A Study Examining the ICT Literacy Levels of Music Educators in the New South Wales Department of Education & Training

Submitted in fulfilment of the requirements for the degree of Master of Arts (Music) in the School of Drama, Fine Art and Music by

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Statement of Originality

The thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library**, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

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Abstract

The use of technology in the Australian secondary school education system has increased considerably over the last two decades. While technology may effectively be implemented at a general level, the uptake in specific disciplines such as music often lags behind. This is significant as a limited use of technology can impact on the success of a student’s studies, future opportunities of employment or education, and, importantly, overall career paths.

Issues of technological integration in education are not new. It was highlighted in 2004 when the Australian Federal Minister for Education, Science and Training, the Hon Dr Brendan Nelson MP, commissioned a report into the delivery of music education in the Australian schooling system. The report, co-ordinated by Murdoch University and released publicly in November 2005 entitled The National Review of School Music Education (Australian Government Department of Education, Science and Training, 2005), indicated that technology should be a mandatory part of the music education process and that music educators must equip themselves with the necessary skills to deliver such education.

Central to this implementation is the technological competency of the music educators themselves. In order to ascertain information about certain aspects of competency, this study considers the perceived level and range of technological familiarity of a selection of secondary school music educators working in the New South Wales (NSW) Department of Education and Training. It also considers attitudes towards technology.

The study, while somewhat limited in scope, noted that most of the music educators surveyed possessed a good level of general technological literacy and many were fluently using this in their teaching. There was also a smaller element that evidenced an amount of disconnect between
their personal use of technology and its application in an educational context. Additionally, it identified a number of possible factors that may be affecting technological implementation in music including curriculum, resourcing, familiarity with current technology, training and educational practice itself.
1.0 Introduction

This research extends across a number of areas, namely technology (often referred to as ICT), literacy and music education. It aims to briefly examine each of these fields autonomously in addition to considering their combined interactions within the context of secondary school music education. Of particular interest are teacher’s practical implementation and attitudes towards technology. Through this avenue of enquiry the study will consider one of the potential challenges facing the effective implementation of technology in the secondary school music classroom.

The Australian National Review of School Music Education (Australian Government Department of Education, Science and Training, 2005) indicated that the use of technology should be made a mandatory part of the school music education process and that music educators should equip themselves with the necessary skills to deliver such education. The implementation of the recommendations of the review are quite extensive with a number of factors coming into play, not the least being the fundamental technological literacy of the music educators themselves.

To facilitate this research a selection of Australian secondary school music teachers were surveyed to determine their perceived levels of understanding and adoption across a range of technological advancements. Information was also gathered regarding their levels of comfort concerning the use of technology.

The data produced by this study provides a snapshot of a cohort of practicing secondary music educators. It helps create an awareness of the matters that emerge and presents issues that could become prominent in the future. It is acknowledged from the outset that the information obtained will not necessarily be representative of the entire cohort of Australian secondary music educators including public, Catholic, and independent schools, neither is it a comprehensive study indicative of all regions.
Nevertheless it does present sufficient information from which further enquiry could proceed and provides an impression from a select cohort of music teachers endeavouring to implement technology into their teaching practices.
1.1 Research Questions

Australian secondary schools are regulated by a curriculum standards framework. While this provides a certain level of consistency across the various education systems and allows for individual customisation and adaptation it does impose a level of responsibility to adhere to the minimum requirements.

In the state of New South Wales (NSW), for example, the Board of Studies NSW provides educational leadership by developing curriculum and awards, such as the Higher School Certificate. As part of this process the Board prescribes the core curriculum and develops syllabuses for commencing students (Kindergarten) through to the final year of secondary studies (Year 12). These are then passed on to be implemented through schools. This situation places demands on the various education systems, their schools and, ultimately, their teaching staff.

The integration of electronic technology into education has not been a smooth transition with a wide variation in the quantity, quality and methodology of adoption. In recent years syllabus requirements have been updated to identify technology as a key competency in the area of music (Board of Studies NSW, 2010). In addition to the directives disseminated in updated curriculum requirements, other sources such as the National Review of School Music Education (2005) provide recommendations to improve the music education system. In this instance the review indicated that technology should be a mandatory part of music education and that educators must obtain the necessary expertise to effectively deliver such education.

The provision of recommendations are a mechanism to ensure the relevancy of education in Australian schools. Notwithstanding the improvement these changes may have on educational outcomes a concern lies with the practical implementation of these directives.
It is possible that a combination of factors may be affecting the implementation of technology in the secondary music education environment. These may include attitudinal issues of resistance or apprehensiveness, problems with technological resourcing including accessibility and functionality, and the process of integrating technology into an existing (traditional) educational context. Additionally, the volume of time required to become, and remain, adept with technological advancements may be influential.

To examine the veracity of these statements this study adopts an approach of measuring the perceived levels of technological literacy over a broad range of technological areas in addition to measuring attitudes towards technological training and implementation. The cohort to be surveyed are a group of practicing secondary school music educators who have recently been involved with technological implementation in their area of specialisation.

To examine the subject area this research asks a number of questions pertinent to secondary school music educators. These include:

- What forms of ICT do they use within and without the realm of music education?
- What level of ICT are they engaging with?
- Is there any distinction between levels of personal and work-related use of ICT?
- What attitudes may exist towards technological implementation in the context of music education?

Answering these fundamental questions will aid in identifying the potential influence of ICT literacy levels on the implementation of technology in the secondary school music classroom.
1.2 Significance of the Research

The topic and timeliness of this study are both important. Studies such as the Australian National Sample Assessment for Information and Communication Technology Literacy Program (Australian Curriculum Assessment and Reporting Authority, 2011) look at student literacy levels. Fewer studies, such as the Western Australian Government’s report on Teacher ICT Skills (2005), appear to be undertaken to examine the literacy levels of Australian educators, and even fewer studies are specific to the state of NSW and the music educators therein. The literature review in the following chapter discusses a number of reports that focus on school educators at large such as the Western Australian Government’s report on Teacher ICT Skills (2005) but these often focus on common technology skills such as word processing rather than more specialist skills such as usage of audio and video. This study is unique as it focuses specifically on the technology literacy levels of secondary school music educators and examines their use of technology both within and without the music education context.

The timeliness of the study is pertinent as the secondary school education system grapples with the Digital Education Revolution (NSW Department of Education and Communities, 2012). Additionally, the implementation of the recommendations of the National Review of School Music Education (2005) is having an effect on the sector. Furthermore, the upsurge in music technology paraphernalia that has appeared in the last few years provides much more scope for the use of technology in music education. It is from within this context that the study takes its viewpoint.

From an international perspective, the issue of the technological literacy levels of music educators continues to be raised through the activities of organisations such as Technology Institute for Music Educators (TIME) and the International Society for Music Education (ISME). This body of work fits well within current activity in the international arena.
It is also highlighted that this research is being undertaken independently of Australian Government secondary education departments. It is understood that various departments are able to instigate statistical studies in areas relevant to demand. It is believed that little or no research has previously been undertaken into this specific area of enquiry, particularly by an independent body.

### 1.3 Limitations of the Research

This study has a number of limitations that are expected to influence the data that is obtained. By identifying and acknowledging these issues it alerts the researcher to potential skewing of data while assisting in developing areas of strength. The identification of limitations will also be helpful in post-analytical considerations.

The cohort studied is restricted to a group of secondary school music educators who teach within the NSW Department of Education and Training. (Note: At the time of printing (August 2012) this division has been restructured and titled the NSW Department of Education and Communities.) While this constitutes a convenience sample and may not be considered to be representative of the population, the statistical generalisibility of the results may be limited. However, assessing teachers from a variety of different backgrounds was considered beneficial, including those located in city and regional areas, but this is still limited from within the state of NSW. When compared to data from other areas such as state/territory, national and international data, it may possess slightly different characteristics owing to the inherent features of each locale.

Additionally, the data obtained in this case study (contain in chapter 4) will not necessarily be indicative of music educators from all schooling systems such as Catholic and independent schools. Each of these schooling systems have their own models of music education implementation and systems for accountability.
It should be particularly noted that the cohort utilised in the study voluntarily agreed to participate in the research rather than being randomly selected from a large pool of possible participants. This in itself has problems and may yield a higher level of participants desiring to provide a strong opinion, either positive or negative, and create an absence of educators who would otherwise provide comments of a more neutral nature.

Another limitation of the study is the narrow scope of the survey questions. In order to provide an acceptable survey time and to minimise the chance of attention loss/disinterest that may yield false data, the survey was designed to take most participants 45 minutes or less. This limited the number of questions that could be provided and reduced the detail that was obtainable through the survey instrument. The data that is obtained, though, is anticipated to be a fairly accurate representation of the sample cohort.
2.0 Literature Review

2.1 Technology and Education

Technologies in their basest forms are “the tools and artefacts used by humans to transform nature, enable social interaction or extend human capacities” (Flew, 2005, p. 25). They occur in many forms and may be applied explicitly or implicitly in our lives. By itself technology has limited capacity but when harnessed it becomes valuable and enables “the user to do things with it” (Flew, 2005, p. 26). An item of technology by itself may not exhibit a particular purpose unless it is related to a particular application. A user, for example, will need to possess sufficient skills and knowledge to effectively utilise the technology. This requires the “interaction between physical objects, contexts of use, and systems of knowledge, indicating that technologies inevitably intersect with cultures” (ibid).

Technologies have potential uses. Digital documents, for example, “...have their own affordances. They can be easily searched, shared, stored, accessed remotely, and linked to other relevant material” (Gladwell, 2002, p. 93). With this also comes limitations which may hinder a user familiar with the use of normal documents. According to Flew (2005), Ryder and Wilson (1995) “…understood the Internet in terms of a series of affordances it presented for users, or the range of potential uses that a person saw for that item. They also noted that affordances could also be constraints, as the awareness of new possibilities arising from a new media technology also draws attention to practical limitations in achieving these gains” (Flew, 2005, p. 7). These considerations provide the context for examining practical applications of technology in an educational context.

Technology in education receives a significant amount of attention. Since the late 1990’s numerous reports concerning the involvement of Information and Communication Technology (ICT) in the education process have appeared with many critical of the way in which ICT is handled. For example, in March 1997 the Stevenson Report (Information
“and Communications Technology in UK Schools – An Independent Inquiry” commissioned by Tony Blair and David Blunkett was released. Its purpose was to examine the role that ICT should play in both primary and secondary education sectors and to suggest a desirable set of priorities for the intended Government to implement. The report asserted that “the state of ICT in our schools is primitive and not improving” (Stevenson, 1997) and requested that a coherent unified system be developed to direct ICT use in the UK schooling system.

Since that time many educational organisations have developed, or are developing, guidelines concerning the inclusion of ICT in their teaching curriculum. In an Australian context the Board of Studies NSW, a government department serving government and non-government schools in the development of school education for Years K-12, has developed ICT curriculum initiatives. As part of these initiatives they map the use of ICT through the various schooling syllabuses. They state that “The basic aims for ICT across the curriculum are to ensure that all students have the opportunity to become competent, discriminating and creative users of ICT, and that they are better able to achieve syllabus outcomes through effective use of ICT for enhanced learning” (Board of Studies NSW, 2007).

In the context of the UK, ICT is a statutory component of the Key Stages 2 and 3 National Curricula. Even though it is mandatory Savage (2010) indicates that music education is still dominated by conservative uses of ICT that reinforce traditional subject content. He asserts that strategies for the “sharing of knowledge … are needed if wider impact is to be made on the delivery of music curriculum that exploits the broader potential of ICT to widen access and provide students with an inclusive and personalised curriculum” (Savage, 2010, p. 89). In an Australian context a number of NSW syllabuses have been recently revised to incorporate ICT based on the mandatory curriculum. The Board of Studies has indicated that “All new syllabuses make some explicit statements about the ICT that is to be incorporated into teaching and learning” (Board of Studies NSW, 2007). The mapping of ICT into the revised mandatory stage 4 and 5 syllabuses,
for example, has some statements that are quite direct in linking “learn about” and/or “learn to” content to units of teaching while other areas may be implemented in a range of different teaching units.

The Board of Studies in NSW has divided the various areas of study into ten groups and has specified related ICT skills for these fields. Table 1 shows the number of ICT skills prescribed within the context of the Australian stages 4 & 5 (years 7-10) syllabuses.

Table 1

*Mapping of ICT Skills in Revised Mandatory Stages 4 and 5 Syllabuses*

<table>
<thead>
<tr>
<th>Subject area</th>
<th>Number of specified ICT skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>28</td>
</tr>
<tr>
<td>Languages</td>
<td>6</td>
</tr>
<tr>
<td>Geography</td>
<td>13</td>
</tr>
<tr>
<td>History</td>
<td>19</td>
</tr>
<tr>
<td>Mathematics</td>
<td>31</td>
</tr>
<tr>
<td>Music</td>
<td>1</td>
</tr>
<tr>
<td>PDHPE</td>
<td>5</td>
</tr>
<tr>
<td>Science</td>
<td>10</td>
</tr>
<tr>
<td>Technology</td>
<td>31</td>
</tr>
<tr>
<td>Visual Arts</td>
<td>5</td>
</tr>
</tbody>
</table>

*Note.* Data obtained from the NSW Board of Studies, 2007.

From this data we observe that some areas of study such as science and mathematics have a larger proportion of ICT integrated into their syllabuses, while many of the creative arts, for example music and visual arts, have significantly less. The specified ICT skill for music is an outcome (#4.6) of the stage 4 (years 7-10) syllabus (2003 release). This specifies that “a student experiments with different forms of technology in the composition
process”. It also states the outcome: “students learn to explore forms of musical notation, including computer-based applications, as a method of recording their own musical ideas” (Board of Studies NSW, 2003, p. 12 & 24). The implementation of this, though, is interpreted in each individual context.

In light of educational requirements such as those mentioned above, a section in *Teaching Computer Literacy* (Corbel & Gruba, 2004) attempts to establish a number of practical approaches that educators can use to implement computer technology in the classroom particularly for adult learners. Their thoughts are based on research conducted by specialist computer teachers and centre on the use of computer-based technology for the delivery of, primarily, language education. While this research is specific to a particular discipline there are similarities that can be likened across the education sector including music education. One notable feature of their work is their use of the phrase “computer-based technologies”, referring to a wide range of technological devices including DVD players and mobile phones. They point out that, in its original form, computer technology may be normally perceived as working with a desktop computer. They challenge this thinking by providing additional perspectives on computers and learning.

The comparison between technological literacy, language literacy and employment prospects are briefly addressed in their writing: “In English language education in particular, teachers of immigrants and refugees realise they need to help their learners acquire computer skills since students are likely to take jobs that require familiarity with a range of digital literacies (Corbel & Gruba, 2004, p. v)”’. From this it could be contended that music educators are in a similar circumstance concerning the digital literacy of their music students and their future employability. Corbel and Gruba also state that, “while still only 10 per cent of the world’s population is online, digital literacies are increasingly becoming an essential tool for social, education and occupational worlds” (Corbel & Gruba, 2004, p. v).

Since the publication of their book (2004) this has become more evident,
particularly with the advent of many social networking websites and the implementation of more online-supported education.

Underlying their thinking, Corbel and Gruba believe that professional educators require more than just “hints and techniques” about using computer-based technologies. They assert that teachers want to understand more about the research and theory on which teaching approaches are built, not just the practicalities of implementation. It is quite possible that this concept may equally apply to music education. “Professional development” courses are available providing hands-on approaches and quick tutorials, but there appears to be a lack of theoretical and empirical research material available on the topic.

As part of their own research Corbel and Gruba also refer to research carried out in the United States (Council of Australian University Librarians, 2001; United States National Research Council, 1999) that asserted that fundamental computer literacy, the ability to learn specific hardware and software applications, is a requirement for engaging with the new “digital”, “silicon” or other “electronic literacies”. Using this prerequisite as a basic assumption Corbal and Gruba put forward the proposition that “if our students are unable to effectively operate a personal computer, we argue, they would lack the requisite foundation on which to build sophisticated skills that are now needed to fully participate in today’s digital society” (Corbel & Gruba, 2004, p. 2).

One significant concept discussed by Corbel and Gruba is the notion that teachers of a particular discipline, be it language or music, are responsible for helping their students gain computer literacy skills. Rather than leave the entire responsibility of technological training to others, such as in the case of dedicated technology training classes, the development of computer literacy should be integrated into all teaching practices. They argue that “not all teachers want to become full-time computer trainers but each, we argue, has a role to play in helping their student gain the skills needed to live and work in the Information Age” (Corbel & Gruba, 2004, p. 2). While this
argument has merit it also raises the issue about a possible distinction between fundamental technology literacy, that which is required for dealing with everyday technology, versus discipline-specific technology literacy, that which is specific to the needs of a discipline area such the creative arts.

Notwithstanding the nature and quantity of technological implementation, it is generally agreed that educators should be using technology in their teaching practices. As Bradley Merrick argues in a conference paper, “to be using technology is to be seen as being 'in touch' with the current trends and applications of society on the whole” (Merrick, 1995, p. 192).

While the importance of being ‘in touch’ is critical, so too is the need for definitional precision. In education circles, particularly in Australia, the term “computer-based technology” is often loosely enveloped in the broader term of “Information and Communications Technology” (ICT) and is often referred to as such in syllabuses and educational documentation. This envelopment widens the scope of the topic and encapsulates additional areas such as data structures and digital management systems.

The publication Dimensions of Learning in Practice in Australian Primary, Secondary and Tertiary Education (Grainger & Allen, 2007) discusses some of the barriers (social and physical) that may hinder the uptake of ICT by classroom teachers. As a case study, they examine an approach at the tertiary level that attempts to demonstrate how teachers may find creative ways to solve familiar problems with new (unfamiliar) technologies.

According to Prensky (2001), the power of technology is doubling each year and the development of new tools, software and hardware, places teachers in a position to deal with a range of issues that will challenge their capability in this environment. Grainger and Allen state that “…this is happening at a time when schools are being called to educate a more diverse population than ever before, and to educate them to higher standards than ever before” (Grainger & Allen, 2007, p. 7). O’Neill (2006) claims that “Schools are charged with the responsibility to educate students to thrive in a 21st
Century world characterised by change and complexity with a workforce that in many respects is struggling to develop new skills”, referring to the writings of various authors (Candy, 2004; Dalton, 2005; Gee, 2003; Prensky, 2005 & Brown, 2000).

Interestingly, O’Neill (2006) cites Hargreaves (2004) claiming that while ICT has an important role to “transform education”, there is little evidence that significant benefit and improvements to student learning outcomes has occurred. Much of the literature appears to attribute the cause to the following factors: a lack of pedagogical support and professional development for teachers. While these may have been significant factors in the period 2000-2006, there may be other influences that also need consideration in the context of this study.

According to an article in Education Queensland (2005), education and the teaching profession particularly appears to be caught up in the movements between science and technology that has been referred to in some more modern policy documents as the “digital revolution”. Brown (2000) states that students who are “growing up digital” often see their teachers as people who speak a different language. Prensky (2001) asserts even more of a distinction between those who have gradually entered the era of digital technology and those who were born into it. In his seminal work Digital Natives: Digital Immigrants (2001) Prensky uses the terms “digital native” and “digital immigrant” to identify two different cohorts. While there are some evident problems with the term, as Bennet, Maton and Kervin (2008) point out, Prensky has established these categories in common usage. In focussing on the difference between the two groups from an educational perspective he uses age-based delineation to discuss the different mindset of each cohort. In essence he argues that the introduction of technology in the latter parts of the twentieth century has changed the brain patterns of digital natives. He also identifies a digital immigrant “accent” whereby immigrants maintain particular characteristics from the pre-digital experiences through their mannerisms with technological use. Prensky is also quoted as saying “…our Digital Immigrant instructors, who speak an outdated language (that
of the pre-digital era), are struggling to teach a population that speaks an entirely new language” (Prensky, 2001, p.2). While some of these ideas may be *in extremis*, this does not deny the idea that familiarity with digital technology, as a part of everyday use, can have some impact on approaches to that technology’s use. This process, in fact, may have the notion of literacy at its heart whereby a native speaker may have a level of fluency that is difficult to match by a person who has to learn or become fluent, that is literate, in the language they adopt. In this regard Prensky identifies the characteristics of a “typical” digital native learner, i.e. fast paced, wanting learning to be fun and to achieve instant gratification, and predicts that games-based learning will be an integral part of future learning contexts.

Grainger and Allen (2007) refer to the importance of educational institutions to evolve in order for ICT to be seen as integral to teaching and learning. They assert that “ICT can be seen as the catalyst to create new solutions, rather than a new approach to old practices” (Grainger & Allen, 2007, p. 64). It is these “old practices” that are inherently embedded in certain fields of study and are evident in the discipline of music. Attitudes to learning and ICT literacies are two areas that Grainger and Allen consider pivotal to the effective incorporation of ICT into educational practices. O’Neill (2006) also cites a lack of pedagogical “know how” as a significant barrier to the uptake of ICT in classrooms.

Despite recognition of the level of expertise required, ICT in education is still high on the political agenda with many government policies being implemented. In an Australian context, the $1.2 billion Digital Education Revolution package announced in 2008 improves access to ICT resources in addition to ensuring “that all teachers have appropriate ICT skills” (Australian Government, 2008, p. 38). In the long term it is the Australian Government’s vision that ICT will improve the education system and:

- “students and teachers will communicate freely across Australia and internationally through shared classes, projects and activities such as video conferencing;
• students will have access to specialist teachers in subjects such as languages and music; and
• parents and school leaders will be better able to use ICT for effective communication and administration”. (Australian Government, 2008, p. 38).

While the realisation of this vision may produce a world-class education system it possesses a number of significant hurdles that have, to date, not been successfully addressed. Notably amongst these are the ICT skills of educators and the integration of ICT into teaching practices.

However, literacy has significantly increased its presence in educational policy, curriculum development and educational practice to the point of being a key ideal (Lankshear & Knobel, 2006). Over the last three decades literacy has emerged from occasional references in various disciplines, such as reading and writing, to being integrated through the whole education process.

Lankshear & Knobel (2006) cite three reasons why literacy was pushed to the forefront of educational focus and effort:

• The radical education movement of the late 1960’s, especially the work of Paulo Freire, which involved “reading the word and the world”. In this case groups of learners would collaboratively pursue real-world social experiences in conjunction with discussing words and their applications.

• The widespread “discovery” of apparent illiteracy among adults in the US in the early 1970’s. This was the time when the US moved toward becoming a post-industrial society. These changes included the economy, labour market, employment and the institutions of daily life. The “literacy crisis” was a seen as a result of people being poorly-prepared for these changes.
The increasing development of a sociocultural perspective within studies of language and social sciences. This had influence on conceptual and theoretical understandings of practices involved texts, particularly during the 1980’s and 1990’s. Many studies where drawn together to challenge established approaches to fundamental literacy’s in education (Lankshear & Knobel, 2006, pp. 9-10).

Out of this context *literacy* has emerged as a fundamental focus of formal education. A number of government’s policies have adopted it as a key factor in the education system of nations, though the interpretation and implementation did differ somewhat. The United States, for example, passed legislation called the *No Child Left Behind Act* (2001) as the basis for a new school education system. In this case *literacy* emerged as a sociological concept rather than a psychological one (Lankshear & Knobel, 2006).

Additionally, the Australian Government report *Literacy for All: The Challenge for Australian Schools* (Australian Government Department of Education Training and Youth Affairs, 1998) also attempts to challenge the “literacy void” by implementing national principles, though the scope of the term *literacy* is somewhat limited. The publication has a small section on “Literacy and Technology” which summarises a study carried out by Lankshear, Bigum, Durrant, Green, Honan, Murray, et al. in 1997. It focuses on the link between literacy and technology and particularly written language literacy. They say that “whatever the particular technologies involved in specific cases, technology is always necessarily inherent in literacy” (Australian Government Department of Education Training and Youth Affairs, 1998, section 5.8).

Additionally, in her doctoral thesis, Helen Nixon (1999) examines generational difference and how it threatens existing pedagogical relationships between the teacher and student particularly with regard to the issues of technology. She discusses how computer-related literacies enter discursive constructs of educational development. Furthermore, she aims to
encourage policy makers, educators and educational researchers to rethink what the situation of education and schooling considering the changing “techno-cultural” context. However, student ICT competency levels are regularly discussed by policy makers and educational researchers, but the issue of ICT implementation and competence levels of those providing the edification i.e. the educators, is a topic broached much less frequently. A fundamental problem exists if an educator is unable to sufficiently comprehend certain concepts for example ICT, if those concepts are to be satisfactorily incorporated into educational practices as appears to be the intention.

To overcome this problem a number of international professional bodies exist that support educators specifically about the use of technology. For example, the following statement underpins the aim of the International Society for Technology in Education (ISTE), a not-profit organisation that is dedicated to supporting the use of ICT to assist in the learning and teaching of primary and secondary students and teachers: “Today’s classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher’s professional repertoire” (International Society for Technology in Education, 2000).

