynjolfsson (1996) concur recommending that managers should focus on how IT can strategically advantage product position, quality, and customer service. Perez (1998) aims to shed light on the how and why of investment decision-making. Management criteria are most frequently used, development criteria are next, and finally financial criteria. The more strategic the investment the greater the need for the use of qualitative assessment.

Ferguson et al (1996), Vowler (1999), Thorpe (1999) like Taninecz, state that business rather than IT criteria were important justifications for IT investment. An exploratory study into the evaluation methods for IT investments, used by three organisations, reveals that if the benefits of the IT investment represent a core business objective, the fulfilment of the objective is sufficient justification for that investment. Additionally it may not be either feasible or necessary to quantify the benefits of the IT.

"The value of information for any organisation is of paramount importance when considering investment in new IT applications." (Ragowsky et al, 1996, Page 98)
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They do not find a direct relationship between investment in an IT application and the performance of the organisation, the aim of their study. However they find an approach to relate the organisation's characteristics, to the benefits the organisation may gain from using a specified application. This new tool allows managers to assess the benefits and importance of an IT application to an organisation before it is installed. Although this study is confined to the manufacturing industry Ragowsky et al (1996) assert that this approach can be applied to other types of organisations. It enables the applications and the variables that represent uncertainty to be identified, and also identifies the variables that represent the importance of information.

Sethi et al (1993) recommend that until consistent measures are used across studies, comparisons cannot be made into the effectiveness of IT. Their study takes a detailed look at Computerworld's ranking criteria and effectiveness index. They find there are problems with Face Validity because IT Effectiveness is not defined, there is little justification of the weighting scale used, assumptions are not verified, one measure is not an IT measure but a company measure, and there are omissions. Problems occur with Construct Validity in that Computerworld makes the assumption that IT Effectiveness results in improved company performance. There is a lack of strong theoretical or pragmatic basis for the criteria in use, in fact Sethi et al (1993) question that it is measuring IT Effectiveness at all! They believe that it may be too soon to measure IT effectiveness precisely as there is little evidence of a cumulative tradition in IT measurement. The measures in use and their assumptions are diverse. They develop a Conceptual Model of IT Measures (See Figure 7: A Conceptual Model of IT Measures) based on the work of previous researchers, and suggest using this as a basis for future research.

This model enables consistent use of three categories of IT measures:

- IT Investments – the optimisation of IT value
- IT Investment Components – effective benchmarks and levels of IT systems resources.
- IT Components – adopting the "right" techniques and using them in the "right" functional areas.
Brynjolfsson’s (1993) review and assessment of the current research into IT productivity concludes that the lack of appropriate measurement and methodological tools are as much to blame as mismanagement by the users or developers of IT.

“The lack of good quantitative measures for the output and value created by IT has made the MIT manager’s job of justifying investments particularly difficult.” (Brynjolfsson 1993, Page 67)
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Due (1996) is challenged by the results of a Howard Rubin survey of 4,000 IT organisations, indicating the majority have such a lack of IT productivity measurement that managers are unable to monitor their IT investments. He concludes that managers can no longer rely on subjective measures such as customer satisfaction, nor on "ineffective counterproductive metrics like lines of code" and budget size. He recommends that managers use Function Point Analysis coupled with a suite of other metrics including profitability, customer satisfaction, time to value, value added, employee satisfaction, productivity and quality, system development life cycle shape change, learning rate, rework rate, and reuse. He asserts that only by using these can managers measure the overall rate of return IT investments provide to the organisation.

"historic approaches for justifying Information Technology investment are inaccurate, they are selfishly motivated. They justify the existence of the MIS organisation rather than the performance of the technology investment."
(Clarke, 1996, Page 1)

He recommends the use of five metrics to establish the validity of an IT investment, which he maintains are effective regardless of the size of the organisation.

The metrics establish whether the investment:

- creates new value for customers
- makes it easier for clients / customers to do business with the organisation
- makes the organisation appear larger than it is
- differentiates the organisation from its competitors
- recognisably and measurably supports the business objectives of the organisation.

The justification of IT investments poses serious problems for organisations because there are differing opinions, inconsistencies in practice and a variety of models in use.
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There is also the recognition that businesses frequently invest, not for competitive gain but to remain as a player in the business arena. Clark’s (1996) five metrics to establish the validity of IT investments appears to provide the most value in the current research as it is able to be used in any sized organisation, and the metrics specified are able to be interpreted in terms of the educational arena.

IT Infrastructure Investment

Weill and Broadbent’s (1994) study of organisations in three Australian industries forms part of worldwide research establishing which IT infrastructure investments are most appropriate for particular industries and particular business strategies. Their findings reveal that organisations invest in IT to achieve four different management objectives:

- Strategic – to gain competitive advantage or strategically position the organisation.
- Informational – to support management and control the organisation.
- Transactional – to cut costs or handle higher volumes of data.
- Infrastructure – to have reliable IT services and IT components throughout the organisation eg Electronic Data Interchange (EDI), hardware and communication facilities. Infrastructure is determined in terms of the reach, the extent of the network, and the range and depth of the services provided.

The view held by the organisation of the role of the IT infrastructure determines the benefits, expectations, and value gained from investments. If the view is utilitarian, cost savings are achieved, an enabling view focuses on long term requirements, and a dependent view achieves a business strategy. Interestingly more than half of the firms use Business Process Re-engineering (BPR) and all of these firms have either a dependent or enabling view of IT infrastructure. Weill and Broadbent (1994) are of the opinion that a dependent view of IT infrastructure is the minimum requirement for successful BPR. Broadbent and Weill’s (1997) research adds a fourth view of the IT infrastructure, none. This view is held when the organisation does not make organisational wide infrastructure investments. The other three views remain basically the same. Broadbent and Weill (1997) stress the need for an organisation to
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have a sound understanding of where the organisation is heading, rather than where it has been, to be able to create appropriate infrastructure. The challenge is for organisations to know which infrastructure services they need; twenty-three infrastructure services are identified. The most common is management of the organisation’s communications network.

They devised the following framework to be used jointly by business and IT managers in deciding on infrastructure investment:

The Strategic Context – the synergies amongst the business units and the extent to which these are to be exploited are established.

The Business Maxims - the organisation’s competitive stance, its future directions, are derived from the strategic context.

The IT Maxims – the organisation’s IT role, its need to process transactions, its access / use of shared data across the organisation and from external sources, are established from the business maxims.

The View of the Infrastructure is identified from the business and IT maxims.

The Infrastructure Services are specified.

Review the Linkages.

Skinner (1998) asserts that infrastructure investments must be treated as a special case with organisations allocating a fixed amount for infrastructure investments, and using an “expiration process” for periodic major upgrades and additions. Most organisations are convinced of the necessity for building and maintaining IT infrastructure. However this is a burden as maintaining and adding to infrastructure is an ever increasing cost.

Currently many of the investments made in the educational sphere involve improvements to the infrastructure. The Victorian government is investing millions to ensure that the schools are linked with the education department’s offices and to ensure that students are able to access the Internet. It will be interesting to discover
how many of the educational institutions are utilising strategies such as those specified by Broadbent and Weill when deciding on new infrastructure investments.

**IT in Education**

The changing nature of IT means that schools have to keep abreast and informed of developments in IT to produce students equipped for an ever-changing world. The way schools are managing IT is a challenging and two faceted problem because schools have two clearly defined IT related roles to:

- manage the school’s administration
- manage the educational IT requirements of the school.

Schools are limited in their resources because governments only provide a certain amount of the necessary operational finance. To this end schools have to make choices on what to purchase. In making decisions on purchases the stakeholders’ views have to be taken into consideration. O’Mahony and Dampney (1996) in their research into the NSW school scene devised a PACT (Parents / Administrators / Children / Teachers) model based on the characteristics of professional bureaucracies - Customers / Managers / Products / Workers as defined by previous researchers. They maintain that the PA side refers to the efficiency aspect and the CT side refers to the effectiveness aspect.

Hope (1996) refers to three levels of information needs in any organisation, strategic, tactical and operational. The information needs differ across these three levels according to the stakeholders involved (Customers, employees, shareholders); the stakeholder’s requirements; the quality planning; and the quality improvement process. Efficiency involves the shareholders driving the business plan with ROI as its main focus based on the organisation’s productivity. Effectiveness involves the customers and employees driving the quality aspects of the business plan. The most advanced quality organisations combined quality and productivity into one document.
Strategic management is concerned mainly with ROI and only addresses customers if retention rate drops or if employee absenteeism and retention rates drop.

The aim of this research is to establish criteria (if any) in use by the IT manager (or equivalent) in making decisions on what is an effective IT investment.

**Strategic Alignment of IT in Education**

Researchers in business maintain that the strategic alignment of IT to business goals is vital to the success of the organisation. In education researchers are also stressing the need for schools to strategically align IT to the school’s goals.

An example of the strategic alignment of IT in the educational arena is found at the Sante Fe Community College’s Information Technology Services in the USA. This department has an Internet site stating its Missions and Goals, which form part of the college’s effectiveness model (Santa Fe Community College, 1997). It is interesting to observe that besides aligning the goals of the IT services with those of the College as a whole, the stakeholders categorised in O’Mahony and Dampney’s (1996) PACT model are specifically addressed. The IT Services declare commitment to providing efficient and effective IT throughout the college, to enhance teaching and learning (the CT effectiveness aspect) and the administrative operations of the institution (the PA efficiency aspect).

Visscher (1994-5) asserts that school information systems (SIT) are developing worldwide because they are recognised as providing advantages to schools.

However

“remarkably little has been published on strategies for the design and development of such systems” (Visscher, 1994-5, Page 231)
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His response to this is the development of a SCHOLIT strategy (See Figure 8 : The SCHOLIT Strategy). This strategy enables schools to determine their organisational requirements, those, which improve the functioning of the organisation by automating activities involved in the school’s procedures. These requirements are used to analyse the objects needed and decide which are suitable for automation, thus defining the input, processing and output.

![Diagram: SCHOLIT Strategy]

Figure 8 : The SCHOLIT Strategy

The SCHOLIT strategy project, undertaken in Dutch schools, proved to be very labour intensive. However it met the goals of the researchers to design and develop an integrated school information system which is accepted and provides long term, meaningful support to school staff. The system design enables schools to adapt it to their specific needs hence aligning it with the strategic requirements of the administration requirements within schools. Visscher (1994-5) states that the final system provides schools with IT support which meets future needs.

In business, competition, gaining competitive advantage, or obtaining competitive parity is necessary to staying in business. Education provides a service to the community, that of educating students. Usually the provision of this service is funded and controlled by government. Competition and competitive advantage are not essential to the functioning of schools in the government sector. The governmental body responsible for schools therefore undertakes the developing, planning and controlling of strategic goals for schools. Any strategic alignment of IT in education is specified by the governmental education department and passed onto schools. The Victorian government *Classrooms of the Future* project is an excellent example of
government specifying strategic alignment of IT to educational goals. Latham (1998) states that schools are examples of businesses where IT is still in its infancy and thus to function effectively it is vital that they develop an IT strategic plan. This must address the needs of administration, curriculum management, and curriculum delivery.

Classrooms of the Future

Strategic alignment of IT with education is the driving force behind the Victorian Government Department of Education’s (DoE) Classrooms of the Future project.

"The Classrooms of the Future program is aimed at ensuring that the learning of each Victorian is enhanced through high quality teaching and learning which makes appropriate use of Information Technology and Telecommunications" (Education Victoria, 1996, Page 3).

The specified goals of the Classrooms of the Future are to utilise information technology and its associated facilities to improve learning, facilitate collaborative learning, enhance educational opportunities, develop an Information Technology and Telecommunications (IT&T) conversant workforce, and increase parent participation.

In 1996 the DoE requested tenders for more than sixteen aspects of IT&T as part of the Classrooms of the Future project. The rationale for this centralised requesting of tenders was that the aggregate purchasing power would provide the Victorian Government educational community with the most cost-effective provision of IT&T products and services.

The provision of the Computerised Environment for Schools (CASES) ensures strategic alignment of the goals of the DoE with the schools’ administration and management. CASES records and manages financial, personnel, assets, and administration within schools. Similarly the Victorian Directorate of School
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Education (DSE) has purchased a state wide site licence for KIDMAP to assist schools in implementing the Curriculum Standards Framework. KIDMAP provides teachers and schools with software to assess and record student progress, to plan and develop curriculum, and to allocate school resources.

The DoE set up *Navigator Schools*, providing them with considerable financial, personnel and IT&T assistance. These schools provide leadership and guidance to other schools in implementing IT&T effectively, thus ensuring that IT&T is strategically aligned to the goals of the Classrooms of the Future.

The consulting and planning agency Computelec Australia is recommended by the DoE to assist schools in developing Learning Technologies within schools. The first step in planning for the introduction of IT&T in schools is “Creating The School’s Vision Statement” (Stanton, 1997) on which the learning technologies plan is built, and from which the learning technologies goals and requirements are determined.

The development of a School’s technology plan is interesting for two reasons:

- firstly it indicates the government control over the strategic direction for IT&T in DoE schools as it recommends one consulting group for the state;

- secondly that schools are expected to develop their own strategic plan. This is necessitated by the change in the structure of education in Victoria from central control and funding towards the *self-managing school*. The concept of the self-managed school is becoming popular throughout the world. (Blackmore et al, 1996; Thomas, 1996; Townsend, 1995; Caldwell Brian J., 1996)

“Self-managing schools, therefore, might be considered as a first step towards the privatisation of education.” (Townsend, 1996)

If this is the case, competition becomes a significant factor, and the business models for dealing with strategic alignment of IT are more relevant. It will be interesting in
this research to discover whether schools have developed their own School’s Vision for implementing IT&T and if this IT&T vision reflects the competitive stance taken in business IT strategic planning.

In the higher education sector competition for students has been in place for considerably longer especially overseas. Alavi et al (1997) and Santosus (1997) describe means of obtaining strategic advantage through the use of IT. Alavi et al’s (1997) research is especially interesting, where the creation of strategic alliances between universities through the use of IT alters the whole concept of education. IT is used to share staff and external expertise, create a variety of learning environments, and encourage communication between students and staff. IT is used to effectively transform the learning environment and create added value. A similar example of this named by Cunningham (1998) as “borderless education” describes a consortium arrangement by the Western Governors University which offers programs across universities in ten states of the USA.

**IT Measuring Business Outcomes in Education**

There is little evidence in the literature on educational IT of the measurement of business outcomes. Occasional references are made to ROI. However the most common attempt towards any form of measurement is found in the development of mission statements based on critical success factors. Education provides a service, which has previously been totally funded by governments. Will the change to self-management result in the utilisation of business-like measurement of business outcomes in schools?

**IT Effectiveness in Education**

Rodrigues (1997) maintains that technology is not the means of obtaining effectiveness in education citing the fact that:

“Ninety-nine percent of K-12 Schools have computers and ninety-three percent of students use them every day, yet American students are less
computer literate than their European counterparts” (Rodrigues, 1997, Page 375)

He asserts that although teachers are uppermost in determining IT effectiveness in education to date they have been omitted from the technological learning process. Mansell (1999) agrees and quotes a report by the British Office for Standards in Education blaming the lack of IT expertise amongst teachers as the reason for failure of schools in IT. IT effectiveness in the educational sphere is obtainable when teachers are included in the learning process and provided with adequate educational and technical support. Only then will teachers incorporate technology into their classroom processes, and make it into a tool for effective learning, rather than as a tool to be learned.

Perhaps the best example of IT effectiveness is found in the higher education sector’s implementation and use of online learning where they are following the banking industry’s lead (Ryan, 1998). The results of research into this area have revealed that students are more satisfied, achievements are the same or better, critical thinking and problem solving are higher, interactions between students and instructors are increased, and communication with outside educational professionals is made easier.

“online learning is beginning to transform educational practices at all levels of our school system.” (Kearsley et al, 1995, Page 42)

The problems associated with online learning relate to hardware and software, plus the additional workload on teaching staff, and learning time by students.

Carter (1996) states that traditional curriculum models have not taken into consideration the generation, management and flow of information. Technology has the potential to supply timely, relevant information so that teachers and administrators can better control and manage processes of change. The two ways of using technology
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to achieve information rich environments are by automating and informing (empowering educational professionals to have readily available information to understand and execute educational processes and curriculum events). The use of Information Management Systems is essential to allow for unobtrusive and automated data acquisition which describe the key operations associated with the cycle of relationships between curriculum, instruction and assessment, thus developing education’s full potential.

Similarly Jonassen (1995) believes that until there is a reform in the way learners and teachers are treated, technologies will only be delivery vehicles and not the powerful tools capable of revolutionising education. The most productive and meaningful uses of technology engage students in knowledge construction, conversation, articulation, collaboration, and reflection. However these are not possible in traditional educational institutions where students are engaged in reception, repetition, competition, and prescription.

He maintains that the proper roles for technology in education should be:

- as a tool (to access and represent ideas and generate information)
- as an intellectual partner (to articulate, reflect, support and construct ideas and thinking)
- as context (to represent real world beliefs, deal with problems, and support discourse).

Selwyn (1999) maintains that the role of the school management is a key factor in achieving the effective use of IT in education by establishing a “shared vision and ethos” about IT. This study of sixteen to nineteen year olds use of IT in south-east Wales finds that their use is sporadic and governed largely by subject areas and career pathways.
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Measures of IT Effectiveness in Education

O’Mahony and Dampney’s (1996) research linking organisational culture with IT strategy utilises User Information Satisfaction (UIT) as a means of measuring IT success. The survey is designed to elicit data concerning the school management culture and school IT satisfaction. The results pitted on the PACT quadrant reveal that schools are becoming more business-like in their approach to IT management with:

- 95% having a Mission Statement
- 80% having a formal IT planning group
- 60% having an IT Strategic plan in place.

However 85% rely on teaching staff to manage IT, only three have IT managers. The NSW government states that it will provide high schools with full time IT managers by the end of 1999. The authors deduce that the organisational culture in schools is predominantly bureaucratic because the administrators are most satisfied with IT and parents least satisfied.

Three problems affecting the strategic planning process are:

- The inability to evaluate outcomes of IT strategic planning.
- The use of organisational power to subvert IT strategy.
- Misalignment between organisational groups, and between the professional and bureaucratic objectives. This is perceived as the major factor preventing the operational integration of IT.

O’Mahony and Dampney’s (1996) research could provide a useful basis for comparisons with the current research into IT in Victorian schools.
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IT Effectiveness in Small Business – Education

Schools can readily be classified as small businesses. Using Thong et al’s (1996) criteria, they usually have fewer than 100 employees, have budgets of less than US $7.2 million, and have little or no ability to earn income let alone sales of US $9 million. Small business IT findings are readily replicated in research involving schools.

The O’Mahony and Dampney (1996) research findings are similar to those reported from Small Business IT research. The schools in NSW have IT generalists rather than specialists, there is a lack of professional expertise, and it is rare to have “in-house” expertise. This lack of professional expertise is also revealed in Riffel and Levin’s (1997) research in Canada where it is found that education is driven by volunteer teachers, school administrators, community groups and employer organisations. Thus schools, like small businesses, are susceptible to external forces. As with small business there is IT resource poverty in schools (Milburn and Shiel, 1998; Mitchell, 1997) consequently the least expensive option is frequently chosen.

IT Investment in Education

Many governments throughout the world are investing heavily in educational IT in the belief that it will overcome the failures of their existing education systems. In Victoria, population 4 million, the Government has committed to spending US$39 million 1996-1999 (Thomas, 1998) for the supply of Learning Technologies Training services in Victorian government schools, TAFE (Technical And Further Education) institutions and the Education Department. In the 1999-2000 budget the Victorian Government has committed to expenditure of US$62.4 million for technical support in schools.

There is a belief in the United States of America (USA), population 274 million (United Nations, 1998), that the education system has failed students. Technology is promoted as the solution with billions of dollars spent on the “Electronic Classroom” (Noll, 1997), by 1998 US$4 billion was spent annually on technology (Conte, 1998).
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President Clinton vowed to connect every student to the Internet by the year 2000 (Skinner, 1997) and $US1.275 billion has been earmarked for this in subsidies to libraries and public schools (Williams, 1999). The USA Federal Communications Commission Universal Fund is spending $US2.25 billion annually to discount telecommunications services, wiring, and Internet access (Muhammad, 1998).

Expenditure on IT by schools in the UK (United Kingdom), population 59.4 million, has been four to five times the government’s provision of $US296.4 million. New Zealand, population 3.8 million, government plans to spend $US49 million by the year 2001 (Thomas et al, 1998). Singapore, population 3.5 million, is investing $US350 million for the implementation of IT projects in schools and tertiary institutions (Low, 1999). In Canada, population 30.6 million, school districts have invested heavily in IT over the last ten years, 90% believe that students need to understand IT to be employable (Riffel, 1997), with the Alberta Government spending a once off $41 million on infrastructure and $10 million for ongoing IT funding for specific programs and initiative (Pederson, 1999).

In the USA, technology is currently promoted as the solution to the failure of the education system to meet students needs. Skinner (1997) cites President Clinton’s assertion that every American student will be connected to the Internet by 2000.

The government’s Electronic Classroom project is spending billions of dollars installing computers for educational use and connecting every classroom to the Information Superhighway. Noll (1997) questions this investment stating that the pace of change in technology is very fast but it is very slow in educational institutions, consequently by the time technology is in the classroom it is obsolete.

“Quality of education comes from motivation – students who are motivated to learn by teachers care about education”. (Noll, 1997, Page 22)
In the Australian scene teachers view IT as a way of enhancing education across all curriculum areas, however they have not been provided with the necessary support for effective implementation of IT. Teachers therefore have to educate themselves if they want to keep abreast of changes (Blackmore et al, 1996). Schools expect teachers to be able to implement IT into their curriculum area. The Victorian and NSW departments of education have recently come to recognise the importance of educating their teachers in IT, with NSW introducing a TILT (Technology in Learning and Teaching) program and Victoria increasing its funds for professional development Jackson (1998). Victoria’s 1998 State Budget allowed a $14 million funding over four years to train at least 6,000 teachers in the area of new learning technologies.

Justification of IT Investments in Education

Both the University of Toronto Advisory Forum on Instructional Technology (1993) and Stager et al (1994) stress the need to create a set of guiding principles to document the outcomes of investment in IT in the educational arena. The reason given is that decisions about purchasing IT should be based on demonstrated cost effectiveness, not just on academic performance.

There is a need to define objectives of educational improvements in measurable terms. It is critical to begin this evaluation by specifying exactly what intervention or treatment is to be undertaken. Information is then sought on its effect and ways are established to measure it. Even if no further progress is made, thinking about key points will lead to more effective programs and investments. The evaluation is not random, the University of Virginia devised a scheme, which addresses the areas of the content, the computer literacy of persons involved, and the infrastructure required. This process has four considerations:

- what goals are most important
- where are the biggest gaps between the current situation and the goals
- which are the areas where the use of IT can have the biggest impact
which of these areas have the lowest cost / benefit.

This starts to establish priorities by rationally examining content issues, thus indicating where the greatest benefit to content can be obtained by the introduction and use of IT (Stager et al, 1994).

Similarly the University of Toronto Advisory Forum on Instructional Technology (1993) stress the need to undertake a cost / benefit analysis of instructional IT. These suggestions for justifying IT investments are somewhat similar to what is occurring in business, with investments based on critical success factors (CFS) having a monetary cost effectiveness focus. Both the above refer to the university sector. Will these approaches be in place in schools?

Conversely Lewis (1999) states that purpose of technology in education has been limited to cost-efficiency and learning effectiveness and that technology should address the following four aspects:

- as an area of the curriculum
- as a medium for the presentation of subject matter
- as an infrastructure for the administration and management of the school
- as a mechanism for managing, transacting and recording teaching and learning.

**IT Infrastructure Investments in Education**

The majority of Education Victoria's *Classrooms of the Future* spending on IT&T involves the setting up and enhancement of the necessary infrastructure to connect schools, departments and students to each other, and to the wider global community.

The University of Toronto Advisory Forum on Instructional Technology (1993) indicates the importance of infrastructure to the effective operation of the university and proposes the following mechanisms to improve the infrastructure.
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These are: to make faculty members aware of the support available, to establish a centre for collaborative study of instructional technology, to expand site licenses for products used in instructional technology, and trial software before it is purchased. Galbreath and Andreotta (1994) discuss the implications to educational institutions of the USA's National Information Infrastructure (NII). They state that the Federal Government should be issuing a

"clear statement of a national vision for the infrastructure" (Galbreath and Andreotta, 1994, Page 17)

This is essential if America is to remain competitive and economically viable in the "global marketplace". The government should be making policy decisions to encourage the private sector investments in infrastructure, fund pre competitive research and developments to enhance the value and capabilities of information infrastructure, and participate fully in the telecommunications and communications standards development. Finally the government should extend the NII to smaller users such as schools so that they can benefit from the ready access to the "global marketplace".

The educational IT research reveals similarities with those conducted in the business arena. These appear to be increasing as schools are taking the responsibility of managing themselves and their investments, the largest investments involving changes to the infrastructure.

The networking firm 3Com obviously recognises the importance of infrastructure. It is pledging

"US$4 million investment to build and support information technology education infrastructure for the Asia-Pacific region" (Katz, 1999)

This includes $1 million available for equipment grants to schools, $1.5 million in developing the successful NetPrep program, and $1 million research grants to universities.
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By 1999 schools are emerging as the new global business (Mason, 1999), with software, hardware and networking firms recognising education as the new global business and creating strategic alliances with schools and educational authorities.

Conclusion

This literature review aims to elicit information relevant to establishing a model for IT investment effectiveness in education. Business has a well-developed research tradition in the domain of IT. Thus a review of the literature in the areas of IT investment and IT effectiveness is undertaken to establish the relevance of the business models to education. The chapter concludes with a review of research in IT in education enabling the eliciting of pertinent information and making of valid comparisons.

Business researchers emphasise that the strategic alignment of IT to organisational goals is important to the effectiveness of IT. This alignment needs to be accompanied by senior executive involvement preferably led by the CEO, formal governance structures at both the IT and corporate levels, good communication of successes and failures, education for a common understanding of IT, a business focus and planning, and joint ownership by business and IT personnel of planning and IT strategy.

Effective strategic planning needs to be accompanied by a “mission statement” which is used as a symbol of leadership and as a means of communicating the organisation’s beliefs. The mission statement is an essential prerequisite for using Kaplan and Norton’s (1992) “Balanced Scorecard” for assessing an organisation’s key success factors. In business there is a lack of strategic planning which increases as the size of the company becomes smaller.

Schools as a business are in their infancy and thus need to develop a strategic plan which addresses the needs of administration, curriculum management and curriculum delivery. The Victorian Government’s Classrooms of the Future project recognises the importance of strategic alignment of IT in the education domain. To this end it has five specific goals relating to the utilisation of information technology.
collaborative learning, enhanced educational opportunities, developing an IT&T workforce, and parent participation. Research reveals three problems affecting the strategic planning process in schools: the inability to evaluate outcomes of IT strategic planning, the use of organisational power to subvert IT strategy, and misalignment between organisational groups and professional and bureaucratic objectives.

Initially the measuring of IT effectiveness concentrate on economic measures such as ROI, CBA, NPV and IRR. However these prove inadequate as they do not include intangible benefits. IE includes tangible benefits and is commended as including the seven Cs of comprehensiveness, consistency, clarification, communication, confidence, consensus and culture.

Most of the early research into IT effectiveness is single purpose, which is rejected by researchers who maintain that IT effectiveness is a multidimensional construct and seek to find models to illustrate this. DeLone and McLean's (1992) six dimensions are narrowed to four, use, user information satisfaction, individual impact and organisational impact as measures of IT effectiveness. Further examination of these reveals that:

- IT usage and effectiveness depends on the characteristics of the user and ease of use of the system. It is better to have overall high ability than a few expert users.

- User Information Satisfaction is the most widely used measure of IT effectiveness because of the popularity of Bailey and Pearson (1983) model. It is able to be used to establish the organisational IT effectiveness because it is an indicator between business strategy and MIS scope or strategic alignment.

- Organisational Impact is most significant because it refers to the real world effects IT has on the organisation’s performance and business value; thus the focus should be on the business value and how, why it adds value to the organisation. The three principles to improve the value of IT include: understanding how investments in IT relate to business value, facilitating communication between IT and business people, and choosing the IT service providers carefully. It is crucial
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to know the core competencies of an organisation's success so that IT is assessed and adjusted to meet those business strategies.

- Individual Impact largely involves laboratory experiments assessing the problems confronting individuals resulting from rapid changes in IT. For IT to be effective there is a need to have change readiness strategies for dealing with both passive and active resisters of changes in IT.

Historically business IT research involves large organisations. Small businesses (SB) have different IT requirements where IT is largely used for automating tasks and administration. SBs have simple highly centralised organisational structures, CEOs making the critical IT decisions, short range perspectives, undocumented procedures, resource poverty resulting in choosing the lowest cost alternative, underestimations of the time and effort for IT implementation, a lack of technical expertise, and a susceptibility to external forces. O'Mahony and Dampney's (1996) research in New South Wales (NSW) schools reveals striking similarities with those above for SB.

Educational research reveals that teachers are uppermost in determining IT effectiveness however they have been largely omitted from the technical learning process. In the UK this lack of expertise by teachers is cited as the reason for the failure of IT in schools. IT effectiveness is not attainable until teachers are included in the learning process and provided with adequate technical and educational resources. The role of school management is also a key factor in IT effectiveness by establishing a shared vision and ethos of IT.

Although the investment by business in IT amounts to 40% of capital investments in USA two thirds of the Fortune 500 organisations CEOs do not think that they are getting value from IT investments. The greatest problem appears to be in distinguishing between tangible and intangible benefits. Traditional measures of ROI and CBA dominate but these are inadequate for measuring intangible benefits. There is a "productivity paradox" between IT investment measures and organisational performance. The more strategic the investment the greater the need for qualitative
assessment consequently there is a need to have business criteria as a justification for investment. Clark (1996) gives five metrics for establishing the validity of these quality investments: provide new value for customers, easier for clients and customers to business, make the organisation appear larger, differentiate from competitors, and support the objectives of the organisation. It would appear that the qualitative nature of the business of schooling would naturally lead to the implementation of such metrics as identified by Clark (1996) when establishing the effectiveness of IT investments.

Companies invest for four reasons: strategic, informational, transactional, and infrastructure. Infrastructure investments are a special case of intangible benefits. The organisation’s view of infrastructure determines the investments it makes: utilitarian for cost savings, enabling for long term objectives, dependent for achieving a business strategy. The organisation must therefore have a clear view of its future requirements to make effective IT infrastructure investment decisions. The Victorian government is investing millions in communications infrastructure to provide Internet access for all students and to link schools with offices of the Department of Education. Private organisations are encouraged to invest in infrastructure especially in the education domain.

The literature review has revealed many issues deemed relevant to IT investment effectiveness. In the next chapter explaining the research approach these issues are collated, refined and framed as questions for inclusion in the interview questionnaire.
Chapter 3 - Research Methodology

Introduction

This chapter discusses the approach implemented in this research. The rationale for using a combined interview and Delphi survey approach is explained. The validity of using the Delphi survey based on previous researchers' implementations is given. The development of the research questionnaire based on the literature review undertaken in the preceding chapter, plus the testing of the questionnaire is elucidated. Finally the research phases are discussed in detail.

Analysis of Research Approach

All research has a philosophical perspective. Neuman (1997) describes three approaches to social science research which can be classified as interpretivist, positivist, or critical. A positivist philosophical perspective is based on formal propositions, quantifiable variables, hypothesis testing and the drawing of inferences, reality is objectively given and described by measurable properties. A critical philosophical perspective is an action oriented approach that attempts to empower individuals to transform their situation for the better. An interpretive philosophical perspective is based on hermeneutics and phenomenology and infers that the access to reality is through shared meanings, language and consciousness. When implementing an interpretive philosophical perspective the research method needs to focus on utilising the complexity of human understanding of the process and context of the information system.

The philosophical perspective of this research is interpretive in that

- the dependent and independent variables are not pre-defined, and
- its aim is to produce an understanding of the process whereby the context influences and is influenced by the information system.
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Fergusson and Shaw's (1996) analysis of IS research literature found that the research can be classified as either interpretivist or positivist. They maintain that it is vital for researchers to describe the relevance of their research and in fact the ability of the researcher to make generalisations, to replicate and to refute their research findings are secondary to its relevance.

"If the IS discipline wishes to become more 'applied' then the focus will have to be more oriented toward building knowledge by problem solving."
(Fergusson and Shaw, 1996, p.226)

For research to be relevant, specification of the target audience and the aim of the research should accompany the problem solving focus. The research method implemented should be subject to the phenomenon and the environment being studied. The audience for this research is the practitioners rather than the theorists, the phenomenon is the effectiveness of investment in IT in education and the environment is the secondary school arena.

"A research method is a strategy of inquiry which moves from the underlying philosophical assumptions to research design and data collection." Department of Management Science and Information Systems, University of Auckland (1997)

The qualitative research approach is chosen because it uses text and data to understand and explain social phenomena. The quantitative research approach is not suitable, to the current research because the goal of understanding the social or institutional context is lost when such methods are implemented (Kaplan and Maxwell, 1994) The motivation to undertake qualitative instead of quantitative research is the unique ability of people to talk and explain their social or institutional context. The sources of data most suitable for qualitative research are interviews and questionnaires; however observations, field work, documents, texts, researcher's impressions and reactions can also be useful. The Case Study is the most common form of qualitative research. It could be argued that given the relatively low number
of participants a Case study approach would be adequate to obtain the information required. Whilst agreeing that a Case Study is suitable for gathering information, the reason for not using it is that in interpreting the results of the interviews the interviewer’s bias is more likely to be present. The Delphi Survey provides a method for structuring the group communication process that enables the group to deal with complex issues and problems. The strength of the Delphi Survey is the ability of the group to alter, add or delete any aspect identified by the researcher in the analysis of the interview data thus it ensures that any interviewer bias is minimised.

The modes of analysis for qualitative research refer to the approaches for gathering analysing and interpreting the data, some of these include semiotics, narrative and metaphor, grounded theory and hermeneutics. The interpretive perspective of the current research is based on hermeneutic analysis whose objective is to make sense of the whole, including people’s relationships, the organisation, and information technology. In implementing hermeneutics the researcher needs to be aware that the underlying biases of the researcher can affect the outcomes of the research. To attempt to ameliorate this bias the researcher has implemented two techniques. Firstly the interview questions are based on the literature research into IT effectiveness, IT investment, IT in Small Business, IT in Education, and the edicts on the use of IT in schools - Department of Education in Victoria. Secondly the use of the Delphi Survey approach is used after the initial interviews of the participants.

The research approach involves three components:

1. A literature research on which to base the interview questions
2. Interviews of the participants
3. A modified Delphi where the information obtained in the initial interviews is collated and fed back twice to the participants for ranking and rating.
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Validity of the Delphi Survey

"The Delphi Technique is a method of eliciting opinions or judgement which provides respondents with an opportunity to revise earlier views when presented with additional information." (Cary and Salmon, 1976)

The fundamental tools include:

- **The ability of the group to contribute to building the list.** This research implements the interview process for this purpose.

- **The application of specific voting capabilities.** The participants rating of the issues identified by the researcher, plus the ability to delete issues not deemed relevant and add issues considered important is the mechanism used.

- **The sorting of the list by voting results.** The analysis by the researcher of the results of the participants rating and the production of new lists enables this to occur.

The Delphi Survey is not only a method for structuring the communication process but allows the group as a whole to deal with complex problems. The group is usually of thirty to one hundred participants. It is commonly applied using a pen and paper communication, but is also conducted using Computer Mediated Communication Systems. In this research the group is limited to thirteen participants utilising a combination of the pen and paper approach, facsimile, and Computer Mediated Communication Systems, email. The participants chose which medium to use. Some were forced to use the facsimile because of software incompatibilities between the researcher and participant’s systems. It has been found that the major contribution to the quality of pen and paper Delphi is the analysis of the results of each round by the researcher.

The objectives of the resulting analysis should be to:

- provide a clear presentation of the views expressed thus improving the
understanding of participants,

- find and reveal biases, disagreements, ambiguities, omissions, information patterns, and sub-group positions,
- enable examination of complex situations,
- focus on critical items

Every effort has been made in this research to ensure that the above objectives have been adhered to in the analysis of the initial interviews and the resulting lists provided to the participants for ranking and rating.

A good Delphi allows each participant the opportunity to express personal judgement about what problem to deal with at any time in the group problem solving process. This *asynchronous interaction* between participants is the most important aspect of a Delphi. It enables the participants to:

- participate when they want to,
- contribute only to those aspects important to them,
- include something they believe is worthwhile,
- revise and add contributions over time.

In this research participants are given opportunities for asynchronous interaction. Firstly the participants only participated in the research if they wanted to. On more than one occasion a principal had given approval for the research to be conducted in the school and the proposed participant declined to be involved. The interview was arranged at a time convenient to the participant, more than once the participant changed the interview time as other more pressing issues had arisen. The subsequent ratings of the issues by the participant did not require the presence of the researcher and so was able to be done when the participant was so inclined.
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Secondly the interview questions were deliberately designed to be open ended. This enabled the participants to contribute only those aspects important to them, and include any details they felt worthwhile. Analyses of the interview response views were used to create the initial list containing a rating of issues (See Table 4: The Initial Key Issues) The second list of rated issues (See Table 5: Model #1 Results) was based on the collated responses to the initial list by the participants, and included extra issues provided by participants and indicated where participants had deleted issues and why. The final list of issues (See Table 7: The Final Key Issues) resulted from the analysis and collating of responses to the second list. Thus at all stages throughout the process the participants were given the opportunity to contribute only to those aspects important to them, and include something they believe is worthwhile.

Thirdly providing the participants with a facsimile or email list of issues, to be returned at a later date, facilitated the opportunity for participants to revise and add contributions over time.

"Perhaps the property that most characterises the Delphi method in the mind of most people is the use of anonymity." (Turoff and Hiltz, 1997)

A pen and paper Delphi provides anonymity because it removes the biases present in face-to-face situations. Thus the participants can contribute knowing that they can raise unsuitable and questionable ideas, and change their minds from their initial ideas, without their status influencing the responses from other participants, nor having the fear of identification. This research has ensured anonymity by having the participants rate, delete and amend issues, and return them to the researcher who collated the results and re-distributed them.

Turoff and Hiltz (1997) stress the importance of the participants of a Delphi believing that they are communicating with a peer group. They maintain the primary factor in motivating involvement is the participant’s belief that they will obtain valuable insights from other participants. Great care was taken by the researcher to identify the
secondary schools that are perceived by their peers as leaders in the area of IT. This information was conveyed to the participants so they were aware that their school is perceived as a leader in the area of IT. Interestingly, of the thirteen participants, only one questioned their inclusion in the research.

A primary requirement of the Delphi approach is the need to structure and organise material in a manner to make sense to the group. The most difficult aspect of a good Delphi is the need to define the whole communication structure into a framework so that it produces a group view and synchronises the group process. This was achieved by trialing the initial interview questions to ensure clarity, thus there was rarely any necessity for the interviewer to elaborate on any of the questions. The subsequent lists of issues distributed to participants were accompanied with clear explanations of what was required. One participant remarked as to how easy this process had been.

**Similar Research in a Comparable Domain**

**Use of the Delphi Survey in Identifying Key IS Issues**

The Delphi approach has proved useful in obtaining a group view from perceived experts in their fields. This has been used in the IT area to establish key information system management issues by Dickson et al (1984), Watson (1989), and Pervan (1993).

Dickson et al (1984) from the University of Minnesota’s Management of Information Systems Research Centre (MISRC) conducted a pen and paper Delphi survey with a leading group of IS professionals. The reason for using Delphi was that it enabled a greater level of consensus on the key IS management issues than would be obtained using a standard survey. Initially the participants were asked to identify and describe five to ten major issues. These were then collated into a combined list of issues and rationales. Participants reviewed the combined list on three subsequent occasions. At each stage the researchers established a new aggregate group ranking. Dickson et al (1984) found that this process provided a systematic way of sharing valuable, diverse
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perspectives. They stated of the Delphi survey that

"Its success here may point to other possible uses in information systems research." Dickson et al (1984, p.145)

The search for a consensus, or group view, on the key issues on investment effectiveness in education was the aim of this research, consequently the Delphi survey as indicated by Dickson et al (1984) was perceived as the most suitable research tool. Their approach for obtaining the initial list was replaced by open-ended questioning at the individual participant interviews. The reason for using an interview, and not simply asking for a list of key issues, was that IT investment in education is relatively new, unlike IS management, and there is not a collective understanding of the issues involved.

Watson (1989) used a three round Delphi study to identify the ten top critical information systems management issues facing IS managers in Australia. The purpose of his research was to indicate to IS managers the problems they are facing and to indicate where they should be directing their resources. He did not start with an open-ended questionnaire but instead used the issues resulting from a 1987 study conducted at the MISRC. His rationale for this decision was that the key concerns of managers in Australia would not be vastly different from those in the USA. He asked the respondents to rate all issues rather than rank the top ten issues. The rationale for this decision was that the information processing power of humans to identify and rank issues is limited if a list of issues is greater than seven. In the current study twenty-six issues were identified on analysis of the interviews, consequently it was decided to ask the participants to rate them rather than rank and select key issues.

Pervan (1993) utilised a three round Delphi approach to rank in order of importance the key IS management issues facing IS managers of large Australian companies. He used an identical approach to Watson (1989) in that the key issues were obtained from the MISRC's 1991 study. Pervan included an appendix with his research tool: the Key Information Systems Management Issues. The design of this tool was used as a
basis for the development of the tool used in this research (see Appendices 4 and 5). A list of key issues for ranking was distributed to participants in the two rounds of the Delphi approach.

The Interview

Doukidis et al (1992) used semi structured interviews lasting at least one hour using a questionnaire of forty seven questions with forty IS executives from leading Greek companies. The firms were chosen because they had maintained steady growth over for three years, had a good reputation, were leading firms in their sector, and their IS managers were highly respected. Doukidis et al (1992) found that the interview approach enabled them to produce a picture of the key issues of concern to these IS executives. This research has based its interview approach on the one conducted by Doukidis et al (1992). The schools were chosen in a similar manner, based on their perceived leading role in IT. The interviews were conducted over at least an hour, based on a questionnaire of thirty-six open-ended questions (see Appendix 1 – Interview Questions). The participant’s responses were invaluable in producing a picture of the key issues in investment effectiveness in IT in the education arena. To maintain context validity each school participant was interviewed by the same person using the same questionnaire.

Research Phases

The Interview Questionnaire

In attempting to identify whether intrinsic criteria exist and are used by IT management in the school sector for evaluating the effectiveness of IT investments, it was vital to ensure that the questionnaire elicited these criteria.

Thus the development of the questionnaire was perhaps the most difficult task of the whole research project. It was essential that the questions asked were open-ended and did not limit the responses of the participants. The sequence of the questions was carefully analysed to ensure that the preceding questions did not influence the
participants’ responses. The initial three questions were easy, unchallenging and closed ended, clearly relevant to the purpose of the study and aimed to build up the participant’s confidence that they would be able to answer the rest of the questions. Extensive research into IT effectiveness and IT investment in the business arena, IT effectiveness in small business, and IT in education, was used as a basis for identifying the key issues to be raised as questions and ensure content validity. The subsequent questions were designed to make allowance for the possible total lack of criteria in schools so that the participants could indicate the criteria they believed appropriate even if they were not currently being employed within their school.

“The wording of questions is perhaps the most difficult and important task in questionnaire construction. Improperly worded questions can only result in biased or otherwise meaningless responses. An essential prerequisite for developing properly worded questions is to have a clear conceptual idea of just what content is to be measured.” Judd et al (1991, Page 234-235)

In an attempt to eliminate as many problems as possible with the wording of the questionnaire it was tested for clarity and suitability on a very experienced secondary school teacher, and a manager of a Computing Services Department at a TAFE. After each of the trial interviews amendments were made. The questions were revised until the interviewer was convinced that the questions were being interpreted in the same manner by all interviewees, thus obtaining content validity. The second interview only indicated one ambiguity and it was therefore deemed unnecessary to undertake further trial interviews. The finalised interview questionnaire of thirty-six questions (See Appendix 1 – Interview Questions) was used, unaltered, on all participants. It encouraged free flowing discussion of the issues relating to investment effectiveness in IT in education. The participants were generous in the time they allowed for the interview with many exceeding one-hour. Many commented favourably on the structure and content of the questions.
Interview Questions Sources

The questionnaire was in four sections, the first already mentioned above, and the other three sections to obtain relevant information. At the end of every section there was a question to ensure that nothing had been omitted, (See Appendix 1 – Interview Questions). The content questions were aimed to elicit the impact the philosophy of the school had on IT, gain an understanding of IT investment within the school, and to establish the effectiveness of IT. The questions are based on the findings of previous researchers detailed in Chapter 2, the Literature Review.

Sources are referenced below:


- Question 5 – school’s goals for the utilisation of IT, Education Victoria, Goals for Classrooms of the Future (1996)


- Question 7 – way teachers are using IT, Rodrigues (1997).


- Question 12 – adequacy of schools’ IT resources, Blackmore et al (1996)

- Question 13 – attempts to subvert IT strategy, O’Mahony and Dampney (1996)

- Question 15 and 16 – proportion of school budget spent on IT, and adequacy of this investment, Mahmood and Mann (1993), Cronk and Fitzgerald (1996)

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- Questions 18 and 19 – objectives of investment and priority of those investments, Weill and Broadbent (1994)


- Question 34 – internal and external influences on IT effectiveness, Grover et al (1996)

The process of developing the questionnaire was undertaken concurrently with the canvassing for the “experts”. A problem existed because there are currently no clearly established experts in IT in Victorian schools. An initial task was to obtain the names of secondary schools who have a reputation for excellence in IT / IS. The following sources were used to obtain names of suitable “expert” schools to participate in the project: the General Manager of Information Technology Division...
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Education Victoria, Department of Education, the Information Services Unit of the Catholic Education Office, the Independent Schools Union, the Federal Union of Teachers, suppliers of Learning Technologies products and services, and of other IT products in the Education sphere, university lecturers, TAFE teachers and Computing staff, SOFWeb and SOFNet, teachers in State and private schools. The names were ranked according to the frequency of recommendation.

It was hoped that ten participants would participate in this research. Anticipating considerable attrition, the first sixteen schools on the list were approached. Prior to this, approval had to be obtained from Education Victoria, Department of Education (DoE) and the Catholic Education Office to undertake research in their schools. The Learning Technologies section of the DoE requested that their Navigator and Science and Technologies Centres be involved (six in all).

Letters were sent to the principals of the schools requesting approval for the project to be conducted in that school and for access to the member of staff who was the designated "Head of IT" within the school (See Appendix II – Letter of request to School Principals). It was recognised that "selling" the project and obtaining agreement from the schools to participate in the whole Delphi process may be a difficult task. More emphasis was therefore placed on the fact that all participating schools would receive a copy of the resulting model for assessing IT effectiveness in investment thus providing them with valuable information for decision making on investment in IT.

The letter was followed by a telephone call to the principal to ensure that the letter had been received and to obtain verbal approval or rejection of the proposal to participate. Several had not received the letter and so facsimiles of the letters were sent to them. Fifteen principals agreed to participate and gave permission for the researcher to approach the staff person involved. Thirteen of these participants were interviewed and involved in the two round Delphi. There were five State schools, two Catholic schools and six private schools represented.
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The Interviews

The participants were contacted by phone to establish a time suitable both to them and to the researcher, at this stage it was stressed that the interview would take at least one hour. Interviews were conducted in Northern Victoria, Geelong and in Melbourne from the inner city to the outer suburbs. Considerable time and travel was involved. It was hoped that the interviews would be conducted over a one-week period as the researcher had taken a week off work to do these. However it took nearly three weeks.

Before starting the interview the participants were asked to read and complete the Participant Agreement Form (see Appendix III – Participant Agreement Form). They were asked to agree to the interview and the two rounds of the Delphi. All participants agreed to the use of a tape recorder and for the researcher to make notes. Both the notes and especially the tapes proved invaluable in the analysis of the interviews.

The participants were furnished with a copy of the questionnaire. This proved very useful as it allowed the participant to refer to the questions as they were answering them and consequently concentrate more effectively on their answers. The initial questions related to the role of the participant. These were deliberately designed to be non-threatening and give the participants time to relax. Interestingly there was a wide variety of roles, the majority had a dual role as Head of Learning Technologies or Curriculum with a small teaching component, the next most common was Director of Computing, finally there was one Business Manager and one principal. Three clearly defined separate sections prefixed by a brief explanation formed the rest of the questionnaire (see Appendix 1- Interview Questions). These were:

- Questions about the relationship of the IT goals and objectives to the school’s goals and objectives.

- Questions about investment in IT.

- Questions about IT effectiveness.
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There was only one question, number twenty-one, which raised any problems. The researcher identified this with the initial participants and prepared a brief explanation, which was verbally given to all further participants thus ensuring that it was interpreted in the same way by all involved.

There were plenty of opportunities for the participants to expand on issues. At the end of every section they were asked if there were anything they would like to add regarding the aspect under discussion. This was rarely used and a frequent comment was “I think I have covered everything”. The participants were very generous with the time they allocated to the interview and were obviously interested to receive a copy of the final ratings.

Round 1

An in depth three stage analysis of the results from the interviews was used to develop the initial key issues, twenty-four in all (See Appendix IV – Model #1). These issues were ranked in order of the frequency of the occurrence in the interview process. These key issues were then emailed or faxed to the participants. They were asked to rate each of them on a ten point scale with ten the highest and one the lowest, to delete any criteria which they considered not relevant, and to add any omissions. The reasons for inclusion of extra criteria or deletion of irrelevant ones was requested. Thus construct validity was ensured. They were asked to return them to the researcher as soon as possible. It was found that the response rate was slow and many emails and phone calls had to be made to get the initial key issues back.

Round 2

The data from the participant feedback to the initial key issues was collated and re-ranked according to the ratings given by the group. When new criteria were added the rationale given by the respondent for the inclusion was included. Any requests for alterations and deletions also were clearly identified with their participant’s rationales. Columns were inserted to this list to indicate the group’s mean value for the criterion, and the value given by the individual participant, (See Appendix V – Model #2). This
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re-ranked list with all the amendments was then forwarded to the participants for re-rating, deleting, and adding. This process was only repeated twice as time did not allow a true consensus to be achieved.

The Key Issues

On completion of the second round the results (See Appendix VI – Model #2 Feedback) were analysed and a set of ten key issues was elicited from this feedback as representing the group view of IT investment effectiveness in education.

The Final Model

Finally the full research findings were analysed in the context of the current literature and a Model of IT Investment Effectiveness in Education was derived. This was included in a report which was then sent to all participants and to the principals of all participating schools. Initial responses to approaches made for finding suitable participants had indicated that the results of this research were eagerly awaited by the schools.

It is anticipated that this model, and the research findings from the interviews will be suitable for further research into investment effectiveness in IT. Recommendations are included in the final chapter of this thesis.

Conclusion

There is currently no established model of assessing investment effectiveness in IT in the education arena. It was therefore decided that a consensus model was the best way to approach this problem using schools designated by their peers as being “expert”. Even though the research group was small it was decided to use the Delphi Model. Because of the anticipated difficulty of getting the “experts” together at the one time it was decided to use the Pen and Paper Delphi methodology, used via facsimile and email. It is to be hoped that in future research such as this will be able to be conducted using the Internet chat facility / discussion arena as it is an ideal
medium for experts communicating with each other on a topic.

The use of a set of open-ended interview questions was a necessary pre-requisite to the consensus process as currently there is no agreed criteria available in either the education sector or in the business arena addressing explicitly the effectiveness of investment in IT. This use of open-ended questions was considered most likely to obtain ideas that the researcher has not even considered important but could well be highly valued by the majority of participants.

The following chapter discusses the research results obtained by implementing the research methodology discussed in this chapter.
Chapter 4 - Research Results

Introduction

The previous chapter validated the research approach indicating research that had been undertaken in a similar domain. It also described the phases of the research including the interviews, the modified Delphi Survey, and the methodology used to identify the key issues. This chapter reports the findings of the interviews and the subsequent Delphi Survey. A set of ten key issues is elicited from this process. The interviews and subsequent Delphi Survey were conducted with thirteen participants from the secondary school arena in metropolitan and country Victoria. These consisted of six private schools, four State schools, one State Science and Technology Centre, and two Catholic schools. The schools were selected because they are perceived leaders in the area of IT in the secondary arena. Given the size of the sample the results may be seen as indicative of the leading schools but not necessarily representative of the total population. Education authorities would see such schools as models for the larger population, as most of these schools are used in pilot projects by government and private organisations, the findings can therefore be seen as significant.

Interview Results

The analysis of the data from thirteen plus hours of interviews and associated notes was daunting. It was decided to collate the data in table format for each question or group of questions indicating the participant’s number and their private, State or Catholic status. The tapes for all participants were listened to for each group of questions; this was done to ensure that no important information had been missed in the interview notes taken. All participants had readily agreed to the use of the tape recorder. This enabled the researcher to go onto the next question as soon as the participant had finished speaking, and listen for additional data later. The discussion below indicates the information distilled from the interviews. Each question or set of related questions is written in bold followed by the findings.
Chapter 4 - Research Results

The Initial Questions

The initial questions aimed to set the participant at ease in the interview process provided some interesting results, focussing on who is in charge of IT, what is their official role and what percentage of their time is spent on IT.

1. Who is in charge of IT in this school?

2. What is their official role in the school?

Most participants were in charge of IT within the school and had a dual role as head of Learning Technologies\(^1\) (LT) with a teaching component. The roles ranged from Business Manager to Principal, most participants headed the LT Committee. This committee provided guidance to the school in making decisions on what areas in the curriculum IT was to be used.

3. What percentage of their time is spent in this role?

In the private schools the time schools allocated to participants for IT was 95-100% except for the two new starters who spent 30%. One of the schools had established itself as a business with both staff and students working for industry clients. State schools time allowance is 20-33% with the exception of the science and technology centre and one school which has set itself up as the local ISP (Internet Service Provider) for the area, both of these are 100%. The Catholic schools time is 10-50%. The maturity of IT program influences the time allocation as is indicated by the two new private players, and one of the Catholic schools which has increased by 20% this year.

\(^1\) It was found that the schools in this survey used the term Learning Technologies rather than Information Technology (IT).
Chapter 4 - Research Results

IT’s Relationship to the School’s Philosophy

4. My understanding is that the mission statement / philosophy of the school has the following goals / objectives....(These were obtained from the school prior to the interview so that they could be stated to the participant at the time of the interview.)

Describe how these goals / objectives relate to the goals / objectives of IT in the school?

4.1. If there is a relationship:
   Is this a formal / informal process?
   How is it arrived at?

4.2. If there is no relationship:
   How were your IT goals arrived at?
   What are they?

Every school has some sort of mission statement / charter which specifies the goals of the school. Nine schools, State (5), private (3) and Catholic (1), have a formal process in place which relates the objectives of IT to the school’s goals. The Learning Technologies (LT) Committee usually undertakes this, however in two cases the Head of LT solely developed these. In both cases this person expressed concern at having one view and felt that it is far better to have a committee. In all of the State schools a three-year LT Plan is in place, as required by the DoE Classrooms of the Future Project. In one State school the School’s Charter has been derived from the goals of the LT Plan. In one private and one Catholic school the IT goals actually form an integral part of the school’s goals. In four schools, private (3) and Catholic (1), this process is informal, in the Catholic school there are no specified goals for IT.

5. Rank the following goals in order of how they best reflect your school’s utilisation of IT?

5.1. To improve learning

5.2. To facilitate collaborative learning

5.3. To enhance educational opportunities
Chapter 4 - Research Results

5.4. To develop an IT&T conversant workforce

5.5. To increase parent participation

Participants rate the school’s utilisation of IT in the following ways:

- *To improve learning* – is clearly the top priority, rated as 1 by all but two of the participants who rate it 2.

- *To enhance educational opportunities* – a close second with six rating it 1, four 2, and two 3.

- *To facilitate collaborative learning* – is rated by the majority of participants as 2 (five) or 3 (four), the other two participants rated it 1 and 4.

- *To develop an IT & T conversant workforce* – comes in lower with most ratings either 4 (six) or 3 (three), and two rated 2 and one rated 5.

- *To increase parent participation* – is viewed as not applicable by five participants or as a by-product with a rating of 5 by four, the other three participants rated it 2, 3, and 4 respectively.

6. Describe your school’s use of IT. The following terms may be helpful:

6.1. For gaining Information

6.2. For automating processes

6.3. As a tool

6.4. As an intellectual partner (a mind tool for students to articulate, represent, reflect, support thinking / knowledge)

6.5. As context (representing problems, situations, beliefs, perspectives, arguments, supporting discourse)

- All schools are using IT as a tool in research, learning, communication, for motivation, and to do mundane tasks. Participants stress that this is not as a tool to be learned but rather as part of the learning process.

- Eleven schools are using IT as an intellectual partner. Most are moving into this area and this is what they are aiming for.

- Ten schools maintain that they are currently at the point where the IT is
predominantly used for gaining information.

- Eight schools are slowly moving towards using IT as context.
- The use of IT for automating processes is seen by five schools as a means of improving the efficiency of the administration. Four schools refer to this in the areas of Mathematics and the Digital Resource Centre (Library).
- There are numerable other ways schools are using IT however there is no consistent pattern to these. Two participants referred to each of the following -
  extending students, as an aid to education, and offering opportunities previously not available.

7. Which of the following describe the way teachers are using IT? Give examples.

7.1. Including themselves in the learning process

7.2. Integrating IT into their classroom activities

7.3. Using IT as a tool to be learned

7.4. Avoiding using IT

- All thirteen participants state that teachers are integrating IT into their classrooms. This is perceived as the strongest focus for 90% of private school teachers, 2/3 of State school teachers, and as the central focus in Catholic schools.
- Slightly less, eleven, say that teachers are integrating themselves in the learning process. There has been an increase in this over the last two to three years in response to student momentum with about 1/3 to ¼ of the teachers at this point. This is the aim of the collaborative learning approach.
- A minor emphasis is placed on using of IT as a tool to be learned, with some teachers doing the exact opposite and completely integrating IT into the curriculum. Teachers who are using it as a tool to be learned generally are doing this when it is needed. In fact one private school has removed IT as a subject from curriculum in an attempt to avoid IT's use in this way.
- All participants, except one, have some teachers still avoiding using IT. The one school with no teachers unwilling to use IT stated that these teachers had left the school over the last three years, a figure of 70% was quoted by another source, as the turnover in this school.
Other uses by teachers of IT include forming partnerships between teachers and students, publishing in *html* and coaching other teachers by acting as pseudo-experts. In the state schools the use of IT is compulsory and at the end of each year teachers have put forward a Personal Development / Appraisal to identify something that they propose to do with IT in the coming year. Student reports are computerised, and each learning area has to trial an area of technology and report back on its use.

8. **What educational and technical IT support is available to staff (teaching and administration)?**

Private school teachers are provided with by far the best support. Most had a systems manager with sizeable, ten to fifteen, technical support staff, and external technical help from strategic partners. These schools ranged in size from 800 to 3,500 students, all with laptops, some schools had more than one campus. Sizeable Personal Development (PD) budgets were available for teachers and all were provided with a laptop. One school, which previously had staff making a contribution towards the cost of the laptop, noticed a significant improvement in the effectiveness of the IT program after it commenced providing these free of charge.

All State schools have one full time technician, one had more. These schools range in size from 700 to 1,650 students, with 200 to 400 student PCs and laptops. Only one school has a separate Systems manager, and provides teachers with laptops, this school is sending twenty of its staff overseas at the end of 1998 for two to three week exchanges with other schools as part of their PD. Most schools have sent their Principal, vice Principal and head of learning technology overseas on fact-finding tours. The DoE states that teachers must do PD but this has to come out of the school's global budget, it provides a one to four subsidy for IT investments in hardware and software. It is providing low cost laptops for teachers to purchase.

Both Catholic schools had a Network / IT Manager and one full time technician, one school was about to employ a Help Desk person. These schools ranged in student size
from 1,150 to 1,500, with approximately 200 student PCs or laptops.

These schools run after hours voluntary PD for staff.

9. **What in-house knowledge is available in the school? Does this create / solve problems?**

   All schools found in-house expertise solves more problems than it creates. Getting staff to show how they use IT and Buddy Systems are proving extremely effective in encouraging hesitant staff to take up IT more readily. However there are three areas where in-house knowledge creates problems. Firstly from powerful stakeholders who are negative to newcomers using IT and use their influence to prevent IT budgets etc, secondly from IT people who are loathe to either share their knowledge with other staff or use it in the classroom, and thirdly from teachers’ unwillingness to be taught by administrative people, they want to be taught by other teachers.

10. **Describe the involvement of the following in IT in the school:**

    10.1. The Principal of the school
    10.2. The school’s council
    10.3. The teaching staff
    10.4. The students
    10.5. The administrative staff
    10.6. Vendors / suppliers
    10.7. Consultants
    10.8. Others

    - All participants perceive the *Principal* as critical to the success of effectiveness of investments in IT. Principals achieve this by ensuring adequate budgets and budget approval by the School Council. Also staff look to the way IT is promoted in the school and respond positively to the Principal’s lead. Interestingly it is deemed not important for the Principal to be the most active user, rather that the Principal is a *Visionary* who understands the importance of IT to the students and to the school’s marketing strategy. The Principal is a “key player” arranging
money, budgets and providing infrastructure, promoting and supporting IT. Two schools, whose Principals are not actively involved, indicated that this is disadvantaging their IT programs.

- In all schools the School Council’s role is one of approving budgets, making decisions on policy and plans, they are generally supportive of the IT program in the schools. One participant indicated that the school council initially questioned every request for IT funding and so the participant had to educate the school council to understand the value of IT to education.

- All participants state that the teachers are crucial to the success of an IT program and are good indicators of its success. They are in control of how far the opportunities for IT are taken.

- Across the spectrum private, State and Catholic schools cited IT as having the biggest impact on the students. IT is changing the teaching and learning styles by liberating the dependence of students on teachers, allowing the students to get to higher levels of analysis as routine tasks can now be done by IT, and providing opportunities previously not available, thus empowering the students. In many cases the students are driving the IT into new areas of the curriculum. Collaborative learning projects are common. In one school students are involved in developing Web sites and offering programming expertise as business ventures for the school. The Students in all private schools have laptops.

- Administration Staff are all heavy users of IT and have been using it for many years. Most are using email, in one school all paper-based communication has been removed and information is posted for all staff, administration and teachers to access. In another school administration staff are no longer typing letters etc and are involved in more high-end activities, in fact one of the administration staff is the Web Master for the school maintaining contact with parents and staff via the Web.

- Vendors and Suppliers - All private schools have strategic partnerships with vendors of their notebooks, plus some have strategic partnerships for networking and with software houses. Besides maintaining the notebooks, the strategic partners fund Pilot schemes and make recommendations for investments. One school has a strategic partnership for the development of new technology, touch screens. Several have changed strategic partners because they were not satisfied
Chapter 4 - Research Results

with what they were gaining from the relationship. The consensus is that strategic partnerships are crucial to their ability to operate effectively, and any school trying to operate without them will fail. All but one of the State schools have “low level” strategic relationships with the suppliers of their PCs and laptops. One has strategic partnerships for networking and with software houses. One state school has none and maintains that vendors and suppliers are the greatest creator of problems. Neither of the Catholic schools have strategic relationships, both tender for price as it is more cost effective and allows impartiality.

- **Consultants** are not extensively used. They are employed in all schools to assist in making decisions for major investments, such as networks, and as keynote speakers for Personal Development (PD) of staff. One of the Catholic schools utilised expertise from within the parent body when consultant skill was required, this proved extremely successful. In the last twelve months the DoE has provided useful information and assistance to both State and Catholic schools, prior to this it was perceived as ineffective. The private schools have made extensive use of the University of Melbourne Research Centre in assessing the effectiveness of their laptops programs. Monash University has also provided significant support. One school has set itself up as a consulting firm working in Australia and Indonesia employing teachers and students as consultants.

- **Others:**
The Library has a significant involvement in IT as most Libraries are changing to Digital Resource Centres with online catalogues, databases and the Internet access. In two schools the Library was the major impetus for introducing IT within the school.

Other schools, locally, interstate and overseas have significant involvement in IT. There is a wide school network of people who assist each other in their IT programs. In the last two years private schools have developed a network of IT (Learning Technologies) people who meet regularly to discuss issues and share information. The perception is that schools must do this to be able to keep abreast of the constant, ever changing demands of IT, no school is capable of “standing alone”.

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11. Rate the level of satisfaction with IT amongst the following:


11.1. Principals

11.2. Parents

11.3. Teachers

11.4. Students

11.5. Other

The table below (see Table 1: Level of Satisfaction with IT) indicates that Principals are mostly extremely satisfied with IT, followed closely by the teachers and the administration staff, who are quite satisfied, as are students and parents.

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<thead>
<tr>
<th>Rating</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td></td>
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<tr>
<td>Parents</td>
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<td></td>
<td>5</td>
<td>4</td>
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<td></td>
<td>S-2.C-1</td>
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</tr>
</tbody>
</table>

Legend:  P = Private  C = Catholic  S = State

Table 1: Level of Satisfaction with IT

There are a variety of reasons given for the level of satisfaction. In one school the reason given for students being most satisfied was that in the lower socio-economic area there was no vandalism to IT equipment even though the labs were not locked during the day. Several mention that parents are very impressed, one school had

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conducted a survey and found that parents were most satisfied. The administration staff in one school is asking to have the software upgraded, hence a rating of only satisfied.

12. Do you think that the IT resources in the school are adequate or inadequate? Give reasons.

Most schools IT resources are adequate. All recognise that there is much more to be done in IT and more resources are needed for this. The private and Catholic schools vary from adequate to very good. The State schools extend from on the way to being adequate to adequate, hardware and software are adequate but support personnel is borderline to inadequate.

13. Can you describe any attempts to subvert IT strategy? How? Where does this usually come from?

Attempts to subvert IT strategy are not significant and not considered an issue. The areas mentioned as minimal attempts to subvert IT strategy include older teachers who do not want IT, are refusing to use it and are actively discouraging younger teachers and students from using it; parents and staffroom gossip and rumour; students putting viruses on the network deliberately; and IT specialists subverting the direction wider learning is going as they disagree with it.

14. Are there any additional comments you would like to make with regard to the IT programme in your school?

The additional comments are wide and varied, however there is a general agreement that there is a need to integrate IT across all areas of the curriculum with an educational focus rather than a hardware one. IT provides many opportunities for teachers and most schools are in the fortuitous position of having teachers who are seizing these opportunities and developing them within their curriculum areas.
IT Investment

The school’s annual budget is approximately......................

(This information where available was obtained prior to the interview.)

Only one private school was able to divulge the school’s annual budget, this was $8 to $10 million. The Catholic schools’ annual budgets are between $7½ and $8 million. The State schools range between $2½ and $6½ million.

15. What proportion of this budget is spent on IT?

The percentage of the budget spent on IT ranged from 5-25% (private), 3-8% (State) and 4-5% (Catholic).

16. Is this investment adequate? Why / why not?

The private and Catholic schools stated that their budgets are adequate to more than adequate, the school allocated 25% stated that “relative to industry it is high”.

The State schools, with the exception of the ISP school, do not think that their budgets are adequate, maintaining that their programs run on the good will of staff. All the State schools interviewed were navigator schools which had been given a one off $1.2million grant to set up their IT infrastructure. They are concerned at the lack of technical support and are worried about teachers losing interest in the program because of this lack of support. They are constantly applying for grants and supplementary funds from external sources to maintain their IT programs. One school is re-engineering the way it is set up, using fewer assistant Principals and maximising the class sizes at the beginning of the year, thus reducing the number of teachers employed. The savings are then redirected to IT.

The participants maintain that an adequate budget is vital because it dictates how much can be done and when it is done, programs will not go forward without it. Also participants stress that it is essential to the effective planning of IT to have a clearly defined budget amount, preferably stated as a percentage of the school’s annual budget. IT is unlike other areas in education where change tends to be slow and there is always something new happening consequently there can never be enough money.
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17. Give examples to indicate on what your school’s IT investment is based, eg cost effectiveness, academic performance of students, competitive advantage over other schools, to keep up with other schools, etc

- *Academic Performance* - is the basis in 5 private and 2 State schools.
- *Competitive Advantage over other schools* - private 4, State 2.
- *Cost Effectiveness* - private 2, State 3.
- *Keep up with other schools* - private 2.

Two private schools use all of the above.

- *Other:*
  - Both of the Catholic schools maintain that none of the above are relevant and their investment is based on *quality outcomes for the students*.
  - *Future Planning* is the basis for two private schools.
  - Two State schools refer to student factors such as *motivating unmotivated students, enabling students to change their roles*.

18. In business organisations invest to achieve four objectives:

18.1. To place it in a Strategic position in the marketplace

18.2. To obtain Information

18.3. To undertake day to day Transactions

18.4. To provide Infrastructure support (networks etc)

Which of these objectives are relevant to investments in your school? Why / why not?

The objectives of investment are rated almost equally with most participants including all of the above objectives as relevant.

- *To place it in a strategic position in the marketplace* (private 5, State 4, Catholic 2) and *provide infrastructure support* (private 5, State 4, Catholic 2) 11 participants mention both. The former is the core objective of most private schools, and the latter is important to all participating schools.
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• Next mentioned by 10 participants are obtaining information (private 4, State 4, Catholic 2) and undertaking of day to day transactions (private 5, State 4, Catholic 1). In State schools the former relates to the demands made by the DoE. and the latter is perceived by all as relating to administration requirements.