The Journal of Technology and Teacher Education (JTATE), the official journal of the Society for Information Technology and Teacher Education (SITE), operates as a forum for the exchange of knowledge about the use of information technology in teacher education. It discusses teacher education teacher education in areas such as curriculum content, instruction, administration, staff development instructional technology, and computers in education (Association for the Advancement of Computing in Education, 2009).

In an Australian context there appears to be nothing available in a similar fashion to the above journals/societies. There are, though, smaller groups
that act as a forum for discussion about ICT in education. For example, the refereed academic journal *Australasian Journal of Educational Technology* (AJET) published by the *Australasian Society for Computers in Learning in Tertiary Education* (ASCILITE) publishes articles about educational technology, online and e-learning, educational design and computer assisted learning. In their September 2009 issue they published an article (Crawford, 2009) related to a case study about ICT issues in the music classroom (discussed later in this section).

Several state-based societies also exist operating to support educators in the use of ICT. *The Queensland Society for Information Technology in Education*, for example, acts as a network to connect and support “educators, institutions and their stakeholders so they may fully explore the opportunities Information Communication Technologies bring to Queensland education and its classrooms every day” (Queensland Society for Information Technology in Education, 2009). While this statement may seem encompassing, and the work of many of these groups is quite beneficial, they tend to lend themselves to localised user support networks rather than public societies supporting the development of ICT in education.

A number of publications existing in print form that aid educators in the implementation of ICT in the classroom, including the music classroom. *Strategies for Teaching* (McCord, 2001), for example, provides specific ideas of how educators can achieve the standards coherent with the *National Standards for Arts Education* (USA). While this in itself is a good initiative and gives “grass roots” level advice, it doesn’t provide the educator with associated support/training and does not help resources functionality and availability issues. However, it is acknowledged that the strategies in the publication are not a formal curriculum, rather they are provided to assist in the development of curricula, planning classes, and the assessment of music learning.

*Teaching Music with Technology* (Rudolph, 2004) also provides educators with practical ideas though it appears to have more of a “hands-on” focus on
technology in music, rather than a discussion of music education and technology. *The Technology Guide for Music Educators* (Rudolph, Richmond, Mash & Williams, 2005) also has its benefits, but once again is limited within its own context.

Renée Crawford in her article *Secondary School Music Education: A Case Study in Adapting to ICT Resource Limitations* (2009) broaches a number of the issues affecting music educators and the use of ICT. Based on an interview as part of a case study in Victoria (Australia), she highlights several issues that educators may encounter, particularly unequal distribution of resourcing and the politics of IT problems within the school context. While her ethnographic research contains much merit, it is noted that the scope of the study was not extensive and may not necessarily be representative of all secondary schools throughout Australia.

Crawford’s research observes that while resourcing implications can significantly affect the successful implementation of ICT in educational contexts, there are other factors that may be of greater significance such as the ICT skills and implementation ability of the educators themselves. The concern “we have insufficient resources” may be true in some scenarios but there are some suggestions, largely undocumented, that adequate ICT resources may be available but it is the lack of understanding, skills, willingness and ability to implementation that is the point of difficulty. The conclusion of Crawford’s article identifies “the importance of ICT, the necessity for reliable resources and for music teachers to receive appropriate school support, technical assistance and professional development” (Crawford, 2009, p. 486). This statement covers many of the issues music educators grapple with concerning ICT.

Finally, Corbel and Gruba suggest that “Teachers are often hesitant to teach computer literacy because they are concerned about their own lack of skills in computers” (Corbel & Gruba, 2004, p. 8). They believe that “… the acquisition of computer literacy skills comes through the results of sustained personal effort within a supportive social context.” This issue is noteworthy
as the teachers self-confidence may be a significant factor affecting the ICT literacy acquisition of music educators.
2.2 Studies Into ICT Application and Integration

This section aims to highlight a number of key studies specifically related to ICT use in school education. The studies are of relevancy to this research as they cover a number of similar topics and, in particular, several have specific relevance to music education.

2.2.1 The WADET Teacher ICT Skills Study

In 2005 the Western Australian government undertook a study (West Australian Department of Education and Training (Evaluation and Accountability), 2005) to evaluate the ICT knowledge and skill levels of Western Australian government school teachers. The study was undertaken by the Evaluation and Accountability division of the Western Australian Department of Education and Training (WADET).

The study was done to:

- provide a valid and reliable assessment of the level and nature of ICT knowledge and skills among WA government school teachers;
- establish to what extent teachers are integrating their ICT knowledge and skills in classrooms;
- identify factors seen by teachers’ as impacting on the development of ICT competence and its integration in teaching and learning; and
- determine potential ICT support and development strategies to enhance effectiveness in the future (West Australian Department of Education and Training (Evaluation and Accountability), 2005, p.5)

It utilised a self reported ICT teacher survey, an online test which assessed the ICT knowledge and skills of teachers, and the statistical validation of the data by comparing the survey and online test results to indicate the accuracy of the data. Survey forms were sent to 2,332 teachers which comprised 12.5% of the overall teacher population working in Western Australian Government schools. Of these, 1500 forms were returned - a response rate of 66%. Smaller groups from metropolitan or country schools and primary
and secondary schools were identified using a stratified random sampling technique. The total number of teachers included in each subgroup was adjusted to reflect the actual proportions of the teacher population. Subgroup responses included 367 responses from metropolitan primary schools; 395 responses from metropolitan secondary schools; 373 responses from country primary schools and 365 responses from teachers in country secondary schools.

While no limits were applied beyond the school type and region, the random nature of teacher selection resulted in a match between the demographics of the overall teacher population and those of the teachers who returned their survey forms.

The outcomes of the study, summarised below, are drawn from the report’s Executive Summary (pp.5-7) and provide a good picture of the current state of ICT levels in that context.

**Teacher ICT competence**

- The basic suite of ICT applications used by more than 95% of teachers is comprised of word processing, Internet, email and file navigation.
- 65% of teachers have used both spreadsheets and presentation software.
- Only 30% of teachers have ever used a database.

**Factors impacting on teacher ICT competence**

- It was found that males, younger teachers, teachers with less teaching experience and secondary school teachers are more likely to have higher levels of ICT competence.
- The extent to which a teacher uses ICT for professional purposes, the ICT capacity of their school and their attitudes and motivation
were found to be the three most influential factors on ICT competence.

- Analysis revealed that limited access to technical support and computers for student use provided the greatest barriers to the development of teacher ICT competence.

**Teacher application of ICT**

- Only 18% of teachers are regularly integrating ICT within teaching and learning (i.e. on a weekly to daily basis); with 46% of teachers integrating ICT on an occasional basis (i.e. once a term to weekly); and the remaining 36% integrating ICT only once a term or not at all.
- Eighty two percent of teachers are not regularly using ICT in the classroom. Of those teachers who are using ICT regularly (18%), most are doing so to improve computer skills and to find out about ideas and information.

**Factors impacting on teacher application of ICT**

- It was found that part-time teachers are less likely to integrate ICT within teaching and learning than full-time teachers.
- A teacher’s level of ICT competence, the ICT capacity of their school, their attitudes and motivation, the planning and leadership of their school and their attendance at training on how to integrate ICT were found to be the most influential factors on a teacher’s integration of ICT in the classroom.
- Analysis revealed that training on how to integrate ICT in the classroom had the most positive impact on a teacher’s level of ICT integration.

The WADET study indicated that the majority of teachers surveyed were quite familiar with word processing applications, internet, email and file management, while a much smaller group of teachers were regularly using
ICT in the classroom. Investigation of the relationship between a teacher’s level of ICT competence, the extent of their integration of ICT in the classroom and the range of factors that influence each of these revealed five groups within the WA government school teacher population, with each group sharing a demonstrable set of characteristics (the specifics of this information is provided in Appendix A).

It is important to note that teachers who were in the highest category for both ICT competence and integration were characteristically:

- Heads of departments
- In secondary schools
- Teachers & administrators
- Science & technology
- Librarians
- Full-time teachers
- 2-3 years teaching
- < 40 years old

While it is not the intention to discuss the study’s findings in detail here, this conclusion does provide a good reference point for research into the ICT literacy levels of music educators in the NSW government education system.

2.2.2 The Merrick Study

Bradley Merrick’s study gives another case in point. At the Australian Society for Music Education 10th National Conference, music educator and education researcher Bradley Merrick presented a paper titled “The Use of Music Technology in the N.S.W. High School Teacher Perspective's and Curriculum Direction” (Merrick, 1995). In this paper he discussed the use of music technology in education and the importance of music teachers keeping pace with technological change. He cites Moore (1992) to emphasise the fact that all areas of human endeavour are influenced by
technology and that the adoption of technology into music education practices is essential to provide relevant and appropriate edification.

Merrick’s study primarily examined the *attitudes* and *feelings* of teachers who were expected to utilise music technology in their teaching practices in addition to practical applications of technology in the music classroom. At the time of his research there had been recent changes to the National Art Profiles and the NSW Music Curricula requiring mandatory use of technology. Merrick provided a series of questions via a written survey and was able to obtain data about human and technological resources. Sixty-five participants were randomly selected from four school areas in the Sydney region across Catholic, independent and state (government) schooling systems.

Keeping in mind the limitations of the scope of his research, including the exclusion of teachers from outside the Sydney area who may have experienced different levels of access to resources and support, the data provided an indicative snapshot of some general undercurrents in the sector at the time of the survey (1993).

The analysis of Merrick’s research found that many music teachers who were expected to be implementing technology in the classroom were trained in an era that addressed different needs and educational outcomes. A total of 55% of teachers had been in the classroom for over a period of ten years while 17% of the teachers were in their first year of teaching. At the time the majority of teachers were not prepared to deal with the mandatory integration of technology into the curriculum based on their prior training.

When Merrick enquired as to further training, only 9% of teachers were currently involved in some form of postgraduate study. To what level this involved technology is not indicated. It was also found that 47% of the teachers had received no form of technology based training, presenting a problem with curriculum requirements versus skill base. It became apparent that less than half of the teachers, 46% of the cohort represented, used
computers in their classroom teaching practices. Of the 46% of teachers using computers, Merrick found that only 26% use computers to prepare materials and resources. He suggested that this reflected the confidence level and depth of understanding of the users. He also believed that the 54% of teachers who didn’t use computers were "philosophically opposed” to, and unable to adapt their teaching style to effectively utilise technology. Meanwhile some 61.5% of teachers indicated they used computers for their own personal productivity type tasks including word processing, databases and spreadsheet operations.

Merrick’s study also found that 43% of teachers felt confident in the use of computers in the classroom, while 71% of the teachers said that they regularly used electronic keyboards and 75% of the teachers surveyed stated their ability lay within the satisfactory to very limited range. Only 3% identified themselves as having excellent knowledge in this area. All of these 3% had experience in the recording industry and studio work from where they had refined their skills.

It was found that 61.5% of survey participants had attended some type of technology based in-service training. The main concern raised by teachers at this level was that the in-service training generally did not provide sufficient detail to change the way teachers function within the classroom. Comments generally referred to the fact that the nature of the in-service training was only very limited in its offering and thus, did not really give the teacher adequate time to master the skills and knowledge obtained. Many of the teachers also raised the issue of needing to be shown how to use the equipment in an educational context rather than just being shown the technical aspects of particular products. It was also acknowledged that the speed at which technology was being developed commercially and then inserted into the curriculum was much greater than the ability of teachers to cope with such rapid change.

The training of all musicians has an effect upon their educational philosophy. Many musicians adopt a more traditional approach to their art
(such as the playing of an acoustic instrument) which can leave the notion of technology seen as a contemporary music additive. Of all the responses to the questions on the styles of music taught in the classroom, only one actually referred to the teaching of technology as a topic area. This supported the notion that, at the time of the survey, many music teachers were still unsure of its relevance and suitability for inclusion in the curriculum. A notable statistic was that 70% of the teachers surveyed were classically trained. It is suggested that if teachers were to view historic masters (Mozart, Beethoven, etc.) as a measure of musical greatness there is a strong possibility that an idealist’s perspective would be adopted thereby limiting merit that is attributable to new developments outside of this thinking. On this issue Merrick quotes Abeles, Hoffer, & Klotman (1984, p.41) stating that "idealists have a very difficult time accounting for new developments and change”.

The teachers that Merrick surveyed also felt that there was a shortfall in the way that music technology consultancy and resources were organised. Only 12% of the cohort felt that these were organised adequately while 92% of teachers felt that there was not enough support from the various education systems. The main concern was that many of them did not have an adequate understanding of the flexible use of music technology in an educational settings. This attitude was particularly prevalent amongst those who identified themselves as not using music technology effectively in classes.

Overall Merrick’s study, while not comprehensive in a range of areas, provided a valuable snapshot of the perception of, and attitudes towards, technology in secondary school music education at the time. It will be a valuable addition to this study as it raises pertinent issues from a similar sample cohort. It also presents an independent survey at an earlier period so a comparison between the data obtained then compared to this study may yield useful data. Additionally, the study presented a number of questions that could be followed up as part of this research.
2.2.3 Other Studies

Bauer, Reese and McAllister (2003) undertook a study examining the effectiveness of a week-long technology training workshop. It assessed the benefit of professional development for music teachers using technology for instructional purposes. In their study they examined three indicators of effectiveness – (i) teacher knowledge, (ii) teacher comfort and (iii) frequency of teacher use. Teachers were assessed via a survey at the commencement, at the conclusion and 9-10 months after the training session. They found the professional development was effective in the aforementioned three areas and that a higher level of use was sustained (indicated in the follow-up questionnaire). Similar methodological concepts from this study could be useful in developing the survey instrument for this research, particularly through examination the three areas of knowledge, comfort and frequency of use. The similarity between their sample cohort and the cohort in this research (i.e. teachers undertaking technology training in music) is pertinent and will be considered.

Another study by Dorfman (2008) examined the status of technology (including its integration) in school music programs throughout Ohio (USA). Dorfman scrutinised (a) the nature of the technology used, (b) the levels of teacher comfort with the technology, (c) the preparation/training of teachers in the use of technology and (d) teachers’ perception of obstacles toward effective technological integration into teaching practices. The survey (522 participants) was drawn from music teachers ranging from years K-12. The results indicated that the teacher’s use of music technology was more frequent than that of their students. Additionally, electronic accompaniment and the use of notation software were several of the most common forms of technology in use. There was also a moderate level of correlation reported between comfort with general technology and comfort with music technology.

The methodology used by Dorfman demonstrated the use of an electronic survey instrument (a short online survey) when the subject matter itself revolved around the use of technology. His report didn’t specifically
indicate whether this would influence the data (for example, by limiting the number of participants to those with sufficient technology literacy) though it did indicate that a number of potential participants (152 of 1629) were unable to be contacted due to expired or changed email addresses which could relate to a technology literacy issue. Also noted was Dorfman’s use of a “Likert-type” scale for participants to rate their own levels of comfort and expertise with technology. In one section he assessed the use of technology for both non-musical and musical tasks and reported that “Respondents produced a substantially, yet not statistically significant, lower mean score regarding expertise in the use of technology for musical tasks such as notation, editing, and sequencing” (Dorfman, 2008, p. 31). These findings may have similarities the data obtained in this research.

In addition to studies that examined teachers and their familiarity, comfort and personal use of technology, other researchers took a different approach. For example Dammers (2009) examined the emergence of music classes that use technology as the primary means for instruction. In his study of New Jersey public schools he initially surveyed principals (175) and found that 28% offered technology based music classes with more affluent districts found to be more likely to offer such courses. He also surveyed 36 music teachers and discovered that these classes were normally taken by non-traditional music students, were stand-alone courses (i.e. not integrated into a structured curriculum) and were initiated primarily by the music teachers themselves. This study provided insight into a particular group of students (and teachers) who may be using a different level (and perhaps different forms) of technology when compared to others who are from a more traditional music background. Dammers’ research emphasises the need for to explore a wider (rather than narrower) range of technological applications in music to encapsulate different educational contexts.

Jinright (2003) took the approach of examining teacher computer use in the classroom (K-12). His aim was to describe the variety of computer use in Alabama, Georgia, and Florida music classrooms and to determine factors associated with their use. A total of 556 teachers completed a short (33
question) survey and looked at factors including teacher education levels, resource availability, attitudes, training and computer use by grouping them into two categories: environment and experience. The research highlighted differences between technological use and different types of music teachers. For example, general music teachers’ environments were more conducive to technology use than were vocal/instrumental teachers. He also found significant variances in levels of computer support between different geographic areas (Alabama when compared to Georgia and Florida). Similarly to Dammers’ research, Jinright demonstrates the variety of contexts that music teachers operate in. This emphasises the need to be mindful of the variations in data that may be obtained depending on the context each music teacher operates in.

Another study from the USA by Reese and Rimington (2000) examines the status of music technology in K-12 classrooms (similar to Jinright) but in the context of Illinois public schools. It focused on five areas including the perceived training needs of teachers, ways teachers and students use technology, and access to music technology. At the time of its release (2000) approximately one quarter of music teachers were using technology in the classroom with less than half of the schools having computers in the music area. Its conclusions were more directed towards improvements in accessibility to teacher training and the need for more formal technology training programs specific to music technology. Notwithstanding the age of the study and the changes that have occurred in technology, it does have relevance to this research. It could, for example, be used to examine if similar issues still do (or are perceived to) exist and aid in identifying any significant long-term issues of consequence.
2.3 ICT and Music

ICT has infiltrated almost every stage of music making from the creative inspiration behind the music through to arrangement, sound generation, storage, performance, distribution and reproduction of music. Some of the ICT practices that are utilised are in common use amongst many fields (such as amplification equipment) but a number of them are unique to the discipline of music.

According to David Williams and Peter Webster (2006) music technology enhances the musical experience for all musicians. They argue that music technology is “a major force in teaching the technical aspects of music and, perhaps most importantly, in encouraging the creative experience of music composition, improvisation, performance, and music listening” (Williams & Webster, 2006, p. xxiii).

ICT has opened up the composition process and provided a tool to assist the composer to realise these musical thoughts, or indeed to create the musical inspiration itself as in the case of generative music software. ICT has also assisted in the development of certain styles of music composition that wouldn’t otherwise have existed, particularly those involving advanced patterns, complex looping and real-time polyphonic synthesis.

ICT has also played a role in the arrangement or organisation of musical information through software. In some cases the music may take on a formal structure, as specified by the composer, or it may be instigated by an ICT device to randomly determine the parameters taking on the form of an improvisational piece. ICT also now permits collaborative processes to take place over great distances via the internet.

The generative method of turning a musical idea or concept into sound has been significantly affected by ICT, particularly in the last 30 years. Many electronic instruments emerged in the 1970’s for the purpose of digitally generating sound, that is, communicating a musical idea through an audible form that was produced digitally (often through synthesis). These have
evolved into compact devices that can produce an enormous array of sonic events, often producing sounds that didn’t previously exist. Controllers and synthesis provided the flexibility to enable composers to customise the sound to suit the artistic need and apply it in creative ways.

The storage of musical sounds was initially founded by storing vibrations on a physical device, for example in wax or on wire. Modern ICT offers the equivalent storage in a digital medium, but with much more flexibility. For example, the storage of musical ideas was often undertaken by scoring notation in written form onto suitable material (e.g. paper). This technique has been enhanced by the usage of software and has broadened to include new forms of music notation.

The distribution of music as sound can incorporate many stages of ICT, from the capturing of an audible event, editing and processing, through to the dissemination of the finished material. Computer, broadcast and internet technologies are now integral to most modern music-making practices. ICT also aids the commercial distribution of music particularly through online sales.

Most music performances that are played publically generally use some form of ICT. This may include microphones, amplifiers, processing equipment, electronic controllers and forms of wireless technology. Instruments too may be software enhanced or perhaps be purely software based. Most acoustic music performances now encounter some form of ICT enhancement when recorded. The Solutions Research Group released statistics in the later part of 2006 showing that the percentage of people who possessed an MP3 player increased three fold compared to the previous year - from 8% to 27% (Mac Publishing, 2006). It also indicated that the percentage of men owning an MP3 player increased from 18% to 28% and the quantity of female iPod users tripled in twelve months. This evidences the impact that ICT has had on both music producers and music consumers.
2.4 ICT Standards in Music Education

With the embedding of ICT in music practice a number of approaches have been made at establishing benchmarks in ICT literacy in the teaching of those music practices. These generally fall into the category of those making recommendations, often by individual authors, or those producing recognised standards, usually produced by a recognised body or institute.

One notable work is the National Educational Technology Standards for Teachers developed by the International Society for Technology in Education (ISTE) in 2000. They provided a well-researched document and included practical applications on implementation across the curriculum.

There are two particular sections of note, the first of which is “Profiles for Technology-Literate Students” (2002, pp.6-7). Based on six broad categories of technology standards they provide a ten point list outlining the expected ICT competencies of students at the completion of grades 2, 5, 8 and 12. These lists are not-specific to any particular discipline so they identify general competencies and describe the level expected to be demonstrated.

Similarly, another section section, “Technology Standards and Performance Indicators for Teachers” (pp.8-9) provided twenty-three performance indicators for teachers irrespective of discipline. These are divided into six sections as summarised below:

- Demonstration of a sound understanding of technology operations and concepts
- Planning and design effective learning environments and experiences supported by technology
- Implementation of curriculum plans that include methods and strategies for applying technology to maximise student learning
- Application of technology to facilitate a variety of effective assessment an evaluation strategies
- Use of technology to enhance productivity and professional practice
- Understanding of social, ethical, legal and human issues surrounding the use of technology in schools

The guidelines were well-developed and are applicable to most areas of education. There are some areas the arts that may not be directly represented in the above criteria particularly those representing the creative outworking of technology in music. Another difficulty is the lack of representation of music in the implementation section. Mathematics, Science and Social Studies are the main areas represented with English/Language/Arts all bundled in together. Certainly brevity can be understood in summarising results but this may lead to limitations in implementation in areas such as music.

Another set of benchmarks, that is the MENC National Standards for Arts Education in the United States, contain a series of standards specific to the discipline of music. The standards were originally established in 1994 and, at that time, did not contain detailed references to the use of technology in music education. They did, though, provide a system for benchmarking music education and exhibited scope for the inclusion of technology in nine defined areas.

An independent group called the Technology Institute for Music Educators (TIME) produced a set of standards (1994) setting out seven areas of competency in music technology that were related to the United Stated National Standards for Arts Education. These were updated in 2004 and revised to six areas of competency that covered a range of technological hardware and software (Rudolph, Richmond, Mash, Webster, Bauer & Walls, 2005). TIME also provide the option of certification through their own training program.

In an Australian context, there appears to be no specific references to ICT standards in music education outside of the general comments contained in syllabus documentation.
2.5 Information and Communications Technology

The term “Information and Communications Technology” (ICT) has become widely used, though not ubiquitously, in the last decade. Of Google’s results for the search “ICT+definition” (Google, n.d.) numerous interpretations are presented, for example: “Short for Information and Communications Technology, it is the study or business of developing and using technology to process information and aid communications” (Webopedia.com, 2005).

The variability of definitions available provides different slants on the term, particularly depending on the year they were produced and the country they were publishing in. The term has also borne the effects of misinterpretation and misuse.

One of the first recorded uses of the term “ICT” was by Stevenson in his 1997 report to the United Kingdom Government (Stevenson, 1997). The term was also popularised in the English National Curriculum documents produced in 2000.

After perusing the different definitions one can comprehend that the term ICT incorporates in its simplest form:

- some form of data (information),
- the transference or processing of the data (communication), and
- incorporation of some form of technological advancement.

The term ICT can be classified as its own discrete term that has been loosely based on a number of existing terms covering a variety of definitional bases. In most English speaking countries ICT is understood to incorporate modern electronic-based technologies. For example, the United Nations Educational Scientific and Cultural Organization (UNESCO) define ICT as:
“…forms of technology that are used to transmit, store, create, display, share or exchange information by electronic means. This broad definition of ICT includes such technologies as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, computer and network hardware and software; as well as the equipment and services associated with these technologies, such as videoconferencing, e-mail and blogs.”

(United Nations Educational Scientific and Cultural Organization, 2007, p.1)

Ong (1988) argues that this definition is too narrow and it should also include other forms of technological and communicative devices such as pen and paper. This broadening of the definition to include older non-electronic devices is not widely subscribed to. Rather, ICT is commonly understood to incorporate the use of modern, emerging, electronic-based, particularly digital, technologies.

The scope of use of the term varies from culture to culture. In some Asian countries the term ICT often has a narrower definition and possesses more of a technical focus such as that used in the manufacturing sector. Nevertheless, it is important to note that the term does not solely refer to computer technology but also to other forms of digital technologies such as computer games, portable music devices, mobile phones, cameras and social networking.

The term is widely employed in policy making, particularly in government and education contexts. Through much of Europe, parts of Asia and particularly in Australia, ICT plays an integral role in policy and development documentation. The United States, though, still exhibits popular use of the term Information Technology (IT) and other terms to incorporate communication in its education and government departments.

“ICT” may be considered a direct evolution of the term Information Technology (IT) but this is problematic as evidenced by the distinctive
definitions and co-existence of the two terms. Oftentimes they are incorrectly used interchangeably, particularly in general discussion. Interestingly, the Dictionary of Media and Communication Studies defines IT as “microelectronics plus computing plus telecommunications” (Watson, 2006). This definition, though not widely adopted, exhibits a blurring between the terms IT and ICT and could perhaps point towards the two eventually becoming synonymous, though currently there is little evidence of this occurring.

Based on the collation of definitions from numerous organisations, the Information Technology Association of America (ITAA) defined IT as: “The study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware” (Information Technology Association of America, 2009). In addition to this definition they provided an explanatory note: “Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communication Technology).” This acknowledgement by the peak body ITAA shows its recognition of the term of “ICT” as distinct but related to “IT”.

Martin and Rader (2003) discuss the similarities of IT, ICT and the lesser used term Communications and Information Technologies (C&IT). C&IT is viewed as a “semi-official” term in the United Kingdom but is used little elsewhere. Meanwhile, the term ICT has been adopted by the European Commission and is widely used by the education bodies of the European Union (EU) member states. Another related term, Information and Learning Technology (ILT), appears in the United Kingdom but is mainly limited to the context of the further education sector. It is, however, interesting to note that the index listing for “ICT” at the back of Martin and Rader’s publication directs the reader to the term “IT” rather than to a section on ICT. Perhaps this is insignificant but it may be demonstrative of a global struggle that occurs with the definition of “ICT”.
Through discussion of the development of the ICT industry in *International Communication: Continuity and Change*, Thussu (2006) discusses the global changes to international trade in the 1980’s and 1990’s and examines the deregulation and privatisation of the communication and media industries. The ensuing changes in conjunction with new communication technologies resulted in the convergence of three significant industry players: the telecommunications, computer and media industries. The result of this merge was the materialisation of a new range of information and communication technologies used to disseminate information internationally. This convergence also caused a shift in the way technology was perceived and utilised. It enabled information to be made more widely available, particularly through wireless technology, and to be more seamlessly integrated into everyday society. It is this fundamental shift in the consolidation of the industry that is a significant driving force behind ICT developments.

In an Australian context, the 2009-2010 Budget Report presents the Australian Government’s view of ICT as “a pervasive and transforming technology for all industries…” (Australian Government, 2009). It denotes innovation in ICT as an integral process to the future of the nation particularly in regard to the economy. The roll out of the government-funded National Broadband Network throughout Australia supports this vision. It is also integral to the Australian Government’s *National Digital Economy Strategy* which aims to position Australia as a leading digital economy by 2020 (Australian Government Department of Broadband Communications and the Digital Economy, 2012). This is a notable activity as accessibility to the internet is integral to many forms of ICT technology.

This study will take on board the Australian Government’s view on this and consider the ramifications of ICT in the context of music educators and its effect on the future of school music education in Australia.
2.6 Interpreting ‘Literacy’

The term *literacy* invokes different interpretations in different contexts. Many of the early recorded references to a person being *literate* are associated with their familiarity with written literature (e.g. the writings of Shakespeare). Drawn from this association with reading (seen as an ability) and knowledge (seen as understanding) comes the notion of a person being well educated or learned (literate, 2000). It is from this basis that most associations with the term “literacy” are automatically made.

Since the late nineteenth century the interpretation of the term has broadened to incorporate additional competence factors, one of which was a person’s ability to write words. Many of these embellishments to the original meaning were brought about by implication rather than by official definitive changes. An example of the widening scope of the term were the basic “three RRR’s” of schooling - reading, writing and arithmetic (Papert, 1993).

In more recent times the term is still generally associated with specific applications (such as English and Mathematics), but it has become less disconnected from the connotations of a specific discipline and can now equally be applied to any body of knowledge. This broadening of scope is demonstrated by the following definition: “The condition or quality of being knowledgeable in a particular subject or field” (literate, 2000).

The term could, for example, be used to describe *geographic literacy, cultural literacy, visual literacy or information literacy*. It is this more recent comprehension of the term that enables it to be applied to a broad range of disciplines including that of technology.

Brian Street poses an *ideological* model of literacy, as opposed to an *autonomous* model, in which literacy “pays greater attention to the social nature of literary practices and their embeddedness in the ideology and social structure” (Street, 1995, p. 246). He believes it is inherently linked to various contexts and the word shouldn’t be identified independently. He
also questions the arguments about the “technical” and “neutral” nature of literacy and its apparent cognitive consequences. He asserts that we cannot generalise and draw assumptions from the acquisition of literacy from within different groups as they all have their own unique contexts.

In June 2003 UNESCO published a position paper “The Plurality of Literacy and its Implications for Policies and Program”. In it they attempted to encapsulate all interpretations and global contexts of the term and developed the following definition of literacy:

Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society. (United Nations Educational Scientific and Cultural Organization, 2004, p.13.)

While rather broad in its phraseology the definition attempted to cover all applications of the term in changing global contexts. It also addressed the issue of quantifying the level of ability by bringing it to a local level within “wider society” i.e. through the second part of the definition.

UNESCO first attempted to define literacy in the 1950’s which then formed the basis for this definition. At that time they also proposed the concept that “literacy be divided into two levels: a minimal level, in which an individual demonstrates the ability to read and write a simple prose message, and a functional level, in which a person achieves a level of literacy high enough to be able to function in a social setting” (Blake, 2002). The notion of dividing literacy into two categories had some merit, though it did have immediate problems, particularly with the broadening interpretation of the word.
The UNESCO paper goes on to say “people acquire and apply literacy for different purposes in different situations, all of which are shaped by culture, history, language, religion and socio-economic conditions” (United Nations Educational Scientific and Cultural Organization, 2004, p.13). This statement consolidates UNESCO’s argument that the need for literacy will always be variable and is inherently linked to each person’s situation. It also infers that the areas of knowledge will vary from circumstance to circumstance. For example, computer literacy may not be relevant to people living in a particular area which do not have access to such facilities, but these people may place a greater reliance on geographical literacy. The paper also discusses how, over the last few decades, literacy has taken on a plural notion to encompass the broadening areas of competency. UNESCO cites economic, political and social transformations and include “globalization and the advancement of information and communication technologies (ICTs)” (United Nations Educational Scientific and Cultural Organization, 2004, p.6) as significant factors influencing worldwide literacy.

Recognising that a number of different types of literacy may be entrenched in the cultural practices of different areas, personal circumstances and collective structures, the measurement of literacy across the world will consequently vary from country to country and person to person. To accurately assess a comparative “literacy rate” across a cohort of people situated in differing situational applications is very difficult to achieve. UNESCO has considered this and attempted to quantify an overall worldwide illiteracy rate (Figure 1).
The information provided with this graph didn’t specify the exact criteria for the selection of the data, for example, what forms of literacy were assessed, what level were they assessed at, and what contexts were they assessed in. It did, though, depict a decreasing trend in overall worldwide illiteracy which some may be interpreted as an increase in worldwide literacy rates. As an aside, it is interesting to note that some governments, such as Japan, assume that their country has a 100% literacy rate, but don’t provide any official data or justified reasoning to support this view (United Nations Development Program, 2005).

In an article published in the Manila Bulletin in December 2007 the UNESCO data is challenged by De Jesus. The author highlights the idea that there are many factors that influence the defining of literacy. He points out that a person’s literacy “requirements” are constantly changing and that data cannot be accurately obtained to reflect worldwide literacy rates. He discusses the changing role of technology stating that “…in some markets, computer ‘literacy’ has become a requirement. Literacy goals can be best seen, therefore, not as fixed points but as moving targets” (De Jesus, 2007). While this could be viewed as a valid argument, no alternative method for acquiring a data sample of worldwide literacy rates or providing the terms for determining the term “literacy” has been provided. If the UNESCO data
is inaccurate and perhaps flawed, the actual data may be quite different. For example, with additional areas being added to functional or basic literacy expectations it may be that worldwide illiteracy is steadier than indicated or perhaps increasing.

The UNESCO study and the associated discourse that surrounds it does highlight the difficulty in obtaining accurate data about literacy rates, particularly for larger groups distributed through different social contexts. It would appear that more accurate data, though limited in its scope, may be obtainable from a smaller survey cohort that function across similar social contexts. This situation would also aid the defining of literacy and the quantifying of literacy rates.

When considering the term *literate*, it often describes a possession of knowledge or competency in a particular field without specifically referring to the level of knowledge or competency (literate, 2011). By historic inference, though, it may be implied as a high level of knowledge/ability. For example, a person may be “well-read” in a particular discipline. Additionally, in the nineteenth century an esteemed individual was sometimes referred to as “a literate”. The implicitly applied quantifiable level of literacy appears to depend on the context of the term’s usage. For example, the expectations for someone to be classed as literate in written word will vary considerably from country to country and social context to social context. Thus using the term “literate” requires additional explanation to describe the level of literacy.

Fundamentally, the word *literacy* when used in its autonomous form may be prone to misinterpretation. It is commonplace for it to be used in conjunction with other descriptive term to make it contextually relevant. In his writing Goad (2002) presents a number of typical applications of the usage of the word. These included references to:

- Computer literacy
- Scientific literacy
• Technical literacy
• Mathematical literacy
• Global literacy
• Historical literacy
• Business literacy
• Professional literacy
• Cultural literacy
• Functional literacy

While some of these terms are specific to a particular discipline or field such as technology, a number of them apply in a more general sense. For example, the expression functional literacy refers to a person’s ability to “read, write, speak, compute, make decisions and otherwise operate within the realm of the specific literacy” (Goad, 2002, p. 15). Being functionally literate is sometimes referred to as “basic” or “simple” literacy – being able to cope with everyday requirements within a person’s local circumstances.

The book Critical Literacy in a Digital Era (Warnick, 2002) uses the term critical literacy. It is described as “a literacy that encourages a reflective, questioning stance toward the forms and content of printed and electronic media” (Tyner, 1988 quoted in Warnick, 2002, p.6). Warnick describes it as an overarching term which can incorporate all forms, modalities and devices of communication. Another important form of literacy is information literacy. It is referred to as “the ability to locate, access, select and apply information” (Goad, 2002, p. ix). Goad argues that literacy in this context is a system of interdependent and often overlapping skills which includes elements of computer literacy, communication skills and creativity. Through these few examples the multifarious contexts of literacy are apparent.

Given that technological literacy is fundamental to the enquiry of this paper, though other forms of literacy are discussed, it is important to note that the term literacy itself could be “superseded by a term such as “fluency” connoting a more sophisticated and situationally-relevant approach” (Martin, 2001, p.20). In a recent writing Briggs and Makice (2011) present
the term “digital fluency” and also use the terms “anti-literacy” and “pre-literacy” to describe the stages that ultimately lead to literacy, and then eventually progress on to the higher level of “fluency”. The distinction they make is that literate people know how to use their “tools”, whereas fluent people know when to use their tools to achieve a particular outcome.

The National Action Plan on Literacy and Numeracy announced in May 2008, a $577.4 million Australian Government funded project, aimed to “better target Australia’s investment in literacy and numeracy” (Australian Government Department of Education Employment and Workplace Relations, 2009). It is interesting to note that the words literacy and numeracy have been juxtaposed even though numeracy is often believed to be part of basic student literacies (i.e. reading, writing and arithmetic). The implementation of the plan to date has seen research work aimed at assessing the levels of reading, writing and numeracy abilities of Australian school students through a national testing program. A campaign (“Getting the Basics Right”) included an annual National Literacy and Numeracy Week organised in conjunction with the Australian Literacy Educators Association (ALEA) and the Australian Association for the Teaching of English (AATE).

The emphasis placed on literacy by the Australian Government demonstrates its significance in the educational profile of the nation. Unfortunately the overall plan has limited emphasis on information and technological literacy – two areas which ultimately affect the life of young people and their future employability.

This study aims to examine these and related areas of literacy in more detail in the context of Australian music educators. It will add to the field of knowledge by further refining “ICT literacy” and identify how this relates to the secondary education context.
2.7 Concepts of ICT Literacy

As exhibited in the previous section managerial bodies can develop guidelines concerning literacy levels particularly with respect to numeracy and communication skills based on written word and speech. In more recent times technological literacy has sometimes been incorporated as an additional literacy factor, either on its own or incorporated into a person’s perceived overall literacy rate. As discussed in section 2.2, literacy is a variable term and is contextually sensitive. Similar circumstances may be encountered when quantifying the degree, or rate, of a particular type of literacy.

So how does one define ICT literacy? An early attempt at defining “computer literacy” provides a good point of reference. Spencer states “To be computer literate one must be able to define, demonstrate, and/or discuss:

- How computers are used
- How computers do their work
- How computers are programmed
- How to use a computer
- How computers affect our society”

(Spencer, 1983 p.395)

While being contextually constrained to the era of publication, these points did provide a foundation that could be applied in a generic sense to most computing applications.

In the mid 1990’s Novell Australasia Pty Ltd released a white paper about computers in education stating that:

The next generation will be computer literate, globally aware and information rich. To realise their full potential they will need to learn about the full range of new technologies available and the potential uses of those technologies. What educators are now striving for is a
heightened form of literacy, dubbed by some as ‘information literacy. (Novell Australasia, 1994, p.3)

While “ICT literacy” is not etymologically the direct descendant of “computer literacy” it does possess a number of commonalities.

In 2006 Colin Lankshear and Michele Knobel published *New Literacies: Everyday Practices and Classroom Learning* in which they contend that schools ignore many forms of digital technologies that their students are embracing. They, however, do discuss how literacy, as opposed to ICT literacy, is central to educational policy, the development of curricula and everyday thinking in educational practice.

In an Australian context a report entitled “Literacy for All: The Challenge for Australian Schools” was funded by the Commonwealth Department of Education, Training and Youth Affairs (1999). It discussed the role of literacy in the school education environment with regards to achieving a national goal through The National Literacy and Numeracy Plan. The aim was to ensure that all children, except for those with severe learning disabilities, would develop foundational literacy and numeracy skills in their early years of schooling. Section 5.8 of the report discusses a study carried out by Lankshear, Bigum, Durrant, Green, Honan, Murray, et al. (1997) linking literacy and technology. It stated:

We argue that written language is always-already technologised, in the sense that it comes into being only in and through available technologies of information and communication. As a distinctive social practice which is linked in complex ways to other social practices, literacy is best understood, historically, in terms of particular formations of language and technology. It only comes into being through available technologies of information and communication: such as marks on natural surfaces, the alphabet and other symbol systems, stylus and pencil, the printing press, and the digital electronic apparatus. Whatever the particular technologies
involved in specific cases, technology is always necessarily inherent in literacy. (p.20)

This report highlights the inherent link between literacy and technology in electronic and non-electronic forms. This is significant as it exhibits that technology, including modern electronic technology, is not an optional adjunct to literacy.

Goad cites the National Adult Literacy Survey (US) referring to functional illiteracy as “the inability of an individual to use reading, speaking writing, and computational skills in everyday life situations” (Goad, 2002, p. 16). Goad argues that this inability, in turn, has an impact on a person’s employability.

Martin and Rader tussles with the term “e-literacy” in Information and IT Literacy (2003) and identifies the challenges of acquiring IT literacy in learners. They discuss the concepts of “computer literacy” and identify three phases: mastery phase (up to mid-1980’s), application phase (mid-1980’s to late 1990’s), and reflective (late 1990’s onwards). This, though, doesn’t necessarily imply a systematic development, rather it may indicate a process of gradual change of emphasis and application.

According to Martin and Rader, in the mastery phase, the computer is a “mysterious and powerful” thing, and the emphasis is on gaining knowledge and mastering it. This includes the basics of how computers operate and how to program it. According to their system, the application phase includes the introduction of simple user interfaces and easy mass market applications. Graphical user interfaces, such as Microsoft Windows, are taken for granted at this stage and the computer is perceived as an everyday tool. The reflective phase is stimulated by the need for students to be autonomous learners. In this phase IT tools are taken for granted or acquired early in life, preferably in childhood, to obtain a certain level of competence. The emphasis is on reflective and evaluative aspects of usage; that is deciding which applications to use, evaluating the information that is
provided or is available, interpreting the information generated, and deciding what to do with the resulting material. These three phases may have posed relevance to certain past periods of technological adoption and, to some extent, are still relevant today. More recent forms of computer embracement have made these phases much faster, less linear and less delineated.

Chris Abbott refers to “the technologically literate teacher” in *ICT: Changing Education* (Abbott, 2001, p. 5) discussing some of the issues and history of teaching with technology. He also discusses the notion of how literacy has changed as a result of the introduction of ICT and the continuum of dealing with instructional technology in the classroom.

When considering this together with the earlier discussions on the definition of ICT and literacy, the concept of ICT literacy becomes difficult. In *Information and IT Literacy* Martin and Rader (2003, p.xviii) highlight the confusion surrounding Information Technology (IT), Information Communications Technology (ICT) and Communications and Information Technology (C&IT). Martin and Rader cite the “Seven Pillars” model used in the United Kingdom where basic IT and library skills support seven information skills (identify, scope, plan, gather, evaluate, manage, present), ultimately attaining *information literacy* (p.18). They also state that “Terminology is unsettled, with claims on one hand that ‘information literacy’ now encompasses IT, and on the other suggestions that ‘literacy’ should be superseded by a term such as ‘fluency’ connoting a more sophisticated and situationally relevant approach” (p.16). This has been proposed by the US National Research Council (NRC) report (1999) which states:

> Generally, ‘computer literacy’ has acquired a ‘skills’ connotation, implying competency with a few of today’s computer applications, such as word processing and e-mail. Literacy is too modest a goal in the presence of rapid change, because it lacks the necessary ‘staying power’. As the technology changes by leaps and bounds, existing skills become antiquated and there is no migration path to new skills.
A better solution is for the individual to plan to adapt to changes in the technology. (p.2)

This comment may have merit as the term “computer literacy” has been used for an extended period and may have attained, over time, certain inherent connotations. The NRC report also implies a certain stagnancy with the term “literacy” though the term may deal well with the current and future needs of people in their environment.

More recently the 2008 Australian Minister for Education Julia Gillard (currently the Australian Prime Minister, 2012) used the term digital competency during discussions on the Education Revolution as part of the 2008-09 Budget announcement:

Without digital competency young Australians cannot participate in a modern and increasingly technical global economy… To have a world-class education system, students and teachers need to be able to access seamlessly, discover, manage, create and use online resources and training. Teachers need the skills to teach information and communications technology (ICT) competency and support students in ICT-rich learning environments. (p.37)

In these statements it is important to note that both the digital competency of students (“young Australians”) and educators are referred to. It is particularly noted that the reference to the educators ICT competency is linked to outcomes in educational practice.
2.8 ICT and Gender

The quantity of literature available concerning gender-specific ICT material highlights the prominence of the issue, particularly over the last two decades. Morritt (1997), for example, discuss women in education who use computer-based technologies including differences in socioeconomic status, ethnicity, and age. Smith and Balka (2000) present a record from the 2000 Women, Work and Computerization conference examining women’s experiences in various areas of technology. A number of the papers comment on the ways women interact differently with technology to men, particularly in the online environment (Balka & Smith, 2000, pp. 6&165). Another document (Walker & O'Neill-Cooper, 2001) examines the lack of female workers in the IT industry and highlights gender bias towards males. They also comment that younger females who have been exposed to technology are not entering the IT industry perhaps due to lack of role models or due to the fact that women were not traditionally encouraged to work in IT. This is supported by Walker and O’Neill (2001) who indicate that women who enter the IT industry don’t necessarily stay in it for long or end up with inadequate roles.

While the above literature points to earlier problems, more recent reports still support the existence of such issues. The report “The Gender Gap in the ICT Industries: Failing to Fully Utilise a National Resource” (Women in ICT Task Force, 2005) exhibits that an issue exists and the problems associated with this have not abated. They highlight the under-representation of females working in ICT as a national problem and provide eleven proposed courses of action to address the issue. If the issues that are presented do indeed exist then this may be an influential factor affecting technology in secondary music education considering the large proportion of females employed in the sector.

Another area of consideration is the technological training of females who were operating in the workforce prior to the widespread adoption of technology. Fidishun (2001) published an article in Computer Training
"Issues of Middle-Aged and Older Women" (Women’s Studies Quarterly) in which she investigates the factors that “encourage or inhibit a middle-age or older women library worker’s acceptance and retention of computer training” (Fidishun, 2001, p. 103). In the study she identifies that, at the time of her report, a large proportion of library staff were females. This is a similar situation with Australian secondary school music educators. Some of the females she surveyed were reluctant to learn computer skills and those that were undertaking training may not be utilising or retaining the skills. She does note, though, that some female staff actively embraced new technology and successfully implemented new skills following training.

In her research she considers the attitudes of middle-aged and older women pertaining to technology and looks at how this may affect the priority that technology holds in their lives and the affect on their motivation to learn. Fidishun cites Maurer and Simonson (1993-1994) when she discusses computer anxiety and asserts that there is “no reason related to intelligence or memory that explains why middle-age and older adults cannot or will not learn computer technology” (Fidishun, 2001, p. 105).
2.9 Conclusion

The information presented in this chapter will assist in the development of the methodology for this research. The two main studies examined (WADET and Merrick) both contained items relevant to the topic of this study and highlighted a number of areas for further enquiry. The defining of ICT, literacy and fluency all assist in breaking down and conceptualising the conglomerate of technology in music education. A good understanding of the term ICT in an Australian (and global) context is important in addition to comprehending the changing face of digital literacy/fluency. This elucidation helps position this research within a larger volume of literature.

The WADET study, while not specifically focussing on music, possessed a good number of concepts concerning teacher ICT literacy, many of which would be used by a typical secondary music teacher. While the WADET study was more thorough in the area of ICT than this study intends to be some of the fundamental areas of ICT literacy assessment may be used as part of the survey instrument to assess general ICT literacy. Additionally, the data provided by the WADET study will be a helpful comparison during the analysis of the sample data produced in this research.

The information presented by Merrick supports the case for more research in the area and raises additional questions concerning the ICT literacy of the teachers themselves. While distinct in its approach to the WADET study it does broach a number of similar areas particularly in reference to the practical use of technology in educational practice. It also engaged a very similar sample cohort to that used by this study (i.e. NSW school music teachers).
3.0 Methodology and Process

3.1 Research Approach

Familiarity With A Range of Technology

After consideration of similar studies in music education (Dammers (2009), Jinright (2003), Resse and Rimington (2000)), it was determined that assessment of a broad range of software and hardware technologies should be used to assess participants from different backgrounds and experiences. This approach does not guarantee encapsulation of all forms of technology but it was intended to cover the majority of key technological areas that the participants would most likely have been exposed to.

The determination of the method of assessment of participant’s familiarity with various technologies was problematic. One approach considered was to undertake an observation of the participants using the technology. While this method may have yielded large amounts of data, observation would not necessarily yield much information about the feelings or emotions of the participants. For example, it may have been possible for participants to exhibit a false level of familiarity by sheer chance or to be affected by the stress of an observation and not provide a true indication of their familiarity. Another issue to the observation approach was the provision of participants with the required technological devices and capturing their use of the technology. When examined this approach was eventually discarded due to the logistical issues and monetary costs involved. The issue also became compounded when it was determined to draw participants from different locations around the state of NSW.

After considering the approaches available it was determined to assess the participants perceived, though potentially not realistic, familiarity with technology. Obtaining personal viewpoints, however, has its problems not the least being the personal perception of what it is to be “technologically familiar”. The handling of this issue was considered to be somewhat controllable by the careful wording of questions. Additionally, to help
assess the integrity of the data it was determined to use information from several areas and compare these for consistency. For example, if a participant indicated they were technologically literate in a broad range of technology but elsewhere in the data they indicated they rarely used email or a computer, the validity of the data may be questionable. Conversely, if information from different areas presented a similar stance then it may support a case for the credibility of the data.

The issue of *truthfulness* in the provision of information is always a concern in data gathering when participants are asked to provide information. It was expected that there may be elements of mistruths received but this was minimised by the size of the cohort being surveyed, the guarantee of anonymity given to the participants and by the comparison of data from several different areas. This situation didn’t account for an overall skewing of results where participants may consider themselves to be more familiar than they really are, or perhaps more literate than they think. These issues are taken into consideration in the analysis section and any abnormalities explained.

**Level of Engagement With Technology**

A search was undertaken to determine the various methods by which levels of technological engagement could be measured. Approaches appeared to vary between the use of technological hardware or software but was regularly associated with the use of different features available on the hardware or software. This approach may provide some useful information but it didn’t address other issues such as the frequency of use, the level of integration in work activities and the variations in the nature of their use.