19. Rank the following in order of priority for investments in your school? Give an example of each.

19.1. Utilitarian (for cost savings)

19.2. Enabling (to meet long term requirements)

19.3. Dependent (to meet the school’s objectives / goals)

19.4. Other

The following table (see Table 2: Priority of Investments) indicates the ranking of the priority of investments. Dependent, to meet the school’s objective / goals is considered most important by schools. Enabling is the next most important, and cost savings is considered least important to not applicable.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>N / A</th>
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<tbody>
<tr>
<td>Dependent</td>
<td>P-4, S-3, C-2</td>
<td>P-2, S-1</td>
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<tr>
<td>Enabling</td>
<td>P-3, S-1</td>
<td>P-3, S-2, C-1</td>
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<td>2</td>
<td>S-1, C-1</td>
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<tr>
<td>Cost Savings</td>
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<td>P-2, S-2, C-1</td>
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<tr>
<td>Other</td>
<td>More Timely</td>
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<tr>
<td></td>
<td>Information - C</td>
<td></td>
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</tr>
</tbody>
</table>

Legend:  P = Private  C = Catholic  S = State

Table 2: Priority of Investments

20. Rate how relevant the following are to IT investments in your school?


20.1. Create new value

20.2. Make it easier to do business (administration and education)
20.3. Make the school appear bigger

20.4. Differentiate the school from others?

20.5. Recognise and measurably support the goals / objectives of the school

Give reasons.

The table below (see Table 3: Relevance to IT Investments) indicates that most schools rate the goals of the school as most relevant to investing in IT. The creation of new value and make it easier to do business although relevant are of less importance. Private schools rate more highly to differentiate the school from others but it is not as relevant to State and Catholic schools. To make the school appear bigger is of little relevance in the school arena.

<table>
<thead>
<tr>
<th>Rating</th>
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<th>4</th>
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<td>Support Schools Goals</td>
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<td>P-5, S-3, C-1</td>
<td>P-1, S-1</td>
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<td>Create New Value</td>
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<td>4</td>
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<td>P-2, S-2</td>
<td>P-3, S-1</td>
<td>S-1, C-1</td>
<td>P-1</td>
<td>C-1</td>
<td></td>
</tr>
<tr>
<td>Easier to do Business</td>
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<td>2</td>
<td>5</td>
<td>1</td>
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<td></td>
<td>P-2, S-1, C-1</td>
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<td>S-2, C-1</td>
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<tr>
<td>Differentiate from Others</td>
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<td>2</td>
<td>6</td>
<td>3</td>
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<td></td>
<td>P-1</td>
<td>P-2</td>
<td>P-3, S-2, C1</td>
<td>S-2, C-1</td>
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<tr>
<td>Make Appear Bigger</td>
<td>1</td>
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<td></td>
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<td>S-3, C-2</td>
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</tbody>
</table>

Legend :  P = Private  C = Catholic  S = State

Table 3: Relevance to IT Investments

21. What proportion (in percentage terms) of the IT investments made in the school could be described as

- *infrastructure* (setting up networks, buying software / hardware)

- *using the infrastructure* for educational / administration purposes?

The proportion of IT investments schools make on infrastructure are significantly higher than non-infrastructure. They range from 20% to 100% of total IT budget. in the 100% school the educational and staffing budgets are separate. The non-
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infrastructure range from 10% to 80%. Investments on infrastructure are significantly higher, 60% on average, than non-infrastructure investments, 40%.

22. Has this changed over the years? How?
Investment has changed over the years. Previously infrastructure investments were less, approximately 50%, as schools tended not to be networked. Now there is far more networking necessary with access to the Internet and the library as a digitised resource centre. Also infrastructure costs in the acquisition stage can be as high as 100%, the average is 80%.

23. How are decisions made on investing in IT?
All but two of the schools have some sort of Learning Technologies (LT) Committee making decisions on investments in IT. The two exceptions where single players are making investment decisions are concerned that their decisions may not be the best for the school and stressed the need for a balance of viewpoints. Participants stress that this committee needs to be small, include powerful stakeholders, teacher representatives, and have both the Head of LT and the Systems Manager as members. One school had the situation where the Systems Manager, who was not on the LT committee and had not worked in schools before, introduced a new version of software in the middle of the school year. This rendered much of the teaching materials no longer useable and created great inconvenience to both teachers and students. Several of the schools have a formal process of submission in the final term of the year for investment requests.

24. How can the current process on making decisions on investments be improved? Give reasons.
The participants maintain that the current process of investment decision making is working well and only a few suggestions are given for improvement. These are that the LT members need to be IT conversant / educated, the key stakeholders in the school must be on the LT committee, and the influence of politics on decisions must be overcome.
25. How long are you given to make decisions on IT investments? Comment on the adequacy of the time given?

Most schools are given adequate time for making decisions on investment. It is common for the LT committee to be setting the pace for decisions on investment and taking as long as is needed to make the correct solution. There were two glaring exceptions to this, one where the participant was given three weeks to create a five year IT plan, and the other where the participant was given one week to make a decision about the network to be installed. The DoE provides State schools with subsidies of $1 for every $3 raised by the school. However the schools do not know when this funding is to become available from the DoE and thus decision making on investments becomes “tricky” with schools frequently having to respond rather than plan ahead.

26. What role do the following have in investments in IT? Give examples:

26.1. The Principal of the school
26.2. The school’s council
26.3. The teaching staff
26.4. The students
26.5. The administrative staff
26.6. Others

Most of the participants covered this question when answering question 10. A summary of the responses relating to the role of the following in investments in IT is given below.

- **Principal** - The maker of final decisions on investment with a fundamental role in investments. The one principal who is not at all involved in the decision making on IT is nervous about how much is spent on IT.

- **School Council** - In the private and Catholic schools the school council has a more active role in what IT investments are made, eg to introduce laptops. However the role is generally one of determining the percentage of the budget to be allocated to IT and then approving it. In the State schools they are less involved in the
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decisions on IT investments, rather approving the funding allocation. Participants state that once the Council has confidence in the IT program, it does not challenge the expenditure and is very supportive of it.

- **Teachers** - are crucial to decisions on IT investments as most decisions arise out of curriculum based needs. It does not matter how much is spent on IT; if the teachers do not see its educational value they will not use it.

- **Students** - are not involved in IT investments other than by making suggestions to LT Committee which are frequently acted upon. In private schools they have to purchase a laptop. Two private schools are now making this purchase part of the fees because parents are unwilling to purchase the appropriate hardware or software. Students are therefore indirectly affecting the schools' IT investment strategy.

- **Administration Staff** - with one exception the administration staff's role is somewhat similar to students, that of individuals making suggestions for investment. The exception is where the school has set up a fortnightly Administration Committee Meeting and suggestions are formally coming from this.

- **Others: The Library** - Libraries are now set up as digital resource centres with their own budgets. Frequently their decisions have significant influence on IT planning and in two of the schools interviewed the library was the impetus for the IT program's growth.

27. Are there any additional comments you would like to make with regard to the IT investment in your school?

None of the participants offered additional comments regarding IT investment in their schools.
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IT Effectiveness

IT Effectiveness can be defined as "The change in the effectiveness of an organisation that occurs as the result of IT being introduced and used."

Effectiveness is "doing the right things", those things that reflect the business expectations and recognise the organisational goals which need to be achieved. Effectiveness is doing the things that need to be done to achieve important business results.

(The above information was provided to ensure that all participants were interpreting IT Effectiveness in the same context as the researcher.)

28. From each of the following indicate whether they are determinants of IT effectiveness in your school? Explain why. Indicate whether they are formally measured?

28.1. Budget

28.2. Value

28.3. Staff

28.4. Training

28.5. Number of PCs / terminals

28.6. Others

The determinants of IT effectiveness are not formally measured.

• The budget and the staff are determinants of IT effectiveness to all thirteen participants. The reasons for the budget as a determinant are that the budget indicates the school’s commitment to IT. IT cannot go forward without it, if you do not resource it well it will not happen, and it dictates how much can be done and when.

• The teaching staff, are the key as is does not matter how much is spent without staff commitment and passion nothing will happen. Teachers are the ones who have to deliver and thus determine how, when, and what is offered. The administration staff are not so important as they deliver efficiency gains rather than effectiveness, one school had relatively old IT available for use by the
administration staff but has 'state of the art' for teachers and students.

- *Training* is a determinant for twelve of the participants, without trained staff you cannot maximise effectiveness. Participants stress that this refers to Personal Development rather than just training, as you have to change the mindset of teachers rather than the skills. eg IT teachers are not the most effective users of IT, frequently not sharing their expertise with other teachers and students, and not seeing its potential in their classroom activities. Teachers do not respond well to being taught by administration staff, this is far better coming from other teachers.

- *Value* is cited by ten participants, however this is not as important a determinant, just part of it. The value is in the change to the teaching learning environment, and relates to the way that teachers adopt it. If teachers view it as not having value they will only give it lip service.

- *Number of PCs* is referred to by nine participants. There is a threshold that has to be reached, until this is achieved it is crucial and then it is relatively unimportant. Providing laptops to staff is a key to IT effectiveness, one school found that providing laptops free to staff significantly improved the IT program in the school.

- *Other:*
  
  *Technical Support* - was volunteered by six participants. Reliability is enormously important as a determinant because if the network is down nothing happens, without strong technical support teachers do not use IT.
  
  *Strong Leadership* - was raised by four participants as crucial to the effectiveness of IT.

29. How do the following indicate the effectiveness IT in the school? Give examples: Have you ever tried to measure this effectiveness? How?

29.1. The Principal of the school

29.2. The school’s council

29.3. The teaching staff

29.4. The students
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29.5. The administrative staff

29.6. Others

Five schools have attempted to measure the indicators of effectiveness by conducting internal and external audits. In the State schools these include staff surveys of IT capabilities and usage within their teaching.

- All thirteen participants refer to teachers as the key indicators of IT effectiveness. This is indicated by the number of teachers doing and seeking to do new and different things, their preparedness to use IT and to change their teaching practices. They are the best indicators of IT effectiveness because they know what is going on and how things are done.

- Twelve participants perceive students as indicators of IT effectiveness. This is visible in the numbers of students using IT and the ways they are using it. The students are empowered, enhancing their skills, confidence and learning ability. The following are indicators used by individual schools: the lack of vandalism on IT equipment, a competency matrix of the students’ IT skill level, and improvement in VCE results which is attributed to the school’s IT program.

- Principals are next with nine. The indicators are the way IT is promoted, the informal expressions of satisfaction with IT, and visits overseas on IT information gathering exercises.

- The School Council and Administration Staff are both on seven. Indicators are the willingness of the School Council to continue to fund projects, and to take the recommendations of the LT Committee. The Administration Staff are extremely effective users rapidly disseminating new skills with each other,

- Other indicators of IT effectiveness include DoE awards, parents indicating satisfaction, participants speaking at seminars, schools piloting new products for vendors / suppliers, and other schools approaching the school for advice.

30. Describe how important external support is to the effective use of IT in the school?

This is covered in the section on Involvement in IT Vendors and Suppliers, and
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Consultants. Briefly external support is vital to the effectiveness of IT investments as a symbiotic relationship is developed with suppliers and vendors. Other sources of external support not mentioned earlier include conferences, seminars and professional development material.

31. How does the way the school is managed impact on the effectiveness of IT in your school?

The way the school is managed is really important and there is a need to have strong leadership of IT from the top. When the head is actively promoting, internally and externally, the whole school moves forward as one. One school’s IT program did not really get started until the head became involved and then it “took off”. Two schools where the principal was not actively involved thought that this was disadvantaging their IT program’s effectiveness.

32. How does the size of the school influence the effectiveness of IT?

All participants state that the size of the school is not significant to its effectiveness, however larger schools have larger budgets and this gives more flexibility in investments. Schools with more than one campus have added infrastructure costs. Smaller schools are more easily managed and flexible enabling easier links between subjects, thus making it easier for more interesting things to happen. A critical size of 700 is necessary for the effective acquisition of resources, and technical support staff.

33. Where can IT make the biggest impact in your school? Explain why.

Participants all agree that the biggest impact IT makes is on students, by changing the way students learn and teachers teach. IT enables students to do routine tasks quicker and easier thus moving more rapidly onto higher levels of analysis, and providing opportunities previously not available. Students are empowered with enhanced skills, confidence and learning ability.
34. What internal and external influences have adversely impacted upon the effectiveness of IT in your school?

There are both internal and external factors that adversely impact on IT effectiveness. Internal factors in the State schools relate to the lack of availability of resources. The private schools are concerned with the lack of teacher time for PD as they already have heavy after hours commitments, and the weight of the student laptops, carried to and from school. People’s own perceptions, their inability to recognise IT as more than a subject, are of concern in the Catholic schools. External factors in the private schools are theft of laptops and parents’ unwillingness to buy the appropriate hardware and software. To overcome this problem two schools are now making leasing a laptop part of their school fees. The State school external factors include, the bureaucratic intervention by the DoE, and the lack of budget and staffing. The Catholic schools indicate no external factors impacting on IT effectiveness.

35. Are there any other comments you would like to make with regard to the IT effectiveness in your school?

Participants agreed that although they have made huge progress and are all well on the way to achieving IT effectiveness in their schools, they still have a long way to go. Most have a good frame of reference based on a firm statement of vision and purpose and senior management commitment to IT.

Concluding Remarks Interview Results

The interviews revealed the following essential requirements for effectiveness of investment in IT in the secondary arena.

- A strong, visionary Principal championing the use of IT.

- Teachers who are given adequate training, resources and technical support and have a willingness to change their teaching styles.

- A budget that is clearly defined as a percentage of the school’s annual budget.

- A Learning Technologies committee to make decisions on IT expenditure based on the curriculum needs.
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- Investments prioritised to meet the goals of the school and recognise the significant proportion required by infrastructure investments.

- Viable strategic partnerships with vendors of laptops / PCs, networking firms and software houses.

The Initial Key Issues

To ascertain an initial set of key issues for use in the Delphi Survey a three-stage analysis of the tabulated interview information on each question or group of questions followed. The purpose of this research was to obtain a group view consequently data relating to similar aspects eg the Principal was collated and used to elicit and prioritise the most important factors to effectiveness in investment in IT in education. The number of times an aspect was referred to and the importance placed on it by the participants in the interviews was definitional in this process hence individual opinions were valued. The following ranked list (See Table 4: The Initial Key Issues) resulted from this analysis as a representative indication of the group view of the issues regarded as most important.

Round 1

The Key Issues

The initial set of key issues (See Table 4: The Initial Key Issues) was then amended to make clear to the participants how the researcher was interpreting each issue.

Pervan's (1993) research instrument used in establishing the Key Issues in Australian IS Management was used as a guide in developing this. Each issue had additional comments to indicate the culmination of views from the group and included an appropriate quote from a participant. The set of issues was then sent by e-mail or Fax to the participants who were asked “Could you please use this list to indicate what you consider to be the most critical issues for secondary schools in maximising the effectiveness of IT investments?” Participants were requested to alter or delete issues,
and to add any additional issues not included in the initial list.

<table>
<thead>
<tr>
<th>Initial Ranking</th>
<th>Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Visionary Principal</td>
</tr>
<tr>
<td>2</td>
<td>The Principal - the Champion</td>
</tr>
<tr>
<td>3</td>
<td>The Changing Teacher's Role</td>
</tr>
<tr>
<td>4</td>
<td>The Teachers - KEY to IT Effectiveness</td>
</tr>
<tr>
<td>5</td>
<td>The Starting Point - NOT the IT Teacher</td>
</tr>
<tr>
<td>6</td>
<td>The Teachers Maximising IT Investment</td>
</tr>
<tr>
<td>7</td>
<td>The Budget</td>
</tr>
<tr>
<td>8</td>
<td>Training and Personal Development (PD)</td>
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<td>The Learning Technologies Committee - The Decision Makers</td>
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<td>Technical Support</td>
</tr>
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<td>11</td>
<td>The Value of IT</td>
</tr>
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<td>12</td>
<td>The Students - IT's Biggest Impact</td>
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<td>13</td>
<td>Strategic Partnerships</td>
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<td>Laptop Programs</td>
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<td>Consultant Utilisation</td>
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<td>Role of School Council</td>
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<td>18</td>
<td>Basis of Investment</td>
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<td>Objectives of Investments</td>
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<td>20</td>
<td>Infrastructure vs Non-Infrastructure Investments</td>
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<td>21</td>
<td>Numbers of PCs</td>
</tr>
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<td>22</td>
<td>The Actual use of IT</td>
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<td>23</td>
<td>Administration Staff - Efficiency not Effectiveness</td>
</tr>
<tr>
<td>24</td>
<td>The Teachers - The Luddites</td>
</tr>
</tbody>
</table>

Table 4: The Initial Key Issues

The feedback from the participants was then placed into a spreadsheet for analysis (See Table 5 Model #1 Results). Eleven of the thirteen participants responded. It was decided that this was sufficient to gain a group view, the aim of the research.

Moroney (1977) and Reichmann (1970) both discuss the problem of deciding the best way to represent the average or group view. The Average, Median, and Mode were all calculated on the participants' analysis (See Table 5 Model #1 Results).
## Participants’ Responses

Numbers in bold indicate a score of 10+

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<th>Initial Ranking</th>
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<th>Aver age Mode 1</th>
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Table 5: Model #1 Results

The small number of participants in this research made representing a group view more difficult as extremes at either end had the potential to skew the results. The
ratings out of 10 by the participants frequently included the extremes of 1 and 10, see Initial Ranking rows for numbers 13, 14, 17, 18 and 20. The average was therefore discounted as it was considered that these extremes would unduly influence the result. The mode was also discounted, as the most frequently occurring rating did not necessarily reflect the group view. This can be observed in the Initial Ranking rows 6, 13, 19, 20 and 24. It was decided that the Median (middle item) value was best able to represent this group of participants, with half the group not less than the median and half the group not greater than the median.

**Analysis of Round 1**

The results in Table 5 are ranked according to the group’s Median rating.

The first four on the Initial Ranking are still in the first four positions with *The Visionary Principal, the Changing Teacher’s Role and The Teachers – The KEY to IT Effectiveness* having a rating of 10. However *The Principal – the Champion* was moved from second position to a rating of 9, in fourth position.

This issue is joined by five other factors with a rating of 9. *Training and Personal Development, Technical Support, and The Students Its Biggest Impact* moved only slightly on original ranking. However there is a significant shift by *Role of School Council* from the initial ranking of 17 to a ranking in the top nine factors. This appears to indicate that the group considered that *the Role of the School Council* is a far more significant factor in investment effectiveness in IT than was indicated by the interviews. Similarly *The Actual Use of IT* moves from a ranking of 22 into the top 9. Thus stressing the importance of IT’s integration into the curriculum by using IT as a tool to assist students in their research, presentation, and doing mundane tasks, and to have IT as an intellectual partner for teachers and students, not IT as a tool to be learned. This is summarised by Participant #1’s additional comment below.

“When you don’t notice students using it, because it is just part of what they are doing, then you have a successful program. It should not be an end in itself.” (Participant #1)
Chapter 4 - Research Results

Six factors have a rating of 8. Pushed down from their original 5\textsuperscript{th}, 6\textsuperscript{th} and 7\textsuperscript{th} positions were \textit{The Starting Point – Not the IT Teacher, The Teachers Maximising IT Investment}, and \textit{The Budget} to a ranking of 10 to 15. Apparently these are not as significant as the interviews indicated. \textit{The Learning Technologies Committee – The Decision-Makers'} move is only slight. However \textit{Basis of Investment} and \textit{Numbers of PCs} move up to the top 15 from positions of 18 and 21 respectively. The participants appear to agree with the criteria of Academic Performance, followed by Cost Effectiveness, Competitive Advantage and Quality Outcomes as the basis for investment, and that until the threshold of the number of PCs is reached by a school it is crucial to IT investment.

A rating of 7 with a ranking of 16\textsuperscript{th} and 17\textsuperscript{th} are achieved by \textit{The Value of IT} moving down from an initial ranking of 11, and \textit{Infrastructure vs Non-Infrastructure Investments} moving up from ranking of 20.

Three factors had a rating of 6. \textit{Objectives of Investments} remains in its initial ranking of 19. \textit{Administration Staff – Efficiency not Effectiveness} move only slightly up from a ranking of 23 to the 18\textsuperscript{th} to 20\textsuperscript{th} positions. \textit{Strategic Partnerships} are not perceived as important as initially anticipated and move down from 13\textsuperscript{th} position.

\textit{The Teachers – The Luddites} achieve a rating of 5, up three to 21\textsuperscript{st} ranking.

Significant moves are observed in the issues with Medians of 4 and 3. \textit{Size of the School, rating 4, down from 16\textsuperscript{th} to 22\textsuperscript{nd} and Consultant Use, rating 3, down from 15\textsuperscript{th} to 23\textsuperscript{rd}, these appear not to be important issues in IT investment effectiveness.}

\textit{Laptops Programs} is rated the least important issue by participants with a rating of 2, down from 14\textsuperscript{th} to 24\textsuperscript{th} ranking. The group does not agree with the negative expressions of laptops given in the interviews. This can be gauged by the comments added by the participants.
Chapter 4 - Research Results

"Notebook programs can enable the student to create and ‘own’ their working environment. This can lead to greater responsibility for learning.” (Participant #11)

“This rationale is based on a dysfunctional notebook program which has not been incorporated as a result of a curriculum drive. A notebook allows the students to select mode of response, access to info resources, Online learning modules, different styles of learning and teaching. A notebook program introduced to complement a conventional classroom curriculum is limiting the vision and scope of portable computing.” (Participant #12)

*Laptop Programs* and *Actual Use of IT* show the most significant differences from the initial ranking, with *Laptop Programs* as the least important issue and the *Actual Use of IT* considered vastly more important, moving from 22 to the top 9. The Principal and the teachers are the highest rated issues to effectiveness in investment in IT.

New Issues

Two new issues were included by Participant #7. These are *Curriculum Planning* and *Information Technology Planning*.

- **Curriculum Planning** - How IT will be used within the delivery of teaching and learning

- **Information Technology Planning** - To meet needs of teaching and learning

Participants added Additional Comments to every issue (See Appendix V – Model #2). This readiness to add / alter / delete issues confirms the researcher’s opinion that the Delphi Survey is ideally suited to use in an electronic format as participants using email were more inclined to alter / add / delete items than those using the fax. The researcher would have preferred to have used a “Chat” or “Bulletin Board”, but these mediums were not readily available to the researcher, and some participants were not even able to use email.
Chapter 4 - Research Results

Concluding Remarks Round 1

The key issues from the first round relate to:

- The Principal as a Visionary and a Champion of IT
- The changing role of Teachers who are a key to IT effectiveness
- The importance of Training, Personal Development and Technical Support for staff
- The big impact students are having on IT
- The actual use of IT
- The role of the school council.
- Laptops Programs are perceived in a far more positive way than emerged in the interviews.

Round 2

The participants were distributed with a copy of the re-ranked issues indicating the median rating for the group, and their own rating (See Table 6 Model #2 Results). The two non-participators in the first round were also sent a copy to maximise the response. This was done as it was only a two round Delphi with only a low number of participants. This approach proved worthwhile as one participant responded to the second round who had not done so in the first.

The Additional Comments from the various participants were included and identified the participant by number. This was done for two reasons, firstly to ensure the anonymity of the participant was preserved, and secondly to indicate to the other participants where the comments were coming from e.g Participant#1 included many, lengthy comments. These additional comments were inserted in bold and italics so that they were easily identifiable from the original model. A column was provided for the participants to write in whether they agreed or disagreed with these comments. The two new issues raised by participant #7 were also included. The participants were asked to re-rate each of the issues, to include additional comments / deletions / additions, and to indicate if they agreed or disagreed with the Participants’ Additional
Chapter 4 - Research Results

Comments. These ratings were re-ranked again on the Median for the group, (See Table 6 Model #2 Results).

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<td>Issue: Consultant Utilisation</td>
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Table 6: Model #2 Results
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Analysis of Round 2

Two participants did not make any changes to their original ratings. One stated that the issues were quite clear and felt that the extra comments “provide nothing new of significance”. The other did not give any rating for the new issues.

*Laptop Programs* with a movement up two rating points was the only issue to move more than one rating point up or down. The ranking of most issues is influenced by the inclusion of the two new issues of *Curriculum Planning* and *Information Technology Planning*, at the high rating levels of 10 and 9 respectively.

All issues with a rating of 10 are the same. These are *The Visionary Principal, The Changing Teacher’s Role*, and *The Teachers Key to IT Effectiveness*. The new additional issue *Curriculum Planning* is the final issue rated 10. One participant questioned the necessity of separating the two new issues *Curriculum Planning* and *Information Technology Planning*.

“These two are basically the same thing. A plan provides direction and makes clear the preferred approaches and software tools and activities. Linked to other aspects of the school (Principal vision, funding etc) it sends a clear message to the school community about why the reorganisation of classroom practice to incorporate Learning Technologies needs to occur and how it will happen.” (Participant #11)

The four issues with a rating of 9, *Principal- the Champion, Technical Support, The Students –IT’s Biggest Impact*, and *The Actual Use of IT* are unchanged. The other new additional issue *Information Technology Planning* is the only new issue rated 9. This, coupled with the rating of 10 for *Curriculum Planning* appears to indicate that planning is considered very significant to investment effectiveness in IT in education.

The ranking for a median of 8 starts at the same point as previously. 10th, however there are two more issues, thus finishing at a ranking of 15th. Four remain at the same
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rating of 8 as in Round 1, these are The Starting Point – Not the IT Teacher, The Budget, The Learning Technologies Committee – The Decision Makers, and Number of PCs. Two move down from a rating of 9, these are Training and Personal Development and Role of the School Council.

The issues with a rating of 7 start at the same rank as in Round 1, 16th. The Teachers Maximising IT Investment and Basis of Investment Movement move down one point from a rating of 8. The other two issues The Value of IT and Infrastructure vs Non-Infrastructure Investments are on the same rating as in Round 1.

The rating of 6 is in a lower ranking from 18th down to 20th again reflecting the inclusion of two new factors at higher levels. However the three issues Strategic Partnerships, Objectives of Investment, and Administration Staff – Efficiency not Effectiveness are unaltered.

The Teachers – The Luddites, rating 5. The Size of the School and Laptop Programs, rating 4, and Consultant Utilisation, rating 3 hold the same ranking as the last four on the list. With exception of Laptop Programs there is no change in their rating either. Laptop Programs move up two points to a rating of 4, this is possibly influenced by the Additional Comment by Participant#1, indicated below, with which participants strongly agreed. In fact this comment is more strongly agreed to than any of the other participant’s comments.

“Notebook programs can enable the student to create and ‘own’ their working environment. This can lead to greater responsibility for learning.” (Participant #1)

Participant Modifications

The feedback received on the second and final round again indicated the strength of the Delphi Method. A couple of the participants responded extensively to the
participant comments even though they had not commented in Round 1. Having the participants indicate if they agreed with any of the comments enabled the researcher to assess the group view of these, eg the positive view of *Laptop Programs*. The two new issues raised by a participant and very highly rated by the group were not identified in the interview process by the researcher. (See Table 6 Model #2 Results).

The Principal as a powerful champion is perceived as essential to the effectiveness of investment in IT. The principal also needs to be pro-active rather than reactive. Replacing the Principal with either a "member of the Principal class" or "an empowered member of staff" is rejected both when referring to the *Visionary Principal* and *The Principal the Champion*. Several of the respondents question the separation of these two issues relating to the Principal.

Participants strongly agree that the Principal is important in the direction and planning of the Learning Technologies committee, without the Principal’s support plans will not proceed. The Learning Technologies committee needs to be *educated* to fulfil the vital role of maximising IT investments.

Teachers also have a crucial role in *Maximising IT Investment* by leading the vision. Staff acceptance of their *Changing Role* is one of the biggest problems facing effective use of IT. Although Teachers are perceived as the *Key to IT Effectiveness*, rated 10, participants agree that the "staff spectrum is very wide" and "IT is not the only driving force in Education“. The *Luddite Teachers* are not an inhibiting factor but should not be tolerated as "museum exhibits". *Training and Personal Development* are critical to this effective use of IT investments and “no program will work without good, solid work with staff first”.

Although adequate *Technical Support* could be described as a “bottomless pit”, good technical support was perceived as critical to the effective use of IT, rated 10. Without it staff are very quickly dispirited and the IT program can easily fail.
Interestingly participants agree that The Starting Point is NOT the IT Teacher. The IT teachers focus on the hardware and software aspects, whereas Non-IT teachers focus on what “the kids will get out of it” and consequently more readily comprehend the usefulness and diversity of the new methods.

Participants strongly agree that IT should not be perceived as a separate entity. The Actual Use of IT should not be an end in itself, a program is successful if the uses by students is not noticed and just part of what they are doing. The Value of IT is when it seamlessly fits into the curriculum program. IT should only be used when it is the most effective medium to be employed. These two issues are closely aligned with the perceived importance of the new ‘planning’ issues. Curriculum Planning rated 10 and IT Planning, rated 8, although one participant commented that these are “basically the same thing”. Participants agree that the curriculum should be planned to decide how IT is used in the delivery of teaching and learning and IT should be planned to meet these teaching and learning needs.

It is agreed that IT raises an equity issue for students rather than one of equality of access to resources.

The Basis of IT Investment is not academic performance, cost effectiveness, competitive advantage, and quality outcomes. IT investment should only be supportive of these and offer more choices for learning and to meet different learning needs.

It is agreed that the School Council could work either “for or against you” and that this is dependent on the personal agendas of individual council members.

It is agreed that there is no definitive Number of PCs for a school to have. However there is an expectation that IT should be available when and where teachers want their classes to use it.
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The idea that it is possible to run without a network because it is more trouble than it is worth is strongly rejected.

Participants strongly agree that Laptop Programs enable the student to create their own working environment thus leading to greater responsibility for learning. They also concur with the comment that the view given of laptop programs is a dysfunctional one.

The core objective of investment for private schools is not necessarily to place it in a strategic position in the market place; rather it is that parents want the education they experienced.

Although it is true that an objective of investment relates to the day to day transactions needs of the Administration this is not important.

Also rejected are the documented comments that:

- “consultants are more trouble than they are worth”,
- the three of the four strategies used for dealing with Teacher Luddites, “sack them, threaten to sack them if they don’t use it, ignore them” should be deleted
- The Size of School should be divided into two separate issues, and the critical size is 700 students.
- Infrastructure costs are necessarily higher than Non-Infrastructure Investments.
- Strategic Partnerships are “not important”.

Concluding Remarks Round 2

The Principal has emerged even more strongly as critical to the effectiveness of investment in IT with participants rejecting suggestions that a Principal appointee can be used as a replacement Champion or Visionary. The important role of teachers as key players in maximising IT investment, with critical training, personal development and technical support needs is retained. The actual use of IT is modified to be
seamlessly fitting into the needs of the curriculum. The impact of students is still highly rated. The Role of the School Council is demoted and replaced by the new key issues of the vital importance of an adequate Budget, and the participant suggested issue, Curriculum Planning. Curriculum Planning and to a lesser extent IT Planning, also participant suggested, are necessary to decide how IT is used in learning and teaching, and to meet those teaching and learning needs.

The Final Key Issues

The participants in this research consistently agreed that there is a set of key issues relating to IT investment effectiveness. Careful study of these issues revealed that some of them were closely rated by participants and related to aspects of the same thing. For example the issues relating to teachers, The Changing Teacher’s Role and the Teachers Key to IT Effectiveness were rated 10, and The Starting Point – Not the IT Teacher rated 8 and The Teachers Maximising the IT Investment was rated 7. Similarly the issues relating to the Principal The Visionary Principal rated 10 and The Principal – The Champion rate 9 were closely aligned.

The analysis of the interviews had indicated these issues as separate and were thus identified as such in the initial 25 key issues (Refer to Table 4: The Initial Key Issues). This was done so that the researcher could determine which factors were most important to the participants. This proved very successful as the participants clearly rejected The Teachers – The Luddites in the final round as it was only rated 5.

The decision was made to combine the four aspects of the teachers into one key issue similarly the two issues relating to the Principal were combined into one issue. The rationale for this was that the clarity of understanding gained by combining these issues far outweighed the necessity to retain them as separate issues.

In the second and final round participants questioned the separation of Curriculum Planning and IT Planning rated 10 and 9 stating that these were the basically
addressing the same thing with both containing aspects of each other and as such should not be separated. Consequently it was decided to combine these into one issue.

<table>
<thead>
<tr>
<th>Key Issues to Investment Effectiveness in Education</th>
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<tbody>
<tr>
<td>1. <strong>The Principal</strong> - the Visionary Champion critical to the success of any IT program.</td>
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<tr>
<td>2. <strong>The Teachers</strong> – acceptance of their changing role is the key to the effectiveness of the investment in IT.</td>
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<tr>
<td>3. <strong>Curriculum Planning</strong> – should provide the direction and make clear the preferred approaches, software tools and activities and include <strong>Information Technology Planning</strong>.</td>
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<tr>
<td>4. <strong>Technical Support</strong> – is critical to the effective use of IT.</td>
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<td>5. <strong>The Students</strong>– are impacted most by IT.</td>
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<td>6. <strong>The Actual Use of IT</strong> – is a good indicator of the success of an IT program.</td>
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<td>7. <strong>Training and Personal Development</strong>– ensures that the IT program will work.</td>
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<td>8. <strong>The School Council</strong> – with its control over budgets has considerable power over how effective IT is in a school.</td>
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<tr>
<td>9. <strong>The Budget</strong> – dictates how much can be done and when.</td>
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<tr>
<td>10. <strong>Learning Technologies Committee</strong> – is vital to creating a Learning Technologies Plan on which IT investment is based.</td>
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Table 7: The Final Key Issues

The analysis at the conclusion of Round 2 of the Delphi Survey elicited ten key issues used in the secondary school sector when managing the effectiveness of their investment in IT. These are set out in descending order in Table 7: The Final Key Issues. The participants rated these issues in groups. The Principal, The Teachers and Curriculum Technical Support rated 10. The Students, and the Actual Use of IT rated at 9. The Budget, Training and Personal Development, The Learning Technologies Committee and Role of School Council rated 8.
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The Principal – is critical to the success of any IT program. The Principal must be a Visionary who is able to see the strategic importance of IT to the delivery of education, giving clear direction for the school, and driving the change. The Principal must also be a strong Champion of IT promoting it to the staff, establishing and creating a sustainable network of support through adequate budgets. This role cannot be filled by a Principal appointed delegate, as this will dramatically slow the rate of change. Principals can be encouraged to take up the mantle of a Visionary and Champion by attending seminars and meetings where other Principals are discussing IT and Learning Technologies.

The Teachers – are the key to the effectiveness of the investment in IT. They are the best indicators of how effective is the IT program. This can be gauged by the way teachers are using IT, how prepared they are to change their teaching practices by implementing IT, especially in collaborative learning projects. The role of the teacher has to change from one where they are in control of everything that happens in the classroom to one where they are facilitators of the students learning. Unless teachers are willing to do this investing in IT is not effective. The changing teacher’s role and as the key to IT investment effectiveness are the major issues relating to teachers. However there are other issues relating to this multi-faceted aspect which did not rate as highly but need to be highlighted.

- Teacher representation on the Learning Technologies committee, the décision making body, is vital as they know which learning outcomes and curriculum are best suited to an IT approach.
- They have a crucial role in maximising the IT investments as they are the ones using IT. Consequently any investment in IT not perceived by teachers as having educational value will not be fully utilised.
- Interestingly the impetus for introducing IT is most effective when it comes from an area other than IT eg English. These teachers recognise IT as a tool to assist and extend their teaching and not as an end in itself. Whereas IT teachers who perceive IT as a tool to be learned, were least likely to share their own expertise with other teachers and their students.
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Curriculum Planning – should provide the direction and make clear the preferred approaches, software tools and activities. It should centre on how IT is used within the delivery of teaching and learning and send a clear message to staff why IT needs to be incorporated into the classroom and how this will occur. Thus any IT Planning should be designed around the curriculum planning by meeting the needs of teaching and learning.