In order to encapsulate as much data as possible to determine an overall level of engagement it was determined that a *perceived* level of engagement would be obtained from the participants. It was believed that this level, while difficult to quantify outside of the realm of this study, would provide an acceptable level of indication concerning levels of technological engagement. The levels indicated could be confirmed or dismissed to some
degree by the comparison to data from other survey participants in addition to comparing the answers for each participant with how they responded at other questions.

**Attitudes Towards Technological Implementation**

The attitudes of individuals towards technology is considered to be an important part of the research, particularly considering the comments of Merrick (1995, 1999, 2004). After examining ways that attitudinal responses could be recorded it was decided to provide an opportunity for participants to discuss, using free text, any burning issues they harboured. The issues they raised and the quantity of information provided was viewed as an indicative method of measuring their attitude towards technology in a music education context.
3.2 Perception Versus Reality

The ability for participants to provide an opinion on their own perceived usage of technology presents several problems. For example, what one participant may consider “literate” may be considered “illiterate” by another. Additionally they may over or underrate themselves depending on their feeling at the time of the indication and relative to the answers of other questions.

As evidenced by the WADET (2005) study, there can be a distinct differentiation between a person’s perceived comprehension of technological ability and the real level of technological ability they possess noting that the term real is used in reference to a measurable level of technological ability.

It is difficult to locate studies that provide a definitive explanation of this occurrence but several lines of thinking could provide some explanation of the disparity. These include:

- the possession of a limited or misguided comprehension of technology and its application within the wider global context;
- possible alienation from real, that is everyday best practices so that participants are unaware of others use of technology, and/or
- the possession of self-instilled attitudes about technology possibly with a decreased level of confidence and/or self-worth.

These factors will be considered during the analysis of this study. Evidence of the above may have an effect on the resultant data and it is acknowledged that it may be difficult to identify it in the data that is obtained.
3.3 Collection Methodology

Taking into consideration the nature of the desired data a variety of formal quantitative and qualitative collection methods were considered. While this research may be approached using a method that is qualitative in nature, others such as Moore (2005) contend that a quantitative approach can successfully be used to measure people’s attitudes and strengths of belief. Moore also highlights that the distinction between the two methods is not clear cut and elements of both methods can be successfully integrated into a methodological approach.

As the main body of research involves obtaining information from a cohort of individuals about their perceptions towards technology, a quantitative technique was investigated. Quantitative data is core to most social research (Moore, 2005). By its inherent nature the method suits techniques such as select questionnaires and interview surveys. These are used to support the understanding that it is possible to generate information about the characteristics of a cohort by obtaining information from a smaller subset of the cohort.

Sampling

To obtain the required data a selection of the larger cohort or population needs to be identified, that is, the sample group. The size and selection of the sample group influences the accuracy of the data collected. While the use of a sample group can be used as a general indicator towards the characteristics of a larger group it is not guaranteed to provide precise data and allowances need to be made for a certain degree of probability.

Initially the sample size was determined by firstly assessing the total cohort available. No official statistical data was obtainable from the NSW Department of Education and Training concerning the total number of music educators in the secondary schooling system. This was partly due to the fact that teachers of music may have a number of roles and come under
different titles within the arts. They may also be casual, fractional or full time. Some may work with group classes while others may be occupied taking music ensembles, etc. To help produce a total figure the number of NSW government secondary schools (including central schools in country areas) their enrolments were taken into account along with an average estimate of the music teaching activities that would typically take place. A total number of up to 600 music teachers was estimated (including casuals, instrumental teachers, etc). From this overall population the intention was to take produce a sample from a range of different music teachers from throughout the state.

The selection of the sample can have significant influence on the resultant data. One approach is to use random samples selected from the entire secondary music educator cohort. Another approach is to stratify the sample guaranteeing a broader cross section from the overall population. At this point it is also important to remember that the focus of this study was not to find out how many secondary music educators use technology, rather the breadth and depth of usage of technology and teachers attitudes towards it. A selection of participants randomly selected would be more representative of the greater population but it may yield less usable data when compared to a more controlled selection from a smaller pool.

To assist with this the selection of stratified samples was considered, that is, the division of the sampling frame into smaller groups. This method of cluster sampling is not uncommon, often when large numbers of the population are involved, and would provide some assistance in the selection of participants. If random selection were used within the clusters, though, it may not achieve a cohort that could provide sufficient usable data. The limitations of this sample selection is acknowledged and it is understood that the sampling frame used may provide a less accurate representation of the overall population.

One of the issues with research data is examined by Sara Cohen (1993) when she questions how typical a research sample might be of the entire
population. Is the small sample representative of the greater whole (Cohen, 1993, p. 125)? Hsia (1988) also examines the issue and states that any sample regardless of how it is produced contains an amount of inaccuracy “because it represents the population but is not the population” (Hsia, 1988, pg. 115). This is an issue fundamental to all data-related research and implies that the representational impression obtained via a sample will always possess inaccuracy when applied back to the original population. Wimmer and Dominick (1991) also confirm this by indicating that a sample is taken to be representative of the entire population. The pivotal word in this description is *representative* because a “sample that is not representative of the population, regardless of its size, is inadequate for testing purposes: the result cannot be generalised” (Wimmer & Dominick, 1991, pg. 63). James Lull (1990), while writing about qualitative research into audiences, rejects the accusation of unrepresentativeness levelled at qualitative empirical research and states that “in reality of course no truly random sample has ever been drawn and the use of convenience samples” (Lull, 1990, pg. 19) are commonplace in research.

It is accepted that the integrity of a sample (random, convenience or otherwise) will never be wholly accurate of its original source but it is understood that the sample will contain characteristics that will be inherent to some of the population. While a stratified random sample may produce a more even spread across a broad cross section of the population, a sample of convenience can also yield usable data though there is a lower level of representation from the overall population.

In the end a convenience method of selection was chosen to guarantee the availability of the sample cohort. The cohort were drawn from throughout different areas of NSW and were selected based on their participation in a music technology training program (similar to Bauer, Reese and McAllister (2003)).
Survey Questionnaire

The choice of a self-completed survey questionnaire was selected as the method of delivery. In addition to having flexible forms of delivery for example, paper, web and email, its ability to accommodate a wide range of data formats including multiple choice and free text, made it a suitable choice. This method was chosen over an interviewer-completed questionnaire, such as that used as part of an interview process, as it would provide scope for participants from a larger geographical area to complete it without an interviewer needing to be present.

The various formats for structured, semi-structured and unstructured questionnaires were investigated. Additionally, closed and opened questions were also assessed. After testing several formats a series of closed, rating scale based questions were selected for the majority of the sections of the survey. Cohen, Manion and Morrison (2007) argue that closed questions do not unduly discriminate on the basis of how articulate respondents are, though they don’t provide options for respondents to add remarks and qualifications and there is a chance that the specified categories might not be sufficient exhaustive and bias may occur. For this reason several open questions were presented as free text to enable participants to write an account in the own words.

Cohen, Manion and Morrison (2007) also highlight the issue of the problems of interpretation where one respondent’s “agree” may be considered to be the same level as another’s “strongly agree”, though this method still remains an attractive and widely used instrument of research. The uni-dimensionality is also an important feature of attitudinal scaling instruments as only one item is measured at a time to avoid the blurring of issues. This approach was fundamental to the thinking of Likert, the instigator of Likert multi-point scale. For this reason a larger series of questions was anticipated to ensure that most items would be assessed thought it must be observed that the length of the overall survey was to be limited to encourage all participants to complete the survey in a timely
fashion. It was also noted that Dorfman (2008) adopted a multipoint Likert scale to collate his data in a study somewhat similar to this research.

After consideration the delivery options for the questionnaire a technology-based delivery was selected. This decision was influenced by the fact that all of the sample frame had internet and computer access via their school and, based on their work requirements, they would most likely possess sufficient skill to complete the online survey. The WADET (2005) and Dorfman (2008) studies both utilised online surveys to obtain their data. It is acknowledged that this approach could potentially preclude some likely participants if they did not possess sufficient ICT skills but this was considered to have minimal impact and to be unlikely. Additionally, firewall restrictions would need to be checked at the survey locations to ensure there were no limitations to those who may wish to access the survey web page.

### 3.4 Sample Group

A consideration of possible cohorts was undertaken and it was determined to utilise a selection of music staff from the NSW Department of Education and Training for the purposes of the survey. This was in contrast to the Merrick study (2003) which surveyed across different schooling systems. Limiting the group of educators to one schooling system may limit the scope of the study in one respect but this possible limitation would have the added benefit of assessing a sample population who would, on the whole, encounter similar resourcing issues and operate under a similarly managed system for training and support.

No official data was available about this cohort but it was estimated that there were approximately 600 full-time (or equivalent) secondary school music educators employed throughout NSW at the time of the survey. This figure was based on informal discussions with a Department staff member and the number of secondary schools in NSW. The intention was to undertake a study of approximately one out of every 25 staff member creating a sample population of approximately 24 participants. While this is
a relatively small sample it would provide some indications of trends from the larger cohort.

Further to the discussion about the selection of the sample population, the sample frame, that is, every secondary music educator, was invited to take part in an online training program operated cooperatively between the University of Newcastle and the NSW Department of Education and Training. A group of teachers from across NSW, thirty-one in total, enrolled in the program. They completed the online program over a period of weeks and undertook coursework using music technology. After the conclusion of the online program the teachers were sent an invitation to participate in the research survey. A total of twenty-two accepted and undertook the online survey. Bauer, Reese and McAllister (2003) undertook a survey of teachers undergoing training and survey them at three points to access the effectiveness of professional development. This research project differs in that the content and operation of the training course is not the focus of the research, neither is the increase in the teachers ability. Rather the data obtained is about the teachers overall perception and existing experiences with technology.

It could be argued that completion of the training course may influence the data obtained. This is a valid point and could potentially vary the results regarding level of ability, but the nature of the survey questions aim to enquire about the teachers existing experiences using technology both at a personal level and in the classroom i.e. drawn from experience over a period of time rather than from the relatively short duration of the course. The section of questions that may have a greater likelihood of being influenced by the completion of the online course concerns perceptions and attitudes to technology. Depending on the teachers experiences in the online course they may be enthused and present a highly motivated and energised attitude about technology. Conversely, if the teachers encounter many technological problems during the online course it may lower there over attitude towards technology. This issue will be taken into account during the analysis and may contribute to extremes of view i.e. very high or low responses.
The adoption of a non-probability sample group does have its problems. These include:

1. Survey participants already exhibit an interest in utilising technology demonstrated by their voluntary enrolment in the online program, and
2. Survey participants will have undergone recent training in music technology which may affect their survey results.

While the limitations of this research is defined within the context of the cohort from which the sample group are selected, it is acknowledged that some of the data obtained in the survey may not accurately reflect the greater cohort of DET educators owing to the process of selecting the sample group. This is not uncommon in this method of research and will be taken into consideration in the analysis of the data.

The research, though, should be able to adequately provide a general indication of the surveyed music educator’s perception of technological comprehension and provide some indicative data exhibiting trends and tendencies that are applicable to the whole cohort.
3.5 Data Collection Method

The mode of delivery of a survey is pertinent to any research work. Importantly, the survey must be delivered in a mode that is suitable for, and accessible to, the cohort being surveyed. It should also avoid influencing the result and should be designed to minimise the amount of possible data skewing that could occur.

The very nature of an online survey instantly indicates the use of electronic technology. This immediately raises potential issues owing to the relation of the mode of delivery to the subject matter being examined, that is, usage of technology. There is little specific material available on undertaking a survey using online technology when the subject matter to be discussed incorporates technology itself, but there are some logical issues that present themselves. These include:

1. Access limitations to technological resources in order to undertake the survey (e.g. a potential survey participant is not able to access a computer with an internet connection),
2. Preclusion of participants from undertaking the survey owing to a limited level of technological literacy (e.g. inability to utilise a computer or web browser),
3. Utilisation of technology to deliver the survey may cause participants to exaggerate views about technology (e.g. personal frustration may be further vented about technology).

These are real issues that need to be addressed in order to maximise the integrity of the data. When observing the situation it may appear that they could significantly impact the operational and data collection aspects of the survey. But when the cohort of potential survey participants (section 4.3) are examined, many of the issues become less of a problem. Issues 1 and 2 above are not considered major concerns as they can be addressed, if required. Issue 3 is a concern that could be largely addressed in the analysis section of the research. It is not unheard of for survey participants to
exaggerate results in order to further a personal agenda, please the researchers or shed favourable light on their employer. Observing and considering the data of obviously “favourable” results is something that is inherent to many forms of surveying (Creative Research Systems, 2009).

From a data perspective, the utilisation of an online survey may be viewed as advantageous for both participant and researcher. As long as issues such as usability and technical problems are addressed, the acquisition of data through electronic means can actually be more beneficial than paper-based methods. For example, with an online survey students are easily able to write and reword responses to written questions whereas this is much harder with paper-based surveys. The convenience of submitting the data electronically rather than having to return a written document via mail means that data from all participants is instantly collected and available to the researcher. Additionally, the data the participants submit is accurately provided to the researcher through electronic means. This reduces the problem of data error when transferring and collating data from paper-based surveys into an electronic form for analysis.
3.6 Survey Questions

The project was titled *Study of a Collaborative Online Non-Tertiary Music Technology Project Operated by the University of Newcastle and NSW Department of Education and Training* (RMO 2006/3789). Some of the material below was used to address section G (ii) and section I of requirements set out by the University of Newcastle Human Research Ethics Committee. The Human Research Ethics Committee approval number is H-347-1206. Ethics permission was also sought from the NSW Department of Education and Training – SERAP number 2006133.

The survey was delivered entirely online and data was collected using Blackboard. The decision to use the online mode of delivery and no provision of a paper survey was made after considerations of the participant’s work environment, to assist with data collection and data consistency, and to reach a wider survey cohort in a timely manner. Consideration was given to earlier studies (Bauer, Reese & McAllister (2003), Dorfman (2008)) and to the anticipated computer literacy of the participants. Providing sufficient instruction and support was provided an online delivered survey was considered an acceptable approach.

A total of fifty questions were devised covering a broad range of issues. The range of topics was kept broad to make it technologically relevant to a wide range of music teachers (following on from the research of Dammers (2009)). It was anticipated that most participants would be able to complete the survey in approximately thirty to forty minutes. (Note: Even though each of the fifty points of enquiry are not necessarily questions, they are referred to as “questions” for the purposes of discussion.)

The survey questions were divided into three sections:

- Section One containing two participant details questions
- Section Two containing forty-six opinion questions
- Section Three containing two questions requiring short written responses
3.6.1 SECTION ONE - Participant Data (Unrated Multiple Choice)

The following two questions did not require the expression of an opinion. They were included to gather personal data from the survey cohort to assist with the formation of gender and demographic data which could then be used in conjunction with the data obtained from the other questions. The answers were selected from unrated multiple choice options. A brief explanation of each question, the reasons for its inclusion and the approach employed to capture the data are provided below. The questions were devised by a combination of methods including observation of other surveys (specially the WADET, Bauer and Dorfman study), an assessment of technology currently available in the field of music (including that used inside and outside the immediate realm of music education) in addition to a consideration of technological “literacy” and the likely technologies that may be employed. To assist in organisation the questions were reduced to a number of categories to ensure that a range of areas were covered.

**Question 1 - Please select your gender**

{Male, Female}

The selection from two genders is a standardised approach. Some, such as a group of University of Maryland Communication and Gender Studies students (PetitionOnline.Com, 2009), dispute that this is inequitable by not including additional options including “Other”. For the purpose of this study it is not considered necessary to venture beyond the scope of the standard male/female state. Keeping to this principle would also assist when comparing the data with information gathered from other sources that also use two gender options.

This information was requested to (a) identify the overall gender balance of the survey participants, and (b) to be used in conjunction with survey data from other questions to identify if there were any gender-specific trends.
Question 2 - Please select your age range

{20-29, 30-39, 40-49, 50-59, 60-69}

Concerning age range, the minimum age was set at 20 years with the expectation that all of the surveyed full-time music educators practicing in the NSW Department of Education and Training would have completed a minimum of a tertiary education. Based on the current Australian tertiary education entry age of 18 years (Just Landed, 2009) and presuming an undergraduate music teaching qualification is a minimum of four years (The University of Newcastle, 2009), the age of 20 years would was set as a realistic minimum age.

The maximum age limit of 69 years was set with the expectation that the majority of secondary school music educators employed through the NSW Department of Education and Training would have retired by this age. Even though the Australian Government does not provide a statutory retirement age and, at the time of writing, the Age Pension was not available until age 65 for males (currently slightly less for females). Recent data showed 76% of men had retired before 63 and 76% of women had retired before the age of 60 (Australian Government Department of Health and Ageing, 2009).

The option of grouping participant’s ages into bands, as opposed to obtaining individual ages, was selected after examining the different ways the data would ultimately be used. It was determined that obtaining individual age data would not provide any significant benefit and, considering the small sample size used, grouping ages into suitable bands would yield a better overall indication of various sections of the surveyed cohort.

The use of age bands, subdivided at appropriate intervals, is a commonly used statistical practice (Audiences UK, 2008). The selection of decade bands was selected as it was anticipated that it would (a) provide an amount of data in each category based on the expected age spread, (b) evidence characteristics from graduates of particular decades when used in
conjunction with data from other questions, and (c) work in well when used in conjunction with statistical data from external sources. It is recognised that other systems of age banding may yield different or more accurate results but the banding of survey participants into their decade of birth was considered sufficient for the purposes of this research project.
3.6.2 SECTION TWO – Rated Questions (Five Point Likert Scale)

The questions in Section Two required participants to express their opinion about a given statement. The statements were written in clear, uncomplicated language with minimal use of jargon to cater for a variety of participant backgrounds and experiences. The aim was twofold: (i) to obtain their personal opinion on the statement, and (ii) determine a level of that opinion. It is anticipated that each participant could allocate approximately thirty to forty seconds, on average, to each question.

The level of the participant’s agreement or disagreement to the given statements was measured using a psychometric scale (i.e. Likert system). The Likert scores are classed as ranked variables (ordinal variables) and are bounded within the restrictions of the given answers. The survey does not possess a normal probability distribution.

This bipolar method of evaluation, that is the provision to agree or disagree, was considered an appropriate option so survey participants could easily provide their opinions on the provided statements. A five point scale including a provision for a neutral opinion was chosen rather than being a forced choice method such as a four point scale where a neutral option is not available, so that survey participants could indicate if they didn’t have a formed opinion on the matter. This was considered important as it didn’t force people into having an opinion if they hadn’t been exposed to the subject matter presented. This, in turn, improves the quality of the data.

Debate exists over the use of the 5 point scale. Psychometricians may recommend the use of 7 or 9 choices though a study (Dawes, 2008) has found that the 5 or 7 point scale could result in a higher mean score relative to the highest score achievable when compared to those produced from a 10 point scale. Other problems exist with data collected using the Likert system including central tendency bias (the avoidance of the extreme response categories), acquiescence bias (agreement with statements as they are presented), and social desirability bias (participants desire to portray
themselves in a more favourable light). These tendencies will be considered in the responses to various questions as part of the analysis.

The five options were presented as levels of agreement/disagreement for all questions in Section 2:

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

The forty-six questions in this section were carefully chosen to obtain data in twenty-four smaller categories. These categories were intended to cover a large range of areas and adopt many of the areas identified in other studies/writings including categories mentioned by Williams & Webster (2006), Rudolph (2004) and Watson (2005). Additional questions covering emerging forms of technology and issues relevant to an Australian context were included.

Category 1 – General Usage of Technology (Q3,4,5)
Category 2 – Usage of Imaging Technology (Q6,7,8)
Category 3 – Usage of Communication Technology (Q9,10)
Category 4 – Usage of Basic Internet Technology (Q11,12,13,14)
Category 5 – Usage of Data Storage Technology (Q15)
Category 6 – Usage of Web 2.0 Technology (Q16)
Category 7 – Usage of Personal Music Technology (Q17)
Category 8 – Usage of Computer Operating Systems (Q18,19)
Category 9 – Usage of Music Performance Technology (Q20,21,22)
Category 10 – Usage of Audio Technology (Software & Hardware) (Q23,24)
Category 11 – Usage of Music Notation Software (Q25,26)
Category 12 – Usage of Music Arrangement Software (Q27,28)
Category 13 – Usage of Music Training Software (Q29,30)
Category 14 – Usage of Loop-Based Music Software (Q31)
Category 15 – Usage of Sound Generation Technology (Q32,33)
Category 16 – Usage of a Basic Development Environment (Q34,35)
Category 17 – Usage of a Music Accompaniment Technology (Q36)
Category 18 – Usage of Assessment & Administration Technology (Q37,38)
Category 19 – Usage of Technological Support Resources (Q39,40)
Category 20 – Attitude to Technological Support (Q41,42)
Category 21 – Attitude to Technological Training (Q43,44)
Category 22 – Attitude to Technological Implementation (Q45,46)
Category 23 – Attitude to Technological Advancements (Q47)
Category 24 – Self-Satisfaction With Technology (Q48)

A brief discussion about each question from within these categories is provided below.

**Question 3 - I am a regular user of technology**

The term “technology” is used and inferred throughout the survey with reference to recent electronic technological innovations. This narrow perception of the word was used to distinguish it from other older forms of technological advancement such as the printing press and non-electronic forms of technology such as a mechanical pencil.

This question was included to identify the level to which participants perceived themselves to be a “technology user” within their day-to-day environment, at home, work, travel or shopping. The data obtained from the question could then be used towards the development of a profile of each participant.

The generalisation of the question is defended due to (a) the variable nature and quantity of technological usage, and (b) people’s differing perceptions of technology. The purpose of the question was not to determine the level of technological usability, as this can be determined later through other questions, rather the participant’s personal perception of themselves in the
context they live and work in. The reasons for this are explained in the
section on literacy in the literature review.

It is acknowledged that this question does not utilise a method of measuring
against a common standard such as benchmarking. It was selected to solely
supply a rating based on each individual's own opinion that is their
perception. It is noted that the opinion presented may contain bias, be over
or under-rated, and could provide data that is comparatively at odds to the
responses in other questions. These issues, and others, are addressed further
in the analysis section.

**Question 4 - I regularly use technology in my work practices**

As the survey targeted practicing secondary school music educators, it was
considered appropriate to ask a question specific to their technological
practices when operating under employment.

The term “regularly” was utilised to ensure consistency in the perceived
level of usability between this question and question 3. Once again this is a
question about their perception, that is, not necessarily an accurate or
quantifiable observation. The question can be used to distinguish between
using technology in work and non-work personal scenarios and the
perceived level of use thereof. By relating the responses from this question
to those from the previous question (3) it should be possible to identify if
the participant utilises technology for non-work (personal) applications, or
for a combination of non-work (personal) and work related purposes and the
level indicated. It cannot be used to determine if a participant uses
technology solely in their work situation.

**Question 5 - I can competently create and use a slideshow**

*(e.g. a Powerpoint presentation)*

This statement was included as the production and use of slide shows has
becoming increasingly popularised by educators in the classroom, for staff
meetings, conference presentations, and the like. The exact nature of the
slide show software was left open to accommodate a variety of products such
as Microsoft Powerpoint and KeyNote.

The choice of a slideshow in preference to other types of technological productions was selected because (a) slideshow software is available to all survey participants through the NSW Department of Education and Training, (b) the participants will have had exposure to slideshows, and (c) most participants would have had the opportunity to undertake training courses to assist them in developing slideshows. The efficient production and, more importantly, the effective use of a slideshow to aid the education process is fast becoming a basic expectation of educators (Teachnology.com, 2009).

The responses to this statement provided an indication of the participants perceived level of competency, that is, it did not gauge the actual level of competency. It also does not gauge the effectiveness of utilising slideshow functionality or the integration of it into a lesson plan.

**Question 6 - I can competently use a computer scanner**

This question was selected to ascertain the users ability to use common technological hardware. The term “common” assumes the commonplace accessibility to the hardware, for example through their workplace or home. An imaging device was selected as it is one of the most commonly used technological devices.

There is no way of indicating from this question if a participant had a physical disability which hindered them from using a computer scanner. While this was recognised, it was considered that this shouldn’t have a significant impact on the data results.

A quantifiable level of technological competency using a computer scanner did not need to be specified in this question as this is ascertainable elsewhere in the survey.
**Question 7 - I can competently use a compact digital video camera to film a music performance**

Digital video imaging equipment is becoming popularised. The capturing of an activity, a musical performance for example, in a visual and audible format requires a certain technological skill coupled with creative and photographic or optical skills. The technological skill is a significant part of the ability. In the case of this question, the quality of the content, that is photographic ability, is not an important aspect.

It was accepted that all participants could obtain access to a digital video camera if they desired through the employer, and that most would have a need to video music performance, for example for examinations and musical productions. This question identifies whether the participant firstly chooses to use the technology and, secondly, points to the frequency, as it is associated with competency, of this usage.

**Question 8 - I can competently make a video DVD of home movies**

This question was pointed towards a non-work perspective as technological experimentation often takes place at home before it is implemented elsewhere such as at work.

The production of a video DVD involves a number of technological literacies which may include editing for video material using computer software, and the burning of material to DVD-ROM material in the appropriate format to be played on a standard DVD player.

This question identifies if the participant undertakes such practices in their personal time, and to what level they feel they are comfortable with such practices. Comfort with a given technology is an important factor as indicated by Bauer, Reese and McAllister (2003) and Forman (2008).
**Question 9 - I regularly use email for communication**

The expectation of using email for communication purposes is increasing both within and without the workplace. Access to email is available to all of the survey participants through resources provided by the NSW Department Employment, Education and Training.

This question was included to identify what level of email communication was employed by the survey participants. It is noted that alternative forms of communication may be also used including electronic and non-electronic means depending on each participant’s situation, but there were varying amounts of usage and accessibility. For this reason email was chosen as a benchmark.

**Question 10 - I regularly use the internet for real-time chatting (e.g. MSN, Skype)**

This question was included to identify if the participants utilised another form of electronic communication either for work or non-work applications. Internet “chatting”, both text and visual, was chosen as it was accessible from standard computer hardware though it may not be accessible through the internet connection at the participant’s workplace owing to restrictions. The technology is frequently used by many of the participant’s students for social communication. The question aimed to identify the participant’s level of awareness and usage of the technology.

**Question 11 - I am capable of maintaining my own personal web page**

The usage and management of web-based content is commonplace amongst most secondary school students. This may be for educational, personal or sometimes business applications.

The implementation of web content at the employer level is variable, so a personal implementation was selected as an alternative. The question identifies if the participant undertakes such practices in their personal time, and to what level they feel they are comfortable with such practices.
Question 12 - I can competently locate material on the internet

The general nature of this question was selected as it was based on the presumption that all users would have some exposure to internet searching as part of their everyday work practice in music education. The NSW Department of Education, Employment and Training provide teaching resources through the internet and encourage its use in the classroom.

It is accepted that the perceived level of competency does not identify the actual level of competency, but it does provide guidance as to the participant’s utilisation of the material on the internet.

Question 13 - I am capable of downloading music from the internet

The utilisation of the internet as a resource for musical content is widely acknowledge both within and without the discipline of music. The ability to successfully use and, by inference, access this resource is surveyed in the question.

The format of the music files were considered irrelevant to this question as the format may vary from music notation for scores, audio files, MIDI files and videos. The ability to “capably” utilise the resource could be discussed, but in reference to each participant’s experiences we will be able to identify to what level they feel they utilise it.

Question 14 - I am capable of buying or selling items on the internet

Similarly to previous questions, the data does not indicate a participant’s engagement with the technologies, rather their familiarity with the concept and ability to undertake activities if so desired. This approach is viewed as important so the survey can encapsulate a good view of the participant cohort.
The ability to utilise the internet’s capacity for retail capabilities was chosen as a question to observe if the participants utilised non-music related technology. This was considered important, particularly as some participants may utilise technology in their personal life, but not employ technology in work-related, that is music education, contexts.

The level of usage of this technological innovation can be determined from the response. The data may also be used to signal a comfort level of technological use.

**Question 15 - I regularly utilise a portable data storage device (e.g. a memory stick)**

This question is used to determine the participant’s technological usage practices. The storage and transfer of data such as information that may have been created by the user, is in a different category to searching for information, that is, information that others have created. The status of importance of this data may also be attained by looking at the participant’s usage of data storage.

A portable storage device, noting that they not directly supplied by the participants employer, is a popularised technological device. Demonstrating use of such a device may help determine the user’s reliance on technology as well as their understanding of data structures such as the importance of data flexibility and “back-ups”.

**Question 16 - I am familiar with the use of a blog or podcast**

The phrase “familiar with” was chosen as not all users would have had the practical ability to utilise blogs or podcasts, even though they are commonly used on the internet, particularly for social and music purposes.

This question determines the survey participant’s comprehension of a current technological innovation. Their perceived level of familiarity may be determined demonstrating their familiarity with the technology.
**Question 17 - I regularly utilise a personal music player (e.g. iPod, iRiver)**

Personal music players are now owned by the majority of music students. This questions aims to identify if music educators also utilise a similar technology. It is expected that music educators will need to transfer a digital rendering of music from one location to another as part of their work practice. This question examines if the technology is utilised in their personal lives.

The question doesn’t ask for an opinion as to whether the survey participant likes or dislikes the technology, rather as to whether they are using it. It also doesn’t identify alternatives for personal music listening such as a portable CD collection. It is used primarily for comparative purposes between the technological practices of the music educator and the music student.

**Question 18 - I am comfortable using a Windows operating system**

This question identifies if the user is comfortable using a popularised computer operating system. This will help identify a fundamental concept behind technology use by the participant. It should also be noted that the Windows operating system is utilised by the NSW Department of Education and Training and is available to all teachers.

**Question 19 - I am comfortable using a Macintosh operating system**

This question identifies if the user is comfortable using a popularised computer operating system. This will help identify a fundamental concept behind technology use by the participant. It is included owing to its prevalent use in creative arts circles as many musicians in the industry choose to use Macintosh hardware for music software.
Question 20 - I regularly utilise technology in music performance (e.g. an electronic instrument, amplification, etc.)

While it is possible to have an entirely acoustic music performance, many music performances particularly in an educational setting, will utilise some form of electronic technology particularly amplification.

This question identifies to what level the survey participant perceives they utilise technology in their particular context.

Question 21 - I am able to set up and operate a simple vocal PA system

Electronic amplification technology is available as a resource to the majority of music educators surveyed. It is “unofficially expected” that music educators are able to utilise such systems in their education context.

This question aims to identify the perceived competency level of the survey participants using this form of non-computer electronic technology.

Question 22 - I am capable of setting up and operating a basic band PA system

This question follows on from Question 22, to assess if the survey participant is capable of handling a larger, more complex technological device that is non-computer electronic technology. When compared to other questions in the survey, this may help identify if technological usage is present without the use of computer hardware.

Question 23 - I can competently edit a digital audio file using audio editing software (e.g. Audacity)

Digital editing using computer software may be considered a “staple” in the technological diet of a musician. This question assesses the level of this music production skill in the cohort of survey participants.

The technology is freely available to survey participants, and is actively
encouraged through training courses by the NSW Department of Education, Employment and Training.

**Question 24 - I am competent at recording sound into a computer with a microphone**
The capturing of a musical performance is an important practice particularly in music performance and education. This question identifies if the survey participants have the ability to competently record sound through a microphone at a basic level.

Availability of resources for this technological practice are variable, but most music educations can normally obtain access to a microphone for a recording purpose if they so desire.

**Question 25 - I can competently produce a small music score using computer notation software (e.g. Finale, Sibelius, etc.)**
This question assesses the survey participant’s ability to utilise computer software to produce a basic music score. While this is not a requirement for all musicians, it is a commonplace task for most music education contexts.

Access to the necessary software resources can be free, that is freely downloadable from the internet and tutorials are freely available. Existing hardware such as a music keyboard, may also be utilised for this purpose. It is then up to each participant if they wish to utilise this form of technology.

**Question 26 - I can competently create pictures of music notation for use in written material (e.g. worksheets)**
Owing to the cohort of targeted survey participants, that is secondary music educators, it is expected that all of them will need to produce music worksheets or similar as part of their work practices.
This question identifies if they utilise technology to assist them to create musical excerpts for these documents, or whether they rely on a non-technological means for producing them.

**Question 27 - I am able to use sequencing software to arrange a basic piece of music**

Many musicians utilise sequencing software to arrange pieces of music. From an education perspective the arrangements of music to suit particular situations such as for instrument combinations is a quite common.

This question identifies if computer sequencing software is utilised in this process or whether non-technological means are used for this purpose.

**Question 28 - I am comfortable with synchronising audio material with video (e.g. for film soundtracks)**

The synchronisation of music to other forms of media such as video is a component of the syllabus for the music educators surveyed. How it is exactly employed is not specified and left up to each individual teacher.

This question aims to identify if technology is utilised in this module of work, or whether alternative, that is non-technological methods are used.

**Question 29 - I know how to utilise an aural training software package (e.g. Auralia)**

The use of software to supplement traditional teaching practices is increasing. The discipline of music has an array of software resources available including some freely available from the internet.

This question identifies if computer software is utilised by the survey participants for the purposes of supplementing traditional aural training methodologies.
**Question 30 - I know how to utilise a software package that provides musicianship training (e.g. Musition)**

The use of software to supplement traditional teaching practices is increasing. The discipline of music has an array of software resources available including some freely available from the internet.

This question identifies if computer software is utilised by the survey participants for the purposes of supplementing traditional musicianship training methodologies.

**Question 31 - I am familiar with a loop-based music software package (e.g. Acid, Fruity Loops, etc.)**

This form of technology is popular with secondary music students. This question ascertains to what level the survey participants are familiar with this popularised form of music technology.

**Question 32 - I am able to comfortably use algorithmic composition software**

This more advanced form of music technology is chosen to see if any of the survey participants have delved into the more complex and less conventional side of technology in music.

While composition software may not be a focus for the many of the survey participants, a level of awareness and perhaps limited experiences may be determined.

**Question 33 - I am able to utilise Virtual Studio Technology (VST) or synthesis**

Virtual Studio Technology is becoming a much more significant part of contemporary music making practices in the music industry.

This question aims to ascertain if the survey participants are utilising this technology and align themselves with current practices in the industry. It is
also recognised that not all survey participants may have access to this technology as it is not normally accessed as part of their employment.

**Question 34 - I am able to develop simple computer software (e.g. with Max MSP)**
Computer programming technology has a place in the realm of music creation.

This question aims to see if the survey participants have had exposure to this form of technology either from within or without.

**Question 35 - I am familiar with software used for multimedia production (e.g. Flash)**
Many musicians are employed to compose music for computer images and animations such as for cartoons. There are now many music software packages available that permit music to be synchronised to other forms of digital media.

It is anticipated that not all survey participants will have had experience with technology, but it will be beneficial to quantify the cohort that have and to what level they have had experiences.

**Question 36 - I am familiar with a computer software package used for real-time music accompaniment (e.g. SmartMusic Studio)**
This question aims to identify if the survey participants are utilising any forms of technological accompaniment devices through software that are outside the traditional modes of music accompaniment.
**Question 37 - I am able to utilise technology to help with music assessments**

A number of technological innovations exist that permit music educators to assess music students through technological means, for example through computer software. This question examines the level of usage of this software in comparison to traditional assessment means.

**Question 38 - I regularly utilise technology to help with administrative duties**

Many software packages are available and sometimes supplied as a matter of course by an employer, to aid with everyday administrative duties. These may include word processing, record keeping, assessment and certain communicative tasks.

This question aimed to determine the level at which participants perceived their usage of technology to assist with administrative duties. While the duties are not specifically specified this was not considered a significant concern as there will be a variable amount of different activities related to each person’s individual circumstances. This was left up to the participant to determine.

There is also the question of quantifying the amount of technology used to assist with administrative duties. Rather than attempting to determine a level of usage comparatively between participants, it was left up to the participant to determine the quantity of usage relative to the amount of administration duty they undertake.

**Question 39 - I regularly read articles about technology**

This questions was used to determine the participants willingness to investigate technological advancements in a text format be it paper-based, web or email. It was not the intention to determine the exact nature of the article, that is, what type of technology they read about or the level to which they understood what they had read.
The data from the question will help indicate if the participant is making any attempt to keep up with advancements in technology, not from the practical viewpoint but from the willingness to investigate the theoretical and/or conceptual viewpoint.

**Question 40 - I regularly utilise the internet as a source of support**

The aim of this question was to determine if the participant utilised commonly accessible online resources as part of their work practices. Internet access is available to all of the participants through the workplace and its use is actively encouraged. To use it as a source of information outside of traditional information sources is worthwhile particularly as it provides up-to-date information on the topics being studied.

The actual amount of usage was not considered important for this study, rather than the concept of using the internet as a source of support. The amount of use was expected to vary considerable considering the nature of the topics studied and the context of each teacher.

**Question 41 - I believe I have sufficient technological resources available to support my needs**

This question was used to determine if the participants considered they had sufficient technological resources available. It is noted that the study is seeking their impression. If they considered they had sufficient resources then this data could be coupled with other questions to determine how they are using it. If they considered they were under-resourced, it may be used to explain why, or why not, certain tasks are being undertaken.

**Question 42 - I feel comfortable helping others (e.g. students) with technological problems**

This question was included to identify the participants level of ease with assisting with technological problems. The greater issue of ability to think logically when problem solving is also presented here in addition to the specifics of the problem solving of technological issues.
Problem-based learning is a focus of many educational approaches and it is considered, though perhaps not expected, that most music educators would be familiar with this concept and be able to solve problems in an acceptable fashion. Inherent technological perceptions may be thrown into the equation and may affect the educator’s ability to work effectively in a logical manner to solve problems. For example, an educator may be excellent at solving problems but as soon as a technological problem is present their experiences with technology comes into play. This can possibly have a negative impact and cause the participant to approach the issues of technological problems solving with some trepidation.

The data collected from this question will be used in conjunction with data from earlier questions to firstly determine the level at which the participant uses technology, that is their familiarity level, and then to see if this has any relation to their level of comfort assisting others with technology.

**Question 43 - I believe that sufficient technological training is available**

The question ascertains the participant’s comprehension of the accessibility to training that they perceive to be related to their usage of technology. It doesn’t necessary indicate if the training is actually available, and to what level of adequacy, rather to what level the participant believes it is available.

This question doesn’t raise the issue of whether technology training is actually undertaken. Training may be available to the participant but they may not actually undertake it. This question will also assess to see if information is filtering through to the participant regarding training and also if the participant is able to find training. This will be done by comparing data with the known dissemination of information within the participants greater work place, that is, the NSW Department of Education and Training.
**Question 44 - I am able allocate time to technological training**

Irrelevant of the availability of training, the issue of allocation of time to such training is examined. It is noted that this is not just a time management issue as it may also involved the desire to attend training. For example, the participant may consider other work activities, such as teaching, a higher priority than upgrading skills. The combined issues of scheduling and personal drive will be considered when the results are analysed.

**Question 45 - I feel that technology is utilised well in my workplace**

The participant’s personal feelings on overall technology use in their workplace may impact on the way they personally utilise technology. Note that this question does not indicate if technology is actually utilised well, rather the participants perception of the level at which they perceive it to be utilised. For example, a participant may not be aware of the technological operations in their immediate workplace which may give them the impression of under-utilisation. Collecting data about their level personal impression of technological usage is defended as this could affect levels of morale, incentive, etc.

**Question 46 - I believe I have a good understanding of how technology can be used as an educational aid in music teaching**

Without obtaining exact details, such as data which can be ascertained from other questions, this question examines the perceived level of comprehension concerning the participants understanding, not implementation, about technology use in music teaching. This question is not specific to the realm of music as it also applies to technology in general terms, for example also to electronic whiteboards. This data can then be compared to other questions for verification and comparison purposes such as to the level of their comprehension).
**Question 47 - I believe I am able to cope with technological change**

This is quite a personal question with the participant requested to indicate their level of agreement with the above statement. The ability to handle or not manage a situation is something that would not normally be discussed in a person-to-person exchange. Owing to the anonymity of this survey it is anticipated that this question will encourage participants to honestly answer this question.

The question is not specific to music or even education, rather to technological change in life in general. There may be some differentiation between technological usage in different parts of participants life but it would be expected that adopting technological change in personal life, that is voluntary adoption, would be easier to cope with than in work life where “enforced adoption” may be the rule. This question intends to takes an average of a person’s overall technological use but it is expected that if a participant is unable to cope with at least one area of technological use, for example at work, that this will be reflected in their overall rating about coping with technology.

The data from this question can be compared to the results of other questions such as the level and nature of their technological practices to see if coping with technological changes is one of the factors directly effecting technological adoption.

**Question 48 - I am satisfied with my own level of technology literacy**

This is another deeply personal question probing into the personal mindset of each participant. The perceived level of self-satisfaction with technology can be used to determine if (a) there are levels of dissatisfaction and (b) if there is a feeling of not wanting to explore new opportunities. When compared to the data in other questions, the actually level of each person’s current technology literacy may be able to be determined in addition to the “direction” of their technological mindset.
3.6.3 SECTION THREE – Open Questions (Short Answers)

The following questions were left open ended to provide survey participants to voice their opinion on related matters not specified in the above questions.

The reason for the open nature of these questions was to allow participants to (a) comment on an area or areas that may not have been covered by the survey which may directly affect their use of technology, and (b) permit them to identify what they personally believe to be possible hindrances. This belief or perception can then be verified to some extent by comparison with other questions in the survey.

*Question 49 - What do you consider to be the single most influential factor affecting the use of technology in your work environment?*

This question aims to identify the main key to the participant’s utilisation of technology. The question refers to general technology rather than to music-specific technology as it is expected the factor would have an underlying influence to both. By obtaining and collating this data we should be able to identify if there are collective factors that affect the sample group being surveyed.

The justification for limiting the data to a single option is the anticipation that there would be a number of similar factors present among the cohort that would be provided as unscaled data. By requesting only one piece of data we are presented with the most significant information.

*Question 50 - Do you have any reservations or concerns about using technology? If so, what?*

This question permitted the survey participants to voice anything that they perceive would hinder them using technology. The use of an open question is included to ensure that any qualification to earlier questions can be provided (if desired) or an item that the participant feels strongly about that is not addressed in the survey can be addressed discussed.
4.0 Responses and Analysis

4.1 Introduction

This section serves to summarise the data obtained from the survey instrument and provide a level of statistical analysis. Full details of the survey, including all data, are contained in the accompanying appendices.

To present this section in a brief form it is assumed, unless otherwise stated, that all survey participants (twenty-two in total) provided valid answers for all questions. Anomalies are identified and discussed.
4.2 Section One – Participant Data

Question 1 - Please select your gender

Figure 2 – Gender Distribution of Surveyed Cohort

A higher proportion of females than males was anticipated considering the typical gender distribution of staff operating in the area surveyed. Authoritative statistical data regarding current gender balance of secondary school music teachers was not accessible from the NSW Department of Education & Training at the time of publication of this document. However, unofficial sources within the Department have estimated the proportion to be more balanced than what has appeared in the cohort surveyed. If this is true, certain trends may arise from within the survey data owing to the higher than average number of female respondents. The significance of a high proportion of females in the study may exhibit certain characteristics as identified in section 2.4. This is further discussed in the analysis in section 4.6.
Question 2 - Please select your age range

The data exhibited in the various age bands depicts a broad spread across the survey cohort. This was helpful as it provides answers from a range of backgrounds and helped identify any anomalies related to generational influences. The data exhibited that the majority of those surveyed were “digital immigrants”, as explained in the literature review (Prensky, 2004). A large proportion of the participants grew up and were trained in an era when technological innovation wasn’t extensively integrated in education.

When the data above is analysed, the mean age would fall in the 40-49 age range. When combined with the previous question, we are able to ascertain that a significant proportion of secondary school music educators being surveyed are females aged in their forties. This is significant as it relates to material presented in section 2.4 (ICT and Gender) concerning middle-aged females using technology, in particular the study by Fidishun (2001). When considering the other areas of this research (including issues of attitude and training) it may be possible to observe some similar trends to Fidishun’s findings though there are areas that are not covered (such as the social background of the course participants). This study does highlight, though, a need for addressing issues of attitudes and technology training/implementation, especially for middle-age women.
4.3 Section Two – Rated Responses

All questions in this section obtained opinions using a five point Likert scale.

4.3.1 Category 1 – General Usage of Technology

Question 3 - I am a regular user of technology

![Figure 4 – Perceived Level of Technological Use](image)

The data obtained from this question clearly indicates that survey participants believe they are regularly users of electronic technological innovations though the nature of the technology, the level of use and the purpose is not ascertainable. This data is used in conjunction with responses to other questions to identify whether there is congruence or disparity between perception and reality.
**Question 4 - I regularly use technology in my work practices**

![Bar Chart: Usage of Technology in Work Environment](image)

*Figure 5 – Usage of Technology in Work Environment*

When the data from this question was compared to Question 3, a notable percentage (10%) of participants expressed a neutral or negative opinion about their perceived use of technology in their individual work environment. This change has drawn an even spread (5% each) from those who Strongly Agreed and from those who Agreed to the statement in Question 3.

Notwithstanding the legitimacy of the data presented, remembering that it is currently based on individual perception rather than evidenced fact, it immediately points to a drop in the use of technology in the work environment when compared to its use in other environments, for example home and leisure. It is also noted that the majority of the survey cohort admit that they use technology in both personal and employment capacities.
**Question 5 - I can competently create and use a slideshow (e.g. a Powerpoint presentation)**

![Bar Chart](chart)

A small percentage (9%) indicate their unease at creating slideshows. This is in contrast to the majority of respondents who appear very confident creating and using them. The segregation between the agreement and disagreement sides of the opinion represents a noted divide. Discussion about the distinction between Disagree and Strongly Disagree should be raised as it is possible that it was difficult for participants to provide a level of lack of competency. It may be easier to determine a level of familiarity when one already uses the particularly technology, than it is to quantify a level of “unfamiliarity” when participants are unsure what they are unfamiliar with, for example, “how well don’t you know the software”. If this is the case it may be worth considering that Disagree and Strongly Disagree categories may be misinterpreted or be inappropriate and it may be more prudent to categorise the data into a single category. This re-categorisation may increase the severity of the void and could enhance the impression of the emergence of two segregated “camps” within the survey cohort.
When the raw data is examined and the responses between Question 5 and Questions 4 are compared (i.e. something not achievable through the above graphical representations), it is interesting to note that the disagreeable respondents in Question 5 are almost identical to the neutral/disagreeable respondents in Questions 4. This is not unexpected as the technology discussed in Question 5 would normally be used in a work environment.
4.3.2 Category 2 – Usage of Imaging Technology

**Question 6 - I can competently use a computer scanner**

![Bar Chart](image)

Figure 7 – Computer Scanner Competency

The various levels of opinion are very similar to Question 5, that is, a rift is evident in the data. The decrease in Strongly Agree and associated increase in Agree points to somewhat less familiarity with the equipment.

The availability of appropriate hardware could be considered as one of the reasons for the slightly lower levels of agreement. Another reason that could be contended is that the need to use scanning hardware may differ within the cohort. Nonetheless, the majority of participants fall in to the first two (agreeable) categories and this situation reinforces the data present in Question 5.
**Question 7 - I can competently use a compact digital video camera to film a music performance**

![Bar Chart](chart.png)

While the level of competency is quite subjective in this question it still provides data as to whether survey participants are (a) using video digital cameras and (b) how comfortable they feel about it.

The majority of respondents (82%) either Agreed or Strongly Agreed with the statement provided. This indicated a high level of access and use of digital video camera technology. The 9% that selected “Neutral” may be aware of the technology but have had little experience with it. The remaining 9% who disagreed or perhaps Strongly Disagreed with the statement (refer to discussion in Question 5) would most likely have little or no comprehension with the technology. Accessibility to equipment may be an issue for certain respondents but this is becoming less of an issue with the prevalence of low-cost cameras entering the market. This matter of accessibility is discussed further towards the end of this chapter. The 18% of the Neutral/Disagree respondents who don’t utilise the technology may be viewed as a concern since capturing and viewing visual and aural footage is an important skill for improving music performance.
**Question 8 - I can competently make a video DVD of home movies**

![Bar Chart](image)

*Figure 9 – Video Editing and DVD Competency*

The level of those who indicated Neutral, Disagree or Strongly Disagree (41%) is significantly higher to the previous three similar questions (9-18%). This shows a much lower level of familiarity with the technology specified. The broader spread of data provided in response to this question may also provide an indication of how the cohort deals with tasks of slightly higher complexity.

As Questions 3 and 4 indicated there were slightly greater technology usage rates in the home, that is non-work environment, the results from this question were somewhat lower than anticipated. This could be attributed to:

(i) less access to the necessary technology in a home environment though this is not seen as a significant issue as home use video editing is becoming more commonplace;

(ii) the desire not to use technology if not required for work though this
may be largely dismissed as evidenced by the results from Questions 3 and 4;

(iii) no need for editing video and burning DVDs, This may be partly feasible with the prevalence of online distribution, though editing skills would still need to be employed;

(iv) the level of technological skill required is slightly higher than those in earlier Questions (5,6,7). This may be a plausible explanation as it requires a higher level of thinking and a greater time commitment.