Technical Support – is critical to the effective use of IT. The increasing emphasis on collaborative learning projects, the use of the Internet, Online communication between students and teachers within the school and with other schools and countries, and the conversion of many libraries into digitised resources centres has meant that much teaching and learning is dependent on IT and Networks. If the network, hardware and software are not working or reliable the teachers lose confidence in it and stop using it. Similarly the administration in most schools is totally dependent on IT and the efficiency of the school is adversely effected by lack of technical support, in fact if it is not working the administration comes to a halt.

The Students – are impacted most by IT. This is closely allied to the teachers and the change in the way students learn. Routine tasks are completed quicker and more easily, thus students move rapidly onto higher levels of analysis. Communication is possible with people in a way previously unheard of eg via email to scientists in Antarctica. Information is readily available in an easily comprehensible format eg Multi-Media CD-ROMs. Consequently students are empowered by IT; it is a leveller in education, giving equity to all students previously not available.

The Actual Use of IT – is a good indicator of the success of an IT program. It should never be an end in itself but rather as a transparent part of the curriculum and classroom activities. This occurs when IT is no longer obvious but has become an integral part of students learning process, an intellectual partner to both students and teachers, a tool to assist in research, enhancing their work and enabling the more rapid completion of mundane tasks. Schools are removing IT as a subject and expecting all teachers to include IT when and where it is needed.
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Training and Personal Development – No IT program will work without good solid work on staff first. Staff have to feel in control of change, to do this you need training and personal development. Schools wanting to maximise the effectiveness of IT and thus IT investment need to change teachers’ pedagogy practices to suit the learning situation of today. Teachers do not respond well to being trained by administration staff. Training teachers eager to use IT and then getting them to show what they have done is one of the greatest influences. Buddy systems are also effective.

The School Council - has considerable power over the effectiveness of the IT program in the school as they are the final arbitrators of the budget. Generally once the school council believes that IT is well manages they are happy to agree to a set an annual IT budget and approve exceptions to this annual amount eg expansions to the network.

The Budget – dictates how much can be done and when. IT will not go forward without an adequate budget. IT needs to be well resourced, thus to be able to plan effectively a known percentage of the school’s annual budget has to be allocated on an ongoing basis, 4-12% is perceived as adequate.

Learning Technologies Committee – is vital to creating a Learning Technologies Plan on which IT investment is based. This LT Plan is a firm statement of the vision and purpose of IT that is developed and communicated throughout the school. The LT Committee must relate the LT Plan to the schools goals and vision by maintaining the “big picture”, and not allow it to fragment into factions. This LT Plan needs to include a flexible plan three years ahead, with a firm plan for the current year. The LT Committee should include powerful stakeholders such as the Principal, Heads of Schools, Head of Learning Technology, and the System Manager. It is essential that the committee includes teacher representatives who are enthusiastic towards IT, IT conversant / educated. The ideal size is four to six, and definitely not more than twelve.
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Conclusion

The background research unveiled little of significance in the area of IT effectiveness in education relating to IT investments. A review of the literature of IT Effectiveness and IT Investment in business, plus Small Business investment effectiveness was undertaken to find appropriate methodologies. The interview questions were based on models and other research findings in business and education. Experts, selected from schools in private, State and Catholic schools, were interviewed to obtain an initial group view. The results of the interviews were then collated and an initial set of twenty-four ranked key issues indicated below was identified as representing the group view.

1. The Visionary Principal
2. The Principal – the Champion
3. The Changing Teacher’s Role
4. The Teachers – KEY to IT Effectiveness
5. The Starting Point – NOT the IT Teacher
6. The Teachers Maximising IT Investment
7. The Budget
8. Training and Personal Development (PD)
9. The Learning Technologies Committee – The Decision Makers
10. Technical Support
11. The Value of IT
12. The Students – IT’s Biggest Impact
13. Strategic Partnerships
14. Laptop Programs
15. Consultant Utilisation
16. Size of School
17. Role of School Council
This initial set of twenty-four key issues was then used with the same experts in a two round Delphi Survey. It was decided that the Delphi Survey was the most suitable approach as it has previously been successfully used in obtaining group views.

These key issues were sent to the experts to rate, amend, delete and add new issues. Two new key issues, Curriculum Planning and IT Planning were identified by a participant in the first round. These two new issues were highly rated by the experts in the second and final round; thus validating the use of the Delphi survey as these issues would not have emerged in a Case Study. Analysis of the feedback from the second round resulted in the set of ten ranked key issues to investment effectiveness in education, see below.

1. The Principal
2. The Teachers
3. Curriculum Planning
4. Technical Support
5. The Students
6. The Actual Use of IT
7. Training and Personal Development
8. The School Council
The next chapter involves the analysis of these research results in comparison with those of researchers found in the literature. The interview analysis is categorised into the headings given in the literature review (Chapter 2). The research questions are discussed, and finally a Model for IT Investment Effectiveness is derived using previous researchers' models as a guide.
Chapter 5 - Research Results and Development of Model

Introduction
The preceding chapter reported results of the interviews and the subsequent Delphi survey, culminating in the identification of a set of key issues for IT investment effectiveness in education. This chapter analyses the research findings and is divided into three sections: validity of the research approach, analysis of the interview responses, analysis of the research questions, and the identification of a Model of IT Investment Effectiveness in Education.

Validity of the Research Approach
The area of IT investment effectiveness in education is one where little if any research has been undertaken. The aim of this research is therefore to develop a model for IT investment effectiveness for secondary schools. The lack of a firm basis on which comparisons could be made led to the decision to implement an interpretive rather than the more commonly used positivist approach where a hypothesis is tested.

The selection of participants perceived as experts in the area enabled the use of the Delphi survey. This was validated by the fact that a clear set of key issues emerged on which there was general agreement if not consensus. The decision to use an interpretive approach proved extremely effective in obtaining the opinions of the participants. The open ended questions used in the interviews revealed information that could not have been as easily accessible had a hypothesis approach been used.

The interviews were used as a mechanism for obtaining an initial set of key issues. The Delphi Survey provided further clarification of the responses to the interviews and gave interesting insights into the group view of effectiveness in investment in the secondary school arena. Finally a Model of IT Investment Effectiveness was developed by carefully analysing the key issues in conjunction with models previously devised by IT researchers.
Interview Analysis

The decision to separate the interview questions into the three areas of strategic alignment of IT, IT investment, and IT effectiveness proved very successful because this focussed the participants attention and enabled a more complete analysis of the responses. The eliciting of the initial set of key issues was therefore more difficult because of the quantity of information, thus making the analysis a far more onerous task, at the same time it enabled these issues to be identified with more confidence because of the detailed information given. The fact that only two additional issues were raised indicated that this approach proved worthwhile. The following gives the major findings from each of these three areas.

Strategic Alignment of IT

The State, private and Catholic secondary schools in this research are displaying best practice in their management of IT. A high level of both strategic planning and clearly defined organisational goals was found consistently throughout the various schools. This situation closely resembles the findings by O'Mahony and Dampney (1996) in New South Wales secondary schools. In fact with only one exception, the IT goals within the school were not only clearly defined but were either formally or informally based on the school’s goals. They understand their core strategies and are using these to provide a capability model to enable them to maximise the effectiveness of IT as they move into the next decade of technological change. These findings reflect the small business research into core strategies by Feeny and Wilcocks (1999) in the UK.

Most schools are effectively implementing a three tiered strategy involving information systems, information technology, and information management.

- The information systems strategy is based on their business (educational / administrative) needs and this is used to make decisions on an appropriate application portfolio of what is needed. Frequently the learning technologies committee sets a date for leading teachers to place requests for software requirements for the following year, from this the committee decides which
Chapter 5 - Research Results and Development of Model

applications best meet the requirements of the whole school.

- The *information technology strategy* decides what resources and technologies are needed to meet the information systems strategy and manage the school’s technology infrastructure. Most schools have three-year plans whereby the infrastructure requirements are defined and maintained, this is coupled with annual plans necessary to meet new requirements arising out of developments in application software and their associated technology.

- The *information management strategy* defines how the information technology activities are managed. It includes the daily management and coordination of schedules, resources and training across the curriculum and administration of the school. The management of the information technology in the schools in this research is undertaken by staff who are members of the learning technologies committee and are invariably educators as well.

This IT strategy mirrors a theoretical approach for effective management of IT in UK schools proposed by Latham (1998).

The strong focus on strategic planning by these schools can perhaps be explained by the fact that they have a reputation for excellence in IT. The basis for their inclusion in this research was the frequency of recommendation by peers or educational authorities. This contrasts with findings by Falconer and Hodgett (1996) in Australian organisations that a significant number of organisations do not undertake strategic planning at all. Thus research is needed on a wider body of schools to establish if this finding is skewed by the selection of participants or whether this strategic alignment of IT is consistent across the wider secondary school community.

The goals of the school are most relevant to investing in IT, as most schools prioritise their IT investments to be dependent upon the goals of the school, and to a lesser extent to meet long term IT goals. It appears that these schools have better existing structures in place than those in business.

- The Principal’s involvement is critical to effective investment in IT. The role is
one of creating a vision of the future and providing the means and policies for achieving that vision.

- A holistic approach to IT is promoted across the curriculum, management resources are integrated, all staff are involved, and there is long term strategic planning.

- There are formal governance structures in place at the school (the school council) and IT (Learning Technologies Committees) levels. Teaching staff are represented at both levels facilitating a common understanding, creating joint ownership, and implementing good communication of the school’s goals and IT plans.

- The learning technologies committee drives decisions on direction and investment in IT.

These findings are consistent with Revell’s (1997) evaluation of the mbanx banking division of the Bank of Montreal.

**Utilisation of IT**

Schools in this research clearly place improvement of learning as the most important goal for the utilisation of IT. Enhancing educational opportunities and facilitating collaborative learning are less important goals and only a few schools believe that developing an IT conversant workforce is pertinent. These findings are consistent with the DoE’s Classroom of the Future goals for the utilisation of IT (Education Victoria, 1996) with one exception, parent participation. Only one school reports using parents as a source of expertise as experienced by schools in Canada (Riffel and Levin, 1997).

Schools are maximising the effective educational use of IT. This is observable where teachers and students are using IT as an intellectual partner and for gaining information via the Internet, external databases and entities, and from multimedia sources. Teachers are only placing minor emphasis on using IT as a tool to be learned. They are integrating IT into their classrooms and including themselves in the learning process. Rarely is IT taught as a tool in itself, rather it becomes an integral part of
the learning process where it is used to perform mundane tasks more rapidly and as a mechanism to access information more easily. In fact there is an emerging trend in these schools to remove IT as a subject from the curriculum and students are taught IT skills and tools when the necessity arises to meet educational needs. Currently only a few schools in this survey are using IT as context however, many are recognising its value and express the desire to achieve this. These findings contradict those of Jonassen (1995) in the USA and Carter (1996) in Western Australia. Efficiency gains, not the focus of this research, emerge as facilitating the use of IT for administration purposes. This confirms the findings of O'Mahony and Dampney's (1996) PACT model.

This research reveals that teachers are uppermost in determining effectiveness in IT. This concurs with Rodrigues (1997) research in USA schools. Private schools are recognising the importance of teachers to their IT effectiveness. Most are providing on-demand personal development and personal laptops for all teachers, and the industry average level of technical support. However Catholic and State schools are not providing adequate educational and technical support. This indicates that the Victorian school system has changed little since Blackmore's (1996) research. It should however be noted that the Victorian government in its 1999-2000 budget committed $104 million for IT technical support in State schools, indicating recognition of the lack of technical support as a problem. Participants in State and Catholic schools maintain that the IT programs are largely run on the goodwill of teaching staff. Interestingly one participant did a survey to see how many technical staff would be required for the school, based on the industry average of 1 technician for every 50-75 Windows 95 and MS Office users. The resulting figure was 4 to 6, however the school has only 2 technical staff. At the time the school would have ranked 416 in the top 500 companies in Australia, based on the number of nodes on the network. This school's network is about average for those participating in this research. It would therefore appear that schools are emerging as significant players in Australian business. To date this has been unrecognised and indicates a need for research into the role of schools as businesses in the Australian context.
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All schools attest that there is a lack of in-house knowledge and thus have considerable reliance on external expertise. This has a parallel in New Zealand small businesses who express similar concerns (Igbaria et al, 1997). Although most schools make little use of consultants, all schools in this survey conducting laptops programs have strategic partnerships with their suppliers, and many schools have strategic partnerships with networking firms and software houses. Unlike the Singapore small business experience (Thong et al, 1996) schools susceptibility to external forces is not a significant factor. Several schools have changed their strategic partnerships following dissatisfaction with this relationship. Most schools, however, believe that they gain significant advantages from their strategic partnerships. They are invariably provided with information and technical support, and are frequently given new software to pilot and hardware and networking products to trial.

Despite the inadequacy of technical support within many schools and the reliance on external expertise most schools state that their IT resources are adequate. They are able to use in-house knowledge to solve more problems than are created. Teachers with IT knowledge are the best sources of encouraging the take-up of IT by hesitant staff.

Schools are forming strategic alliances with other schools locally, within the state of Victoria, and throughout Australia. Some are even forming strategic alliances with schools in other countries. These strategic alliances are similar to those referred to by Alavi et al (1997) in business and Santosus (1997) in universities. The rationale for developing strategic alliances is that changes in technology are happening so rapidly that it is impossible for a single school to keep abreast of changes in IT. They enable the sharing of information, discussion of trends and issues, and consequent improvement in efficiency and effectiveness of IT. This concurs with research into strategic alliances for outsourcing by major companies (Caldwell, Bruce, 1997). A good example of a strategic alliance is found in private schools where IT and Learning Technology Heads have formed a cooperative network to share knowledge, experience and expertise. Similarly Principals from most schools and, in some instances other members of the teaching staff, are going overseas on fact finding tours
and forming alliances with schools in other countries. The International Note (1998) saw this development of cross border alliances as the most important trend in internationalisation.

Attempts to subvert IT strategy are not even considered an issue by schools because they are so insignificant. This contrasts significantly with the findings by O’Mahony and Dampney (1996) in NSW secondary schools where organisational power is used to subvert IT strategy. This difference may be explained by the different criterion used to select the participants in the two studies. O’Mahony and Dampney (1996) chose participating schools that were most likely to demonstrate difference in organisation culture, whereas this research selected schools that have a reputation for excellence in the area of IT.

**IT Investment**

The percentage of budget allocated to IT ranges from 3% to 25% in schools, with an average of about 5%. This is in stark contrast to the 50% of total expenditure invested by businesses in USA (Cronk and Fitzgerald, 1996). Both private and Catholic schools are satisfied that this investment is adequate. Interestingly most State schools are not satisfied with the annual budgeted amount of 3-8% even though all as Science and Technology Centres had been given an initial one off establishment grant of $1.2 million by the DoE. As one participant said

“One of the things you have to understand about IT is that it changes all the time, you can never say “We’re here!” therefore we have to be learning and investing time, money and intellect all the time to make it work.”

Infrastructure investments form a significant proportion of the IT investment in schools, currently these are 60%. Previously this was less however with the rapid rate of developments and the need to keep abreast of these changes infrastructure investments in schools are anticipated to form 80% of the annual IT budget. In the
initial stages of establishing networks infrastructure investment frequently account for 100% of the IT budget.

Most participants indicate that IT investments are prioritised to be dependent on the goals of the school, and secondly enabling the adherence to long-term requirements. Utilitarian or cost savings are not relevant justifications for investment in IT. In schools the fulfilment of an objective is sufficient justification for that investment, this concurs with research in manufacturing industry conducted by Ragowsky (1996).

The goals of investment in schools are closely aligned with their organisational goals. The key basis of investment in the State and private schools is academic performance. Next most important are cost effectiveness for State schools and competitive advantage for private schools. The goals for investment in State and private schools closely parallel those in business thus indicating that schools are becoming businesses. In contrast the Catholic schools have not taken on the business orientation visible in State and private schools and base their investments on quality outcomes for the students.

Schools rate the objectives of investment, strategic position, informational, transactional and infrastructure, almost equally. This reflects the findings by Weill and Broadbent (1994) of organisations in Australian industries. The core objective of private schools is to place them in a strategic position in the marketplace, and the Catholic schools place greater emphasis on obtaining information. The provision of infrastructure support (the network etc) is perceived essential by all schools, it was found that if the network is unreliable IT is simply not used in the school environment. Finally the undertaking of day to day transactions relates to the administration area, and in State schools to the demands of the DoE.

The Learning Technologies (LT) committee has a significant role in the effectiveness of IT investments in schools. All but two of the schools in this study use an LT Committee to make decisions on IT investments. This process involves the LT Committee establishing which goals are most important, where the biggest gaps exist
between the current situation and the goals, where IT is able to be used to greatest
effect, and which have the lowest cost or provide the greatest benefit. This decision
making process by the LT Committees closely reflects the evaluation process used by
the University of Virginia (Stager et al, 1994). The two single players who are
making decisions on their own recognise the need for a balance of viewpoints and are
cconcerned that their decisions may not always be in the school’s best interests.

There was consensus on the composition of the LT committee. This committee needs
to be small comprising of key stakeholders in the school including the Principal, both
the Head of LT and the Systems Manager, and teachers in key learning areas as
members. It is vital that the LT Committee members are IT conversant or educated.
Participants stress the absolutely critical role of the Principal, not a principal
appointed delegate, to the effectiveness of investments in IT as decisions made by the
IT Committee have to be ratified by the school council, which in turn relies on the
Principal’s recommendations. The Principal must recognise the strategic importance
of IT to education, be visible in promoting and driving the change IT incurs, and
ensure that budgets are sufficient to establish and create a sustainable network of
support. The necessity of having the Systems Manager on the LT committee was
clearly identified in one school. This school had the situation where the Systems
Manager was not on the LT committee, had not worked in schools before, and
decided to introduce a new version of software in the middle of the school year. This
rendered much of the teaching materials no longer useable and created great
inconvenience to both teachers and students.

Most schools are satisfied with the amount of time given to make decisions on
investment, with the LT Committee invariably setting the pace for decisions on
investment. The LT Committee usually devises a three-year plan and a more specific
one-year plan. The DoE mandates that this planning has to be undertaken in State
schools. Interestingly the two glaring exceptions to this forward planning involve the
single player decision makers mentioned above. one was given one week to make a
decision on a network, and the other three weeks to establish a five-year plan.

Libraries now named Digital Resource Centres (DRC) have significant influence on
investments in IT as they have their own budgets and thus can make IT decisions which impact the way IT is used within the school. The significance of the DRC's role was emphasised by the fact that in two participating schools they were the impetus for the IT program's evolution within the school.

**IT Effectiveness**

Individual impact is the referent in use within schools to gauge the effectiveness of their IT in terms of the effect of IT has on the individual. Teachers are the key indicators in the school environment closely followed by students. This is observable in the way that IT is actually used in a learning environment where the teacher's role is changing from leading and directing and being in control of all learning of the students to one where they are participants in the learning process and no longer the source of all knowledge. They have to accept a role as a guide in the learning process directing students to where information can be found. Teachers have to adjust to the change in their role from "Sage on the Stage, to a Guide on the Side" – Participant quoting the American Educationalist Jamie McKenzie. Teachers have to adjust to this new role for IT to be really effective. Students are empowered by IT to readily complete mundane tasks and be consequently enabled to move on to higher levels of cognitive ability and activities previously not attainable with traditional educational means. This concurs with O'Mahony and Dampney's (1996) PACT model in NSW schools where the Teachers and Children (students) indicate the effectiveness culture within schools. It differs from Scott's (1995) business based MIMIC model which identifies the indicators of IT effectiveness as peers, CEO and Management.

The determinants of IT effectiveness in schools are strong leadership, good technical support, the teachers, the budget, and training or personal development. Strong leadership from the top is of critical importance. Good technical support ensures that the IT is working effectively. The teachers simply will not use IT if it is not working. The role they have in the learning situation determines whether IT is used to its full potential. The budget is significant as without an adequate budget the IT program comes to a standstill. The number of PCs are not as significant, in fact once a threshold number of PCs is reached this is no longer an issue at all. This threshold
varies from school to school, all private schools expect their students to own/lease a laptop. These determinants differ from those elicited by Scott (1995) for business.

IT effectiveness in schools is identified as a multidimensional construct which cannot be easily measured. This reflects business research by DeLone and McLean (1992), Scott (1995), and Grover et al (1996). The evaluation criterion in use for IT effectiveness in these schools is improvement indicating the way that the organisation has evolved or been improved. The unit of analysis is individual observing the socio-technical provision of information to the user. The evaluation type is assessing the impact of IT on the individuals (students). The only formal attempts to measure IT effectiveness involve audits by internal and external entities.

The schools in this research have simple highly centralised organisational structures and limited political problems with the top manager as the key business decision-maker. The reason for this could be that they are emerging from a bureaucratic model with the central authority of the state frequently defining how they are managed. They reflect the small business organisational theories and practices rather than those of large business. Schools indicate that management support is the most critical factor to their effectiveness, a similar finding to Palvia’s (1996) small business research in USA. Although the necessity of external expertise is vital it in schools it cannot be used to compensate for the lack of top management support this finding differs from Thong et al’s (1996) small business research in Singapore.

Response to the Research Questions
Whether intrinsic criteria exist and are used in the school sector for managing the effectiveness of IT/IT investments.

The Victorian government has invested and continues to invest significant amounts of money in IT. The DoE has set in place many initiatives to ensure that IT is uppermost in its schools eg mandating annual PD and curriculum initiatives in IT for all teachers.
Because of this government direction schools are required to have certain processes in place. The private schools have responded to the government direction and all participating schools have laptop programs. The Catholic schools were significantly influenced by the government incorporating DoE initiatives into their IT programs. This government direction coupled with the fact that schools in contrast with business do not face the competing demands common in industry results in schools with a single focus, education. The research has revealed that schools have intrinsic criteria considered vital to evaluating the effectiveness of IT investments. The initial interviews have provided much useful information in deciding on the initial set of 24 key issues. These were then refined by a two stage Delphi survey. Two new issues supplied by a participant proved to be rated extremely highly by participants. With the exception of these new issues participant ratings were very similar on both rounds, any changes reflecting the inclusion of the new issues. Questions were raised by participants during the Delphi Survey regarding the separation of some issues eg The Principal as the champion and as the Visionary. Consequently the final set of key issues defined by the researcher combines several related issues into one key issue.

- **What criteria are used / recommended to ensure successful IT investments.**

The key issues that have to be dealt with before a school can hope to achieve effectiveness in its investments are the Principal, the teachers, curriculum and IT planning, technical support, the students, the actual use of IT, training and personal development, the school council, the budget, and the learning technologies committee.

The Principal is crucial because of his / her influential position, which is reflected in the small business models of Thong et al (1996) and Palvia (1996). The Principal has the ability to ensure budgets are allocated through recommendations to the School Council. The Principal has to develop change readiness strategies, cited by Benamati (1997) by championing IT and thus ensuring staff acceptance of IT.

This research identified teachers as the key to IT investment effectiveness, without teacher participation it won’t succeed. If teachers are not convinced of the worth of IT to education they will not use it. This concurs with Rodrigues
(1997) research, which found that teachers were uppermost in determining IT effectiveness in education. Consequently teachers need to become educated and informed users of IT.

Curriculum and IT planning - IT is an integral part of the curriculum, success is achieved when IT is no longer a separate entity but rather part of the everyday experience within the classroom. This is similar to the business situation where no business would contemplate working in the current environment without using IT. The schools surveyed indicate that they are well on the way to achieving the same status for IT as was indicated by Feeny and Wilcocks (1998) where businesses are concentrating on their core competencies.

Closely allied to the teachers is technical support. The schools in this research reflect the experience of small business where inadequate technical support can adversely effect the effectiveness of any investments. Participants maintain that if IT is not reliable teachers simply will not use it.

The impact on individual students is an indicator of the effectiveness of the IT investment. This occurs when students are observed using IT to rapidly complete mundane tasks thus enabling them to move more rapidly onto higher levels of learning. IT also enables students to communicate with entities previously unavailable through traditional means, eg email to scientists in Antarctica.

The actual use of IT is considered by participants to be a good indicator of the effectiveness of IT. This is observable when IT is used as a part of the teaching and learning process rather than as a separate entity in itself and IT becomes an intellectual partner for both teachers and students.

"When you don't notice students using it, because it is just part of what they are doing, then you know you have a successful program. It should not be an end in itself." Participant #1
No IT program will work without good solid work on teachers thus *training and personal development* are important pre-requisites to effectiveness of IT investments. Private schools are generally recognising this, and most provide “on demand” PD to teaching staff. However the situation in Catholic and State schools mirrors Blackmore’s (1996) findings that teachers are expected to be able to implement IT into their curriculum areas but have to educate themselves if they want to keep abreast of the current developments in IT.

The *school council* has considerable power in the effectiveness of investments, as they are the final arbitrators of the budget. Thus they need to be convinced of the worth of IT within the school before a program can really be undertaken, without an adequate budget any Curriculum and IT Planning is severely hampered.

The *budget* determines what can be done and when. Schools indicate that it is vital for a clearly defined budget amount stated as a percentage of the school’s budget to be allocated each year.

The *learning technologies committee* must consist of key stakeholders including the heads of LT and IT, the principal and teachers. Their approach to decision making ensures that the most appropriate curriculum goals are selected to maximise the effectiveness gained from any investments. Schools appear to be implementing Macmillan’s (1997) research that managers can improve the value of IT in an organisation by: Understanding the way IT investments relate to business priorities, facilitating effective communication between specialist IT and business personnel, and ensuring that the head of IT is able to interact effectively with business managers and the CEO.

- **Whether there is consensus on the most effective approach for making detailed investment decisions.**

  No clear set of criteria to establish selection from choices was gleaned as each school’s needs are unique and thus the approach developed is more of guiding
principles rather than step by step process. What emerged was that the IT investment decisions are perceived as a strategic level issue and that school’s concerns and emphasis should be at this level to ensure successful IT. If the school has an effective decision making process in place at the strategic level the detailed decisions can be assigned to the appropriate person / committee on a needs basis eg the Learning Technologies committee is best to decide what the needs are at the curriculum level.

- **What criteria are used / recommended for evaluation of pre / post investment effectiveness.**

The methods in use within schools to evaluate effectiveness of investments include subjective observations of students and the actual ways IT is being used within the school. Some schools are also using internal and external audits, and cost benefit analysis.

Schools are able to ascertain the impact that their investments in IT are having by observing their students. Students are using IT to develop new and different approaches to learning activities and are also more rapidly achieving higher levels of learning. Lower socioeconomic schools perceive IT as a mechanism for creating equity for their students both educationally and in their career prospects. This finding concurs with Emmison and Frow (1998) who maintain that IT is a form of cultural capital without which students are disadvantaged.

The actual use of IT is used as an indicator of effectiveness of IT investments observable when IT is an integral part of the curriculum and a facilitator to teaching and learning; when it has become a transparent learning tool rather than as a separate subject area.

Internal and external audits are conducted to assess the effectiveness of IT and investments. Most schools conduct internal audits as the need arises. Additionally the DoE has mandated that individual teachers assess their PD and learning area IT by conducting annual internal audits. Teachers are expected to
implement at least one new aspect of IT into their curriculum and to be involved in at least one new area of IT training / PD. The University of Melbourne has externally audited many private school’s laptop programs.

Some schools are using Cost Benefit Analysis when making choices between alternatives for large investments eg Network acquisition.

• **Whether there is consensus as to the effectiveness of existing and recommended criteria.**

Although there is not consensus, there is general agreement on what needs to be in place before effectiveness in IT investments can be achieved, and on the indicators of a successful program. The determinants include the Principal, the teachers, curriculum and IT planning, technical support, training and personal development, the school council, the budget, and the learning technologies committee. The indicators are the students, and the actual use of IT.

• **Why some criteria are considered more effective than others.**

Participating schools assert that significant expenditure is essential to establish and maintain an effective IT program, this is also a finding of Rodrigues (1997), Emmison and Frow (1998), Page (1998), and Pollak (1999). However expenditure alone is not a determinant of IT success, this finding concurs with research in the business arena by Hitt and Brynjolfsson (1996). It is clear from the evidence obtained in this research that the key factors to IT investment effectiveness are the teachers and the principal. The reasons for this are varied however they all centre around the fact that quality education comes from students motivated to learn by caring teachers who believe in the value of education, a similar assertion to Noll (1997) in USA.

Teachers are revealed as uppermost in determining IT effectiveness, a factor cited by Rodrigues (1997) in USA and Mansell (1999) in the UK. Regardless of how much is spent, if teachers do not see the educational value of IT they simply will not use it.
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For teachers to recognise the value of IT the Principal has to be actively promoting, adequately funding, and leading by example the drive for IT within the school. The visionary leader championing IT is a crucial factor. This role must be undertaken by the principal, when this responsibility is delegated to a deputy the implementation of IT is significantly slowed. Similar findings are made by Selwyn (1999) of schools in the UK.

Another factor affecting teachers utilisation of IT is the provision of good technical support, if the system is not reliable teachers simply will not use it. The Victorian government is recognising this and has allocated AUSS104 million for technical support in the 1999-2000 budget.

Adequate training and personal development is also important for teachers to maximise any IT investments. This training and PD is most effective when conducted by other teachers.

After the teachers and the principal the next most significant factor is curriculum planning. This involves the eliciting of the schools vision and goals as identified by the principal into curriculum and IT goals. All schools in this research have schools goals identified in their mission statement, and almost all of the schools align these goals with their curriculum and IT goals. Curriculum planning is the task of the learning and technologies committee which is most effective when it has the principal and teachers as members.

The school council and the budget have a symbiotic relationship with the principal. The school council relies on the principal to give guidance on how much and where investments are required. The school council and the principal in turn decide on the budget which must be declared in terms of a percentage of the annual budget and contain plans for the next three years.
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Model of IT Investment Effectiveness Identified

The analysis of previous researchers’ findings together with those in this research, reveal that schools in this survey are utilising the best IT practice cited as relevant in the business literature. IT within these schools is a strategic issue with the goals for IT based on and closely aligned to the goals of the school.

A key finding of the literature review was that IT effectiveness is a multi-dimensional construct which cannot be easily measured, nor is it dependent on a single factor. This research therefore aimed to establish what factors are crucial to IT investment effectiveness in education. An initial set of twenty five key issues was distilled from the interview process with separate issues apparently relating to the same factor eg teachers - as the key to IT effectiveness and - for maximising IT investment effectiveness. These issues were kept separate throughout the Delphi Survey in an attempt to clarify those perceived by the participants as most important to the effectiveness of IT investment within schools. This clarification process proved worthwhile as some factors were rejected by participants eg size of the school, whilst others were given high status eg the Visionary Principal. A final set of ten key issues was elicited with the Principal, the Teachers, and Curriculum Planning as the three issues most highly rated by participants. All of these three contain a combination of several closely related and highly rated issues, see Chapter 4, Table 7: The Final Issues. It is considered that this process of combining issues which are closely related has enhanced the clarity of understanding of the key issues of IT investment effectiveness in education.

The analysis of the key issues was enhanced by the fact that the questions for the original interview questionnaire were based on the findings of previous researchers. Consequently comparisons were more easily made. Careful consideration of these findings indicated that some of the key issues are determinants of IT investment effectiveness whilst others are indicators of that success. The determinants are the Principal, the Teachers, Curriculum Planning, Technical Support, training and Personal Development, the School Council, the Budget and the Learning
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Technologies Committee. The indicators are the Students and the Actual Use of IT. A model for IT investment effectiveness seemed to be emerging from the findings of this research. It was therefore decided to review the findings of previous researchers to see if one of their many and varied models could provide a suitable basis as a model for this current research.

An analysis of the findings of previous researchers revealed that Scott’s MIMIC model (1995), depicted in Figure 4: MIMIC Model, had similarly identified antecedents (determinants) and resultants (indicators) which were used by Scott (1995) to enable a more comprehensive view of IT Effectiveness. Although her model related solely to IT effectiveness it is interesting to note that the determinants of the MIMIC model have three factors (Budget, Staff and Training) in common with the findings of this research. Conversely, Scott’s (1995) indicators - CEO, Management, and Peers are found to be determinants of IT investment effectiveness in this research. These determinants are the Principal (CEO), the School Council and Learning Technologies Committee (Management), and the Teachers (Peers). In spite of the differences between the findings of Scott (1995) and this research it was considered that Scott’s (1995) MIMIC model provided the most appropriate starting point.

Scott’s (1995) MIMIC model was however inadequate to model all of the findings of this research. Careful consideration of the ten key issues revealed that there are clearly identifiable individual and organisational factors which were not able to be identified in any way by Scott’s (1995) model. Similarly, Fink and Tjarka (1994) identified limitations of previous research stating that traditional attempts to measure IT effectiveness were limited by the fact that their scope was too restrictive, they have definitional problems and were ad hoc in their application. They maintained that only four of DeLone and McLean’s (1992) six IT success factors were measures of IT effectiveness. Two of these were individual and organisational impact. Further analysis of DeLone and McLean’s (1992) model revealed that it did not provide the clarification required and was rejected.
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Grover et al (1996) recognised the importance of organisational and individual influences on IT effectiveness. Their Construct Space for IT Effectiveness Model, depicted in Figure 3, elaborated on DeLone and McLean's (1992) model and provided individual (micro) and the organisational (macro) perspectives which were referred to as the Unit of Analysis. The micro view observes the socio-technical provision to the user and the macro view observes the organisation's competitive stance in the market. Grover et al (1996) asserted that the focus of an organisation could be gauged by its perspective stance. Those organisations holding a macro perspective enabled the infusion of IT throughout the organisation visible in its response to its customers and impact on its financial productivity. Those with a micro perspective concentrated their IT on usage, attitudes and the influences upon the users, and productivity. Grover et al (1996) appeared to provide the clarification needed for this research. By indicating whether the indicators and determinants were individual or organisational Grover et al's (1996) interpretation of these perspectives could be employed, thus providing a clearer understanding of the influences on schools which impact on the effectiveness of their IT investments. The organisational perspectives which predominate in the schools in this survey are Curriculum Planning, Technical Support, The Actual Use of IT, Training and Personal Development, the School Council, the Budget and the Learning Technologies Committee. The individual perspectives are the Principals, the Teachers and the students.

The key issues identified by participants were interpreted to be indicators or determinants of IT investment effectiveness using Scott's (1995) MIMIC model as a guide. Similarly the Unit of Analysis from Grover et al's (1996) Construct Space for IT Effectiveness was used to further clarify these issues as exhibiting organisational or individual perspectives (See Figure 9: Model of IT Investment Effectiveness) The arrows on this model indicate the direction of the influence that the key issues have upon each other in some cases this is a symbiotic relationship where the sphere of influence is reciprocated, for example the principal and the school council.