Whatever the reason(s), it is evident that the cohort’s literacy levels shift slightly and become more spread when referenced to technology skills of a slightly higher level.
4.3.3 Category 2 – Usage of Imaging Technology

Question 9 - I regularly use email for communication

Figure 10 – Usage of Email

Those participants indicating they regularly used email was quite high with only 5% (rounded up) inferring they don’t utilise email technology regularly and two-thirds (64%) of respondents using it very regularly.

It is important to note that the employer of the survey participants (NSW DET) automatically provides an email account to all of their staff and sends correspondence to the accounts such as newsletters. At the time of the survey (2007) it appears there was no requirement for staff to utilise their email account on a regular basis.

Considering the participant’s accessibility to email at work, in addition to any personal use of email outside of the work environment, the 64% of respondents who use it regularly appear slightly than the statistics on internet usage for 2007 (Google, 2011) showing 67.86% of the Australian population as “Internet Users”, that is, those with accessible
internet. Unfortunately information specifically on email usage in Australia in 2007 was not available.

The response of four participants indicating “Neutral” is uncertain. It is concluded that this most likely indicated no or insignificant usage of email for communication purposes.
Question 10 – I regularly use the internet for real-time chatting (e.g. MSN, Skype)

![Graph showing the distribution of responses to the question](image)

The distinction between two groups within the surveyed cohort is quite evident in this data. Those who provided a positive response (37%) clearly indicated they used a real-time internet-based communication method regularly, compared to 64% who indicated they rarely or never used it.

The tendency towards the highest band (Strongly Agree) within the positive realm tends to indicate that its use was quite prevalent within those users. Conversely, the highest response band (Disagree) sits in the negative realm which was also highest for the survey question, indicating that most participants surveyed didn’t use this form of real-time communication. The response for Strongly Disagree may be interpreted as “never” considering the active nature of the statement.)
### 4.3.4 Category 4 – Usage of Basic Internet Technology

**Question 11 – I am capable of maintaining my own personal web page**

![Bar Chart](image)

*Figure 12 – Maintaining a Web Page Profile*

The variation in the level of agreement to this statement indicated the rather different experiential levels the participants possessed concerning personal web profiles. There was no distinct pattern observed other than the outer bands were both lower. The overall perception was a slight tendency towards disagreement with the provided statement.

The highest band (Disagree – 36%) indicated little skill or experience with web page maintenance, while the next highest band (Agree – 27%) provided evidence of a significant cohort who had some experience or skill. The 14% who provided Neutral as their response perhaps did not know whether they were or were not capable, perhaps from lack of experience.

The outer bands (Strongly Agree 14% and Strongly Disagree 9%) indicates the presence of an “us and them” situation with a close balance between those who were very confident working with this form of ICT compared to those who were very insecure with this form of ICT.
**Question 12 – I can competently locate material on the internet**

![Figure 13 – Capability of Using Internet Search Engines](image)

Notwithstanding the participants’ interpretation of the given statement (as discussed in the previous chapter), the overall feeling was a show of confidence.

Almost three quarters of the participants showed no hesitation accessing and using an internet search engine to locate data. The effectiveness of finding material or information on the internet is not necessarily indicated in this data, but some participants may have indicated this by choosing the second band (Agree 27%). Nonetheless, the skill and confidence has been confirmed as present in the participant cohort.
Question 13 – I am capable of downloading music from the internet

![Histogram showing responses to Question 13](image)

Figure 14 – Ability to Download Music Material

Considering the importance of access to musical material (audio recordings and music scores) to a musician, this question demonstrated the presence of a strong ability to use the Internet as a resource for locating music. This data does not, though, indicate that the skill/ability is necessarily employed in a music education context.

When compared to the similar response of the previous question (14) it indicates that there is a drop in confidence when it comes to working with music material. This may indicate that while certain general ICT skills are high, it does not necessarily follow through to a contextual application with music. Perhaps the necessary skills are present but they are not sure how to employ them. It may also indicate hesitations or problems with certain technologies used for sound or music such as working with sound hardware, audio drivers, media players or embedded score display in browsers or perhaps it indicates apprehensiveness to social or legal issues such as music copyright. This latter situation is not indicated anywhere in the survey except for a free text comment in Question 50 Response 17 raising issues about copyright and privacy.
Question 14 – I am capable of buying or selling items on the internet

![Bar chart showing responses to e-commerce use]

The data yielded for this question indicates a moderately-high level of familiarisation and comfort with e-commerce technologies. The 75% that fall into the agreement bands depict (a) a high skill base and (b) a popularly-adopted method for making monetary transactions.

Familiarity with this process, often one of the areas of discomfort due to internet fraud and security issues, is surprisingly high. The scope of this survey does not provide evidence to support the reason for this in detail, but it does indicate that this form of non-music ICT shows appreciation on the part of respondents for technology on a broader scale.
4.3.5 Category 5 – Usage of Data Storage Technology

Question 15 – I regularly utilise a portable data storage device (e.g. memory stick)

![Figure 16 – Portable Data Storage/Management](image)

The data returned from this statement shows that the majority of participants utilise a portable data storage device, most likely between several computers such as home and work, and utilise some form of self controlled data management. The strong positive response (91%) demonstrates their engagement with this form of common ICT technology, ‘the majority being confident with using the technology.

The remaining 10% who indicated disagreement would not use the technology at all or very little. It is consideration of this 10% (rounded up) which is of interest. They may use alternative forms of electronic data management for example the use of a server, saving files locally to a computer, use a paper-based system or perhaps avoid ICT altogether.
4.3.6 Category 6 – Usage of Web 2.0 Technology

Question 16 – I am familiar with the use of a blog or podcast

![Bar Chart]

Figure 17 – Comprehension of blogs/podcasting

The majority (73%) of participants were quite familiar with the technology presented in the agreement group. The number of participants reduced significantly as the level of familiarity decreased.

Interestingly, the data produced an incremental “slope” result rather than a divide as in several earlier questions. This gradual decrease in familiarity, with the majority of respondents towards the top of the scale, shows a good level of uptake and comfort with blogs and podcasting while a minority feel a little uncomfortable with the technology.
4.3.7 Category 7 – Usage of Personal Music Technology

Question 17 – I regularly utilise a personal music player (e.g. iPod, iRiver)

Limited use of portable music storage devices is exhibited by this data. Almost half of the respondents indicated they didn’t, or rarely, use them. The Neutral option was interpreted as a small level of use. Of those who did use the technology, most used it quite regularly (50%).

Considering that this statement encapsulated personal and work usage it presents an interesting statistic. In the months before the above data was generated the Solutions Research Group indicated an estimated 27% ownership of MP3 players amongst the population (Mac Publishing, 2006) The source country was not indicated by the SRG but it is presumed to be the United States. Based on this statistic, the data above shows the surveyed cohort may possess a significantly higher proportion of ownership than the general population. This is feasible considering their employment in the music education industry.
While this above data may look high it may actually be lower than the students they are educating. Unfortunately no specific data was available on that age group from the year this data was produced, though in 2008 one report indicated 92% of 14-17 years olds owned an MP3 player (British Music Rights, 2007). This may indicate that the percentage of ownership was much higher in the student cohort.
4.3.8 Category 8 – Usage of Computer Operating Systems

Question 18 – I am comfortable using a Windows operating system

![Bar Chart]

Figure 19 – Familiarity with Windows OS

This data, in conjunction with the next question, indicated familiarity with two of the main computer operating systems that are a central part of ICT activity. This is not indicative of the level of proficiency, rather the “comfort” level with their individual level of need.

All participants showed a good level of familiarity which, in turn, indicates a certain level of technical aptitude which can be seen by comparing this question to the tasks indicated in the other questions. By inference, all participants considered they were able to undertake basic tasks using a Windows operating system.
Question 19 – I am comfortable using a Macintosh Operating System

When compared to the previous question, this data showed a significantly different spread. A much smaller percentage (41%) exhibited familiarity with the operating system while a significant proportion (36%) showed their various levels of discomfort with a Mac Operating System. Of those who responded in the neutral category (23%) it is possible that they had had little or no exposure to the environment so may be best counted with the 41% who disagreed. This would then total 59% of respondents who were not able to comfortably use a Macintosh operating system. This statistic is significantly high, considering that many in the professional arts fraternity use Apple hardware, including a Macintosh Operating System, to undertake creative activities, often owing to the processing architecture inherent in the systems. This does present a disparity between what teachers and students are using in secondary education in comparison to what is common practice in the industry. Another factor may be simply lack of accessibility to Apple (Mac OS) computers as the DET normally provided Windows OS computers to state schools as standard issue.
4.3.9 Category 9 – Usage of Music Performance Technology

Question 20 – I regularly utilise technology in music performance (e.g. an electronic instrument, amplification, etc.)

The level of agreement with this statement showed a high level of usage of electronic devices in music performance. While hardware or software was not distinguished it is presumed that most respondents were referring to hardware devices rather than software perhaps due to the examples that were provided.

The use of dedicated non-computer hardware devices for music (such as amplifiers and electric guitars) are a simple implementation of music technology. They often involve a low level of complexity, are readily accessible and require minimal technical knowledge. If the responses to this statement had been different, that is there had been a higher level of disagreement, this situation would have raised other concerns such as technophobia or equipment accessibility.
**Question 21 – I am able to set up and operate a simple vocal PA system**

The 100% positive response to this statement demonstrated at least a minimum of technological literacy in the surveyed cohort. While it doesn’t provide detail of the different levels of competency, for example some systems may not be set up correctly or regularly incur feedback due to equipment misuse, it does show a certain level of technical skill, such as comprehension of basic signal flow, and that operational understanding is present.

It is considered that in a number of cases the respondent is referring to system utilisation in a non-musical context, for example, setting up a PA system for voice only at a school assembly, rather than for a musical application such as miking up a singing voice for a musical performance. While the technical approach may be similar in both applications, the level of operation will vary significantly. If the provided statement specified the scenario as a vocal PA for a music context, such as operating the system for a music ensemble performance, the statistics may have yielded lower results due to the higher operational requirements. Nonetheless, the results of this question do provide a base result to which the results of other questions, particularly Question 22, may be compared.
Question 22 – I am capable of setting up and operating a basic band PA system

The higher level of technical and operational aptitude required in this question is indicative in the spread of data particularly when compared to question 22.

Compared to 100% agreement concerning setting up and operating a basic vocal PA, only 96% agreement is evidenced in this statement with the majority providing a lower level of agreement, that is, they are only just comfortable with the given statement. Additionally, the 5% who responded neutrally did not exhibit agreement with the provided statement perhaps from lack of experience in the area.

This overall level of the response to the given statement, while quite high, still shows an average that is lower than expected considering that the statement describes a fundamental musical activity using technological equipment. It is considered that the prevalence of contemporary music in the secondary education program would be better supported if this statistic were considerable higher, such that the spread of statistics puts the higher results into the top category.
4.3.10 Category 10 – Usage of Audio Technology (Software & Hardware)

Question 23 – I can competently edit a digital audio file using audio editing software (e.g. Audacity)

The level of overall agreement with this statement (86%) exhibited a high level of perceived competency with basic two track audio editing. The actual level, if surveyed through different means, may be lower than this.

The number of respondents who provided a neutral response (9%) or disagreed with the statement (5%) was surprising considering the prevalence of basic two track audio editing software and the need for music editing when for example, they may be trimming recordings. This data also indicates that there may be an element (approx 14%) who are not utilising this basic skill or feel rather uncomfortable doing so. Considering there is no cost outlay required to undertaking basic editing, for example the Audacity software program is available freely, there may be something impeding its use by the music educators either in the classroom or by them personally.
The strong positive response to this statement (91%) shows perceived familiarity with this basic skill though it does not indicate whether it is implemented in an education context. The weighting towards the top of the scale is indicative of a very high level of perceived competency with the response being one of the highest in all these “basic skills” questions.

The occurrence of the neutral and disagreement responses (10% total) could perhaps be grouped together to indicate a cohort that are not regularly using, or have had little to no exposure to, the technology discussed. This data is considered later on in this report in conjunction with responses from other questions in this section.
4.3.11 Category 11 – Usage of Music Notation Software

Question 25 – I can competently produce a small music score using computer notation software (e.g. Finale, Sibelius, etc)

Figure 26 – Familiarity with Music Notation Software

The data depicts a largely positive response (91%) but the 10% (rounded up) who indicate neutral/disagreement (i.e. identical to Question 24 and similar to Questions 23 & 25) shows a similar trend emerging amongst the “basic skills” questions.

The ability to produce small excerpts of music notation, such as writing arrangements for school bands, transpositions for instruments and compositions, is fundamental to most music education contexts and certainly are part of DET understandings). To have approximately 1/10th of the cohort surveyed indicate that they are uncomfortable with using this form of technology is surprising considering the requirements of the syllabus.
Question 26 – I can competently create pictures of music notation for use in written material (e.g. worksheets)

![Bar chart showing responses to Question 26](image)

Figure 27 – Ability to Create and Use Graphics

While those who indicate neutral/disagreement are identical to Questions 24 and 25, the high level of response at the upper end of the agreement realm presents a very positive response to the statement. This is not surprising as the use of the technology identified in Question 25, music software, is normally required to undertake the task identified in Questions 26.

The results appear to indicate that while most participants are able to competently export graphics from their chosen music software, the ability to produce the scoring to an appropriate level is a greater challenge. This would involve a higher level knowledge of the software and the ability to use such features as page layout and staff spacing.
4.3.12 Category 12 – Usage of Music Arrangement Software

Question 27 – I am able to use sequencing software to arrange a basic piece of music

![Bar Chart]

Figure 28 – Competency with Sequencing Software

The response to this statement may be influenced by two considerations: (i) the ability to use a given technology, that is music sequencing software, and the ability to arrange music, involving some comprehension of music theory. Consequently, it is possible that respondents may have perceived the question from either of these perspectives but it is presumed that most respondents considered it from the viewpoint of technological engagement.

Secondly, the specific nature of the musical application of sequencing software was left open to interpretation as the level of skill required varies considerable depending on the specific application.

Nonetheless, the data yielded from the responses provided a distinct divide between agreement with the statement (86%) and disagreement (14%). The lack of results in the Neutral category provided clear delineation between the two groups.
The level of skill required by the statement may be a little higher than certain of the earlier questions, but still was perceived to be in the realm of a “basic skill” for musicians. This may provide an explanation of why the level of disagreement was higher.
Question 28 – I am comfortable with synchronising audio material with video (e.g. for film soundtracks)

A much lower level (63%) of respondents provided positive responses to this statement with most of the participants indicating Neutral or Disagreement (37%). The spread of results was not an even decline, rather a sharp increase occurred in the disagreement category showing further evidence of a “divide” occurring. The significantly lower level of overall agreement may have occurred due to the lack of exposure on the part of educators to mixed media projects, that is those that use both audio and video. While synchronising music to video is not necessarily an integral part of traditional music making, it is nonetheless something many musicians are becoming familiar with as evidenced by the prevalence of relevant features contained within music sequencing software. Additionally, music education often studies areas such as “film music” as can be seen within the secondary education music syllabus. A slight increase in the level of disagreement was anticipated, but the 1/3 (37%) or survey participants who indicated they are not familiar with the technology was surprising. It is noted that 14% indicated Neutral which may indicate they were familiar with the concept and were willing to try it, but had not had the opportunity to engage with the technology.
4.3.13 Category 13 – Usage of Music Training Software

Question 29 – I know how to use an aural training package (e.g. Auralia)

The level of disagreement with this statement (45%) was significant with only just over half (55%) of participants indicating they knew how to use aural training software.

The nature of the software, which includes games and practise drills was not specified as many software options exist and operate at different levels. What was obvious, though, was that software to support aural training was not being significantly utilised. This could be linked to the requirements of the syllabus, the individual approaches adopted by each of the music educators which may explain the low uptake, the suitability of products to that level of education or perhaps even availability of the technology, but the low level of familiarity with the technology is surprisingly lower.

The statement didn’t enquire as to whether the participant utilised the technology in their teaching, that is it focused not on “How Much Do You
Use the Technology?”, rather it focused on their familiarity with the form of the technology and how it could be used. Considering the availability of the technology, and the proactive marketing of it in the education environment, the result is still quite low, though perhaps the increase of the Neutral category to 27% indicates some exposure but limited engagement.
**Question 30 – I know how to use a software package that provides musicianship training (e.g. Musition)**

The spread of the results show an emphasis more towards the middle of the response range, with largest proportion of responses being in the Neutral category, the second highest Neutral response of all questions. Half (50%) of participants indicated that they knew how to use software for the purpose of supporting the teaching of musicianship at the level of basic music theory. A significant proportion of respondents (32%) indicated a Neutral level of comfort with the statement, perhaps largely representing a lack of practical exposure to the technology while being aware of its existence and operation. Most of the 18% who disagreed with the statement perhaps had little to no practical familiarity, which was similar to those in the Neutral category, but also possessed little or no knowledge about the technology. Considering the prevalence of this type of software in the education market the overall survey result is surprisingly low. One explanation could be the decreasing attention placed on fundamental musicianship training in the education system, linked to the prescriptions of the syllabus, while another could be the continued use of traditional means of delivery. Nevertheless, the familiarity with the technology is (comparatively) quite low.
4.3.14 Category 14 – Usage of Loop-Based Music Software

Question 31 – I am familiar with loop-based music software packages (e.g. Acid, Fruity Loops, etc)

![Figure 32 – Familiarity with Loop-Based Music Software](image)

The data presented here shows evidence of a significant divide with 77% of participants agreeing with the statement, though the overall level of agreement tended to be lower, while 18% were unfamiliar with the technology. An additional 5% who indicated neutral were possibly aware of the technology but not very familiar with its operations. The notable rise in the “Disagree” category (18%) is to be observed. A higher level of “Neutral” would have been anticipated indicating a certain level of awareness of how the software was utilised but this was not the case. One possible explanation is the more recent emergence of loop-based compositing popularised through software, though it has existed in a different form for many years, whereas other techniques such as overdubbing and sequencing, have been around much longer. This situation could point to an issue of unfamiliarity with the style of music or composition involved rather than an issue with unfamiliarity with the technology.
4.3.15 Category 1 – Usage of Sound Generation Technology

*Question 32 – I am familiar with algorithmic composition software*

The level of disagreement provided to this statement was not unexpected owing to the nature of the technology and its limited use in secondary music education. It was, though, useful in determining the participants perceived familiarity with an advanced form of music technology which sit in the realm of music composition or processing.

What the data shows is a small element (9%) are quite familiar with working with algorithmic composition software which is quite an advanced form of music making using technology. The 0% response rate for the “Agree” category is notable as it indicates that the participants are significantly engaging with the software or not really engaging at all.

The level of disagreement from the two negative bands (50% total) indicates a large proportion of the participants have not only failed to use the technology, but most would not be familiar with the existence of the technology. The 41% who indicated Neutral may have some awareness of
the technology but have limited or no practical engagement with it.

The data from this question shows that a small number (9%) of participants are involved in high-level use of music technology in the realm of composition or production.
Question 33 – I am able to utilise Virtual Studio Technology (VST) or synthesis

![Bar Chart](image)

This was the only question where 5% of respondents didn’t answer possibly from an inability to comprehend the statement.

Of those who responded (95%), the most significant observation was the 41% of respondents who were in the “Disagree” band and the 18% of respondents who were each in the Neutral and Strongly Disagree bands indicating most were very unfamiliar with the technology.

Only 18% of participants indicated a satisfactory perceived level of ability with the technology. Considering the prevalence of VST or synthesis technology in many music software packages, this appears quite a low percentage. It should be noted that an additional 18% indicated Neutral so they may be aware of the technology but have not had experience with it.

The outcome of this data is an indication that the survey cohort has a wide range of different experiences regarding this form of technology; 18% are very familiar, 18% are partly familiar and the remainder largely unfamiliar.
4.3.16 Category 16 – Usage of a Basic Development Environment

**Question 34 – I am able to develop simple computer software (e.g. with Max MSP)**

![Bar Chart]

*Figure 35 – Familiarity with Music Software Design*

The data from this question has some similarities to Question 32. A small number of respondents indicated strong agreement, in this case the figure was 5% (rounded up). No results were represented in the “Agree” band. The difference occurs in the level of disagreement with only 14% indicating Neutral, that is some understanding, while a total of 82% indicated some form of disagreement. The overall result was low but this was not unexpected as the level of engagement with technology increased as the questions progressed.

What is shown is an even smaller percentage (5%) than Question 32 who are working with advanced technologies associated with the realm of music technology while the majority understand they know very little or nothing about the process. While it is accepted that this technology may have much less relevance to secondary music education than many of the earlier ones, it is still important to observe the usage trends as the level of technology increases.
Question 35 – I am familiar with software used for multimedia production (e.g. Flash)

The responses to this statement gave an interesting result. Both positive and negative areas gave an equal amount of responses in each of the bands. This provided a much broader spread of results than many of the other questions.

36% of participants indicated varying levels of familiarity, indicating engagement with the technology, while 9% were aware but not familiar) and 54% indicated they were not familiar with multimedia production software.

The relevance of this area of technology has become more important since this survey was undertaken and its relation to music has become stronger. While not immediately identifiable as a form of “music making”, the technology is integral to many music software achievements.

The results of the survey again indicate a “divide” with a mark of delineation provided by those who indicated Neutral.
4.3.17 Category 17 – Usage of a Music Accompaniment Technology

**Question 36 – I am familiar with a computer software package used for real-time music accompaniment (e.g. Smart Music Studio)**

The data presented depicts a low level of familiarity with the specified technology. 64% of participants indicated that they had no familiarity while 32% indicated a certain level of familiarity with real-time accompaniment software. The remaining 5% (rounded up) may have known of the technology but didn’t indicate any experience with it.

What is presented are roughly two categories of respondents but the data in this question shows them closer together rather than further apart, as is the case with several earlier questions. The trend towards the Agree and Disagree groups is observed as a reduction in the extremes of Strongly Agree and Strongly Disagree.

Real-time music accompaniment software may have been viewed as an emerging form of music technology at the time of the survey. This may
have led to the shape of the statistics i.e. a number of music educators had heard of the technology but only a few had experienced it while the majority hadn’t yet been exposed to it. Statistically, a higher level of Neutral, that is people who were aware of the technology, was anticipated than what was reported.
4.3.18 Category 18 – Usage of Assessment & Administration Technology

Question 37 – I am able to utilise technology to help with music assessments

The broad range of technology that is available to help with assessment, much of which is non-specific to music, was expected to be evidenced in these results, which it appeared to be. While the utilisation of the technology is quite high (86%) the remainder were either familiar with it but perhaps didn’t use it (5%), or unfamiliar with the technology (9%).

The responses to the lowest band (Strongly Disagree) were notable as it was at distance from the majority of participants, as no responses were recorded in the Disagree band. Data from this question supports the observation that there may be delineation between two cohorts within the group surveyed.

Figure 38 – Use of Technology in Music Assessment
Question 38 – I regularly utilise technology to help with administrative duties

![Chart showing familiarity with administrative technology]

Figure 39 – Familiarity with Administrative Technology

The response from this questions shows that all participants participate in technology to assist with administrative duties. While 68% of respondents feel very comfortable, 32% feel moderately comfortable with the technology.

The nature of the technology is most likely not music specific and is likely to incorporate email and spreadsheets. While the relevance to music is not present, the result from this statement shows that all participants feel comfortable, that is they know about and are engaging with technology for general tasks. This is important data to comprehend when compared to a perceived engagement of basic tasks with specific music technology such as audio editing.
4.3.19 Category 19 – Usage of Technological Support Resources

**Question 39 – I regularly read articles about technology**

The awareness of trends in technology from within and without the realm of music is assessed through this question. The result shows that only a smaller percentage (9%) regularly read articles about technology, while at the opposite end, 9% never read articles about technology. The majority of participants fall into the middle field with 32% occasionally reading articles about technology (i.e. Agree), 23% (Neutral) being aware of what is developing in technology, and the remaining 27% (Disagree) rarely reading articles about technology.

The nature of the statement may not give a true indication on the uptake of information about technology, as other media, for example television and videos, may also be used as a source of information. If the written word, encapsulating the internet, newspapers, magazines, reviews, email lists and blogs, was to be considered the prime source of information, the data doesn’t show a particularly high rate of information uptake, particularly as 59% mainly receive information on an occasional or informal basis.
Question 40 – I regularly utilise the internet as a source of support

The positive response (95%) demonstrated that the project participants believed they made good use of the internet as a resource of gaining support. The evidence of a divide became evident in this question with 5% disagreeing with the statement. If occasional use was inferred rather than “regular” use, it was expected that the respondents may have selected the neutral band.

It is important to note that several things not identified in this question include (a) the quantity (level) of support, (b) the nature of the support (technical or academic), and either or (c) the mechanism of support (email and discussion forums). Irrespective of these factors, the overall utilisation of the technology was perceived to be at a high level as indicated by the positive response rate.
4.3.20 Category 20 – Attitude to Technological Support

**Question 41** – *I believe I have sufficient technological resources available to support my needs*

![Bar Chart](chart.png)

*Figure 42 – Level of Technological Support*

It is possible be that some of the surveyed cohort not aware of the resources available to them, do not know how to use them, are not willing to use the form of resources available or may have sufficient resources available but possess the mindset that more will solve their problems.

The emphasis of the data is definitely in the negative category with 55% of the belief that the technological resources they have available are not sufficient to meet their needs. In its simplest form, for example, this may refer to the availability of a sufficient quantity of suitable computer hardware. Of the 55% who provided a negative response, 23% were in the Strongly Disagree category, indicating a very strong feeling on the matter. Conversely, the lack of responses in the Strongly Agree category was notable (5% rounded up) indicating that a small minority were satisfied with the resources available, while the remaining 1/3 of survey respondents who were in agreement of the statement were only just satisfied with the level of technological resources available.
**Question 42 – I feel comfortable helping others (e.g. students) with technological problems**

![Bar Chart](image)

The majority of survey participants provided a high (77%) positive response rate when posed with the above statement concerning helping students with technological problems. Only 9% felt a little uneasy (Neutral) and 14% felt uncomfortable with this statement.

This positive response may be influenced by the inherent nature of secondary educators helping students, irrespective of the nature of the enquiry. When the response data from other questions is examined, the overall level of comfort with technology appears to be lower than the response indicated here. Also to be considered is the issue of the students growing up with technology (digital native) and perhaps possessing certain technological experiences that the educators themselves may not possess. This may support the argument that the music educators are willing to travel outside their comfort zone for the sake of helping the students. While this commendable action is benefiting the students, it in turn may assist educators in gaining a more thorough understanding of technology.
It is also important to note that many technological problems are sorted out with logical thinking, irrespective of familiarity with the technology. This is something that the music educators may be more experienced at doing considering the broad range of experiences they have encountered compared to the students.
4.3.21 Category 21 – Attitude to Technological Training

Question 43 – I believe that sufficient technological training is available

The participant’s response to this statement was overwhelmingly negative with less than one quarter providing a positive response (23%) in the Agree band, indicating a moderate level of agreement with the statement. Those who provided a Neutral response (23%) did so possibly because they are unaware of all the training options available or possess the belief that while some resources are available, there could be more or it could be of better quality. The most significant response (Disagree - 36%) when included with Strongly Disagree (18%) indicated that over half (54%) were of the firm belief that insufficient technological training was available to them. It is important to note that this question did not provide specific data on the utilisation rates of the training available, nor on the nature of the training whether that be general technology or music-specific technology. It is noted that this response may support the research of Reese and Rimington (2000) and indicate an ongoing need for additional music-specific technological training.
Question 44 – I am able to allocate time to technological training

The data provided in response to this statement exhibited a significant proportion (41%) who were able to allocate time to keeping up with advances in technology. The 23% who selected Neutral may be indicating the answer of “sometimes” while those who indicated Disagree (27%) and Strongly Disagree (9%) were of the belief that they were unable to allocate time. The non selection of “Strongly Agree” was noted as indicating no participants were in resolute acceptance of the statement, perhaps also indicating that technological training is achievable but not part of standard practice.

There may be several reasons for the trend in this data. These may include such factors as personal time management, that is the inability to organise themselves, the availability of training including the suitability and scheduling of that training), human resource management issues such as supervisors not supporting and encouraging training and a possible non-willingness to make an effort to undertake technological training, perhaps making excuses due to apprehension. It is noted that a “divide” is not evidenced in this data, rather a gradual decline in the overall data rates.
4.3.22 Category 22 – Attitude to Technological Implementation

Question 45 – I feel that technology is utilised well in my workplace

A large proportion of survey participants provided a positive level of agreement with this statement (45% Agree/Strongly Agree) while about ¼ (23%) felt only moderately comfortable with this statement, indicated by a Neutral response. Considering that this statement encapsulated all forms of technology, including non-music specific, it was indicative of their perception of how technology was integrated and utilised in their particular workplace, that is, at their school. Of those who disagreed (18%) strongly disagreed (14%), that is about 1/3 in total, their perception was that their workplace was not using technology well. This data is important as a supportive workplace environment is an important contributing factor to the successful implementation of technology. There are exceptions where individual educators may take it on themselves to champion the use of technology in their particular field, such as in music. The relatively low level of positive data, as well as few selections appearing in the Strongly Agree band, indicates that utilisation of technology in many workplaces is perceived to be less than satisfactory.

Figure 46 – Use of Technology in Workplace
**Question 46 – I believe I have a good understanding of how technology can be used as an educational aid in music teaching**

![Bar chart illustrating the results of the survey question. The chart shows the distribution of responses among survey participants. Strongly Agree: 8 (36%), Agree: 9 (41%), Neutral: 2 (9%), Disagree: 3 (14%), Strongly Disagree: 0 (0%).]

The majority (77%) of survey participants provided a positive response to this question indicating that most people believed they possessed a good understanding of technological implementation in an education context. This statement is not necessarily indicative of their familiarity with, or ability to actively engage with, the various forms of music technology, as indicated in earlier questions. It is only an understanding of how it can be used.

Only a small number (9% Neutral) indicated they were not really comfortable with their understanding of using technology in music education, and 14% (Disagree) indicated they were definitely not comfortable with their understanding of technology in music education. No selections were made in the Strongly Disagree category.

These results are indicative of a group of people who, overall, have a strong comprehension of technological implementation in a music education content, but perhaps may lack experience in engagement with the
technology perhaps because of resource limitations or lack of opportunity.

### 4.3.23 Category 23 – Attitude to Technological Advancements

**Question 47 – I believe I am able to cope with technological change**

The perception that the survey participants were able to cope with technological change was indicated by the 87% of respondents who indicated a positive response to the provided statement. 45% of these (Strongly Agree) exhibited a very high level of confidence while 41% (Agree) felt quite comfortable with their ability to cope with change.

Only a small number of survey participants (Neutral 4% and Disagree 9%) were not in agreement with this statement. The 4% who selected a Neutral response may have some level of support for the statement and may be able to cope with technological change in certain circumstances such as with sufficient time or training being made available. 9% disagreed that they were not able to cope with technological change within and without the realm of music. The evidence of a divide in the data may also be evident in this question indicated two observable general categories of respondents with little in between.
4.3.24 Category 24 – Self-Satisfaction With Technology

Question 48 – I am satisfied with my own level of technological literacy

The participants comfort with their own level of technological literacy provided a spread of results across all bands. This question did not assess what the level of technological literacy was, rather the satisfaction of the level the participants possessed. A level of technology literacy is partially achievable by viewing the results from other questions.

Contrary to the results of Questions 46 and 47, only 5% (Strongly Agree) of survey participants indicated they were very comfortable with their personal level of technological literacy. This is quite a substantial drop in confidence considering 36% (Question 46) indicated that they possessed a strong understanding of the applications of technology in music education, and 46% (Question 47) indicated they were confidently able to cope with technological change. It is recognised that the personal satisfaction level throughout the surveyed cohort may vary significantly and that some participants may possess expectations higher than they may be realistically
able to achieve, but the drop in overall satisfaction level is notable.

The 55% who indicated agreement with the statement (Agree/Strongly Agree) may possess the view that they have achieved a level of technological literacy that will satisfy their current technological needs the majority of the time. The 18% who indicated a Neutral response may have a reasonable level of technological literacy but desire a higher level of literacy to cope with a broader or deeper level of technological enquiry.

It is deemed that the 27% who provided some level of negative response (Disagree/Strongly Disagree) to the provided statement possess a technological literacy level that is not able to satisfy their technological needs a significant proportion or the majority of the time. The 9% selection of Strongly Disagree is similar to responses in other questions.
4.4 Section Three – Open Questions

Question 49 – What do you consider to be the single most influential factor affecting the use of technology in your work environment?

(Note: Full responses in free text are supplied in Appendix C. Responses are individually numbered as “R1, R2” etc to assist with referencing.)

A total of 22 responses were received to this question totalling 2050 words. After consideration of the statement the participants were asked to detail their perception of the single most influential factor concerning the use of technology in their individual work environment. While many participants were able to achieve this, a number provided several reasons, sometimes with explanations in great detail, and used the question, coupled with the free text mode of enquiry, as a platform to vent frustrations or express a strong opinion.

In order to obtain a quantity of data from these responses the most significant issue observed within each response identified either by frequency and/or expressiveness, normally the first issue mentioned, was selected and calculated below. These factors are indicated by bold type in the full responses in Appendix C. The data collected is presented in Table 2.
Table 2

Data from Question 49 (Influences on Using Technology)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Frequency</th>
<th>Response(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money For Resources (hardware/software)</td>
<td>5</td>
<td>R1, R4, R12, R16, R19</td>
</tr>
<tr>
<td>Level of Technical Support</td>
<td>1</td>
<td>R2</td>
</tr>
<tr>
<td>Availability of Resources (hardware)</td>
<td>11</td>
<td>R3, R6, R7, R8, R9, R11, R13, R15, R18, R20, R21</td>
</tr>
<tr>
<td>Willingness of Teachers</td>
<td>1</td>
<td>R5</td>
</tr>
<tr>
<td>Time</td>
<td>2</td>
<td>R17, R22</td>
</tr>
<tr>
<td>Answer Unable to be Ascertained</td>
<td>2</td>
<td>R10, R14</td>
</tr>
</tbody>
</table>

There were a number of possible overlaps between the categories identified above, such as, money could have been indicated as a lack of resources. It was, though, considered pertinent to preserve the data in its original form from the responses to assist in identifying issues and trends.

The last row in the Table 2 identified responses that were provided but did not appear to address the question. Data unfortunately was unable to be obtained from these responses.
The data from the 20 usable responses are displayed in the graph below.

![Graph showing factors influencing the use of technology in the work environment]

*Figure 50 – Factors Influencing the Use of Technology in the Work Environment*

The most prevalent response observed were comments about the availability of suitable resources, normally seen as computer hardware. Other responses, though significantly less in number, were money, that is funding for hardware or software, and finding sufficient time to work with technology. The two issues that received the least comments, one each, were the availability of technical support and the willingness of teachers to engage with technology.

Examining the data from the Resources responses (i.e. R3, R6, R7, R8, R9, R11, R13, R15, R18, R20, R21) the majority highlighted accessibility problems, due to (a) the use of generic computers labs which were hard to access, (b) the quality of hardware available, and (c) the lack of music-specific computer hardware accessible in the music area of the schools. Comments such as the following indicate this. “The fact that computers are not present in the music room makes it hard to incorporate technology as much as you would if access was readily available” (Q49:R3).
Meanwhile others identify the “quality” issue: “The greatest stumbling block is the lack of resources. We get the oldest computers and currently only have 8” (Q49:R6).

This is also supported by R7: “I have been unable to integrate technology to the extent that I would like to due to insufficient computers in the music room, inadequate access to general computer rooms as they are mostly timetabled to take computer classes” (Q49:R7).

Some of the responses evidenced emotive writing demonstrating the significance of this issue. The responses who indicated this issue often used the word “availability” meaning either (a) hardware may be available but unable to be accessed due to bookings, or (b) hardware was not in existence (e.g. no computers in the music classrooms).

As aforementioned, the issue of money was represented but lower in frequency. While funding for technological equipment is an issue in itself the interpretation of the responses sometimes about money sometimes indicated a similar issue to those in the “availability of resources” category. For example:

“Without adequate funding the ideals of delivering mandatory technology requirements, having interactive classrooms, students on computers learning with technology, equity of access to computers and programs needed is nothing but a pipe dream for most public schools. This may sound cynical but when you are in the system working everyday, trying to do your best with what ever limited resources your school happens to have at it's access it is often difficult, if not impossible”. (Q49:R12)

The representation of “time” in two of the responses indicated an issue associated with setting up and learning of the technology: “It's always difficult finding enough time to devote to setting up / training staff in the use of technology for our subject area” (Q49:R17).
It was indicated that this was an “extra” activity taken on in addition to normal duties. The issue of allocating time to training and development was also raised.

Taking all the responses into account, the overall impression was an indication that suitable resources were not adequately accessible for the delivery of technology in music education. The reasons for this included issues with booking necessary spaces, the quality and functionality of the equipment such as a lack of speakers or soundcard issues, and a lack of funding to obtain music software or hardware resources. It is also important to note that different types of music teachers teaching at different levels will have different expectations regarding technology. This data may also concur with the research of Jinright (2003) indicating that certain teaching environments are more conducive to technological implementation than others.
**Question 50 – Do you have any reservations or concerns about using technology? If so, what?**

(Note: Full responses in free text are supplied in Appendix C. Responses are individually numbered as “R1, R2” etc to assist with referencing.)

A total of 21 responses (1,387) words were supplied in response to Question 50. Even though the question post was much more open, most of the responses were much shorter than those received in Question 49 perhaps because many of the issues had been “vented” there.

It was more difficult to quantify the data for purposes of analysis in this question owing to the wide variety of free text responses. Many responses raised multiple reservations and concerns. Where possible, each of the issues raised was identified and recorded. This method is in contrast to Question 49 where only the most significant issue was recorded.

Table 3 is a summary of the issues obtained from the responses to Question 50. The numbers of issues identified were rationalised into eight categories. While not addressing every issue that was mentioned, many of which were in passing, it provides a representative view of the majority of the issues and concerns identified by the surveyed cohort. Table 3 indicates which response(s) the data was obtained from.
Table 3

Data from Question 50 (Reservations About Technology)

<table>
<thead>
<tr>
<th>Reservation/concern</th>
<th>Frequency</th>
<th>Response(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Knowledge/Skills</td>
<td>4</td>
<td>R1, R11, R18, R19</td>
</tr>
<tr>
<td>Purpose/Direction/Syllabus</td>
<td>3</td>
<td>R2, R14, R15</td>
</tr>
<tr>
<td>Lack of Equipment</td>
<td>3</td>
<td>R3, R11, R16</td>
</tr>
<tr>
<td>Support Mechanisms</td>
<td>1</td>
<td>R12</td>
</tr>
<tr>
<td>Time</td>
<td>5</td>
<td>R5, R6, R8, R18, R21</td>
</tr>
<tr>
<td>Money</td>
<td>3</td>
<td>R5, R7, R21</td>
</tr>
<tr>
<td>Copyright/Privacy</td>
<td>1</td>
<td>R17</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>R9, R10, R13, R19, R20</td>
</tr>
</tbody>
</table>

The spread of responses across a number of questions indicates the prevalence of the reservation/concern. This in itself indicates the gravity of each of the issues in reference to each other. Figure 51 graphically indicates the number (frequency) of responses.
Figure 51 – Reservations About Using Technology

Of the two most prevalent reservations/concerns (Time and None), the “None” category was identified by approximately ¼ of all respondents. This category was used to indicate they had no, or very minor, concerns about using technology. Some very positive responses were provided such as: “...I'm keen to embrace new technology and am keen to move our faculty forward in this area” (Q50:R10).

The recognition of technology was also identified in Response 20: “I think the use of technology is of high importance in teaching today” (Q50:R20).

Of all the concerns raised, the issue of the time taken to pursue technology was identified as the most worrisome. Response 18 provided more details while time is a concern to them:

“I still don't feel as comfortable as I would like to about using technology. I find if I don't keep using new things that I learn I quickly forget how to do it. There is also the matter of having enough time to sit down and experiment with different programs or find various things on the internet. With the demands of music teaching...
and everyday life I find time is a big factor in not being as proficient with technology as I would like to be”. *(Q50:R18)*

The issue of possessing and keeping up to date with the necessary skills was raised by several participants. This produced statements such as the following two: “Some times [I] feel the students know more than I do *(Q50:R1)*, and “Far greater training and support (from DET) is required (e.g. release time to play with tech)” *(Q50:R19)*.

The purposefulness of technology in music education was raised as a concern, particularly as there are many approaches that are viewed as ad hoc solutions. Some raised the issue of being issued directives “from above”, such as in the case of syllabus requirements, but not being able to comply as they did not believe they possessed the necessary resources or skills to implement the requirements. Others questioned the ethos behind technology stating that some students find the technology itself more interesting than the subject matter. For example:

“…Technology should be used to serve a clear purpose, as opposed to finding exciting things to do with technology just for the sake of it - in my experience some students are genuinely engaged more through the presence of smartboards and other access to technology, but by no means all of them are” *(Q50:R2)*.

Response 15 also highlights the issue of not letting technology take precedence: “*Use of technology is fun and extends the possibilities enormously, but I want us to keep sight of the basic art of music sharing on a humble human level*” *(Q50:R15)*.

The issues of equipment and money, also raised in Question 49, were put forward as genuine concerns. A notable concern about money was: “*I am happy to learn new technology skills and I have embraced the way technology has affected students. My main concern is the ongoing cost of keeping up with it and how quickly it becomes outdated*” *(Q50:R7)*.
Response 21 also highlighted the issue of the speed of change of technology: “My reservations about using technology are based on how quickly technology changes and how little time I have to keep myself current in this area” (Q50:R21).

The issue of support was not a significant reservation being only identified in R12. R17 raised the genuine concern of copyright and privacy issues but this was not extrapolated in their response.

Of the reservations or concerns raised, of which there was a broad range, the two that were identified as key were (a) the allocation of time to learn about technology and (b) the obtaining of skills to better utilise and support technology in music.
4.5 Methodological Reflections

The information yielded from the study provided an amount of usable data. The data was mainly iteratively processed and a number of patterns were observed. Some of these patterns were clearly distinguishable (such as the existence of two cohorts within the survey participants) while others were trends that were only observed when different sections of the survey were compared (such as personal versus work-related usages of technology). This approach was primarily used to determine patterns and anomalies though a more heuristic approach was sometimes adopted to assist with the consideration of the data.

The data, though inconclusive owing to the sample size and convenience sampling, was successful as a pilot study and provided indicators for future research. It was noted that the data was obtained solely on the provision of information at a perceptual level directly from the participants. As there was no specific information (such as direct testing for IT literacy) the data was unable to be triangulated for verification purposes. A basic level of verification was possible by comparing the fifty answers for each respondent to check that the view presented was consistent throughout.

A study using multiple enquiry techniques may have yielded slightly different, and perhaps more definitive, results. It is possible that more detailed studies may exhibit similar underlying trends as intrinsically evident, though the level of participant’s actual ICT literacy may be lower than indicated in this research. The use of self-assessment may have provided an inflated level of ICT literacy levels in additional to the recent completion of an online course in music technology. According to DeAngelis (2003) the occurrence of overestimating ones competence may occur due to ignorance and chronic self-belief rather than due to arrogance. This phenomenon may be supported in this study by the limited exposure the survey participants indicated they had in reference to current technological advancements.
It is also possible that using a more accurate method of data gathering in a controlled environment in addition to a larger randomly-selected sample cohort may yield slightly lower levels of ICT literacy. It may, though, cause increased levels of stress which could vary the data slightly.

Considerations of possible bias ranging from the intrinsic online nature of the survey through to the evidence of bias associated with the Likert measurement system (central tendency bias, acquiescence bias and social desirability bias) have been considered both in individual questions and in the overall results. The presence of bias was observed in several sections of the survey data and was considered in the analysis.
4.6 Observations from the Data Analysis

The data obtained from the research indicated that most of the sampled cohort were females with a significant proportion classified by their age as digital immigrants. The high proportion of females in the survey was not unexpected considering the gender balance of teachers in the secondary music education sector. It is possible that this cohort may bring with it certain characteristics associated gender-specific issues (refer to discussion in section 2.4) though gender-specific issues may be a decreasing concern as ICT issues become more common between genders. Nonetheless sections of the survey data may evidence gender-specific characteristics such as the lower response concerning loop-based music software, though this is difficult verify without further studies across a larger cohort.

The majority of the sampled cohort indicated that they regularly use some form of technology. For a small proportion of the cohort the “regular use” referred mainly to general technology such as email rather than technology specific to music. This appeared to indicate that while there is a certain level of acceptance of ICT as part of everyday activities such as for administrative tasks and social communications, this does not necessarily translate to the effective implantation of ICT in music educational practices. This may be because the use of personal technology (used primarily in private) is more comfortable and poses more room for error during learning. It may cause minimal embarrassment if problems occur whereas the pressures of an active educational context such as a secondary classroom may hinder the use of “unproven” ICT, particularly if a digital immigrant is teaching a group of digital natives. Prensky’s (2001) comments on digital natives/immigrants may also supports this thinking through the existence of a group (digital natives) who are quite willing to try technology (even without reading a manual) and a group who are more cautious about using technology (digital immigrants). Operating in a classroom situation may also cause a digital immigrant’s “accents” to become pronounced, perhaps to the dissatisfaction of those being educated (digital natives). It is acknowledged that this data and analysis alone is insufficient to provide
conclusive proof of the existence of an immigrant/native divide between the various age groups surveyed.

Another line of thinking for the low ICT implementation rate could be a lack of suitable resources or a non-awareness of the capabilities of the technology available. Both resources and training issues are cited in the survey.

An observable divide exists in the data between those who indicate they actively engage with technology and those who exhibit a very low level of technological use (approximately 10-15% surveyed). The data evidences a clear division between the two categories. The validity of the data could be challenged by impugning the research methodology but the division is significant and is internally triangulated through a number of questions. A distinct group (approximately 10-15%) appear in regular contrast to the majority of the cohort. When this is examined there does appear to be a possible connection to age as the majority of those in the 15% who do indicate regular engagement are located in the 40-49 and 50-59 age bands. While this study doesn’t conclusively prove the digital divide, further detailed analysis (using non-parametric statistics) and additional data gathering may yield more conclusive results.

Certain questions (such as the use of portable data storage devices) evidenced high levels of technological adoption across all age bands while a lower levels of agreement (and disagreement) emerged in many questions within the 40-49 and 50-59 age bands. This does not apply consistently to all areas with certain questions such as Question 11 (maintaining a personal web page) evidencing more widespread levels of disagreement across the age ranges. This may provide some correlation to Prensky’s considerations on the existences of two cohorts of technology users, but the data from certain questions in the survey (such as question 11) does not specifically align with his thinking. The may be due to the specifics of the cohort being surveyed or perhaps due to the phrasing of the question. It does perhaps
evidence that Prensky’s assertion cannot be broadly applied to all cohorts of technology users in all areas of technological use.

Areas of technology indirectly related to the production of music, such as video, exhibit significantly lower levels of overall technological engagement. This may perhaps be explained by the small relationship that visual media has historically had with acoustic music performance and the more recent emergence of accessible technology that can deal with both forms of media in a digital format. Additionally, the training of staff in relevant areas and the ability of school computer hardware to deal with the greater technological requirements of video technology may have contributed to the slow uptake of this form of music technology. Aside from the technological issues it is possible that visual literacy could also be a contributable factor to its low use. The ability to draw interpretative meaning from information provided in the form of a graphical image requires different skills to, for example, interpreting a graphically notated musical score. It is also possible that as musicians operate in primarily an aurally-centred field, the focus on other sensory sources may not be so easy to adopt. Nevertheless, musicians working with digital video material is a relatively new concept and as such may take some time to infiltrate through to formal educational practices.

The majority of music educators surveyed demonstrated a respectable level of willingness to experiment with technology. While this observation was widespread it did not necessarily follow through to the adoption (integration) of technology in music educational practices. The evidence of this willingness is important as it is fundamental to the enhancement of ICT literacy. While it may indicate an overall desire to sample technology it does not necessarily translate to higher levels of experimentation, training and ultimately implementation. This situation is could be indicated by the levels of response shown at Question 44 concerning the allocation of time to technological training. The evidence of this phenomenon may signify an inherent problem experienced by music educators when dealing with the adoption of new ICT into music teaching.
The embracing of non-traditional music production techniques such as the arrangement of digital sound using audio samples is one of the areas with a lower level of uptake. The reason(s) for this are not exactly clear from the data when the results of the other questions are examined. One line of thinking could be the existence of reservations about the adoption of newer forms of digital music composition though this form of music making has been around in an analogue form for quite some time. Certainly the low usage rates of technologies that utilise loop based music support the above statement, but it doesn’t necessarily provide a clear reason for its occurrence. One deduction could be that a significant number of music educators are not able to participate in this form of music making as a result of the limitations of their training. Similarly to point 4 it could also indicate transitional delays of new music making practices into secondary educational practices.