This research revealed that a micro perspective predominates in the schools surveyed as the individual determinants of the Principal and the Teachers are the two most highly ranked issues. The relationship between these two significantly influences IT
investment effectiveness because the Principal is viewed as a Visionary and Champion of IT by the teachers who in turn are able to influence their Principal. This finding appears to indicate that usage, perception and productivity measures are most relevant to IT investment effectiveness in schools. However these two individual determinants are impacted by organisational issues, (See Figure 9 : Model of IT Investment Effectiveness), some of these which they in turn can influence. Thus the macro view of infusion, market and economic measures appear to also hold significance when seeking to establish measures for IT investment effectiveness.

![Diagram of IT Investment Effectiveness]

**Figure 9 : Model of IT Investment Effectiveness**

Training and Personal Development and Technical Support are organisational determinants which impact on Teachers. If teachers are not properly trained, given appropriate opportunities for personal development, nor provided with adequate Technical Support they simply do not use IT. Thus any investment in IT is not effective unless these organisational issues are addressed.
The discussion above indicates that there are individual and organisational issues which are key determinants of IT investment effectiveness. The micro/individual perspectives of the Principal and the Teachers clearly predominate but these can be adversely impacted upon and even negated by macro or organisational issues such as Technical Support and the Budget.

What of the indicators of IT investment effectiveness? At the individual level the Students usage, productivity and perceptions are clear indicators. The organisational indicator is the Actual Use of IT across the school. This is observable in the way that IT is infused throughout the school, the way the school responds to the demands for IT by the students, parents and the government, and finally in the impact IT is having on the school’s viability.

The model depicted in the Model of IT Investment Effectiveness can now be used by schools to assess their IT investment effectiveness.

- Firstly schools need to establish whether they are addressing all ten of the key issues.
- Secondly they should assess the importance placed on these issues by ranking them within their school.
- Does the Principal recognise the strategic importance of IT to the delivery of education by promoting and championing IT? If not this needs to be addressed. Encouraging the Principal to become involved in peer IT meetings and committees is a mechanism whereby schools can assist the Principal in taking on this role. This role is not one of the active user but rather one of a visionary leader promoting IT to staff, creating a network of support and ensuring adequate budgets.
- How are teachers using IT? Is IT a tool to be taught or is it an integral part of the learning process? This can be established by observing the teacher’s pedagogical practices are becoming facilitators rather than controllers of learning?
- Does the training and personal development provided to teachers centre around the need for them to change their pedagogy practices to suit an IT focused learning environment? Does the school recognise the advantage of using other
teachers for this training? Are buddy systems encouraged within the school?

- Does the school have adequate technical support to ensure that the network, hardware and software are reliable?

- Is the IT budget defined as a percentage of the school’s budget? This needs to be between 4%-12% for effective use of IT investments, without this amount long term planning is not possible.

- Do the school council support the IT initiatives? This is discernible by its readiness to allocate a percentage of the school budget to IT and their willingness to fund special IT needs as they arise.

- Is there a Learning Technologies Committee within the school? Does this have the Principal, the Head of Learning Technologies, the Systems Manager and teacher representatives? Are these members IT conversant?

- Does curriculum planning centre on how IT is used within the delivery of teaching and learning and provide direction by making clear the preferred approaches, software tools, and activities? Is the IT planning designed to meet the teaching and learning needs within the school?

- How are the students using IT? Is it enabling them to do routine tasks more readily and thus move onto higher levels of analysis? Are they empowered by IT? Is IT providing equity previously not available?

- How is IT actually used? Is it integrated into the teaching and learning or is it still taught as a subject to be learned?

Conclusion

In basing the interview questions on the findings of various previous researchers in business, small business and education comparisons with the literature were made more distinctly. The schools participating in this research were chosen because of their recognised status as leaders in the area of IT, thus the sample chosen was the elite in the secondary arena. What emerges is a group of organisations that are implementing best business practice in the management of their schools and IT.
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There were strong resemblances to small business with the Principal playing a critical role in the effectiveness of IT investments and external entities such as vendors and suppliers having significant impact on IT.

There is general agreement on what criteria need to be in place ie the key issues for IT effectiveness in investment. No specific approach was discernible in making selection from available choices as each school has unique requirements. This was because schools’ concerns are not at this level rather they are more at the strategic level. The methods used to evaluate IT investment effectiveness include internal and external audits, Cost Benefit Analysis for large investments, and observation of the impacts on students and the way students are learning and teachers are teaching as a result of the implementation of IT.

The participants indicate that some criteria are far more important than others in achieving IT investment effectiveness. The most important issue is having a Principal who is a visionary and a champion of IT. Teachers are uppermost in determining IT effectiveness and need good technical support and readily available and appropriate Personal Development. Curriculum Planning revolves around having a valid Learning Technologies Committee with key stakeholders in the school who are able to make informed decisions on investment based on the goals of the school.

The final Model of IT Investment Effectiveness depicted in Figure 9 was developed from careful analysis of the ten key issues elicited from the interviews and Delphi Survey in conjunction with a review of models developed by other researchers into IT effectiveness. The model gives determinants and indicators like Scott’s MIMIC Model (1995) which enable a more comprehensive view of IT investment effectiveness. Although Scott’s model provided the basis for the model it was found to be inadequate as the key issues revealed in this research were clearly individual or organisational. Grover et al (1996) addressed this in their Construct Space for IT Effectiveness. They maintained that IT effectiveness should be assessed from an explicit viewpoint and to develop a complete picture of IT effectiveness the unit of analysis should consider both organisational and individual perspectives. These
perspectives are included in the final model. In analysing the individual and organisational perspectives it was deemed necessary to indicate what individual and organisational issues were influenced by and had influence upon other issues.

This research reveals that the individual perspectives of the Principal and to a lesser extent the teachers is most significant in schools. However these are clearly impacted on by organisational issues which must be addressed for schools to maximise the effectiveness of their IT investments.

A Model for IT Investment Effectiveness in education has now been developed. This can be used by schools to evaluate the effectiveness of their IT investments. This can be achieved by assessing to what extent they are addressing the key issues and the implications of not doing so. The model also enables schools to determine whether they are utilising an organisational or individual perspective stance and the outcomes achievable from this approach.

The next and final chapter of this thesis gives a summary of the research, indicating the limitations of the research and making recommendations for further research based on the findings to date.
Chapter 6 - Conclusions and Recommendations

Summary of the Research

The interpretive approach selected for this research has revealed insights into the way that schools are conducting their IT and IT investments. The interview process although lengthy, taking at least one hour, was free flowing and participants were eager to ensure that their opinions were clearly understood. The initial rapport created in this environment ensured continuing involvement in the subsequent Delphi Survey. There were thirteen participants interviewed and in both rounds of the Delphi Survey eleven responses were received. Thus the information elicited from the participants is a truly representative sample of the group.

The decision to use the Delphi Survey instead of a Case Study was validated by the inclusion of two new issues not identified by the researcher from the interviews. This process also clarified the group view on the ranking of the issues and the necessity to eliminate some issues raised in the interviews. The possibility of researcher bias was also minimised.

Basing the interview questions on the findings of previous researchers not only gave content validity but made comparisons with the research findings much easier thus justifying the lengthy research process. The researcher would recommend this approach to future researchers.

There is an obvious eagerness in schools for information relating to their IT programs as thirteen of the sixteen schools approached agreed to participate. The researcher had planned on interviewing ten participants.

Using private, Catholic and State schools gave context validity to this research and in the process enabled some interesting comparisons. These suggest relevant areas for future research.
Chapter 6 - Conclusions and Recommendations

This research reveals that the approach to managing IT investment effectiveness within these schools occurs at the strategic level. The final model based on the ten key issues elicited from the research approach indicates that there is a group view on how effectiveness in IT investment can be achieved in the secondary school environment. The issues are clearly ranked as to their importance. The determinants of IT investment effectiveness in education include the following. The principal is most crucial. The key to IT effectiveness is well supported and IT educated teachers. The support includes adequate technical support and personal development on a needs basis. Curriculum planning founded on school goals needs to be undertaken by a Learning Technologies Committee of key stakeholders. IT planning needs to meet the requirements of this curriculum planning. None of these can occur unless there is an adequate budget, which is assigned as an annual percentage of the school’s budget. The school council’s role is significant here, as they need to be conversant with the needs of IT within the school. The principal is influential in assuring that this occurs. The indicators of IT investment effectiveness include organisational and individual factors. The organisational issues include internal and external audits, Cost Benefit Analysis prior to large investments, and observations of how IT is actually being used by students and teachers in the teaching and learning environments. The students are most impacted by IT and thus they are the most significant individual indicators of the effectiveness of investments in IT.

Limitations

This research was undertaken in an attempt to establish whether there were criteria in use by schools to manage the effectiveness of their IT investments. From this it was hoped to ultimately develop a model which could be used by other schools to assess the effectiveness of their IT investments. The approach was to obtain the views on this issue using questions based on researchers’ findings in other areas. This was undertaken in the absence of any adequate instrument available in the education sector. The participants were from schools recognised as experts in the area of IT. The results of these interviews were then evaluated and a list of key issues elicited which were then used in a Delphi Survey to obtain the group view.
Chapter 6 - Conclusions and Recommendations

The limitations of the research are as follows:

- The sample used is extremely small and is not representative of the general school population, rather it is representative of best practice in the industry, secondary school education. Many of the participating schools are involved in pilot projects with external entities including vendors, suppliers, software houses, businesses and government. Thus the results obtained cannot be interpreted as indicative of the opinions of secondary schools as a whole.

- There were only two rounds in the Delphi Survey; thus participants did not have as much opportunity to give feedback as they may have desired. This was indicated by the lengthy comments made by two participants in the second and final round.

Recommendations for Future Research

Further research is needed into the whole area of IT investments in schools. There is a dearth of information and consequently many schools are making investments with little, if any, guidance as to how best to invest.

Recently there has been large expenditure in IT by secondary schools - private, Catholic and State, and the Victorian Government via the DoE. This research has indicated that secondary schools in Victoria are keen to establish mechanisms for assessing the effectiveness of these investments in IT. To date there has been no significant research. There is a need for a large scale across the board research in private, Catholic and State secondary schools. The key issues identified in this research could be used to develop an audit tool for this purpose. This audit tool could be used to conduct a survey in a large number of schools to establish the actual situation across the whole secondary school population.

The interviews revealed many areas where there is a need for wide ranging research across the whole secondary school sector including State, private and Catholic schools.
These include:

- A study into the role of strategic partnerships between schools and IT supplier, vendors, software houses, and networking firms. All State and private schools with laptop programs in this research had strategic partnerships with their laptop vendor/supplier; many also had strategic partnerships with other vendors and suppliers, software houses and networking firms.

- Many of the private schools in this study have had their laptop programs evaluated by the University of Melbourne. A cross school study including State, private and Catholic schools into the effectiveness of laptops would give much useful information to those schools and to schools contemplating the implementation of laptops.

- Research could be undertaken into the significance of the school sector to IT within the business community in Australia. One school indicated that the number of nodes within the network put it into the top 500 companies in Australia. This school was by no means the largest in this study. Does this indicate that schools are significant players in IT in Australia? Research is needed to establish this influence.

- Many of the schools have established cooperative relationships with other schools. These cooperative ventures include State, private, and Catholic schools, schools in other states, and even schools overseas. One school was running an online cooperative learning venture with another school. In the coming year there were to be three schools in this project. Research needs to be undertaken into the implications, benefits and limitations of these IT enhanced cooperative ventures.

- The heads of IT in the private schools have formed a group to support each other with their IT programs, investment decision making etc. The attitude of one participant involved in this group was that “any school who tries to go it alone will fail”. Is this attitude justified? How crucial are these support groups to the success of any IT program? Research is needed to establish how widely spread these groups are and the implications of these groups to the IT effectiveness and investments in schools.

- The role of the principal has changed greatly with the move towards the self-
managed school and the influence of economic rationalism. The role of the principal becoming more like that of the CEO in business. This research indicated that the principal is crucial to the effectiveness of IT investment. This finding needs to be tested on a large sample of schools.
Bibliography

Ainley John, “Effective Schools: Where to from Here?”, Leading & Managing, Volume 1, No. 1, Autumn 1995


Berry John, “Time to Justify IT expenses”, Internetweek, Volume 760, April 12 1999, Page 30

Black George, “Businesses’ spending on technology hits the roof”, Computer Weekly, April 9 1998, Page 14


Cary J.W. and Salmon P.W., "Delphi and Participatory Planning", Agricultural Extension Unit, School of Agriculture and Forestry, University of Melbourne, 1976, Pages 1-10


Conte Christopher, “Technology in Schools: Hip or Hype”, The Education Digest, January 1998, Pages 28-33


Bibliography


Education Victoria, “Provision of IT & T Products and Services to Department of Education Explanatory Overview”, October 1996


Foreshew Jennifer, “IT employers can’t get enough”, The Australian, August 4 1999, Page 22


Bibliography


Low Eugene, “Higher Development Spending not Pump-Priming, but Investment”, Business Times (Singapore), February 27, 1999, Page 6
Bibliography


McGee Kolbasuk Marianne and Mateyaschuk Jennifer, “Educating the Masses” Infoworld, Volume 721, February 15 1999, Pages 61-66


Muhammad Tariq K., “Reading, Writing & RAM”, Black Enterprise, Volume 28 No. 8, March 1998, Pages 72-76


Cecily Mason: Swinburne University of Technology 172
Bibliography


Pollak Andy, “Martin has a taste for reform and a detailed shopping list to go with it”, The Irish Times, August 19 1999, Page 14


Rana Eila, “Pioneers cut cost of online training for smaller firms”. People Management, Volume 5, No. 11, March 3 1999, Pages 16-19

Bibliography


Selwyn Neil, “The Permeation of Information and Communications Technology into 16 to 19 Education”, School Leadership & Management, Volume 19 No. 1, February 1999, Page 143-144
Bibliography


Shannon C.E., and Weaver W., “The mathematical theory of communication”, University of Illinios Press, Urbana, IL, 1949


Stanton Mark, “Getting Started with You or Schools Technology Plan”, Computelec Australia, 1997


Cecily Mason : Swinburne University of Technology 175


Vowler Julia, “It’s more than a simple ROI equation”, Computer Weekly, July 15 1999, Page 40


Weill Dr Peter and Broadbent Dr Marianne, “Infrastructure goes industry specific”, MIS Quarterly, July 1994, Pages 35-39

Weill Peter and Olson Margrethe H., “Managing Investment in Information Technology: Mini Case Examples and Implications”, MIS Quarterly, March 1989, Pages 3-17


Bibliography


Wirszczyz Rob, “More data is needed to cater for small firms’ requirements”, Management Today, February 1998, Page 74-75


Appendix

Appendix 1 - Interview Questions

1. Who is in charge of IT in this school?

2. What is their official role in the school?

3. What percentage of their time is spent in this role?

The following questions relate to how the school’s philosophy affects IT

4. My understanding is that the mission statement / philosophy of the school has the following goals / objectives.
   
   •
   •
   •
   •
   •

Describe how these goals / objectives relate to the goals / objectives of IT in the school?

4.1. If there is a relationship:
   Is this a formal / informal process?
   How is it arrived at?

4.2. If there is no relationship:
   How were your IT goals arrived at?
   What are they?

5. Rank the following goals in order of how they best reflect your school’s utilisation of IT?

   5.1. To improve learning

   5.2. To facilitate collaborative learning

   5.3. To enhance educational opportunities

   5.4. To develop an IT&T conversant workforce

   5.5. To increase parent participation
6. Describe your school’s use of IT. The following terms may be helpful:
   6.1. For gaining Information
   6.2. For automating processes
   6.3. As a tool
   6.4. As an intellectual partner (a mind tool for students to articulate, represent, reflect, support thinking / knowledge)
   6.5. As context (representing problems, situations, beliefs, perspectives, arguments, supporting discourse)

7. Which of the following describe the way teachers are using IT? Give examples.
   7.1. Including themselves in the learning process
   7.2. Integrating IT into their classroom activities
   7.3. Using IT as a tool to be learned
   7.4. Avoiding using IT

8. What educational and technical IT support is available to staff (teaching and administration)?

9. What in-house knowledge is available in the school? Does this create / solve problems?

10. Describe the involvement of the following in IT in the school:
   10.1. The Principal of the school
   10.2. The school’s council
   10.3. The teaching staff
   10.4. The students
   10.5. The administrative staff
   10.6. Vendors / suppliers
   10.7. Consultants
   10.8. Others

11. Rate the level of satisfaction with IT amongst the following:
   11.1. Principals □□□□□
   11.2. Parents □□□□□
Appendix

11.3. Teachers □

11.4. Students □

11.5. Other □

Give reasons for your ratings.

12. Do you think that the IT resources in the school are adequate or inadequate? Give reasons.

13. Can you describe any attempts to subvert IT strategy? How? Where does this usually come from?

14. Are there any additional comments you would like to make with regard to the IT programme in your school?

The following questions relate to IT investment in the school

The school’s annual budget is approximately..........................

15. What proportion of this budget is spent on IT?

16. Is this investment adequate? Why / why not?

17. Give examples to indicate on what your school’s IT investment is based, eg cost effectiveness, academic performance of students, competitive advantage over other schools, to keep up with other schools, etc

18. In business organisations invest to achieve four objectives:
   18.1. To place it in a Strategic position in the marketplace
   18.2. To obtain Information
   18.3. To undertake day to day Transactions
   18.4. To provide Infrastructure support (networks etc)

Which of these objectives are relevant to investments in your school? Why / why not?

19. Rank the following in order of priority for investments in your school? Give an example of each.
   19.1. Utilitarian (for cost savings) □
Appendix

19.2. Enabling (to meet long term requirements)

19.3. Dependent (to meet the school’s objectives / goals)

19.4. Other

20. Rate how relevant the following are to IT investments in your school?


20.1 Create new value

20.2 Make it easier to do business (administration and education)

20.3 Make the school appear bigger

20.4 Differentiate the school from others?

20.5 Recognise and measurably support the goals / objectives of the school

Give reasons.

21. What proportion (in percentage terms) of the IT investments made in the school could be described as

- *infrastructure* (setting up networks, buying software / hardware)

- *using the infrastructure* for educational / administration purposes?

22. Has this changed over the years? How?

23. How are decisions made on investing in IT?

24. How can the current process on making decisions on investments be improved? Give reasons.

25. How long are you given to make decisions on IT investments? Comment on the adequacy of the time given?

26. What role do the following have in investments in IT? Give examples:

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26.1. The Principal of the school
26.2. The school’s council
26.3. The teaching staff
26.4. The students
26.5. The administrative staff
26.6. Others

27. Are there any additional comments you would like to make with regard to the IT investment in your school?

The following questions relate to IT effectiveness

*IT Effectiveness can be defined as “The change in the effectiveness of an organisation that occurs as the result of IT being introduced and used.”*

*Effectiveness is “doing the right things”, those things that reflect the business expectations and recognise the organisational goals which need to be achieved. Effectiveness is doing the things that need to be done to achieve important business results.*

28. From each of the following indicate whether they are determinants of IT effectiveness in your school? Explain why. Indicate whether they are formally measured?

28.1. Budget
28.2. Value
28.3. Staff
28.4. Training
28.5. Number of PCs / terminals
28.6. Others

29. How do the following indicate the effectiveness IT in the school? Give examples: Have you ever tried to measure this effectiveness? How?

29.1. The Principal of the school
29.2. The school’s council
29.3. The teaching staff
29.4. The students
29.5. The administrative staff
29.6. Others
30. Describe how important external support is to the effective use of IT in the school?

31. How does the way the school is managed impact on the effectiveness of IT in your school?

32. How does the size of the school influence the effectiveness of IT?

33. Where can IT make the biggest impact in your school? Explain why.

34. What internal and external influences have adversely impacted upon the effectiveness of IT in your school?

35. Are there any other comments you would like to make with regard to the IT effectiveness in your school?
Appendix

Appendix II – Letter of request to School Principals
(Letterhead of the organisation where the researcher is employed)

Date

Dear,

The name of your school has been given to me as a leader in the area of Information Technology by Paul Doherty, General Manager Information Technology Division Education Victoria. It is for this reason I approach you with a request that you will give approval for your school to participate in my research on IT Effectiveness in Investment in Education. The Curriculum Development and Learning Technologies Section have also requested that I include your school in my research, as they are keen to receive a copy of my findings. The Department of Education has given verbal approval for me to conduct this research, and I am expecting written confirmation in the not too distant future.

I am a Masters student at Swinburne University of Technology undertaking a thesis on Effectiveness in Information Technology Investment in Education. I will be using a modified Delphi approach to obtain information from the person in charge of Information Technology, in a small number of secondary schools in Victoria. This approach requires a consensus to be obtained from a group of “experts” by means of analysis, rejection and inclusion of factors. A model will be developed from the information gathered. It is hoped that this model will be used by secondary schools to evaluate the effectiveness of investments in Information Technology. Thus enabling schools to make better informed decisions on investments in Information Technology and maximise benefits gained from the funds available within schools. All participating schools will be furnished with a copy of the final model.

My request is to be able to interview the person in charge of Information Technology in your school. It is anticipated that the initial interview will take approximately one hour, the trial interviews have indicated that this is a realistic time allocation. On two subsequent occasions the participant will be supplied with a criteria for analysis and feedback. It is expected that this will take a half an hour. It is emphasised that this is to be done at a time convenient to the participant and does not involve my presence at the school. Thus the total time requirements for the participant is anticipated to be two hours.

Attached is a copy of participant’s agreement form, required by research undertaken in Swinburne University of Technology. This explains more fully what the research and approach are about. I will be ringing you in a few days with regard to this request for approval and will look forward to speaking to you then. However if you require any further information prior to this, please do not hesitate to call me on one of the following

Phone: 9564 1770 (W) 9889 5002 (H)
Fax: 9564 1821 (W) 9809 4208 (H)
email: cccilym@holmesglen.vic.edu.au

Yours Sincerely,

Cecily Mason, DipT. BEd. Grad Dip IT. AACS
Advanced Skills Teacher

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Appendix III – Participant Agreement Form

PARTICIPANT AGREEMENT FORM

1. Project Title

   Information Technology Effectiveness in Investment in Education

2. Investigators

   Principal Investigator
   Cecily Mason    Student in Masters of Information Systems
                   School of Information Technology
                   Swinburne University of Technology

   Pamela Simmons  Supervisor
                   Senior Lecturer
                   School of Information Technology
                   Swinburne University of Technology

3. Participants Name

   ........................................................................................................................................

4. Explanation of Project

   The following are the overall aims of the research are to determine:

   Whether intrinsic criteria exist and are used by IS management in the school sector for
   evaluating the effectiveness of IS / IT investments.

   • What criteria are used / recommended for selection from available choices.
   • What criteria are used / recommended for the approach to be taken to investments.
   • What criteria are used / recommended for evaluation of pre / post investment effectiveness
   • Whether there is consensus as to the effectiveness of existing and recommended criteria.
Appendix

• Why some criteria are considered more effective than others.
• Whether the criteria established reflect the findings of previous research found in the literature on IT effectiveness and investment.

By addressing these aims it is anticipated that a model for use in the educational sector to evaluate the effectiveness of investments in IT will be developed.

Research Approach:
Approximately ten Secondary, public, private and Catholic, schools in Victoria are to be involved in this research study. These have been chosen because they are considered to be the “expert” / leading schools in IT in the state.

Approval is to be obtained from the Principal of the school for the person in charge of IT in his / her school to participate. It is stressed that commitment to the project is required for the three stages indicated below:

1. The person in charge of IT in each school will be interviewed to establish views on IT effectiveness and investment within the school.

2. The results of the interviews will be collated and ranked on a list with a Lickert type scale alongside each entry. This form will then be emailed or faxed to each person interviewed at each school. The interviewees will be asked to rank and rate the responses. They will be requested to remove any they think irrelevant and to add any omissions. These removals and additions are to be accompanied by explanations for their removal / inclusion. These responses are to be emailed or faxed back to the Principal Investigator.

3. The results will again be collated and ranked by the Principal Investigator. A second and final round of ranking and responses will be sought from the interviewees.

The final responses will be collated and a model for use in the educational sector to evaluate the effectiveness of investments in IT will be developed. This model will be given to the Principal at each school.

5. Time Required
It is anticipated that the following time will be required by each participant:
• Approximately one hour for the initial interview.
• Approximately two half-hour time slots to rank and rate the resulting lists, and to return them.
6. Potential Benefits

It is anticipated that the resulting model will be able to be used in the educational sector, specifically secondary schools, to evaluate the effectiveness of proposed investments in IT.

This model will be able to be used by schools in maximising the effective use of funds designated for IT in their global budgets.

Schools will also be able to maximise educational benefits to students ensuring that the spending on IT is undertaken in areas with the greatest potential for IT effectiveness.

7. Withdrawal

In the event of unforeseen problems arising from continued participation in the research, the participant is free to withdraw or discontinue. If this occurs it is requested that the participant inform the researcher Cecily Mason of the withdrawal so that other arrangements can be made to ensure continuation of the research.

8. Questions regarding procedures

Any questions regarding the project titled: Information Technology Effectiveness in Investment in Education

can be directed to the Principal Investigator: Cecily Mason

of the Department / School of: Computing Studies

Holmesglen Institute of TAFE

on the telephone number: 9564 1770

9. Complaints

If the participant has any complaints with regard to the way he / she has been treated during the research study, or has a query that the Senior Investigator has been unable to satisfy he / she should write to:

The Chair
Human Experimentation Ethics Committee
Swinburne University of Technology
PO Box 218
HAWTTHORN, VIC, 3122
10. Agreement

I .................................................. have read and understood the information above. Any questions I have asked have been answered to my satisfaction.

I agree to participate in this activity, realising that I may withdraw at any time.

I agree that research data collected for the study may be published or provided to other researchers on the conditions that my name is not used.

Name of Participant

Signature ........................................ Date

Name of Authorised Representative

Relationship to the Participant

or

Position

Signature ........................................ Date

Name of Principal Investigator

Signature ........................................ Date

Signature ........................................ Date
Appendix

Appendix IV – Model #1

“When a bucket of money is not enough”

“One of the things you have to understand about IT is that it changes all the time, you can never say “We’re here!” therefore we have to be learning and investing time, money and intellect all the time to make it work.” - Participant

The following model attempts to identify the critical issues required for secondary schools in Victoria to maximise the effectiveness of investments in IT. It was developed as a process of interaction with Private, State and Catholic secondary schools who are perceived to be the leaders in the area of IT by their peers, Education Victoria, the Department of Catholic Education, vendors, suppliers, consultants, unions and numerous other bodies.

It is hoped that this model will prove useful to Secondary schools when evaluating their IT investment strategy. The utilisation of the critical issues provided in this tool is aimed to assist Secondary schools in this assessment process.

TO THE PARTICIPANTS:

Below is a ranked list of critical issues that have been elicited from the responses given to the interview questions by participants.

Could you please use this list to indicate what you consider to be the most critical issues for secondary schools in maximising the effectiveness of IT investments?

Rate your views on each issue on the scale 1 to 10, where 1 indicates a lowest priority and 10 indicates a highest priority issue. The more important the issue the higher the score. Use the spaces below to assign your ratings. If an issue is of no importance please give it a rating of 0 (zero) and indicate why you think that this issue should be removed from the list. Feel free to change the wording of the issues or modify the rationale. Note when making changes could you please use italics and bold so that these changes are easily identifiable by the researcher.

Space is provided at the end of this form to include any additional issues that you consider important. Please give a rationale and a rating to each of these inclusions.

<table>
<thead>
<tr>
<th>Initial Ranking</th>
<th>Your Rating</th>
<th>Key Issues and their rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>Issue: The Visionary Principal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Principal needs to see the strategic importance of IT to the delivery of education and must be actively promoting it</td>
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<tr>
<td></td>
<td></td>
<td>Thus ensuring adequate budgets and budget approval by the School CouncilProviding the necessary infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Without that top support the school’s got no hope” – Participant</td>
</tr>
</tbody>
</table>

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Appendix

<table>
<thead>
<tr>
<th>Initial Ranking</th>
<th>Your Rating</th>
<th>Key Issues and their rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td></td>
<td><strong>Issue: The Principal – the Champion</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Staff look to the way IT is being promoted in the school and respond positively to the Principal’s lead</td>
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<tr>
<td></td>
<td></td>
<td>• The Principal needs to be strong or can be over-ruled by strong staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“You need a powerful Champion. We didn’t do much until the Principal came on board and bang everything started to happen once the Principal indicated commitment” – Participant</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td><strong>Issue: The Changing Teacher’s Role</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The central focus is having teachers integrate IT into their classrooms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Teachers are increasingly allowing themselves to be part of the learning process by accepting the students momentum towards collaborative learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Most effective uses of IT are found in collaborative projects across subjects</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The teachers’ role is crucial to the success of the IT program” – Participant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Used to be the Sage on the Stage, now it’s the Guide on the Side” – Participant quoting the American Educationalist Jamie McKenzie</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td><strong>Issue: The Teachers – KEY to IT Effectiveness</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The best indicators are how prepared are teachers to use IT, to change, to use it in their courses.</td>
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<tr>
<td></td>
<td></td>
<td>• Teachers are in control of how far opportunities are taken</td>
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<tr>
<td></td>
<td></td>
<td>• They know what’s going on and tell how things are going</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• One of the biggest internal impacts on IT effectiveness is staff negativity and reluctance to use and embrace IT</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Teachers are good indicators of an IT programs success” – Participant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“If you don’t have staff commitment, interest, passion it doesn’t matter how much you spend” – Participant</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td><strong>Issue: The Starting Point – NOT the IT,Teacher</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The initial IT focus in a school should be in a Non-IT area. Non-IT teachers are the best at seeing the possibilities of IT because they are more lateral thinkers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Best success started in English, Art, Humanities and the Library (Resource Centre) areas</td>
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<tr>
<td></td>
<td></td>
<td>• Worst disasters when IT staff started programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IT literate teachers are often not the people using IT in their pedagogical practices</td>
</tr>
</tbody>
</table>
### Appendix

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<thead>
<tr>
<th>Initial Ranking</th>
<th>Your Rating</th>
<th>Key Issues and their rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Rationale:</strong> <em>“These IT people they’re away with the tweeties”</em> - Participant</td>
</tr>
</tbody>
</table>

6. **Issue: The Teachers Maximising IT Investment**
- Teachers have a crucial role in IT investments in deciding what sorts of hardware and software are needed and used.
- Because IT investments should focus on learning outcomes and curriculum.
- A Learning Technology Committee with teacher representatives and input from teachers via their curriculum area is vital to IT investment decision making.

**Rationale:** *“You need an educational focus not a hardware focus”* – Participant

7. **Issue: The Budget**
- An adequate budget is vital.
- Programs will not go forward without it.
- The budget dictates how much can be done and when it can be done.
- To be able to plan effectively a percentage of the School’s annual budget needs to be allocated every year, a range from 3.4% - 12% was indicated as adequate.

**Rationale:** *“If you don’t resource well it won’t happen”* – Participant

8. **Issue: Training and Personal Development (PD)**
- Without trained staff IT effectiveness cannot be maximised.
- Personal development is more important than training.
- Teachers do not respond well to being taught by administration staff, far prefer to be taught by peers.
- Buddy Systems go extremely well in developing teacher’s knowledge and skill level.
- Teachers in the secondary arena are more subject oriented thus big changes needed in teaching practices to maximise the effectiveness of IT.
- Providing teachers with laptops is a good investment because it creates a significant improvement in their utilisation and confidence in using IT. This in turn is reflected in more effective use of IT in the learning environment.

**Rationale:**
*“The biggest problem is changing teachers pedagogical practices to suit the learning situation of today”* – Participant
*“Get staff to show what they have done has the greatest impact in terms of use in schools”* – Participant
<table>
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<tr>
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<tbody>
<tr>
<td>9.</td>
<td></td>
<td><strong>Issue: The Learning Technologies Committee – The Decision Makers</strong></td>
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<tr>
<td></td>
<td></td>
<td>- It is considered vital to have a Learning Technologies committee whose role is to create a Learning Technologies Plan on which IT investment is based</td>
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<tr>
<td></td>
<td></td>
<td>- The plan should be 3 years ahead at all times.</td>
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<td></td>
<td></td>
<td>- Powerful stakeholders such as the Principal, Heads of Schools, the Director of Learning Technologies plus the System Manager should be on this committee</td>
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<td></td>
<td>- This committee should not be too big eg 12 or more, 4-6 ideal</td>
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<td></td>
<td>- The timelines on decision making should be realistic. eg “One week to design a network is unrealistic.”</td>
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<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“IT effectiveness has significantly improved now it has a firm statement of vision and purpose, and senior management commitment” – Participant</td>
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<tr>
<td>10.</td>
<td></td>
<td><strong>Issue: Technical Support</strong></td>
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<tr>
<td></td>
<td></td>
<td>- Adequate technical staff is critical to the effective use of IT.</td>
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<td>- If the network is not working the school is inoperable.</td>
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<td>- The industry ratio for technical support in a Windows environment is 1 technician per every 50-75 staff, very few schools have anywhere near this ratio.</td>
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<td></td>
<td>- The following is not an uncommon example – a school with 200 PCs and 20 laptops plus a PC for every administrative staff (all running windows) has one full-time technician who manages the network, provides laptop support, repairs the PCs and installs all software.</td>
</tr>
<tr>
<td></td>
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<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
<td></td>
<td>“If it doesn’t work the staff (teachers) won’t use it” – Participant</td>
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<td>“There is a lot lumped on just a few people and it is only through enormous goodwill that it works” – Participant</td>
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<td>11.</td>
<td></td>
<td><strong>Issue: The Value of IT</strong></td>
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<tr>
<td></td>
<td></td>
<td>- The perceived value of IT partially determines IT effectiveness</td>
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<td></td>
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<td>- This value is viewed as the educational value as perceived by teachers</td>
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<td>- It relates to the ways that teachers adopt IT</td>
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<td>- Any investments not perceived as having educational value by teachers will not be fully utilised</td>
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<td></td>
<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
<td></td>
<td>“If teachers don’t see IT as having educational value they will only give it lip service” – Participant</td>
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</table>
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<tr>
<td>12.</td>
<td></td>
<td><strong>Issue: The Students – IT’s Biggest Impact</strong></td>
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<td></td>
<td>- The biggest impact that IT has is in changing the way students learn and teachers teach.</td>
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<td>- IT enables the students to do the routine tasks quicker and thus get to higher levels of analysis.</td>
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<td>- IT provides opportunities previously not there.</td>
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<td></td>
<td>- Students are <em>empowered</em>, enhancing their skills, confidence and learning ability.</td>
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<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
<td></td>
<td>“IT gives all the students equality of access to resources and enforces them in the process” – <em>Participant</em></td>
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</table>

| 13.             |             | **Issue: Strategic Partnerships** |
|                 |             | - All schools running Laptop programs have *strategic partnerships* with their suppliers. The suppliers provide staffing for the repair and maintenance of laptops, training and technology. These are important to managing these laptop programs. |
|                 |             | - Strategic partnerships can also be mutually advantageous in the provision of networks and software. They provide schools to pilot technology they could not otherwise afford. |
|                 |             | - It is necessary to be prepared to change strategic partners. Many schools had. |
|                 |             | **Rationale:** |
|                 |             | “Any school that tries to do without it (Strategic Partnerships) will fail” – *Participant* |
|                 |             | “A Win Win relationship for both of us” – *Participant* |

| 14.             |             | **Issue: Laptop Programs** |
|                 |             | - Compulsory purchase of Laptops by students creates problems with incompatible hardware and software, because parents refuse to buy the recommended machine and refuse to upgrade machines when requested. |
|                 |             | - Frequently teachers have to create several versions of the same worksheet for the different machines and software versions. Teachers are therefore not able to maximise the effectiveness IT offers. |
|                 |             | - It is more effective in IT for the schools to lease laptops and pass this cost on to parents than to allow parents to purchase laptops. |
|                 |             | - School provided laptops are useful in collaborative learning projects where a small group of students share a laptop. |
|                 |             | **Rationale:** |
|                 |             | “Where every child has a Laptop that they can use in school they become little islands, working in their own little area” – *Participant* |
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<td></td>
<td><strong>Issue: Consultant Utilisation</strong></td>
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<td></td>
<td>- Consultants are an effective way of obtaining specialist programming, network expertise and training not readily available in schools</td>
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<td>- Consultants are also useful in decision making on investments as they can provide important background research information</td>
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<td></td>
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<td>- Key note speakers are frequently used for staff PD</td>
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<td>- Parents can be good sources of IT expertise when major investment decisions are under consideration.</td>
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<td></td>
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<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
<td></td>
<td>“Only use 'em when we have to” – Participant</td>
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<td>16.</td>
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<td><strong>Issue: Size of School</strong></td>
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<td></td>
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<td>- The size of the school is not significant but the larger the school the greater the budget and this enables more flexibility with the budget. Large schools are maximising class numbers, the saving on staffing costs is then directed to IT expenditure.</td>
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<td>- The critical size is 700 students anything less than this would prevent acquisition of resources to access IT, a lack of expertise in the staff and a lack of technical support.</td>
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<td>- Smaller schools are more easily managed and flexible and so enable more interesting things to happen. It is easier to get direct links between subjects.</td>
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<td>- Schools with more than one campus have high infrastructure costs in networking the sites.</td>
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<td></td>
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<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Doesn’t alter the effectiveness but alters the way things are done” – Participant</td>
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<tr>
<td>17.</td>
<td></td>
<td><strong>Issue: Role of School Council</strong></td>
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<tr>
<td></td>
<td></td>
<td>- The School Council has considerable power over how effective IT is in a school as it is the final arbitrators of the school’s budget.</td>
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<td>- It has played a significant role in IT direction by the decisions it makes eg for laptop programs and selection of Principal perceived as a leader in IT.</td>
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<td>- Once the School Council has confidence in the IT program it generally does not challenge the expenditure and is very supportive.</td>
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<td>- Provides an ongoing percentage of the school’s budget for IT.</td>
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<td>- Generally rely on the Principal for guidance on these IT investment decisions.</td>
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<td><strong>Rationale:</strong></td>
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<tr>
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<td></td>
<td>“Not just rubber stampers, incredibly supportive, very good in assisting in business plans etc” – Participant</td>
</tr>
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</table>
# Appendix

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<tr>
<td>18.</td>
<td></td>
<td><strong>Issue: Basis of Investment</strong></td>
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<tr>
<td></td>
<td></td>
<td>- <em>Academic performance</em> is the most important basis for investment.</td>
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<td>- <em>Cost effectiveness</em> and <em>Competitive advantage</em> are the next most important.</td>
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<tr>
<td></td>
<td></td>
<td>- <em>Quality outcomes</em> for the students are also important.</td>
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<td></td>
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<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
<td></td>
<td>“IT is a means of motivating otherwise unmotivated students” – <em>Participant</em></td>
</tr>
<tr>
<td>19.</td>
<td></td>
<td><strong>Issue: Objectives of Investments</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- In business companies invest to <em>place it in a strategic position in the marketplace</em>, or to <em>provide infrastructure</em>, or to <em>obtain information</em> or to <em>undertake day to day transactions</em>. Usually one is clearly the most important.</td>
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<tr>
<td></td>
<td></td>
<td>- In education schools invest for <em>all</em> the above reasons almost equally.</td>
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<tr>
<td></td>
<td></td>
<td>- * Provision of an infrastructure* was important to all schools</td>
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<tr>
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<td></td>
<td>- The core objective for investment in IT in most Private schools was to <em>place it in a strategic position in the market place</em>.</td>
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<td></td>
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<td>- <em>Obtaining information</em> in State schools largely revolves around the demands of the DOE.</td>
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<tr>
<td></td>
<td></td>
<td>- Finally the <em>day to day transactions</em> relate to the needs of the Administration.</td>
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<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
<td></td>
<td>“Couldn’t live without them” (all four objectives) - <em>Participant</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re the Provision of the Infrastructure “If the network is unreliable it won’t happen.” – <em>Participant</em></td>
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<tr>
<td>20.</td>
<td></td>
<td><strong>Issue: Infrastructure vs Non-Infrastructure Investments</strong></td>
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<tr>
<td></td>
<td></td>
<td>- Infrastructure costs are significantly higher and ongoing with the necessity to continually upgrade both hardware and software.</td>
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<td></td>
<td>- Infrastructure Costs are usually 60% and non-infrastructure 40%</td>
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<tr>
<td></td>
<td></td>
<td>- Initial infrastructure costs can be as high as 100% of the IT Budget.</td>
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<td></td>
<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“In the first years higher on infrastructure” – <em>Participant</em></td>
</tr>
<tr>
<td>21.</td>
<td></td>
<td><strong>Issue: Numbers of PCs</strong></td>
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<tr>
<td></td>
<td></td>
<td>- The number of PCs available for students is crucial, in investment terms, until a threshold is reached.</td>
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<tr>
<td></td>
<td></td>
<td>- Once this threshold is reached it is relatively unimportant</td>
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### Appendix

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<tbody>
<tr>
<td>Rationale :</td>
<td></td>
<td>&quot;You've got to give access to students and staff not the latest <em>Gee Wizz!</em>&quot; – Participant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Access to equipment is the biggest challenge&quot; – Participant</td>
</tr>
</tbody>
</table>
| 22.             | Issue : The Actual use of IT | ▪ Students using IT as a tool to assist in research, as a means of enhancing the presentation of their work, and to assist in mundane tasks. Schools are investing in areas which maximise these opportunities.  
▪ The most effective use of IT is when it becomes an intellectual partner for the teachers and students and is integrated into the learning process. Not offered as a tool to be taught. |
|                 | Rationale : | "IT is offering opportunities, enhances learning and teaching not previously available" – Participant |
| 23.             | Issue : Administration Staff – Efficiency not Effectiveness | ▪ The Administrative use of IT provides gains in efficiency.  
▪ More important to spend in educational arena than in administration |
|                 | Rationale : | "Efficiency gains, things like shifted to email, no paper memos. therefore very easy for front staff to manage." – Participant |
| 24.             | Issue : The Teachers – The Luddites | ▪ There are always the few (5% to 10%) who are unwilling to use IT in their classrooms.  
▪ Four strategies are used for dealing with them – sack them, threaten to sack them if they don’t use IT, ignore them, give them time and PD (personal development) training to adjust (a slow process). |
|                 | Rationale : | "Some staff do not want to use it until they are sure that it will work" |
| Others          |             |                                |
Appendix

Appendix V – Model #2

TO THE PARTICIPANTS:

NOTE: This is the second and your final opportunity to give feedback.

Below is a ranked list of critical issues that have been elicited from the rating of the key issues by you and the other participants. Additional Comments and two additional issues have been inserted in bold and italics for easy identification by you.

You will note the insertion of an additional three new columns. These are:

1. **Group Rating Model#1** – This is the median rating derived from the ratings provided by all the participants.
2. **Your Rating Model#1** – This is your initial rating.
3. **Your Revised Rating** - A Blank column for you to insert your revised rating. This column is also used by you to insert agree or disagree with the additional comments and issues.

Could you please indicate whether you agree or not with the additional comments and two additional issues raised by other participants, by typing agree or disagree in the Your Revised Rating column?

Also could you please use this list to rate the key issues for secondary schools in maximising the effectiveness of IT investments? **Rate** your views on each issue on the scale 1 to 10, where 1 indicates a lowest priority and 10 indicates a highest priority issue. The more important the issue the higher the score. Assign your ratings in the spaces in the Your Revised Rating column. If an issue is of no importance please give it a rating of 0 (zero) and indicate why you think that this issue should be removed from the list. Feel free to change the wording of the issues or modify the rationale. Note when making changes could you please use **bold** so that these changes are easily identifiable by the researcher.

Space is provided at the end of this form to include any additional issues that you consider important. Please give the rationale for each of these inclusions.

<table>
<thead>
<tr>
<th>Initial Ranking</th>
<th>Group Rating Model#1</th>
<th>Your Rating Model#1</th>
<th>Your Revised Rating</th>
<th>Key issues and their rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>10</td>
<td></td>
<td></td>
<td><strong>Issue: The Visionary Principal</strong></td>
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<td></td>
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<td></td>
<td>The Principal needs to see the strategic importance of IT to the delivery of education and must be actively promoting it</td>
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<td><strong>Additional Comments:</strong></td>
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<td>Replace “The Principal” with “A member of the Principal Class” (Participant #5)</td>
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<td></td>
<td>Thus ensuring adequate budgets and budget approval by the School Council</td>
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<td></td>
<td>Providing the necessary infrastructure</td>
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<td></td>
<td><strong>Rationale:</strong></td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>“Without that top support the school’s got no hope”</td>
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Cecily Mason : Swinburne University of Technology
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<td></td>
<td><strong>Additional Comments:</strong></td>
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<td><em>A Principal with vision is proactive instead of reactive. Being reactive means you are always 10 steps behind.</em> (Participant #1)</td>
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<td>3.</td>
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<td></td>
<td><strong>Issue: The Changing Teacher’s Role</strong></td>
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<td></td>
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<td></td>
<td></td>
<td>- The central focus is having teachers integrate IT into their classrooms</td>
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<td>- Teachers are increasingly allowing themselves to be part of the learning process by accepting the students momentum towards collaborative learning</td>
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<td></td>
<td>- Most effective uses of IT are found in collaborative projects across subjects</td>
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<td></td>
<td><strong>Rationale:</strong> “The teachers’ role is crucial to the success of the IT program” – Participant</td>
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<td>“Used to be the Sage on the Stage, now it’s the Guide on the Side” – Participant quoting the American Educationalist Jamie McKenzie</td>
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<td></td>
<td><strong>Additional Comments:</strong> Getting staff to accept this is the biggest problem and yet it has become a key to good learning practice. Maintaining 19th Century teaching styles just won’t work with students today. (Participant #1)</td>
</tr>
<tr>
<td>4.</td>
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<td></td>
<td><strong>Issue: The Teachers – KEY to IT Effectiveness</strong></td>
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<tr>
<td></td>
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<td></td>
<td>- The best indicators are how prepared are teachers to use IT, to change, to use it in their courses.</td>
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<td>- Teachers are in control of how far opportunities are taken</td>
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<td>- They know what’s going on and tell how things are going</td>
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<td></td>
<td>- One of the biggest internal impacts on IT effectiveness is staff negativity and reluctance to use and embrace IT</td>
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<td></td>
<td><strong>Rationale:</strong> “Teachers are good indicators of an IT programs success” – Participant</td>
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<td></td>
<td></td>
<td>“If you don’t have staff commitment, interest, passion it doesn’t matter how much you spend” – Participant</td>
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<td></td>
<td><strong>Additional Comments:</strong> The staff spectrum is very wide. While this issue is important, it is watered down somewhat by varying</td>
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<td><strong>skills and commitment. It is NOT the only driving force in Education, despite what IT teachers may think. For effective IT style teaching, you have to look past the staff because their involvements and interests are much broader than IT.</strong> (Participant#1)</td>
</tr>
</tbody>
</table>

### 2. Issue: The Principal – the Champion
- Staff look to the way IT is being promoted in the school and respond positively to the Principal’s lead
- The Principal needs to be strong or can be over-ruled by strong staff

**Additional Comments:**
The Principal or an empowered member of staff(?)
(Participant #11)

**Rationale:**
"You need a powerful Champion. We didn’t do much until the Principal came on board and bang everything started to happen once the Principal indicated commitment" – Participant

**Additional Comments:**
As with the Visionary Principal. Someone with ‘authority’ must be pushing from behind. The Principal must keep the staff in front. A good leader makes sure the staff (or at least some) are in front. They become the leaders of other staff.
(Participant #1)

### 8. Issue: Training and Personal Development (PD)
- Without trained staff IT effectiveness cannot be maximised
- Personal development is more important than training (Delete Participant #4)
- Teachers do not respond well to being taught by administration staff, far prefer to be taught by peers.
- Buddy Systems go extremely well in developing teacher’s knowledge and skill level
- Teachers in the secondary arena are more subject oriented thus big changes needed in teaching practices to maximise the effectiveness of IT
- Providing teachers with laptops is a good investment because it creates a significant improvement in their utilisation and confidence in using IT. This in turn is reflected in more effective use of IT in the learning environment.
### Appendix

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**Rationale:**

"The biggest problem is changing teachers pedagogical practices to suit the learning situation of today" – Participant

"Get staff to show what they have done has the greatest impact in terms of use in schools" – Participant

**Additional Comments:**

No program will work without good, solid work with staff first. Programs that start with hardware and students never really succeed because staff are on the back foot and will retreat rather than be put in a position where they have NO control at all. Even with the new methodologies for teaching practice, it requires the teacher to decide to become the facilitator. **They have that control. By pushing them into a position where students wrest that from them by virtue of the fact that students have the skills the teacher lacks is a recipe for disaster. The teacher will retreat to what they know, probably ‘chalk and talk’. (Participant #1)**

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**Issue: Technical Support**

- Adequate technical staff is critical to the effective use of IT.
- If the network is not working the school is inoperable.
- The industry ratio for technical support in a Windows environment is 1 technician per every 50-75 staff, very few schools have anywhere near this ratio.
- The following is not an uncommon example – a school with 200 PCs and 20 laptops plus a PC for every administrative staff (all running windows) has one full-time technician who manages the network, provides laptop support, repairs the PCs and installs all software.

**Additional Comments:**

Can run without a network. Network can be more trouble than it is worth (Participant #5)

**Rationale:**

"If it doesn’t work the staff (teachers) won’t use it" – Participant

"There is a lot lumped on just a few people and it is only through enormous goodwill that it works”

**Additional Comments:**

What is ‘adequate’?? The more you provide, the more is required. It can become a bottomless pit. But, good tech support is crucial. Staff get dispirited very
### Appendix

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<td>quickly. <em>An IT program can die very easily through lack of support.</em> (Participant #1)</td>
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<td><strong>Issue : The Students – IT’s Biggest Impact</strong></td>
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<td>- The biggest impact that IT has is in changing the way students learn and teachers teach.</td>
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<td>- IT enables the students to do the routine tasks quicker and thus get to higher levels of analysis</td>
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<td>- IT provides opportunities previously not there</td>
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<td>- Students are <strong>empowered</strong>, enhancing their skills, confidence and learning ability.</td>
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<td><strong>Rationale :</strong></td>
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<td></td>
<td>“IT gives all the students equality of access to resources and enthuses them in the process” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td>Replace “equality of access” with there is an Equity Issue”</td>
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<td>An easy one. 90% of students WANT IT. So long as it meets their needs for ‘entertainment’, the program will work. If it is tedious, though, they will hate it. On the whole, it is not much of an issue. (Participant #1)</td>
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<td>17.</td>
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<td><strong>Issue : Role of School Council</strong></td>
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<td>- The School Council has considerable power over how effective IT is in a school as it is the final arbitrators of the school’s budget.</td>
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<td>- It has played a significant role in IT direction by the decisions it makes eg for laptop programs and selection of Principal perceived as a leader in IT.</td>
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<td>- Once the School Council has confidence in the IT program it generally does not challenge the expenditure and is very supportive.</td>
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<td>- Provides an ongoing percentage of the school’s budget for IT.</td>
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<td>- Generally rely on the Principal for guidance on these IT investment decisions.</td>
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<td><strong>Rationale :</strong></td>
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<td></td>
<td></td>
<td>“Not just rubber stampers, incredibly supportive, very good in assisting in business plans etc” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td>Can work for you or against you. If they have personal axes to grind....... (Participant #1)</td>
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## Appendix

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<td>22.</td>
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<td><strong>Issue: The Actual use of IT</strong></td>
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<td>- Students using IT as a tool to assist in research, as a means of enhancing the presentation of their work, and to assist in mundane tasks. Schools are investing in areas, which maximise these opportunities.</td>
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<td>- The most effective use of IT is when it is becomes an intellectual partner for the teachers and students and is integrated into the learning process. Not offered as a tool to be taught.</td>
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<td><strong>Rationale:</strong></td>
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<td></td>
<td>“IT is offering opportunities, enhances learning and teaching not previously available” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td>When you don’t notice students using it, because it is just part of what they are doing, then you have a successful program. It should not be an end in itself. (Participant #1)</td>
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<td><strong>Issue: The Starting Point – NOT the IT Teacher</strong></td>
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<td>- The initial IT focus in a school should be in a Non-IT area. Non-IT teachers are the best at seeing the possibilities of IT because they are more lateral thinkers.</td>
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<td>- Best success started in English, Art, Humanities and the Library (Resource Centre) areas</td>
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<td>- Worst disasters when IT staff started programs</td>
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<td>- IT literate teachers are often not the people using IT in their pedagogical practices</td>
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<td><strong>Rationale:</strong></td>
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<td>“These IT people they’re away with the tweeties” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td>suffer from “techno lust” (Participant #5)</td>
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<td><strong>Very definitely. The teachers must ‘own’ their teaching styles and methods. They won’t do this if it is perceived to be a specialist area. By starting the flow of new methods from non-IT areas, staff are more likely to comprehend the usefulness and diversity of these new methods of teaching and learning.</strong> (Participant #1)</td>
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<td>Issue : The Teachers Maximising IT Investment</td>
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<td>- Teachers have a crucial role in IT investments in deciding what sorts of hardware and software are needed and used (Delete Participant #4)</td>
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<td>Additional Comments:</td>
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<td>Teachers have a crucial role in leading the vision of what can be done. The IT professionals would source the hardware and software to meet the teachers proposed outcomes (Participant #12)</td>
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<td>- Because IT investments should focus on learning outcomes and curriculum</td>
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<td>- A Learning Technology Committee with teacher representatives and input from teachers via their curriculum area is vital to IT investment decision making.</td>
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<td>Additional Comments:</td>
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<td></td>
<td>Replace “A” with “An educated” - Participant #11</td>
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<td>Rationale:</td>
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<td>“You need an educational focus not a hardware focus” – Participant</td>
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<td>Additional Comments:</td>
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<td>Good in concept but often not very practical. Especially when the teacher reps often begin by saying “I don’t know much about computers...”. While it is important that they have input and feel they make a difference, the reality is that those who have the skills often manoeuvre the majority into decisions those more expert in the field decide upon. The input from teachers is important in that it maintains the focus on curriculum. The danger is that they will try to make decisions they are not qualified to make. (Participant #1)</td>
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<td></td>
<td>Issue : The Budget</td>
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<td>- An adequate budget is vital.</td>
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<td>- Programs will not go forward without it.</td>
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<td>- The budget dictates how much can be done and when it can be done.</td>
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<td>- To be able to plan effectively a percentage of the School’s annual budget needs to be allocated every year, a range from 3.4% - 12% was indicated as adequate.</td>
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<td>Rationale:</td>
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<td></td>
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<td>“If you don’t resource well it won’t happen” – Participant</td>
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*We all look for the golden fleece. We NEVER have enough though. Part of the struggle to maintain a good program is to do it despite the constraints of budget. The worst programs have been the well-funded ones. They tend to be top heavy on resources and light on real, long lasting impact. The place where there can never be enough money is professional development. Put the most money in the best resource, people. (Participant #1)*

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**Issue: The Learning Technologies Committee – The Decision Makers**

- It is considered vital to have a Learning Technologies committee whose role is to create a Learning Technologies Plan on which IT investment is based.
- The plan should be 3 years ahead at all times.
- Powerful stakeholders such as the Principal, Heads of Schools, the Director of Learning Technologies plus the System Manager should be on this committee.
- This committee should not be too big eg 12 or more. 4-6 ideal.
- The timelines on decision making should be realistic. eg “One week to design a network is unrealistic.”

**Rationale:**

“IT effectiveness has significantly improved now it has a firm statement of vision and purpose. And senior management commitment” — Participant

**Additional Comments:**

*It is important to plan and develop direction. This is tied to the ‘Visionary’ Principalas well. A committee can formulate everything they want, but it goes nowhere........ (Participant #1)*

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**Issue: Basis of Investment**

- *Academic performance* is the most important basis for investment.
- *Cost effectiveness* and *Competitive advantage* are the next most important.
- *Quality outcomes* for the students are also important.

**Rationale:**

“IT is a means of motivating otherwise unmotivated...”
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<td></td>
<td><strong>students” - Participant</strong></td>
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<td><strong>Additional Comments:</strong></td>
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<td>Offers more choices for learning and to meet different learning needs. (Participant #11)</td>
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<td>Need to be supportive, but that’s all. (Participant #5).</td>
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<td><strong>Ultimately, what do we want to achieve? Jobs? Life-long learning? Social position? Forget the rhetoric of the school, look at what comes out the other end. (Hidden agenda) then decide whether the use of IT has enhanced the ‘real’ aims of the school.</strong> (Participant #1)</td>
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<tr>
<td>Issue : Numbers of PCs</td>
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<td>• The number of PCs available for students is crucial, in investment terms, until a threshold is reached.</td>
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<td>• Once this threshold is reached it is relatively unimportant <em>(Delete Participant #4)</em></td>
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<td>Rationale :</td>
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<td>“You’ve got to give access to students and staff not the latest <em>Gee Wiz!</em>” - Participant</td>
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<td>“Access to equipment is the biggest challenge” - Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td>While some schools achieve incredible results with very little, the expectation is that if a teacher wants the class to use IT, it should be there and available WHEN they want it. (Participant #1)</td>
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<tr>
<td>Issue : The Value of IT</td>
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<td>• The perceived value of IT partially determines IT effectiveness</td>
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<td>• This value is viewed as the educational value as perceived by teachers</td>
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<td>• It relates to the ways that teachers adopt IT</td>
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<td>• Any investments not perceived as having educational value by teachers will not be fully utilised</td>
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<tr>
<td><strong>Additional Comments:</strong></td>
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<td>IT should not be seen as a separate identity. A curriculum programme has come of age when it is seamless. The curriculum outcome / process must determine how a unit is taught and if IT is the most effective medium it should be employed! (Participant #12)</td>
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<td>Relates to Issues No. 4 (Participant #5)</td>
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<td><strong>Rationale:</strong></td>
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<td></td>
<td>“If teachers don’t see IT as having educational value they will only give it lip service” – Participant</td>
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<td><strong>Additional Comments:</strong> Concepts of value are very subjective. You have to work around the fact that at least 40% of staff will not value IT in the curriculum and will resist it. (Participant #1)</td>
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<td><strong>Issue: Infrastructure vs Non-Infrastructure Investments</strong></td>
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<td>- Infrastructure costs are significantly higher and ongoing with the necessity to continually upgrade both hardware and software.</td>
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<td>- Infrastructure Costs are usually 60% and non-infrastructure 40%</td>
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<td>- Initial infrastructure costs can be as high as 100% of the IT Budget.</td>
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<td><strong>Additional Comments:</strong> Not necessarily. Delete (Participant #5)</td>
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<td><strong>Rationale:</strong></td>
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<td>“In the first years higher on infrastructure” – Participant</td>
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<td><strong>Additional Comments:</strong> Hardware and staffing for support. The smallest amount is actually spent on software(Participant#1)</td>
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<td><strong>Issue: Strategic Partnerships</strong></td>
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<td>- All schools running Laptop programs have strategic partnerships with their suppliers. The suppliers provide staffing for the repair and maintenance of laptops, training and technology. These are important to managing these laptop programs.</td>
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<td>- Strategic partnerships can also be mutually advantageous in the provision of networks and software. They provide schools to pilot technology they could not otherwise afford.</td>
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<td>- It is necessary to be prepared to change strategic partners. Many schools had.</td>
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<td><strong>Additional Comments:</strong> To what end? (Participant #5)</td>
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<td></td>
<td><strong>Rationale:</strong></td>
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<td></td>
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<td></td>
<td>“Any school that tries to do without it (Strategic Partnerships) will fail” – Participant</td>
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</table>
## Appendix

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<thead>
<tr>
<th>Initial Ranking</th>
<th>Group Rating Model#1</th>
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<th>Your Revised Rating</th>
<th>Key issues and their rationale</th>
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<td>“A Win Win relationship for both of us” – Participant</td>
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</table>

### Issue: Objectives of Investments

- In business companies invest to *place it in a strategic position in the marketplace*, or to *provide infrastructure*, or to *obtain information* or to *undertake day to day transactions*. Usually one is clearly the most important.
- In education schools invest for *all* the above reasons almost equally.
- *Provision of an infrastructure* was important to all schools
- The core objective for investment in IT in most Private schools was *to place it in a strategic position in the marketplace*.

**Additional Comments:**
Not necessarily – most parents want the education they had!! (Participant #12)
- *Obtaining information* in State schools largely revolves around the demands of the DOE.
- Finally the *day to day transactions* relate to the needs of the Administration.

**Additional Comments:**
True but not important (Participant #5)

**Rationale:**
- “Couldn’t live without them” (all four objectives) – Participant
  - Re the Provision of the Infrastructure “If the network is unreliable it won’t happen.” – Participant

**Additional Comments:**
As above, comments for Issue: Basis of Investment (Participant #1)

<table>
<thead>
<tr>
<th>23.</th>
<th>6</th>
<th></th>
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<th><strong>Issue: Administration Staff – Efficiency not Effectiveness</strong></th>
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<tbody>
<tr>
<td></td>
<td></td>
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<td>• The Administrative use of IT provides gains in efficiency.</td>
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<td>• Interesting the administrative use of IT is not</td>
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<td>important to IT effectiveness.</td>
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<td>• More important to spend in educational arena</td>
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<td>than in administration</td>
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### Appendix

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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td><em>Re last point - Needs both — (Participant #11)</em></td>
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<td></td>
<td><em>True (Participant #5)</em></td>
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<td><em>Delete (Participant #4)</em></td>
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<td><strong>Rationale:</strong></td>
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<td>&quot;Efficiency gains, things like shifted to email, no paper memos, therefore very easy for front staff to manage.&quot; — Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td><em>Depends on the individual. The better staff take to IT and use it effectively and efficiently.</em> (Participant #1)</td>
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<td><strong>Issue: The Teachers — The Luddites</strong></td>
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<td>- There are always the few (5% to 10%) who are unwilling to use IT in their classrooms.</td>
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<td>- Four strategies are used for dealing with them — <em>sack them, threaten to sack them if they don't use IT, ignore them</em>, give them time and PD (personal development) training to adjust (a slow process).</td>
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<td><strong>Additional Comments:</strong></td>
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<td><em>Delete the highlighted words (Participant #4)</em></td>
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<td><em>Not an inhibiting factor (Participant #5)</em></td>
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<td><strong>Rationale:</strong></td>
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<td>&quot;Some staff do not want to use it until they are sure that it will work&quot; — Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td><em>If they can be kept in a very small minority, they tend to get tolerated and treated as 'museum exhibits' by other staff and students.</em> (Participant #1)</td>
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<td>16.</td>
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<td><strong>Issue: Size of School</strong></td>
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<td>- The size of the school is not significant but the larger the school the greater the budget and this enables more flexibility with the budget. Large schools are maximising class numbers, the saving on staffing costs is then directed to IT expenditure.</td>
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<td><strong>Additional Comments:</strong></td>
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<td><em>The above should be two separate issues not one (Participant #4)</em></td>
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<td>- The critical size is 700 students anything less than this would prevent acquisition of</td>
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</table>
## Appendix

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<thead>
<tr>
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<td>resources to access IT, a lack of expertise in the staff and a lack of technical support.</td>
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<td><strong>Additional Comments:</strong></td>
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<tr>
<td>Not necessarily (Participant #5)</td>
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<td>- Smaller schools are more easily managed and flexible and so enable more interesting things to happen. It is easier to get direct links between subjects.</td>
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<td>- Schools with more than one campus have high infrastructure costs in networking the sites.</td>
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<td><strong>Rationale:</strong></td>
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<tr>
<td>“Doesn’t alter the effectiveness but alters the way things are done” – Participant</td>
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<tr>
<th>15.</th>
<th>3</th>
<th>Issue: Consultant Utilisation</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>- Consultants are an effective way of obtaining specialist programming, network expertise and training not readily available in schools</td>
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<td>- Consultants are also useful in decision making on investments as they can provide important background research information</td>
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<td></td>
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<td>- Key note speakers are frequently used for staff PD (Delete Participant #4)</td>
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<td>- Parents can be good sources of IT expertise when major investment decisions are under consideration. (Delete Participant #4)</td>
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<tr>
<td><strong>Additional Comments:</strong></td>
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<tr>
<td>More trouble than they are worth (Participant #5)</td>
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<tr>
<td><strong>Rationale:</strong></td>
<td></td>
<td></td>
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<tr>
<td>“Only use ‘em when we have to” – Participant</td>
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<th>14.</th>
<th>2</th>
<th>Issue: Laptop Programs</th>
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<tr>
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<td>- Compulsory purchase of Laptops by students creates problems with incompatible hardware and software, because parents refuse to buy the recommended machine and refuse to upgrade machines when requested.</td>
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<td>- Frequently teachers have to create several versions of the same worksheet for the different machines and software versions. Teachers are therefore not able to maximise the effectiveness IT offers.</td>
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<td></td>
<td>- It is more effective in IT for the schools to lease laptops and pass this cost on to parents than to allow parents to purchase laptops.</td>
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<td></td>
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<td>- School provided laptops are useful in collaborative learning projects where a small group of students</td>
</tr>
</tbody>
</table>
Appendix

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<tr>
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<th>Your Revised Rating</th>
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</tr>
</thead>
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<td></td>
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<td>share a laptop.</td>
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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td>Re &quot;Compulsory&quot; in first comment. Not necessary.</td>
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<td>Issue of Equity Pedagogy (Participant #5)</td>
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<td>Notebook programs can enable the student to create and ‘own’ their working environment. This can lead to greater responsibility for learning. (Participant #11)</td>
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<td><strong>Rationale:</strong></td>
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<td></td>
<td>“Where every child has a Laptop that they can use in school they become little islands, working in their own little area” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td>This rationale is based on a dysfunctional notebook programme which has not been incorporated as a result of a curriculum drive. A notebook allows the students to select mode of response, access to info resources, online learning modules, different styles of learning and teaching. A notebook programme introduced to complement a conventional classroom curriculum is limiting the vision and scope of portable computing. (Participant #12)</td>
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<td><strong>Personal Opinion:</strong> There are MUCH better ways to deliver IT than through a Laptop program. The problems far outweigh any advantages. You do not need a computer in every lesson. (Participant #1)</td>
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<tr>
<th>New Issues</th>
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<tbody>
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<td>25.</td>
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<td><strong>Issue : Curriculum Planning</strong></td>
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<td>* How IT will be used within the delivery of teaching and learning (Participant #7)</td>
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<td>26.</td>
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<td><strong>Issue : Information Technology Planning</strong></td>
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<td>* To meet needs of teaching and learning</td>
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### Appendix VI – Model #2 Feedback

<table>
<thead>
<tr>
<th>Initial Rating</th>
<th>Group Rating Model#1</th>
<th>Your Revised Rating</th>
<th>Key issues and their rationale</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>10</td>
<td></td>
<td><strong>Issue: The Visionary Principal</strong></td>
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<tr>
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<td>• The Principal needs to see the strategic importance of IT to the delivery of education and must be actively promoting it</td>
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<td></td>
<td>Disagree (3)</td>
<td><strong>Additional Comments:</strong></td>
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<td></td>
<td></td>
<td>Agree (2)</td>
<td>Replace “The Principal” with “A member of the Principal Class” (Participant #5)</td>
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<td><strong>The Principal must drive the change (Participant #10)</strong></td>
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<td></td>
<td></td>
<td>Agree (1)</td>
<td><strong>Many Schools are run by the Deputy (Participant #9)</strong></td>
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<td></td>
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<td>Disagree (1)</td>
<td>• Thus ensuring adequate budgets and budget approval by the School Council</td>
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<td></td>
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<td>Agree (2)</td>
<td>• Providing the necessary infrastructure</td>
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<td><strong>Rationale:</strong></td>
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<td></td>
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<td></td>
<td>“Without that top support the school’s got no hope” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td>A Principal with vision is pro-active instead of reactive. Being reactive means you are always 10 steps behind. (Participant #1)</td>
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<td><strong>The process of change management is more difficult without Principal leadership and reflective forward planning / target and goal setting (Participant #10)</strong></td>
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<td>3.</td>
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<td></td>
<td><strong>Issue: The Changing Teacher’s Role</strong></td>
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<td>• The central focus is having teachers integrate IT into their classrooms</td>
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<td>• Teachers are increasingly allowing themselves to be part of the learning process by accepting the students momentum towards collaborative learning</td>
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<td>• Most effective uses of IT are found in collaborative projects across subjects</td>
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<td>Agree (3)</td>
<td><strong>Rationale:</strong></td>
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<td>“The teachers’ role is crucial to the success of the IT program” – Participant</td>
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<td>“Used to be the Sage on the Stage, now it’s the Guide on the Side” – Participant quoting the American Educationalist Jamie McKenzie</td>
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<td><strong>Additional Comments:</strong></td>
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<td>Getting stuff to accept this is the biggest problem and yet it has become a key to good learning practice. Maintaining 19th Century teaching styles just won’t work with students today. (Participant #1)</td>
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</table>
## Appendix

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<thead>
<tr>
<th>Initial Ranking</th>
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<tr>
<td>4.</td>
<td>10</td>
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<td><strong>Issue: The Teachers – KEY to IT Effectiveness</strong></td>
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<td>• The best indicators are how prepared are teachers to use IT to change, to use it in their courses.</td>
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<td>• Teachers are in control of how far opportunities are taken</td>
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<td>• They know what’s going on and tell how things are going</td>
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<td>• One of the biggest internal impacts on IT effectiveness is staff negativity and reluctance to use and embrace IT</td>
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<td>Agree (3)</td>
<td><strong>Rationale:</strong></td>
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<td></td>
<td></td>
<td></td>
<td>“Teachers are good indicators of an IT program’s success” – Participant</td>
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<td></td>
<td>“If you don’t have staff commitment, interest, passion it doesn’t matter how much you spend” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td>The staff spectrum is very wide. While this issue is important, it is watered down somewhat by varying skills and commitment. It is NOT the only driving force in Education, despite what IT teachers may think. For effective IT style teaching, you have to look past the staff because their involvements and interests are much broader than IT. (Participant #1)</td>
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<td>Though this issue is different from the one above. Teachers and their attitudes affect the take up on LT in the classroom but it is one of a number of competing agendas and does not assume prime importance for a large number of teachers. (Participant #10)</td>
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<td>2.</td>
<td>9</td>
<td>Disagree (2)</td>
<td><strong>Issue: The Principal – the Champion</strong></td>
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<td>• Staff look to the way IT is being promoted in the school and respond positively to the Principal’s lead</td>
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<td>• The Principal needs to be strong or can be overruled by strong staff</td>
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<td>In what way is this different to criteria one? The visionary Principal will also be a champion of the approach (Participant #10, same comment verbally #8)</td>
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<td><strong>Additional Comments:</strong></td>
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<td>The Principal or an empowered member of staff(?) (Participant #11)</td>
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<td>Unsure - If the point is that staff will gain confidence from each other then it is well made. Staff are more likely to attempt to use LT in the classroom if a colleague whom they respect has done so. (Participant #10)</td>
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<td><strong>Rationale:</strong></td>
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<td>“You need a powerful Champion. We didn’t do much until the Principal came on board and hanged everything started to happen once the Principal indicated commitment” – Participant</td>
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### Appendix

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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Agree (4)</strong></td>
<td>Ditto (Participant #9)</td>
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<tr>
<td></td>
<td></td>
<td>**Disagree (1) **</td>
<td><strong>Additional Comments:</strong></td>
</tr>
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<td></td>
<td><strong>Agree (1)</strong></td>
<td>As with the Visionary Principal. Someone with ‘authority’ must be pushing from behind. The Principal must keep the staff in front. A good leader makes sure the staff (or at least some) are in front. They become the leaders of other staff. (Participant #1)</td>
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<td><strong>This process is about establishing a sustainable network of support which must be underpinned by a clear direction for the school which by definition needs to be provided by the Principal. (Participant #10)</strong></td>
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<td>8.</td>
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<td></td>
<td><strong>Issue: Training and Personal Development (PD)</strong></td>
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<tr>
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<td></td>
<td></td>
<td>• Without trained staff IT effectiveness cannot be maximised</td>
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<td></td>
<td>• Personal development is more important than training (Delete Participant #4)</td>
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<td></td>
<td>• Teachers do not respond well to being taught by administration staff, far prefer to be taught by peers.</td>
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<td>• Buddy Systems go extremely well in developing teacher’s knowledge and skill level</td>
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<td>• Teachers in the secondary arena are more subject oriented thus big changes needed in teaching practices to maximise the effectiveness of IT</td>
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<td>• Providing teachers with laptops is a good investment because it creates a significant improvement in their utilisation and confidence in using IT. This in turn is reflected in more effective use of IT in the learning environment.</td>
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<td><strong>Rationale:</strong></td>
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<td>“The biggest problem is changing teachers pedagogical practices to suit the learning situation of today” – Participant</td>
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<td>“Get staff to show what they have done has the greatest impact in terms of use in schools” – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td>No program will work without good, solid work with staff first. Programs that start with hardware and students never really succeed because staff are on the back foot and will retreat rather than be put in a position where they have NO control at all. Even with the new methodologies for teaching practice, it requires the teacher to decide to become the facilitator. They have that control. By pushing them into a position where students wrest that from them by virtue of the fact that students have the skills the teacher lacks is a recipe for disaster. The teacher will retreat to what they know, probably ‘chalk and talk’. (Participant #1)</td>
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<td></td>
<td><strong>Enthusiasm must be there first then training is essential. This comment is very true. (Participant #9)</strong></td>
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<td></td>
<td></td>
<td></td>
<td><strong>The aspects of personal LT and classroom capability are very</strong></td>
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</table>

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## Appendix

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<thead>
<tr>
<th>Initial Rating</th>
<th>Group Rating Model#1</th>
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<th>Key issues and their rationale</th>
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<td>different. Often staff feel they must have a reasonable level of personal LT skill with a software package before trying it in the classroom given that there is likely to be little support while they are teaching. We attempt to promote an environment where both teachers and students are learners so if the students know more then they should be used as a teaching resource. Once teachers are prepared to try LT based activities in their classrooms then they are more receptive to pedagogical change. The areas of classroom organisation management, planning processes workload shortcuts needs to be addressed but will make more sense in a situation where the teacher has begun to use IT (Participant #10) Same issue as Changing Teacher’s Role (Participant #5)</td>
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<td>10.</td>
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<td></td>
<td>9</td>
<td>Issue: Technical Support</td>
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<td>• Adequate technical staff is critical to the effective use of IT.</td>
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<td>• If the network is not working the school is inoperable.</td>
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<td>• The industry ratio for technical support in a Windows environment is 1 technician per every 50-75 staff, very few schools have anywhere near this ratio.</td>
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<td>• The following is not an uncommon example – a school with 200 PCs and 20 laptops plus a PC for every administrative staff (all running windows) has one full-time technician who manages the network, provides laptop support, repairs the PCs and installs all software.</td>
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<td></td>
<td>Additional Comments: Can run without a network. Network can be more trouble than it is worth. (Participant #5)</td>
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<td>The new focus of LT is on collaboration and communication between students in the same school and in different schools / countries and between teachers in the same school and in different schools / countries. (Participant #10)</td>
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<td>Rationale: &quot;If it doesn’t work the staff (teachers) won’t use it&quot; – Participant</td>
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<td></td>
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<td>&quot;There is a lot lumped on just a few people and it is only through enormous goodwill that it works&quot; – Participant</td>
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<td>Additional Comments: What is ‘adequate’?? The more you provide, the more is required. It can become a bottomless pit. But, good tech support is crucial. Staff get dispirited very quickly. An IT program can die very easily through lack of support. (Participant #11)</td>
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<td>Staff need to feel supported, gain advice, get connected – especially relevant since the initial distribution of DoE sponsored laptops. (Participant #10)</td>
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<td>12.</td>
<td>9</td>
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<td>Issue: The Students IT’s Biggest Impact</td>
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</table>

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<table>
<thead>
<tr>
<th>Initial Rank - Rating</th>
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<th>Your Revised Rating</th>
<th>Key issues and their rationale</th>
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<tbody>
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<td></td>
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<td>The biggest impact that IT has is in changing the way students learn and teachers teach.</td>
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<td>IT enables the students to do the routine tasks quicker and thus get to higher levels of analysis.</td>
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<td>IT provides opportunities previously not there.</td>
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<td>Students are empowered, enhancing their skills, confidence and learning ability.</td>
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<tr>
<td>Rationale:</td>
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<td></td>
<td>“IT gives all the students equality of access to resources and enthuses them in the process” – Participant</td>
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<tr>
<td>Additional Comments:</td>
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<td></td>
<td>Replace “equality of access” with there is an Equity Issue”</td>
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<td></td>
<td></td>
<td>Agree (2)</td>
<td>An easy one. 90% of students WANT IT. So long as it meets their needs for ‘entertainment’, the program will work. If it is tedious, though, they will hate it. On the whole, it is not much of an issue. (Participant #1)</td>
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<td></td>
<td></td>
<td>Disagree (1)</td>
<td>It is the issue. The reform process involving classroom LT use is all about improving student learning outcomes. The program needs to be challenging and meaningful rather than entertaining. (Participant #10)</td>
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<td>This is an issue re notebook programs, the kids have to want to bring them etc, not such an issue in non-notebook schools, where students are taken to equipment. (Participant #9)</td>
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</tbody>
</table>

| 17.                   | 9                     | Issue: Role of School Council |
|                       |                       | The School Council has considerable power over how effective IT is in a school as it is the final arbitrators of the school’s budget. |
|                       |                       | It has played a significant role in IT direction by the decisions it makes eg for laptop programs and selection of Principal perceived as a leader in IT. |
|                       |                       | Once the School Council has confidence in the IT program it generally does not challenge the expenditure and is very supportive. |
|                       |                       | Provides an ongoing percentage of the school’s budget for IT. |
|                       |                       | Generally rely on the Principal for guidance on these IT investment decisions. |
| Rationale:            |                       | “Not just rubber stampers, incredibly supportive, very good in assisting in business plans etc” – Participant |
| Additional Comments:  |                       | Can work for you or against you. If they have personal axes to grind....... (Participant #1) |

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<tbody>
<tr>
<td>22.</td>
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<td><strong>Issue: The Actual Use of IT</strong></td>
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<td>- Students using IT as a tool to assist in research, as a means of enhancing the presentation of their work, and to assist in mundane tasks. Schools are investing in areas, which maximise these opportunities.</td>
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<td>- The most effective use of IT is when it is becomes an intellectual partner for the teachers and students and is integrated into the learning process. Not offered as a tool to be taught.</td>
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<td>Agree (4)</td>
<td><strong>Rationale:</strong></td>
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<td></td>
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<td></td>
<td>&quot;IT is offering opportunities, enhances learning and teaching not previously available&quot; – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td>When you don’t notice students using it, because it is just part of what they are doing, then you have a successful program. It should not be an end in itself. (Participant #1)</td>
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<td>This actually shows that it is an effective use of resources rather than encourages an effective use of resources. This comment is very fair. (Participant #9)</td>
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<td>More important than 12 or 17 (Participant #5)</td>
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<td><strong>Issue: The Starting Point – NOT the IT Teacher</strong></td>
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<td>- The initial IT focus in a school should be in a Non-IT area. Non-IT teachers are the best at seeing the possibilities of IT because they are more lateral thinkers.</td>
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<td>- Best success started in English, Art, Humanities and the Library (Resource Centre) areas</td>
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<td>- Worst disasters when IT staff started programs</td>
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<td>- IT literate teachers are often not the people using IT in their pedagogical practices</td>
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<td>Disagree (1)</td>
<td><strong>Rationale:</strong></td>
</tr>
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<td>&quot;These IT people they’re away with the tweeties&quot; – Participant</td>
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<td><strong>Additional Comments:</strong></td>
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<td></td>
<td>suffer from “techno lust&quot; (Participant #5)</td>
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<td>Very definitely. The teachers must ‘own’ their teaching styles and methods. They won’t do this if it is perceived to be a specialist area. By starting the flow of new methods from non-IT areas, staff are more likely to comprehend the usefulness and diversity of these new methods of teaching and learning. (Participant #1)</td>
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<td></td>
<td>Very Relevant (Participant #9)</td>
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<td>The difference is learning about computers or learning with computers. Non IT teachers think about what the kids will get out of it, IT teachers tend to focus on skills or what software or hardware they can use. (Participant #10)</td>
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Appendix

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<thead>
<tr>
<th>Initial Rank</th>
<th>Group Rating Model#1</th>
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<th>Key issues and their rationale</th>
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<tr>
<td>6.</td>
<td>8</td>
<td></td>
<td>Issue: The Teachers Maximising IT Investment</td>
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<tr>
<td></td>
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<td></td>
<td>- Teachers have a crucial role in IT investments in deciding what sorts of hardware and software are needed and used (Delete Participant #4)</td>
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<td>Agree (4)</td>
<td>Should decide “NEED” – derive software + hardware needs form this (Participant #5)</td>
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<td><strong>Additional Comments:</strong> Teachers have a crucial role in leading the vision of what can be done. The IT professionals would source the hardware and software to meet the teachers proposed outcomes (Participant #12)</td>
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<td>Agree (4)</td>
<td>Agree to some extent. It is like the chicken and egg argument – we want LT educated and literate staff but don’t want them to waste our time in making them aware of hardware and software requirements. Teachers should have a say in software because this will directly influence the teaching strategies. Hardware is not so critical because it takes care of itself in many ways. (Participant #10)</td>
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<td></td>
<td>- Because IT investments should focus on learning outcomes and curriculum</td>
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<td>- A Learning Technology Committee with teacher representatives and input from teachers via their curriculum area is vital to IT investment decision making.</td>
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<td></td>
<td>Agree (1)</td>
<td><strong>Additional Comments:</strong> Replace “A” with “An educated” – Participant #11)</td>
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<tr>
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<td></td>
<td><strong>Rationale:</strong> “You need an educational focus not a hardware focus” – Participant</td>
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<td><strong>Additional Comments:</strong> Good in concept but often not very practical. Especially when the teacher reps often begin by saying “I don’t know much about computers....”. While it is important that they have input and feel they make a difference, the reality is that those who have the skills often manoeuvre the majority into decisions those more expert in the field decide upon. The input from teachers is important in that it maintains the focus on curriculum. The danger is that they will try to make decisions they are not qualified to make. (Participant #1)</td>
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<td>I can’t follow this comment! (Participant #8)</td>
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</table>
|              |                      |                     | This comes after the enthusiasm and training. (Participant #9) I strongly agree with Participant #1. Very few teachers are either qualified or experienced enough to be responsible for specifying hardware requirements. This is the domain of the specialist – usually the Network Manager (if the school has one), otherwise engage a consultant. Teachers must have an input into the types of software they will be required to operate (not including admin systems or basic software platforms (eg
<table>
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<td>7.</td>
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<td>8</td>
<td><strong>Novell V’s Unix etc</strong> (Participant #4) <strong>You are using IT and LT interchangeably – this is confusing in education.</strong> (Participant #5)</td>
</tr>
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</table>

**Issue: The Budget**

- An adequate budget is vital.
- Programs will not go forward without it.
- The budget dictates how much can be done and when it can be done.
- To be able to plan effectively a percentage of the School’s annual budget needs to be allocated every year, a range from 3.4% - 12% was indicated as adequate.

**Rationale:**

“If you don’t resource well it won’t happen” – Participant

**Additional Comments:**

We all look for the golden fleece. We NEVER have enough though. Part of the struggle to maintain a good program is to do it despite the constraints of budget. The worst programs have been the well-funded ones. They tend to be top heavy on resources and light on real, long lasting impact. The place where there can never be enough money is professional development. Put the most money in the best resource, people. (Participant #1)

Twaddle (Participant #4)

<table>
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<tr>
<th>9.</th>
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<th><strong>Issue: The Learning Technologies Committee – The Decision Makers</strong></th>
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<td><strong>It is considered vital to have a Learning Technologies committee whose role is to create a Learning Technologies Plan on which IT investment is based</strong></td>
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<td><strong>The plan should be 3 years ahead at all times.</strong></td>
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<td><strong>Powerful stakeholders such as the Principal, Heads of Schools, the Director of Learning Technologies plus the System Manager should be on this committee</strong></td>
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<td><strong>This committee should not be too big eg 12 or more, 4-6 ideal</strong></td>
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<td><strong>The timelines on decision making should be realistic. eg “One week to design a network is unrealistic.”</strong></td>
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**Rationale:**

“IT effectiveness has significantly improved now it has a firm statement of vision and purpose, and senior management commitment” – Participant

**Additional Comments:**

*It is important to plan and develop direction. This is tied to the ‘Visionary’ Principal as well. A committee can formulate everything they want, but it goes nowhere........ (Participant #1)*
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>18.</td>
<td>8</td>
<td>Agree (4)</td>
<td>The big picture must always be maintained to ensure that the money however much or little is not spent in one area. (Participant #9)</td>
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<td>21.</td>
<td>8</td>
<td>Agree (2)</td>
<td>Issue: Basis of Investment</td>
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<tr>
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<td>Agree (3)</td>
<td>• Academic performance is the most important basis for investment.</td>
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<td>• Cost effectiveness and Competitive advantage are the next most important.</td>
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<td>• Quality outcomes for the students are also important.</td>
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<td>Rationale:</td>
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<td>“IT is a means of motivating otherwise unmotivated students” – Participant.</td>
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<td>Agree (3)</td>
<td>Additional Comments: Offers more choices for learning and to meet different learning needs. (Participant #11)</td>
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<td>Need to be supportive, but that’s all. (Participant #5).</td>
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<td>Ultimately, what do we want to achieve? Jobs? Life-long learning? Social position? Forget the rhetoric of the school, look at what comes out the other end. (Hidden agenda) then decide whether the use of IT has enhanced the ‘real’ aims of the school. (Participant #1)</td>
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<td></td>
<td>Not a comment a question! (Participant #8)</td>
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<tr>
<td>11.</td>
<td>7</td>
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<td>Issue: Numbers of PCs</td>
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<tr>
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<td>Agree (3)</td>
<td>• The number of PCs available for students is crucial, in investment terms, until a threshold is reached.</td>
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<td>• Once this threshold is reached it is relatively unimportant (Delete Participant #4)</td>
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<td></td>
<td></td>
<td>Rationale:</td>
</tr>
<tr>
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<td></td>
<td>“You’ve got to give access to students and staff not the latest Gee Wiz!” – Participant</td>
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<td></td>
<td>“Access to equipment is the biggest challenge” – Participant</td>
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<td>Additional Comments:</td>
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<tr>
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<td>While some schools achieve incredible results with very little, the expectation is that if a teacher wants the class to use IT, it should be there and available WHEN they want it. (Participant #1)</td>
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</table>

Issue: The Value of IT

• The perceived value of IT partially determines IT effectiveness

• This value is viewed as the educational value as perceived by teachers
## Appendix

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<tr>
<th>Initial Rating</th>
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</thead>
</table>
| Agree (4)      |                      |                     | • It relates to the ways that teachers adopt IT  
• Any investments not perceived as having educational value by teachers will not be fully utilised |
| Disagree (1)   |                      |                     | Additional Comments:  
IT should not be seen as a separate identity. A curriculum programme has come of age when it is seamless. The curriculum outcome/process must determine how a unit is taught and if IT is the most effective medium it should be employed! (Participant #12)  
If the Teachers don’t value IT as contributing or enhancing the curriculum they won’t use it. (Participant #10)  
Relates to Issues No. 4 (Participant #5) |
| Agree (1)      |                      |                     | Rationale:  
“If teachers don’t see IT as having educational value they will only give it lip service” – Participant |
|                |                      |                     | Additional Comments:  
Concepts of value are very subjective. You have to work around the fact that at least 40% of staff will not value IT in the curriculum and will resist it. (Participant #1)  
Very real comment. (Participant #9) |
| 20.            | 7                    |                     | Issue: Infrastructure vs Non-Infrastructure Investments  
• Infrastructure costs are significantly higher and ongoing with the necessity to continually upgrade both hardware and software.  
• Infrastructure Costs are usually 60% and non-infrastructure 40%.  
• Initial infrastructure costs can be as high as 100% of the IT Budget. |
| Agree (2)      |                      |                     | Additional Comments:  
Not necessarily. Delete (Participant #5) |
| Disagree (1)   |                      |                     | Rationale:  
“In the first years higher on infrastructure” – Participant |
| Agree (1)      |                      |                     | Additional Comments:  
Hardware and staffing for support. The smallest amount is actually spent on software. (Participant #1)  
I still disagree with this (Participant #5) |
| 13.            | 6                    |                     | Issue: Strategic Partnerships  
All schools running Laptop programs have strategic partnerships with their suppliers. The suppliers provide staffing for the repair and maintenance of laptops, training and technology. These are important to managing these laptop programs.  
• Strategic partnerships can also be mutually advantageous in the provision of networks and software. They provide schools to pilot technology they could not |

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XLIII
### Appendix

<table>
<thead>
<tr>
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<th>Key issues and their rationale</th>
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<td></td>
<td></td>
<td></td>
<td>otherwise afford.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• It is necessary to be prepared to change strategic partners. Many schools had.</td>
</tr>
<tr>
<td>Disagree (2)</td>
<td></td>
<td></td>
<td>Not important (Participant #5)</td>
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<td></td>
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<td></td>
<td>Additional Comments:</td>
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<td></td>
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<td></td>
<td>To what end? (Participant #5)</td>
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<tr>
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<td></td>
<td>? (Participant #8)</td>
</tr>
<tr>
<td>Agree (1)</td>
<td></td>
<td></td>
<td>Rationale:</td>
</tr>
<tr>
<td></td>
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<td>“Any school that tries to do without it (Strategic Partnerships) will fail” – Participant</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>“A Win Win relationship for both of us” – Participant</td>
</tr>
</tbody>
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<thead>
<tr>
<th>19.</th>
<th>6</th>
<th>Issue: Objectives of Investments</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>• In business companies invest to place it in a strategic position in the marketplace, or to provide infrastructure, or to obtain information or to undertake day to day transactions. Usually one is clearly the most important.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In education schools invest for all the above reasons almost equally.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provision of an infrastructure was important to all schools</td>
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<tr>
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<td>• The core objective for investment in IT in most Private schools was to place it in a strategic position in the market place.</td>
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<td></td>
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<td>Additional Comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not necessarily – most parents want the education they had!! (Participant #12)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Obtaining information in State schools largely revolves around the demands of the DOE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Finally the day to day transactions relate to the needs of the Administration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional Comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>True but not important (Participant #5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rationale:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Couldn’t live without them”( all four objectives) – Participant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re the Provision of the Infrastructure “If the network is unreliable it won’t happen.” – Participant</td>
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<tr>
<td></td>
<td></td>
<td>Additional Comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As above, comments for Issue: Basis of Investment (Participant #1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>? (PARTICIPANT #8)</td>
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<tr>
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<th>Your Revised Rating</th>
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</tr>
</thead>
</table>
| 23.                | 6                    |                     | **Issue**: *Administration Staff – Efficiency not Effectiveness*  
|                    |                      |                     | - The Administrative use of IT provides gains in efficiency.  
|                    |                      |                     | - Interesting the administrative use of IT is not important to IT effectiveness.  
|                    |                      |                     | - More important to spend in educational arena than in administration  
| Agree (1)          |                      |                     | **Additional Comments:**  
|                    |                      |                     | *Re last point – Needs both – (Participant #11)*  
|                    |                      |                     | *True (Participant #5)*  
|                    |                      |                     | *Delete (Participant #4)*  
|                    |                      |                     | **Rationale**:  
|                    |                      |                     | "Efficiency gains, things like shifted to email, no paper memos, therefore very easy for front staff to manage." – Participant  
|                    |                      |                     | **Additional Comments:**  
|                    |                      |                     | Depends on the individual. The better staff take to IT and use it effectively and efficiently. (Participant #1)  
|                    |                      |                     | Effective admin use saves time and effort for everyone and makes available current and useful data, which improves the working conditions of every member of staff. (Participant #10)  
| 24.                | 5                    |                     | **Issue**: *The Teachers – The Luddites*  
|                    |                      |                     | - There are always the few (5% to 10%) who are unwilling to use IT in their classrooms.  
|                    |                      |                     | - Four strategies are used for dealing with them – *sack them, threaten to sack them if they don't use IT, ignore them, give them time and PD (personal development) training to adjust (a slow process).*  
| Disagree (3)       |                      |                     | **Additional Comments:**  
| Agreed (3)         |                      |                     | Delete the highlighted words (Participant #4)  
|                    |                      |                     | Not an inhibiting factor (Participant #5)  
|                    |                      |                     | Depends on the proportion but would mostly agree (Participant #10)  
| Disagree (1)       |                      |                     | **Rationale**:  
| Agree (1)          |                      |                     | "Some staff do not want to use it until they are sure that it will work" – Participant  
|                    |                      |                     | **Additional Comments:**  
| Disagree (2)       |                      |                     | If they can be kept in a very small minority, they tend to get tolerated and treated as 'museum exhibits' by other staff and students. (Participant #1)  
| Agree (1)          |                      |                     |
### Appendix

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<tr>
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<tbody>
<tr>
<td><strong>16.</strong></td>
<td>4</td>
<td></td>
<td><strong>Issue: Size of School</strong></td>
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<tr>
<td></td>
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<td>- The size of the school is not significant but the larger the school the greater the budget and this enables more flexibility with the budget. Large schools are maximising class numbers, the saving on staffing costs is then directed to IT expenditure.</td>
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<td><strong>Additional Comments:</strong></td>
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<td>- The critical size is 700 students, anything less than this would prevent acquisition of resources to access IT, a lack of expertise in the staff and a lack of technical support.</td>
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<td></td>
<td></td>
<td></td>
<td><strong>Not necessarily (Participant #5)</strong></td>
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<tr>
<td></td>
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<td>- Smaller schools are more easily managed and flexible and so enable more interesting things to happen. It is easier to get direct links between subjects.</td>
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<td>- Schools with more than one campus have high infrastructure costs in networking the sites.</td>
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<td></td>
<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
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<td></td>
<td>&quot;Doesn't alter the effectiveness but alters the way things are done&quot; – Participant</td>
</tr>
</tbody>
</table>

<p>| <strong>15.</strong>      | 3                    |                    | <strong>Issue: Consultant Utilisation</strong> |
|              |                      |                    | - Consultants are an effective way of obtaining specialist programming, network expertise and training not readily available in schools |
|              |                      |                    | - Consultants are also useful in decision making on investments as they can provide important background research information |
|              |                      |                    | - Key note speakers are frequently used for staff PD (Delete Participant #4) |
|              |                      |                    | - Parents can be good sources of IT expertise when major investment decisions are under consideration. (Delete Participant #4) |
|              |                      |                    | <strong>Additional Comments:</strong>       |
|              |                      |                    | More trouble than they are worth (Participant #5) |
|              |                      |                    | <strong>Rationale:</strong>                 |
|              |                      |                    | &quot;Only use 'em when we have to&quot; – Participant |
|              |                      |                    | **Agree with this rationale. Need to target properly and have something specific to offer the school in terms of direction to be taken or philosophy to be reflected upon. (Participant #10) ** |</p>
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<tbody>
<tr>
<td>14.</td>
<td>2</td>
<td></td>
<td><strong>Issue: Laptop Programs</strong></td>
</tr>
<tr>
<td></td>
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<td>• Compulsory purchase of Laptops by students creates problems with incompatible hardware and software, because parents refuse to buy the recommended machine and refuse to upgrade machines when requested.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Frequently teachers have to create several versions of the same worksheet for the different machines and software versions. Teachers are therefore not able to maximise the effectiveness IT offers.</td>
</tr>
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<td>• It is more effective in IT for the schools to lease laptops and pass this cost on to parents than to allow parents to purchase laptops.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• School provided laptops are useful in collaborative learning projects where a small group of students share a laptop.</td>
</tr>
<tr>
<td>Disagree (1)</td>
<td></td>
<td></td>
<td><strong>Additional Comments:</strong></td>
</tr>
<tr>
<td>Agree (5)</td>
<td></td>
<td></td>
<td>Re “Compulsory” in first comment. Not necessary. Issue of Equity Pedagogy (Participant #5)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Notebook programs can enable the student to create and ‘own’ their working environment. This can lead to greater responsibility for learning. (Participant #11)</td>
</tr>
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<td>A notebook program offers both advantages and disadvantages. The disadvantages listed above are more indicative of a problem with program organisation rather than reflecting the use of a laptop in itself. (Participant #10)</td>
</tr>
<tr>
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<td>Yes it can if the other factors are present. Every notebook program is different. (Participant #9)</td>
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<td><strong>Rationale:</strong></td>
</tr>
<tr>
<td></td>
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<td></td>
<td>“Where every child has a Laptop that they can use in school they become little islands, working in their own little area” – Participant</td>
</tr>
<tr>
<td>Agree (2)</td>
<td></td>
<td></td>
<td><strong>Additional Comments:</strong></td>
</tr>
<tr>
<td>Disagree (1)</td>
<td></td>
<td></td>
<td>This rationale is based on a dysfunctional notebook programme which has not been incorporated as a result of a curriculum drive. A notebook allows the students to select mode of response, access to info resources, online learning modules, different styles of learning and teaching. A notebook programme introduced to complement a conventional classroom curriculum is limiting the vision and scope of portable computing. (Participant #12)</td>
</tr>
<tr>
<td>Agree (2)</td>
<td></td>
<td></td>
<td>Personal Opinion? There are MUCH better ways to deliver IT than through a Laptop program. The problems far outweigh any advantages. You do not need a computer in every lesson. (Participant #1)</td>
</tr>
<tr>
<td>Disagree (1)</td>
<td></td>
<td></td>
<td>Disagree with the notion of the problems outweighing disadvantages. Like any use of LT there needs to be just as much focus on reorganisation and change in teaching methodologies, thinking skills and metacognitive reinforcement with the laptop or a ‘normal’ class. The laptop offers a</td>
</tr>
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</table>
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<tbody>
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<td></td>
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<td>flexibility and increasingly a connectivity that can have obvious advantages. (Participant #10)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Note: Don't forget Melbourne is unique to the world in the amount of notebook programs operating and for better or worse we are the leaders in a massive change, a very emotionally charged change. It is still very early to judge for good or bad. (Participant #9)</td>
</tr>
<tr>
<td>25.</td>
<td>Agree (2)</td>
<td></td>
<td>Issue: Curriculum Planning</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>- How IT will be used within the delivery of teaching and learning (Participant #7)</td>
</tr>
<tr>
<td>26.</td>
<td>Agree (2)</td>
<td></td>
<td>Issue: Information Technology Planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- To meet needs of teaching and learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ummm I would lay this responsibility with the learning technologies committee. (Participant #9)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>These two (Issues 25 and 26) are basically the same thing. A plan provides direction and makes it clear the preferred approaches and software tools and activities. Linked with other aspects if the school (principal vision, funding etc) it sends a clear message to the school community about why the reorganisation of classroom practice to incorporate LT needs to occur and how it will happen. (Participant #10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Isn't 25 and 26 basically addressing the same issue? (Participant #4)</td>
</tr>
</tbody>
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Appendix V11 – Published Paper IMDA Eighth World Business Congress 1999

Schools the New Global Business – A Model for IT Investment Effectiveness

Cecily Mason Holmesglen Institute of TAFE, Australia

Schools are emerging as the new global businesses. The mechanism driving this change has been the trend away from centralised bureaucratic control towards school based management. Closely allied with this has been the demand to be economically accountable for decisions made at the school level. The interviews in this research revealed that schools are not only developing relationships with other schools in this State but also with schools in other countries throughout the world. They are forming strategic partnerships with vendors and suppliers of software, hardware and networking products. This research developed a model for schools to use in assessing their IT investment. The key issues obtained from the experts indicate that the Principal is critical to IT investment effectiveness, other factors important are the teachers, curriculum planning, technical support, the students, the actual use of IT, training and personal development, the school council, the budget and the learning technologies committee. The model derived from these key issues classifies them into organisational and individual determinants and indicators of IT investment effectiveness.

In recent years the role of schools has changed dramatically. The management of schools is moving from centralised bureaucracies to autonomous structures. Closely associated with this is the pressure for schools to become economically independent. Thus schools are emerging as businesses rather than as just educational institutions. The advent of technology has placed schools under further pressure with parents and governments perceiving technology as crucial for providing equity in education for students in today’s world. This research aimed to establish a model for schools in the secondary arena to use in assessing their information technology (IT) investment effectiveness. IT in this context is an all encompassing term referring to the technology aspects of hardware and infrastructure, and the information systems aspects of software. Effectiveness is "doing the right things" (Fink & Tjarka, 1994) to achieve important organisational goals. IT effectiveness is the change in the effectiveness of an organisation that results from the introduction and use of IT (Ivania et al. 1994). A search of literature relating to education IT effectiveness and education investment in IT revealed that there is currently no body of research into IT investment effectiveness for this new business, schooling. It was therefore deemed necessary to utilise research findings and models from the business and small business sector as a basis for the current research.

Schools the new Global Business

In recent years there has been a steady trend in many countries throughout the world towards self management in schools, this pragmatic approach replacing the bureaucratic, centralised management of education with a more autonomous one. The rationale behind the movement towards School Based Management (SBM) is that effective education is best provided by those closest to the students in their care. A survey by Gamage et al (1996) in Victorian State schools in 1993 gave a historical perspective of this "democratic devolution" resulting in findings of more effective 'decision making and increased autonomy, flexibility, productivity and accountability within schools.

Recent developments have seen this idea of self-management extended to include the concept of economic rationalism. School communities, led by the Principal, are now responsible, not only for the educational management of their students, but also for the full management of the school, including staffing, maintenance, purchases, funding and

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finances. The emphasis is on the achievement of “value for money” in education of the students, and the school’s public accountability in providing the efficient management of educational resources (Levacic & Glover. 1997).

This change in focus from schools as learning centres to schools as businesses has proved extremely difficult for those involved, especially the Principals, who are trying to relate educational objectives to spending, and to assess the cost effectiveness of spending and use of resources. The role of the Principal has taken on a similar status to that of Chief Executive Officer (CEO) in businesses, they have to “adopt corporate cultures, corporate structures and corporate processes” (Chadbourne & Ingvarson, 1998, pp. 63). The Principal’s workload has increased up to 60% with many working more than 60 hours per week. School communities and ultimately their Principals are now held publicly accountable for the way that they administer their schools and the equity of educational opportunities available to their students. The concern with regard to these can be found in the Victorian context as a new magazine for educational administrators, “Leading & Managing”, was released in 1995, two years after the move towards an economic rationalist model. SBM and economic rationalism have altered the educational perspectives from education as a benefit to a cost, schools as service agencies to businesses, parents as partners to customers (Townsend, 1996). Symes (1999) maintains that schools have developed an advertising culture devising sophisticated promotional strategies in their prospectuses as a result of the marketisation of education. Hesketh & Knight (1998) view education as just one more commodity to be sold to the consumer with schools attracting not only pupils but the right sort of pupils.

In 1994 Caldwell Brian (1996) undertook a review of educational developments in Australia, Canada, Hong Kong, New Zealand (NZ), USA and UK. He found that reform in education involved the self-management of schools, the downsizing of regional agencies, and the establishment of a strategic core “steering the system”.

Thomas (1997) referred to the focus on an equitable, efficient and effective education system as requiring a new theory of educational needs with the possible emergence of “a different 3Rs - a resourced, redistributed and relevant school system for all our children.”

To achieve this it is necessary for educational institutions to clearly identify their competitors and partners based on their strategic goals and to establish partnerships with educational institutions, entertainment providers and other countries (Lewis, 1999).

**Technology a Source of Equity**

IT is perceived as a source of equity in education. “Technological literacy has become as fundamental to functioning in society as the 3Rs” (Rodrigues, 1997). Those who do not have up to date IT facilities in their schools are concerned that their students are disadvantaged. This was confirmed by Thomas et al’s (1998) recent national study of communication and information technology in Australian primary and secondary schools which noted that educational inequities are maintained and even increased by the use of IT. Page (1998) found that the less privileged of America have been left behind not only in access to up-to-date technology but in the ways that they are using it. He urged school districts to ensure equitable learning of new technologies.

In the United Kingdom (UK) the government has been criticised for failing to equip children with skills needed to survive in a world where IT is part of nearly all jobs. This lack of skills is costing business opportunities. (Anonymous, 1997). The changing nature of IT means that schools have to keep abreast and informed of developments in IT to produce students equipped for an ever-changing world.

**Technology Investment in Schools**

Governments and particularly school communities have finite resources. The assumption is that Principals and the school community have the expertise to make decisions on the best technologies in which to invest. It is important that investments in IT in education are made in areas where they are to be effective, otherwise a lot of money will be wasted. However, of more concern is the fact that students may well be irrevocably disadvantaged in their future academic and economic opportunities as a consequence of poor investments made by their schools. School communities make investments with the best intentions but they are not necessarily effective because the expertise required to make these investments is not available. Consequently schools with the most money to
invest in IT may not necessarily be providing the best opportunities for their students.

School communities and governments are currently investing heavily in IT on the assumption that this will prepare their children for the needs of the workforce and for living in the world of the future. The Victorian Government has committed itself to expenditure of $AUS60 million 1996-1999 (Thomas et al. 1998) for the supply of Learning Technologies Training services in Victorian government schools, TAFE (Technical and Further Education) institutions and the Education Department (Education Victoria, 1996). In the 1999-2000 budget the Victorian Government has committed to expenditure of $104 million for IT technical support in schools. There is a belief in the United States of America (USA) that the education system has failed students. Technology is promoted as the solution with billions of dollars spent on the “Electronic Classroom” (Noll, 1997). In the USA schools spend $US 4 billion annually on technology. President Clinton wants the federal government to spend $US 2 billion over next five years for hardware and software, and the Federal Communications Commission has a $US2.25 billion fund for Internet connections (Conne, 1998). President Clinton has vowed to connect every student to the Internet by the year 2000 (Skinner, 1997). Expenditure on IT by schools in the United Kingdom since 1988 has been four to five times the government provision of 187 million UK pounds. New Zealand government plans to spend $NZ 276 million by 2001 (Thomas et al. 1998). Canadian school districts have invested heavily in IT over the last ten years. 90% believe that students need to understand IT to be employable (Riffel, 1997).

**Research into Technology Investment Effectiveness**

In spite of the overwhelming belief by governments and school communities in the value of IT in education, there is little evidence of the effectiveness of IT in education. Skinner (1997) bemoans “the spotty state of research” into the effectiveness of IT in education. Others refer to the fact that the amount spent on IT in the educational sphere is not necessarily reflected in improved performance by students. Rodrigues (1997) was concerned that even though K-12 students in the USA have ready access to computers in schools, European students are more computer literate.

The way schools are managing IT is a challenging and two faceted problem because schools have two clearly defined roles; to manage the school’s administration, and to manage the educational IT requirements of the school.

Schools are limited in their resources because governments only provide a certain amount of the necessary operational finance. To this end schools have to make choices on what to purchase. In making decisions on purchases the stakeholders’ views have to be taken into consideration. O’Mahony & Dampney (1996) in their research into the New South Wales school scene devised a PACT (Parents / Administrators / Children / Teachers) model based on the characteristics of professional bureaucracies - Customers / Managers / Products / Workers as defined by previous researchers. They maintain that the PA side refers to the efficiency aspect and the CT side refers to the effectiveness aspect.

**Business Models of IT Investment Effectiveness**

IT has been used in business for many years. It would be reasonable for school communities to expect to find assistance in maximising IT investment effectiveness from business sector models. However business has failed to achieve consensus, there are many models available and in use for assessing the effectiveness of IT investment. One of the major problems for business in justifying business investment effectiveness is that it involves qualitative as well as quantitative measurement. Qualitative measures are those where the “benefits can be represented in a core business objective, and the IT project is directed toward the fulfillment of that objective, these factors are sufficient justification of the project.” (Ferguson et al, 1996)

Thus it is possible for firms to obtain gains from investments in IT without these translating into higher profits, or other quantifiable benefits.
Research Approach

The research approach involved three components:

- A literature research on which to base the interview questions
- Interviews of the participants
- A modified Delphi where the information obtained in the initial interviews was collated and fed back twice to the participants for ranking and rating.

The Research Approach This research implemented an Interpretive Approach. This is quite different from the Hypothesis Approach frequently used in research, where a hypothesis is expounded and tested by the researcher. It was decided that this approach was not suited to the current research, as there is not a body of research, which could be used as a basis for developing a hypothesis. The use of an open-ended questionnaire was used as a means of tapping into the degree of existing knowledge. The knowledge thus gained was then used as a basis for an initial set of key issues relating to IT investment effectiveness in education, specifically the secondary school arena. A two round Delphi approach was then used to elicit the key issues as defined by the group.

The Delphi approach has proved useful in obtaining a group view, even consensus, from perceived experts in their fields. It has previously been used in the IT area to establish key information system management issues by Watson (1989), Doukidis et al. (1992) and Pervan (1993). The Delphi approach was therefore considered the most appropriate method of establishing an effectiveness criteria for IT investment in Victorian schools.

The Interview Questionnaire In attempting to identify whether intrinsic criteria exist and are used by IT management in the school sector for evaluating the effectiveness of IT investments, it was vital to ensure that the questionnaire elicited these criteria. Thus the development of the questionnaire was perhaps the most difficult task of the whole research project. It was essential that the questions asked were open-ended and did not limit the responses of the participants. The sequence of the questions was carefully analysed to ensure that the preceding questions did not influence the participants’ responses. The initial three questions were easy, unchallenging and closed ended, clearly relevant to the purpose of the study and aimed to build up the participant’s confidence that they would be able to answer the rest of the questions.

Extensive research into IT effectiveness and IT investment in the business arena, IT effectiveness in small business, and IT in education, was used as a basis for identifying the key issues to be raised as questions and ensure content validity. The subsequent questions were designed to make allowance for the possible total lack of criteria in schools so that the participants could indicate the criteria they believed appropriate, even if they were not currently being employed within their school.

In an attempt to eliminate as many problems as possible with the wording of the questionnaire it was tested for clarity and suitability on a very experienced secondary school teacher, and a manager of a Computing Services Department at a TAFE Institute. After each of the trial interviews amendments were made. The questions were revised until the interviewer was satisfied that the questions were being interpreted in the same manner by all interviewees, thus obtaining content validity. The finalised interview questionnaire of thirty-six questions was used, unaltered, on all participants. It encouraged free flowing discussion of the issues relating to investment effectiveness in IT in education. The participants were generous in the time they allowed for the interview with many exceeding one hour. The finalised interview questions were used on all participants by the same researcher, thus ensuring context validity.

The Selection of the Participants The process of developing the questionnaire was undertaken concurrently with the canvassing for the “experts”. A problem existed because there were no clearly established experts in IT in Victorian schools. An initial task was to obtain the names of secondary schools who have a reputation for excellence in IT. The following sources were used to obtain names of suitable “expert” schools to participate in the project: the General Manager of Information Technology Division Education Victoria, Department of Education, the Information Services Unit of the Catholic Education Office, the Independent Schools Union, the Federal Union of Teachers, Suppliers of Learning Technologies products and services, and of other IT products in the Education sphere, university lecturers, TAFE teachers and Computing staff, teachers in State and private schools. The names obtained were
then ranked according to the frequency of recommendation.

It was hoped that ten participants would participate in this research. Anticipating considerable attrition the first sixteen schools on the list were approached, thirteen schools agreed. Letters were sent to the Principals of the schools requesting approval for the project to be conducted in that school and for access to the member of staff who was the designated "Head of IT" within the school. It was recognised that "selling" the project and obtaining agreement from the schools to participate in the whole Delphi process may be a difficult task. More emphasis was therefore placed on the fact that all participating schools would receive a report of the findings, thus providing them with information for decision making on investment in IT.

**The Interviews**

After consent was obtained from the participants an interview time of one hour was organised. Interviews were conducted in metropolitan Melbourne and Victorian rural schools.

At the interview the participants were furnished with a copy of the questionnaire. This allowed the participants to refer to the questions as they were answering, consequently concentrating more effectively on their answers. The initial questions related to the role of the participant. These were deliberately designed to be non-threatening and give the participants time to relax. The majority of participants had a dual role as Head of Learning Technologies or Curriculum with a small teaching component, the next most common was Director of Computing, finally there was one Business Manager and one Principal. Three clearly defined separate sections prefixed by a brief explanation formed the rest of the questionnaire.

These were:

- Questions about the relationship of the IT goals and objectives to the school’s goals and objectives.
- Questions about investment in IT.
- Questions about IT effectiveness.

The data from the Interviews was collated and analysed in a three stage process. The most important factors relating to effectiveness in investment in IT in education were distilled based on the number of times an aspect was referred to and on the importance placed on it by the participants in the interviews. The purpose of the research was to obtain a group view and consequently personal opinions were valued in this process. The table of initial key issues, twenty-four in all (see Table 1 - Initial Key Issues) were ranked in order of the frequency of the occurrence in the interview process as a representative sample of the group view of the issues seen as most important.

It is interesting to note that all schools with laptops have strategic partnerships with the vendors / suppliers, some also have strategic partnerships with networking firms and software houses. Schools and their Heads of IT are also forming cooperative relationships with other schools both within the State and overseas. Several of the schools have sent principals and teachers overseas on fact-finding tours and on exchange programs.

**Round 1**

The initial set of key issues was then amended to make clear to the participants how the researcher was interpreting each issue. Pervan’s (1993) research instrument used in establishing the Key Issues in Australian IS Management was used as a guide in developing this. Each issue had additional comments to indicate the culmination of views from the group and included an appropriate quote from a participant. The set of issues was then sent by e-mail or Fax to the participants who were asked “Could you please use this list to indicate what you consider to be the most critical issues for secondary schools in maximising the effectiveness of IT investments?” Participants were requested to alter or delete issues, and to add any additional issues not included in the initial list.

The feedback from the participants was then placed into a spreadsheet for analysis. Eleven of the thirteen participants responded. It was decided that this was sufficient to gain a group view.

The small number of participants in this research made representing a group view more difficult as extremes at either end had the potential to skew the results. The ratings out of 10 by the participants frequently included the extremes of 1 and 10. The average was therefore discounted as it was considered that these extremes would unduly influence the
Appendix

result. The mode was also discounted as the most frequently occurring rating did not necessarily reflect the group view. It was decided that the Median (middle item) value was best able to represent this group of participants, with half the group not less than the median and half the group not greater than the median (Moroney, 1977, p 43, Reichman, 1970, p 68)

<table>
<thead>
<tr>
<th>Initial Ranking</th>
<th>Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Visionary Principal</td>
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<tr>
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</tr>
<tr>
<td>3</td>
<td>The Changing Teacher’s Role</td>
</tr>
<tr>
<td>4</td>
<td>The Teachers – K/L to IT Effectiveness</td>
</tr>
<tr>
<td>5</td>
<td>The Starting Point – NOT the IT Teacher</td>
</tr>
<tr>
<td>6</td>
<td>The Teachers Maximising IT Investment</td>
</tr>
<tr>
<td>7</td>
<td>The Budget</td>
</tr>
<tr>
<td>8</td>
<td>Training and Personal Development (PD)</td>
</tr>
<tr>
<td>9</td>
<td>The Learning Technologies Committee – The Decision Makers</td>
</tr>
<tr>
<td>10</td>
<td>Technical Support</td>
</tr>
<tr>
<td>11</td>
<td>The Value of IT</td>
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<tr>
<td>12</td>
<td>The Students – IT’s Biggest Impact</td>
</tr>
<tr>
<td>13</td>
<td>Strategic Partnerships</td>
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<tr>
<td>14</td>
<td>Laptop Programs</td>
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<tr>
<td>15</td>
<td>Consultant Utilisation</td>
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<tr>
<td>16</td>
<td>Size of School</td>
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<tr>
<td>17</td>
<td>Role of School Council</td>
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<tr>
<td>18</td>
<td>Basis of Investment</td>
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<tr>
<td>19</td>
<td>Objectives of Investments</td>
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<tr>
<td>20</td>
<td>Infrastructure vs Non-Infrastructure Investments</td>
</tr>
<tr>
<td>21</td>
<td>Numbers of PCs</td>
</tr>
<tr>
<td>22</td>
<td>The Actual use of IT</td>
</tr>
<tr>
<td>23</td>
<td>Administration Staff - Efficiency not Effectiveness</td>
</tr>
<tr>
<td>24</td>
<td>The Teachers - The Luddites</td>
</tr>
</tbody>
</table>

Table 1 – Initial Key Issues

Two new issues were included by a participant, Curriculum Planning and Information Technology Planning. Participants added additional comments to every issue. This readiness to add / alter / delete issues confirmed the researcher’s opinion that the Delphi Survey is ideally suited to use in an electronic format as participants using e-mail were more inclined to alter / add / delete items than those using the fax.

The key issues from the first round related to the Principal as a Visionary and a Champion of IT; the changing role of Teachers who are a key to IT effectiveness; the importance of Training, Personal Development and Technical Support for staff; the big impact students are having on IT; the actual use of IT; and the role of the school council. Laptops Programs were perceived in a far more positive way than had emerged in the interviews.

Round 2

The participants were distributed with a copy of the re-ranked issues indicating the median rating for the group, and their own rating. The two non-participators in the first round were also sent a copy to maximise the response. This was done as it was a two round Delphi with a low number of participants. This approach proved worthwhile as one participant who had not responded to the first round did so in the second.

The additional comments from the various participants were included and identified the participant by number. This was done for two reasons, firstly to ensure the anonymity of the participant was preserved, and secondly to indicate to the other participants where the comments were coming from eg Participant#1 included many lengthy comments. These additional comments were inserted in bold and italics so that they were easily identifiable from the original model. A column was provided for the participants to write in whether they agreed or disagreed with these comments. The two new issues raised by a participant were also included. The participants were asked to re-rate each of the issues, to include additional comments / deletions / additions, and to indicate if they agreed or disagreed with the Participants’ additional comments. These ratings were re-ranked again on the Median of the group.

The feedback received on the second and final round again indicated the strength of the Delphi Method. The two new issues raised by a participant and very highly rated by the group had not been identified in the interview process by the researcher. A couple of the participants responded extensively even though they had not commented in the first round. The researcher was better able to assess the group view by having the participants indicate whether they agreed or disagreed with the additional comments.

The Principal emerged even more strongly as critical to the effectiveness of investment in IT with participants rejecting suggestions that a Principal appointee can be used as a replacement Champion or Visionary. The important role of teachers as key players in
maximising IT investment, with critical training, personal development and technical support needs was retained. The actual use of IT was modified to be seamlessly fitting into the needs of the curriculum. The impact of students was still highly rated. The Role of the School Council was demoted and replaced by the Budget, Curriculum Planning and IT Planning.

Key Issues Identified

The final ranking revealed a set of ten key issues relating to the Principal, the Teachers, Curriculum and IT Planning, Technical Support, the Students, the Actual Use of IT, Training and Personal Development, the School Council, the Budget and the Learning Technologies Committee.

The Principal is critical to the success of any IT program. The Principal must be a Visionary who is able to see the strategic importance of IT to the delivery of education, giving clear direction for the school, and driving the change. The Principal must also be a strong Champion of IT promoting it to the staff, establishing and creating a sustainable network of support through adequate budgets. This role cannot be filled by a Principal appointed delegate, as this will dramatically slow the rate of change. Principals can be encouraged to take up the mantle of a Visionary and Champion by attending seminars and meetings where other Principals are discussing IT and Learning Technologies.

The Teachers are the key to the effectiveness of the investment in IT. They are the best indicators of how effective is the IT program. This can be gauged by the way teachers are using IT. How prepared they are to change their teaching practices by implementing IT, especially in collaborative learning projects. The role of teachers has to change from one where they are in control of everything that happens in the classroom to one where they are facilitators of the students learning. Unless teachers are willing to do this investing in IT is not effective.

Teachers have a crucial role in making decisions on IT investments, as they are the ones using IT. Any investment in IT not perceived by teachers as having educational value will not be fully utilised. Teacher representation on the Learning Technologies committee is vital as they know which learning outcomes and curriculum are suited to an IT approach.

Interestingly the impetus for introducing IT is most effective when it comes from an area other than IT eg English. These teachers recognise IT as a tool to assist and extend their teaching and not as an end in itself. IT teachers who perceive IT as a tool to be learned, were least likely to share their own expertise with other teachers and their students.

Curriculum Planning should provide the direction and make clear the preferred approaches, software tools and activities. It should centre on how IT is used within the delivery of teaching and learning and send a clear message to staff why IT needs to be incorporated into the classroom and how this will occur. Thus any IT Planning should be designed around Curriculum Planning to meet the needs of teaching and learning.

Technical Support is critical to the effective use of IT. The increasing emphasis on collaborative learning projects, the use of the Internet, online communication between students and teachers within the school and with other schools and countries, and the conversion of many libraries into digital resources centres has meant that much teaching and learning is dependent on IT and Networks. If the network, hardware and software are not working or reliable the teachers lose confidence in it and stop using it. Similarly the administration in most schools is totally dependent on IT and the efficiency of the school is adversely effected by lack of technical support, in fact if it is not working the administration comes to a halt.

The Students are the best indicators of the effectiveness of IT as they are impacted most by it. This is observable in the change in the way students learn. Routine tasks are completed quicker and more easily, thus students move rapidly onto higher levels of analysis. Communication is possible with people in a way previously unheard of eg via e-mail to scientists in Antarctica. Information is readily available in an easily comprehensible format eg Multi-Media CD-ROMs. Consequently students are empowered by IT, it is a leveller in education, giving equity to all students previously not available.

The Actual Use of IT is a good indicator of the success of an IT program. For IT to be successful it should never be an end in itself but rather a transparent part of the curriculum and classroom activities. This occurs when IT is no longer obvious but has become an integral part of students learning process, an intellectual partner to both students and
teachers, a tool to assist in research, enhancing their work and enabling the more rapid completion of mundane tasks. Schools are removing IT as a subject, expecting all teachers to include IT when and where it is needed.

Training and Personal Development No IT program will work without good solid work on staff first. Staff have to feel in control of change, to do this you need training and personal development. Schools wanting to maximise the effectiveness of IT and thus IT investment need to change teachers' pedagogical practices to suit the learning situation of today. Teachers do not respond well to being trained by administration staff. Training teachers eager to use IT and then getting them to show what they have done is one of the greatest influences. Buddy systems are also effective.

The School Council has considerable power over the effectiveness of the IT program in the school as it is the final arbiter of the budget and therefore ultimately controls any investments made. The council has to be convinced of the value of IT before it is willing to allocate a set budget amount. However once the school council believes that IT is well managed it is happy to agree to set an annual IT budget and approve exceptions to this annual amount e.g expansions to the network.

The Budget dictates how much can be done and when. IT will not go forward without an adequate budget. IT needs to be well resourced, thus to be able to plan effectively a known percentage of the school’s annual budget has to be allocated on an ongoing basis, 4-12% is perceived as adequate.

The Learning Technologies Committee is vital to creating a Learning Technologies (LT) Plan on which IT investment is based. This LT Plan is a firm statement of the vision and purpose of IT which is developed and communicated throughout the school. The LT Committee must relate the LT Plan to the school’s goals and vision by maintaining the “big picture”, and not allow it to fragment into faction. This LT Plan needs to include a flexible plan three years ahead, with a firm plan for the current year. The LT Committee should include powerful stakeholders such as the Principal, Heads of Schools, Head of Learning Technology, and the System Manager. It is essential that the committee includes teacher representatives who are enthusiastic towards IT and are IT conversant and educated. The ideal committee size is four to six, and definitely not more than twelve.

Model Of IT Investment Effectiveness

The key issues were then analysed to develop a Model of IT Investment Effectiveness (See Figure 1).

This model like Scott’s MIMIC Model (1995) gives determinants and indicators and thus enables a more comprehensive view of IT Investment Effectiveness which could be used to develop a standardised rating criteria. Grover et al (1996) developed three definitional dimensions in an attempt to synthesise the disparate array of previous research approaches. They maintained that effectiveness should be assessed from an explicit viewpoint and to develop a complete picture of IT effectiveness the unit of analysis should consider both the organisational and individual perspectives.

This research reveals clearly defined organisational and individual perspectives both as determinants and as indicators. The individual determinants are the Principal and the Teachers. The organisational determinants are the Budget, the School Council, the Learning Technologies Committee, Curriculum and IT Planning, Training and Personal Development, and Technical Support. The Budget is determined by the School Council which in turn is influenced by the Principal. The Learning Technologies Committee determines the Curriculum and IT Planning which in turn places restrictions on the Learning Technologies Committee’s decisions. The Principal and Teachers are members of the Learning Technologies Committee and consequently are determinants of them. Training and Personal Development and Technical Support have direct influence on the Teachers.

The impact that IT is having on Students is a clear indicator of IT investment effectiveness at the individual level. The Actual Use of IT within the school indicates the organisational effectiveness of IT investments.
Appendix

![Diagram: Model of IT Investment Effectiveness]

Figure 1: Model of IT Investment Effectiveness

Conclusion

Schools are emerging as the new global business. The move to School Based Management (SBM) and economic rationalism has seen Principals responsible for the full management of the school. Their role has changed to be one closely aligned to the CEOs in business, with corporate cultures, structures and processes predominating. This research found that schools are forming strategic partnerships with vendors and suppliers, and alliances with other schools locally, nationally and internationally. The heads of IT are forming cooperative relationships with other schools, and many schools are sending their principals and other members of staff on fact-finding tours overseas.

Governments throughout the world are investing billions of dollars in IT on the premise that it provides equity in education. Recent studies have revealed that IT has actually increased the lack of equity in the provision of facilities and in the ways that IT is used by individuals. However, participants in this research viewed IT as a leveller in education empowering students and giving them equity previously not available.

The aim of this research was to establish a model of IT investment effectiveness based on the views of a group of experts who would represent best practice in schools. Individual interviews and a subsequent two round Delphi Survey with the participants identified the ten key issues crucial to IT investment effectiveness as: the Principal, the Teachers, Curriculum Planning, Technical Support, the Students, the Actual Use of IT, Training and Personal Development, the School Council, the Budget, and the Learning Technologies Committee.

The Final Model reveals clear determinants and indicators of IT investment effectiveness both at the individual and the organisational levels. In the new global business of schooling such measures will be essential to satisfying the needs of their clientele, competing effectively, and in long term perhaps even survival.
References


Education Victoria, Provision of IT & T Products and Services to Department of Education Explanatory Overview, Department of Education, October 1996


Schools with a Future – A Model for IT Investment Effectiveness

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A critical factor for schools of the future is the ability to manage information technology (IT) investments effectively. School communities and governments are investing heavily in IT on the assumption that this will prepare their children for the needs of the workforce and for living in the world of the future. The mechanism driving change has been the trend away from centralised bureaucratic control towards school based management. Closely allied with this has been the demand to be economically accountable for decisions made at the school level. The change in focus from schools as learning centres to schools as businesses has proved extremely difficult for those involved, especially the principals, who are trying to relate educational objectives to spending, and to assess the cost effectiveness of spending and use of resources. The interviews in this research reveal that schools are forming strategic partnerships with vendors and suppliers of software, hardware, and networking products, and with other schools both in Australia and throughout the world. A modified Delphi Survey conducted with experts elicited ten key issues of IT investment effectiveness. These indicate that the Principal is critical, other important factors include the teachers, curriculum planning, technical support, the students, the actual use of IT, training and personal development, the school council, the budget and the learning technologies committee. The key issues are used to develop a model for IT investment effectiveness indicating organisational and individual determinants and indicators of IT investment effectiveness.

Introduction

The ability to exploit the opportunities provided by Information Technology (IT) and to maximise its potential are crucial to schools in the current world environment. No longer can schools be satisfied with providing their students with the 3 Rs of Reading, Writing and Arithmetic.

"Technological literacy has become as fundamental to functioning in society as the 3Rs" (Rodrigues, 1997).

The focus needs to be on an equitable, efficient and effective education system which is resourced, redistributed and relevant (Thomas, 1997). Consequently the effective management of IT investments is critical for the future success of schools.
This research was undertaken to establish a model for IT investment effectiveness in education, specifically in the secondary school arena in Victoria. IT in this context is an all-encompassing term referring to the technology aspects of hardware and infrastructure, and the information systems aspects of software. Effectiveness is "doing the right things" (Fink and Tjarka, 1994) to achieve important organisational goals. IT effectiveness is the change in the effectiveness of an organisation that results from the introduction and use of IT (Iivari et al, 1994).

**Heavy Investments in IT**

Currently school communities and governments are investing heavily in IT on the assumption that this will prepare their children for the needs of the workforce, for living in the world of the future and will overcome the failures of their existing education systems. Table 8: Government Expenditure on IT indicates amounts invested by countries throughout the world.

In the United Kingdom (UK) the government has been criticised for failing to equip children with skills needed to survive in a world where IT is part of nearly all jobs. Michael Martin the Irish Minister of Education has used arguments by business and industry about this skills shortage to persuade the government to treat education as an investment rather than as a cost, for example the creation of a Technological Investment Fund used to bring IT to all levels of education (Pollak, 1999).

<table>
<thead>
<tr>
<th>Country / State</th>
<th>Investment</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria, Australia</td>
<td>1996-99 $US39 million $62.4 million</td>
<td>4 million</td>
</tr>
<tr>
<td>USA</td>
<td>1998 $US4 billion per annum</td>
<td>274 million</td>
</tr>
<tr>
<td></td>
<td>President Clinton - $US 2 billion</td>
<td></td>
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<tr>
<td></td>
<td>The Federal Communications Commission $2.25 billion</td>
<td></td>
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<tr>
<td>United Kingdom</td>
<td>$US296.4 million</td>
<td>59.4 million</td>
</tr>
<tr>
<td></td>
<td>Schools in the UK spending 4-5 times this amount</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>$US49 million by 2000</td>
<td>3.8 million</td>
</tr>
<tr>
<td>Singapore</td>
<td>$US 350 million</td>
<td>3.5 million</td>
</tr>
<tr>
<td>Alberta, Canada</td>
<td>$41 million (infrastructure), $10 million per annum</td>
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Table 8: Government Expenditure on IT

IT is perceived as a source of equity in education. Those who do not have up to date IT facilities in their schools are concerned that their students are disadvantaged. Page (1998) found that the less privileged of America have been left behind not only in access to up-to-date technology but in the ways that they are using it. He urged school districts to ensure equitable learning of new technologies. Similarly Emmison and Frow (1998) assert that IT is another form of "cultural capital" where those with access to and familiarity with IT are advantaged.

**Mechanisms Driving the Change**

Closely allied with heavy governmental investment in IT has been the changing role of schools in Australia, Canada, Hong Kong, Singapore, New Zealand, UK, Ireland and USA where schools are expected to become more efficient and to provide value for money.

In recent years there has been a steady trend in many countries throughout the world towards self management in schools, this pragmatic approach replacing the bureaucratic, centralised approach.

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2 This table was created using figures on government investment in IT in education extracted from information published by a variety of researchers in the period 1998 – 1999. The population figures were obtained from the United Nations 1998 population statistics.
management of education with a more autonomous one. The rationale behind the movement towards school based management is that effective education is best provided by those closest to the students in their care.

The concept of self-management now includes the concept of economic rationalism where the emphasis is on the achievement of “value for money” in education of students, and the school’s public accountability in providing the efficient management of educational resources (Levacic and Glover, 1997). Consequently schools are fully responsible for the management of staffing, maintenance, purchases, funding and finances. School communities and ultimately their principals are now held publicly accountable for the way that they administer their schools and the equity of educational opportunities available to their students. The concern with regard to these can be found in the Victorian context as a new magazine for educational administrators, “Leading and Managing”, was released in 1995, two years after the move towards an economic rationalist model.

School based management and economic rationalism have altered the educational perspectives from education as a benefit to a cost, from schools as service agencies to businesses, from parents as partners to customers (Townsend, 1996).

**Schools as Businesses**

This change in focus from schools as centres of learning to schools as businesses has proved extremely difficult for those involved, especially the principals, who are trying to relate educational objectives to spending, and to assess the cost effectiveness of spending and use of resources. The role of the principal has taken on a similar status to that of Chief Executive Officer (CEO) in businesses, they have to

> "adopt corporate cultures, corporate structures and corporate processes"

(Chadbourne and Ingvarson, 1998, pp. 63).

Symes (1999) maintains that schools have developed an advertising culture devising sophisticated promotional strategies in their prospectuses as a result of the marketisation of education. Hesketh and Knight (1998) view education as just one more commodity to be sold to the consumer with schools attracting not only pupils but the right sort of pupils.

**Research Approach**

The area of IT investment effectiveness in education was one where little if any research had been undertaken. The aim of this research was to develop a model for IT investment effectiveness for secondary schools. The lack of a firm basis on which comparisons could be made led to the decision to implement an interpretive rather than the more commonly used positivist approach where a hypothesis is tested. This entailed a combined approach involving three components

- A literature research on which to base the interview questions
- Individual interviews with all participants
- A modified Delphi Survey where the initial information obtained from the experts in the interviews was collated into a set of key issues and fed back twice to the participants

Extensive research into IT effectiveness and IT investment in the business arena, IT effectiveness in small business, and IT in education, was used as a mechanism for obtaining relevant information on which to base the questions in the questionnaire and to ensure content validity. The questionnaire was in four sections and contained thirty-six questions. The initial closed questions were used to establish rapport with the participants. These were followed by open-ended questions which sought to elicit information from the interviewees relating to the alignment of the schools goals to IT goals, the strategy of IT Investment within the school, and the effectiveness of IT within the school.

The process of developing the interview questionnaire was undertaken concurrently with the canvassing for the experts, a pre-requisite of a Delphi Survey. A problem existed because there were no clearly established experts in IT in Victorian schools. An initial task was to obtain the names of secondary schools that had a reputation for excellence in IT. Thirteen participating experts from five State schools, two Catholic schools and six private schools were interviewed and involved in the two round Delphi.

**The Interviews**
The interviews were used as a mechanism for eliciting information from which an initial set of key issues was derived. This information was carefully analysed in an in depth three-stage process and twenty-four key issues were extracted. The issues thus established were then ranked according to the frequency with which they were referred and the importance placed upon them in the interview process, see Table 9 – Initial Key Issues.

**Interview Discussion**

All schools conducting laptops programs had strategic partnerships with their suppliers, and many schools had strategic partnerships with networking firms and software houses. Most schools, however, believed that they gained significant advantages from their strategic partnerships.

Schools were forming strategic alliances with other schools locally, within the state of Victoria, and throughout Australia. Some were even forming strategic alliances with schools in other countries. The rationale for developing strategic alliances was that changes in technology were happening so rapidly that it was impossible for a single school to keep abreast of changes in IT without them. These alliances enabled the sharing of information, discussion of trends and issues, and consequent improvement in efficiency and effectiveness of IT in schools.

All schools attest that there was a lack of in-house knowledge and thus had considerable reliance on external expertise, largely provided by vendors and suppliers with which they had strategic alliances.

Infrastructure investments formed a significant proportion of the IT investment in schools, 60% on average. In the initial stages of establishing networks infrastructure investment frequently accounted for 100% of the IT budget.

**The Delphi Survey**

The key issues were then forwarded to the participants to rate on a ten-point scale, to delete any criteria that they considered not relevant, and to add any omissions giving reasons for these inclusions and deletions.

The participant feedback to the key issues was collated and re-ranked according to the ratings given by the group. Two new criteria were identified Curriculum Planning and IT Planning, these were subsequently highly rated by participants thus validating the use of the Delphi Survey. This process was only repeated twice as it was found that with the exception of the high rating applied to the two new issues there was little change from the first round rating of the initial twenty-four issues.

**Research Findings**

**Key Issues Identified**

The participants in this research consistently agreed that there was a set of ten key issues to be dealt with before a school can hope to achieve effectiveness in its IT investments. These included the Principal, the teachers, curriculum and IT planning, technical support, the students, the actual use of IT, training and personal development, the school council, the budget, and the learning technologies committee.

*Principal Leadership and Vision* — is critical to the success of any IT program. The Principal has to be a visionary leader championing IT actively promoting, adequately funding, and leading the impetus for IT within the school. This role must be undertaken by the principal, and cannot be delegated to a deputy.

*Teachers as Facilitators* — are the key to IT investment effectiveness, without their participation it will not succeed. The role of the teacher has to change from one where they are in control of everything that happens in the classroom to one where they are facilitators of the students learning.

*Alignment of the Schools Goals to Curriculum Planning* — involves the eliciting of the schools vision and goals as identified by the principal into curriculum and IT goals. All schools in this research have schools goals identified in their mission statement, and nearly all of the schools align these goals with their curriculum and IT goals.
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Table 9 – Initial Key Issues

**Technical Support** – is critical to the effective use of IT. Participants maintain that if the network, hardware and software are not working or reliable the teachers lose confidence in it and stop using it.

**IT Empowers Students** – Students are empowered by IT and are given equity by IT. The impact on individual students is an indicator of the effectiveness of the IT investment. This occurs when students are observed using IT to rapidly complete routine tasks thus enabling them to move more rapidly onto higher levels of analysis. IT also enables students to communicate with entities previously unavailable through traditional means.

**Seamless Use of IT** – The actual use of IT is a good indicator of the success of an IT program. This is observable when IT is used as a part of the teaching and learning process rather than as a separate entity in itself. Increasingly schools are removing IT as a subject and expecting all teachers to include IT when and where it is needed.

**Teacher Personal Development and IT Training** – are important pre-requisites to effectiveness of IT investments. Private schools are generally recognising this, and most provide on-demand personal development for teaching staff. However the situation in Catholic and State schools mirrors Blackmore et al’s (1996) findings that teachers are expected to be able to implement IT into their curriculum areas but have to educate themselves if they want to keep abreast of the current developments in IT.

**The School Council’s Comprehension and Commitment to IT** - has considerable power over the effectiveness of IT investment as they are the final arbiters of the budget. Council members need to be convinced of the worth of IT within the school before an IT program can really be undertaken.
Appendix

**Ongoing Clearly Identified IT Budget Allocation** – determines what can be done and when. Schools indicate that it is vital a clearly defined budget amount stated as a percentage of the school’s budget is allocated annually.

**Learning Technologies Committee** – needs to be small comprising of key stakeholders in the school including the Principal, the Head of Learning Technologies, the Systems Manager, and teachers in key learning areas. It is vital that the Learning Technology Committee members are IT conversant or educated.

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**Figure 1 - Model of IT Investment Effectiveness**

**Model of IT Investment Effectiveness**

Careful consideration of these findings indicated that some of the key issues were determinants of IT investment effectiveness whilst others were indicators. The determinants were the Principal, the Teachers, Curriculum Planning, Technical Support, Training and Personal Development, the School Council, the Budget, and the Learning Technologies Committee. The indicators were the Students and the Actual Use of IT.

Scott’s MIMIC model (1995) had identified antecedents (determinants) and resultants (indicators) and Grover et al’s (1996) Construct Space for IT Effectiveness Model had classified indicators and determinants as individual or organisational. By combining these a Model of IT Investment Effectiveness was developed, see Figure 4 – Model of IT Investment Effectiveness. The arrows indicate the way the issues impact on each other. This can now be used by schools to assess their IT investment effectiveness.

**Conclusion**

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Participants stressed the absolutely critical role of the Principal, not a principal appointed delegate, to the effectiveness of investments in IT. Teachers are uppermost in determining effectiveness in IT. The Learning Technologies (LT) committee has a significant role in the effectiveness of IT investments in schools. Students are empowered by IT that is perceived as a source of equity. The Budget is significant as without an adequate budget the IT program comes to a standstill.

The analysis of this research revealed that participating schools were displaying best practice when compared to business in their management of IT. A high level of both strategic planning and clearly defined organisational goals was found consistently throughout the various schools. This situation closely resembles the findings by O'Mahony and Dampney's (1996) in New South Wales secondary schools. In fact with only one exception, the IT goals within the school were not only clearly defined but were either formally or informally based on the school's goals. They understand their core strategies and are using these to provide a capability model to enable them to maximise the effectiveness of IT as they move into the next decade of technological change.

The participating schools have identified the key issues for schools when investing in IT. The model developed provides schools with a tool to assess their IT investment strategy and maximise their effectiveness thus providing them with a future.

Bibliography


Pollak Andy, “Martin has a taste for reform and a detailed shopping list to go with it”, The Irish Times, August 19, 1999, Page 14


Symes Colin, “Education for sale: A semiotic analysis of school prospectuses and other forms of
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