Many of the music educators surveyed (almost 50%) indicated they were largely unfamiliar with the music technology their students are using. The students, assumed in this case to be digital natives, make up the educated cohort while the educators are a combination of digital immigrants and digital natives, though this itself does not assert that either group are more or less familiar with technology. The issue raised is not whether the educators appreciate the musical idioms or the technology the students are using but whether they are (a) aware of it and (b) willing to use it as part of their educational practice. The low level of response to Question 39 (reading articles on technology) and the responses to Question 46 (comprehension of using technology in music teaching) indicate that many feel they don’t possess a strong grasp of modern music technology, particularly things that may have developed post-teacher training. Teachers may be more familiar with the general (e.g. communications) technology the students are using than the technology they are using to make music. Even though we see that music educators may be willing to look at new technology they also indicate that they are not necessarily abreast of current developments of music technology. This issue is also indicated through the varying familiarity
levels with music software and, to an extent, hardware. All of this evidence does tend to highlight a discrepancy as most survey participants indicated they believed they were able to cope with technological change (Question 47) which may be true in some areas of general technology but may not necessarily be true in other areas such as music technology.

The adoption of technology is higher where it is integrated into more traditional areas of music making. Utilisation of technology in areas such as instrumental performance appeared to be more prevalent than other areas such as computer based music composition such as the use of loop based music production. This result could indicate an issue with the technology being used and/or unfamiliarity with the musical practices themselves. In the former case, resourcing issues or technical ineptness could contribute to the less prevalent use of the technology. This situation may be particularly the case when newer “unproven” technology is used over technology that has existed for a number of years. The duration of the existence of technology may also increase the likelihood of its adoption as there is more chance the educators will be familiar with them. The possible existence of delayed implementation of new technology into education practice is seen as an issue as it compounds the problem of educators not using utilising current technology, often the music technology that their students are starting to adopt.

The level of familiarity with software design to assist instructional and assessment, such as that dealing with aural and musicianship exercises, is moderately low. Possible reasons for this include the continued use of traditional methods for delivering instruction, resourcing and funding issues, availability of suitable technology and/or problems with implementation in the educational environment such as networking and database management issues. It is also possible that secondary music education is moving away from addressing these fundamental areas of music training which could also explain the moderately low level of familiarity. This cannot be evidenced directly in this research though observation of changes to music curricula
may provide indicative data to support this.

The majority of music educators hold the belief that they have insufficient technological resources available to them to support their teaching. The existence of this perception was prevalent throughout the cohort but the actual level of available technology was not measured in any quantifiable way to verify this viewpoint. The presence of the belief though does point to an indication that it may be true in which case it could be a notable influential factor affecting the use of technology in the music classroom. This may also be supported by the results from other questions indicating that the educators are using personal forms of technology themselves but do not appear to implementing it in the classroom possibly because they do not have sufficient technological resources to do so. Conversely, the scheduling of shared resources was raised as an issue in Question 49 and others appeared to indicate similar concerns in the free text responses. Nevertheless accessibility to appropriate, functional technological resources is identified as a factor influencing the implementation of technology in the educational context.

Almost half of the music educators surveyed indicated they were not entirely comfortable with their personal level of ICT literacy. While the exact reasoning for this was not ascertained in the research the responses to other questions indicated that this may be partly to do with familiarity with technology itself as most participants appear to be using technology in some form. It may also be partly the knowledge of how to implement the technology in an educational context. The research also indicated that the majority of music educators believe that the availability of relevant technological training and appropriate time allocation are certainly important factors. This may also be supported by the data indicating that over half the music educators felt that technology was not utilised very well in their workplace. Additional research would need to be undertaken to conclusively identify this but it would appear that approximately half of the survey participants are uncomfortable working with technology in their current teaching context. This is not to say they are avoiding technology or
are afraid to use it. Rather, this situation may be viewed as an area of movement that may benefit from a period of review and consolidation. Indeed, most teachers believe they are able to cope with technological change and felt comfortable helping students even if they themselves were not very familiar with the technology.

It is important to note that the overall level of familiarity with music technology may be higher in this sample cohort owing to their recent completion of an online training program in music technology. This survey was completed several weeks after the completion of the program and the effects of the training may have enhanced their perceptions of music technology in the weeks leading up to the survey. If this is the case there may be more of a distinction between their use of music technology and their use of general personal technology.
5.0 Conclusion

5.1 Summary

This research project was undertaken in an area that has little available verifiable research data. While a large body of literature exists in the broader field of ICT and education this research targeted its enquiry on (a) the educators, rather than the students, and (b) in the area of secondary music education. With an investigation of this nature it has been possible to examine some of the issues that may exist specific to this domain. The limiting of the study to secondary school music teachers is one of the strengths of the research as other major studies such as the WADET Teacher ICT Skills study (2005) did not investigate this level of detail. Furthermore this project carries on from the research produced by others such as Merrick (1995) who undertook research in Australian schools at a time when music technology in education was less known and less accessible.

From the initial implementation of the research project the development of the research question was directed by the increasing emphasis, particularly from governing agencies, to better integrate technology into the secondary education system. To successfully address this issue an assessment of the ICT literacy levels of the music educators was chosen owing to its overall influence on the way technology is utilised in secondary education. Other areas of influence such as resourcing, curriculum, etc, were not specifically focussed on but did emerge as part of the research.

At the conclusion of this enquiry the research approach is defended as it uncovered a number of intrinsic issues that may not have been otherwise identifiable. It also provided sufficient scope for consideration of other issues associated with the research question and did not preclude the emergence and consideration of such. This was found to be important as the data was increasingly analysed.
Considering the research retrospectively several small changes to the survey instrument in specific areas may have yielded more data to aid in clarifying certain issues. While much information was able to be ascertained during the comparative research process more data from the survey sample and their technological practices in education and, specifically, the process of integration, may have been useful. Nonetheless the outcomes from data analysis still provide strong indicators for the existence of certain trends in secondary music education.
5.2 Considerations

The study successfully yielded a small but valuable amount of data pertaining to the ICT literacy levels of music secondary music educators. Although the research was undertaken within the context of the NSW Department of Education & Training, the findings may be applicable to other educational contexts throughout secondary music education, including Catholic and independent schools, from both within Australia and internationally. It is acknowledged that there may be some issues unique to the Australian context such as the use of localised software/hardware and the existence of certain curriculum specific issues but reports of cases appearing in the literature tend to indicate that many of the issues discussed in this research present themselves in secondary music education globally.

Even though the survey was relatively small, certain issues kept emerging that tied together to form several larger issues. The reasons for their emergence was sometime clear and evidenced in existing literature while at other times certain trends appeared without prior expectation or explanation. One of the observations, though inconclusive due to the sample size, indicated that gender may still play a role in the use of certain types of technology as discussed by Morritt (1997), Smith & Balka (2000) and Walter & O’Neill-Cooper (2001). The low number of males in the case study (18%) made it harder to determine specific trends but the data analysis did tend to indicate a slightly higher proportion of males actively engaging in technology when compared to their female counterparts. Overall results indicated a higher use in areas such as administration, recording of sound and live music performance. While these results may be characteristic of this particular cohort it may still echo the existence of a gender-specific ICT issues. What is also noted is that the differentiation between genders does vary depending on the type of technology being used. It is difficult to compare this data to earlier studies which may have a more even gender balance in the sample, but it could also be indicating that gender disparity in technology is lessening. Considering the significantly higher proportion of females working in the secondary music education sector gender could be
one of the factors, albeit small, affecting the effective integration of technology into the secondary school music classroom, particularly if there is an overall increase in female classroom teachers over time.

Another issue is the characterisation of the digital immigrant (Prensky, 2001). Approximately 1/2 of the sampled cohort indicated they were of the age that would fall into the category of a “digital immigrant” if calculated from the mid 1960’s. When all survey participants were assessed on their use of technology many of those in the digital immigrant category were found to have overall lower levels of ICT literacy based on the criterion in the survey. This result may appear to lend support to the existence of a digital immigrant cohort though it is only one characteristic of many a digital immigrant may possess. Of note were several areas where digital immigrants where reported to have a high use of technology (in areas such as email and internet searching) and these may sometimes be superior to the younger digital natives. This may be due to digital immigrants possessing a different way of thinking to digital natives as discussed in Prensky’s writing (2001) – perhaps even the existence of a more advanced level of communication skill and/or a higher level of discernment/reasoning. Conversely digital natives do utilise technology more in particular areas such as internet commerce, but there are a few who admit they are not utilising technology well in their work practices. This indicates tends to indicate that many digital immigrants are capable of learning technology up to and, if needed, beyond the level of digital natives, in specific areas of relevance to an individual. There are also some, much fewer, digital immigrants who do not conform to this model and are not embracing technology in their education practices but their may be using technology successfully in their everyday life.

Overall there is evidence of a distinction between those born natively into the digital era and those born prior to its emergence but there does not appear to be a clear delineation between the two categories. The distinction between the two could be becoming increasingly blurred which may indicate that digital immigrants are becoming more ICT literate. This would
be seen to enhance the likelihood of ICT integration into the secondary music classroom but what is more of a concern are those digital immigrants teaching in the secondary music classroom who have low ICT literacy and may not be capable of delivering current and future teaching requirements concerning ICT. Furthermore the data also appears to indicate evidence of a distinct divide between the majority who are using or attempting to effectively utilise technology in the classroom and a smaller group who are only using technology mainly for personal everyday use and not in their educational work context. This use would be viewed as a hindrance to effective technological integration in the secondary music classroom.

Another issue is the existence of secondary music educators who do not appear to be effectively integrating technology into their teaching practices. The survey ascertained that most educators believed they were regularly using technology in their work practices but when this indication was compared to the responses from other questions regarding the practical use of technology in a broad range of areas within and without the realm of music it was found that many indeed utilised technology at work but in many cases it was largely weighted towards administrative or technical functions rather than artistic practices. This trend occurred throughout the cohort both with digital immigrants and digital natives. While a small number exhibited consistent levels of ICT across a broad range of technological areas, many had lower ICT levels when it came to music technology. When the level of ICT literacy is ascertained for individuals by looking across their responses, it found that many possessed quite acceptable ICT levels but did not effectively use them in the music classroom. The inability to effectively integrate technology into the classroom is perhaps the main explanation rather than the lack of ICT literacy itself or the lack of suitable resources. This is supported by the observation that most teachers are effectively using technology on a personal level exhibiting willingness to utilise technology but are not necessarily integrating technology into the classroom effectively.
Another observation is that technology is more readily adopted in areas of traditional music making such as notation software and sound recording, rather than in more progressive areas of music making such as sampled based composition and computer generated music. This could be viewed as a reasonable phenomenon particularly as many of the educators may not have been trained in the practices of sampled based composition and computer generated music. It may also be limited by the general specifications of curriculums that require a minimum of technological use in limited areas. This situation unfortunately can lead to a limited perspective of technology in music and not expose students to many of the more modern music production technologies currently used globally. The data tends to indicate that certain schools are well ahead of other schools when it comes to technology in music education which presents equity issues. It may also place specific music educators familiar with technology under increasing pressures to provide much of the technological erudition rather than share the load across the staffing profile. The lifting of the ICT literacy level of all music staff to be educated across a broad range of technological innovation could be viewed as fundamental to the successful engagement of technology across secondary school music education.
5.3 The Future

This study has presented a finite indication of the ICT literacy of secondary music educators in their personal and work environments. Further qualitative and quantitative studies in this field would help qualify some of the issues presented in this research. Specifically, future studies observing educators actual use of technology, rather than self-reporting, as well as a more detailed examination of their perceptions of technology would be of benefit. Additional non-parametric studies may help identify if there are statistically significant differences in gender and age.

Further examination of educational practice concerning ICT in secondary music education is required to follow up the issues indirectly observed by this study. This may also include a review of technological resources required to effectively deliver a secondary music education program and how this is used by the staffing profile to enable effective educational practice.

Key to the effective integration of technology into the music classroom is the enhancement of educator’s ICT literacy levels in music and continued training in technologies as they emerge. Also beneficial would be a system to provide greater assistance with technological implementation specific to music. Benchmarking may also improve the ICT levels of music teachers. One group who does satisfactorily is the non-profit educational organisation Technology Institute for Music Educators that provides music educators with training options to aid educators achieve certain levels of attainment.
5.4 Conclusion

This research considered the ICT literacy levels of secondary school music educators. It may have identified several broader and perhaps more influential issues pertaining to the delivery of music education in the secondary school music classroom, particularly those of technological adoption and educational implantation practices.

The study indicates that the majority of the sampled cohort are enthusiastic, engaging and willing to travel into unchartered territory for the purpose of enhancing the education process and, ultimately, providing students with the best possible secondary music education.

It is believed that this study has clarified a number of the reasons hindering technological implementation in secondary music education. The issues music educators grapple with are quite varied but are not uncommon to other fields and are certainly not insurmountable. By focussing on existing strengths and with appropriate attention to particular issues it is possible to elevate Australia’s secondary school music education system to the level of world’s best practice involving the innovative use of technology in music. This advancement would be championed by a cohort of creative, technologically fluent and progressive-thinking music educators.
Bibliography


Appendices

The following pages contain detailed data that supports the information presented in this report.
Appendix A – Teacher ICT Skills (WADET Study)


This data shows five groupings of teachers (with reference to ICT competency and ICT integration levels) and describes the common characteristics of these groups.

<table>
<thead>
<tr>
<th>ICT Competence Score:</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 3 (highest)</td>
<td>9%</td>
<td>12%</td>
<td>4%</td>
</tr>
<tr>
<td>Stage 2</td>
<td>8%</td>
<td>25%</td>
<td>29%</td>
</tr>
<tr>
<td>Stage 1 (lowest)</td>
<td>1%</td>
<td>9%</td>
<td>12%</td>
</tr>
</tbody>
</table>

The characteristics of each group of teachers is shown below, along with the ICT development and support strategies identified in the evaluation as being most appropriate to each group.

<table>
<thead>
<tr>
<th>Colour</th>
<th>Teacher characteristics</th>
<th>Potential strategies</th>
</tr>
</thead>
</table>
| Green  | These teachers are likely to be:  
- Early childhood  
- Primary specialist  
- Senior teacher level 1  
- Permanent teachers  
- Part-time teachers  
- 20+ years teaching  
- 40+ years old | When both ICT competence and ICT integration are low, attention should be focused on building teacher interest in ICT. 
These teachers will benefit from more specialised hands-on training |
| Yellow | These teachers are likely to be:  
- In primary schools  
- Teachers of English & Maths  
- 20+ years teaching  
- 40+ years old | When ICT integration is higher than ICT competence, attention should be focused on providing general ICT training for teachers. 
Improving school ICT resources (technical support and computers for students) will facilitate the ICT use and experience of these teachers |
| Red    | These teachers are likely to be:  
- In secondary schools  
- < 40 years old | When ICT competence is higher than ICT integration, attention should be focused on:  
- Improving technical support at schools  
- Providing computers for student use  
- Training these teachers to integrate ICT within teaching and learning |
| Purple | These teachers are likely to be:  
- In primary schools  
- < 40 years old | When both ICT competence and ICT integration are moderate, teachers will benefit from access to the strategies outlined in both yellow and red above |
| Blue   | These teachers are likely to be:  
- Heads of departments  
- In secondary schools  
- Teachers & administrators  
- Science & technology  
- Librarians  
- Full-time teachers  
- 2-3 years teaching  
- < 40 years old | When both ICT competence and ICT integration are high, consideration could be given to promoting these teachers as best practice examples within schools |
Appendix B – Survey Question Responses (Q1-Q48)

Assessment Statistics:
DET Online Survey

Question 1 Multiple Choice
Please select your gender
Male 18.182%
Female 81.818%
Unanswered 0%

Question 2 Multiple Choice
Please select your age range
20-29 9.091%
30-39 27.273%
40-49 45.455%
50-59 18.182%
60-69 0%
Unanswered 0%

Question 3 Opinion Scale/Likert
I am a regular user of technology
Strongly Agree 59.091%
Agree 40.909%
Neither Agree nor Disagree 0%
Strongly Disagree 0%
Unanswered 0%

Question 4 Opinion Scale/Likert
I regularly use technology in my work practices
Strongly Agree 54.545%
Agree 36.364%
Neither Agree nor Disagree 4.545%
Disagree 4.545%
Strongly Disagree 0%
Unanswered 0%

Question 5 Opinion Scale/Likert
I can competently create and use a slideshow (e.g. a Powerpoint presentation)
Strongly Agree 59.091%
Agree 31.818%
Neither Agree nor Disagree 0%
Disagree 9.091%
Strongly Disagree 0%
Unanswered 0%

Question 6 Opinion Scale/Likert
I can competently use a computer scanner
Strongly Agree 50%
Agree 40.909%
Neither Agree nor Disagree 0%
Disagree 9.091%
Strongly Disagree 0%
Unanswered 0%

Question 7 Opinion Scale/Likert
I can competently use a compact digital video camera to film a music performance
Strongly Agree 40.909%
Agree 40.909%
Neither Agree nor Disagree 9.091%
Disagree 9.091%
Strongly Disagree 0%
Unanswered 0%

Question 8 Opinion Scale/Likert
I can competently make a video DVD of home movies
Strongly Agree 27.273%
Agree 31.818%
Neither Agree nor Disagree 9.091%
Disagree 27.273%
Strongly Disagree 4.545%
Unanswered 0%

Question 9 Opinion Scale/Likert
I regularly use email for communication
Strongly Agree 63.636%
Agree 31.818%
Neither Agree nor Disagree 4.545%
Disagree 0%
Strongly Disagree 0%
Unanswered 0%

Question 10 Opinion Scale/Likert
I regularly use the internet for real-time chatting (e.g. MSN, Skype)
Strongly Agree 22.727%
Agree 13.636%
Neither Agree nor Disagree 0%
Disagree 40.909%
Strongly Disagree 22.727%
Unanswered 0%

Question 11 Opinion Scale/Likert
I am capable of maintaining my own personal web page
Strongly Agree 13.636%
Agree 27.273%
Neither Agree nor Disagree 13.636%
Disagree 36.364%
Strongly Disagree 9.091%
Unanswered 0%

Question 12 Opinion Scale/Likert
I can competently locate material on the internet
Strongly Agree 72.727%
Agree 27.273%
Neither Agree nor Disagree 0%
Disagree 0%
Strongly Disagree 0%
Unanswered 0%
Question 13 Opinion Scale/Likert
I am capable of downloading music from the internet
Strongly Agree 68.182%
Agree 31.818%
Neither Agree nor Disagree 0%
Disagree 0%
Strongly Disagree 0%
Unanswered 0%

Question 14 Opinion Scale/Likert
I am capable of buying or selling items on the internet
Strongly Agree 31.818%
Agree 40.909%
Neither Agree nor Disagree 13.636%
Disagree 13.636%
Strongly Disagree 0%
Unanswered 0%

Question 15 Opinion Scale/Likert
I regularly utilise a portable data storage device (e.g. a memory stick)
Strongly Agree 81.818%
Agree 9.091%
Neither Agree nor Disagree 0%
Disagree 4.545%
Strongly Disagree 4.545%
Unanswered 0%

Question 16 Opinion Scale/Likert
I am familiar the use of a blog or podcast
Strongly Agree 40.909%
Agree 31.818%
Neither Agree nor Disagree 13.636%
Disagree 4.545%
Strongly Disagree 4.545%
Unanswered 0%

Question 17 Opinion Scale/Likert
I regularly utilise a personal music player (e.g. iPod, iRiver)
Strongly Agree 31.818%
Agree 18.182%
Neither Agree nor Disagree 4.545%
Disagree 40.909%
Strongly Disagree 4.545%
Unanswered 0%

Question 18 Opinion Scale/Likert
I am comfortable using a Windows operating system
Strongly Agree 77.273%
Agree 22.727%
Neither Agree nor Disagree 0%
Disagree 0%
Strongly Disagree 0%
Unanswered 0%

Question 19 Opinion Scale/Likert
I am comfortable using a Macintosh operating system
Strongly Agree 13.636%
Agree 27.273%
Neither Agree nor Disagree 22.727%
Disagree 27.273%
Strongly Disagree 9.091%
Unanswered 0%

Question 20 Opinion Scale/Likert
I regularly utilise technology in music performance (e.g. an electronic instrument, amplification, etc.)
Strongly Agree 72.727%
Agree 22.727%
Neither Agree nor Disagree 4.545%
Disagree 4.545%
Strongly Disagree 0%
Unanswered 0%

Question 21 Opinion Scale/Likert
I am able to set up and operate a simple vocal PA system
Strongly Agree 63.636%
Agree 36.364%
Neither Agree nor Disagree 0%
Disagree 0%
Strongly Disagree 0%
Unanswered 0%

Question 22 Opinion Scale/Likert
I am capable of setting up and operating a basic band PA system
Strongly Agree 40.909%
Agree 54.545%
Neither Agree nor Disagree 0%
Disagree 4.545%
Strongly Disagree 0%
Unanswered 0%

Question 23 Opinion Scale/Likert
I can competently edit a digital audio file using audio editing software (e.g. Audacity)
Strongly Agree 59.091%
Agree 27.273%
Neither Agree nor Disagree 4.545%
Disagree 4.545%
Strongly Disagree 0%
Unanswered 0%

Question 24 Opinion Scale/Likert
I am competent at recording sound into a computer with a microphone
Strongly Agree 68.182%
Agree 22.727%
Neither Agree nor Disagree 4.545%
Disagree 4.545%
Strongly Disagree 0%
Unanswered 0%
**Question 25 Opinion Scale/Likert**
I can competently produce a small music score using computer notation software (e.g. *Finale*, *Sibelius*, etc.)
- Strongly Agree 59.091%
- Agree 31.818%
- Neither Agree nor Disagree 4.545%
- Disagree 4.545%
- Strongly Disagree 0%
- Unanswered 0%

**Question 26 Opinion Scale/Likert**
I can competently create pictures of music notation for use in written material (e.g. worksheets)
- Strongly Agree 68.182%
- Agree 22.727%
- Neither Agree nor Disagree 4.545%
- Disagree 4.545%
- Strongly Disagree 0%
- Unanswered 0%

**Question 27 Opinion Scale/Likert**
I am able to use sequencing software to arrange a basic piece of music
- Strongly Agree 50%
- Agree 36.364%
- Neither Agree nor Disagree 0%
- Disagree 13.636%
- Strongly Disagree 0%
- Unanswered 0%

**Question 28 Opinion Scale/Likert**
I am comfortable with synchronising audio material with video (e.g. for film soundtracks)
- Strongly Agree 36.364%
- Agree 27.273%
- Neither Agree nor Disagree 13.636%
- Disagree 22.727%
- Strongly Disagree 0%
- Unanswered 0%

**Question 29 Opinion Scale/Likert**
I know how to use utilise an aural training software package (e.g. *Aura*lia)
- Strongly Agree 31.818%
- Agree 22.727%
- Neither Agree nor Disagree 27.273%
- Disagree 18.182%
- Strongly Disagree 0%
- Unanswered 0%

**Question 30 Opinion Scale/Likert**
I know how to use a software package that provides musicianship training (e.g. *Musion*)
- Strongly Agree 22.727%
- Agree 27.273%
- Neither Agree nor Disagree 31.818%
- Disagree 18.182%
- Strongly Disagree 0%
- Unanswered 0%

**Question 31 Opinion Scale/Likert**
I am familiar with a loop-based music software package (e.g. Acid, Fruity Loops, etc.)
- Strongly Agree 31.818%
- Agree 45.455%
- Neither Agree nor Disagree 4.545%
- Disagree 18.182%
- Strongly Disagree 0%
- Unanswered 0%

**Question 32 Opinion Scale/Likert**
I am able to comfortably use algorithmic composition software
- Strongly Agree 9.091%
- Agree 9.091%
- Neither Agree nor Disagree 18.182%
- Disagree 40.909%
- Strongly Disagree 18.182%
- Unanswered 4.545%

**Question 33 Opinion Scale/Likert**
I am able to utilise Virtual Studio Technology (VST) or synthesis
- Strongly Agree 4.545%
- Agree 0%
- Neither Agree nor Disagree 13.636%
- Disagree 31.818%
- Strongly Disagree 50%
- Unanswered 0%

**Question 34 Opinion Scale/Likert**
I am able to develop simple computer software (e.g. with *Max MSP*)
- Strongly Agree 9.091%
- Agree 9.091%
- Neither Agree nor Disagree 13.636%
- Disagree 31.818%
- Strongly Disagree 50%
- Unanswered 0%

**Question 35 Opinion Scale/Likert**
I am familiar with software use for multimedia production (e.g. *Flash*)
- Strongly Agree 18.182%
- Agree 18.182%
- Neither Agree nor Disagree 9.091%
- Disagree 27.273%
- Strongly Disagree 27.273%
- Unanswered 0%

**Question 36 Opinion Scale/Likert**
I am familiar with a computer software package used for real-time music accompaniment (e.g. *SmartMusic Studio*)
- Strongly Agree 9.091%
- Agree 22.727%
- Neither Agree nor Disagree 4.545%
- Disagree 40.909%
- Strongly Disagree 22.727%
- Unanswered 0%
**Question 37 Opinion Scale/Likert**
I am able to utilise technology to help with music assessments
- Strongly Agree 36.364%
- Agree 50%
- Neither Agree nor Disagree 4.545%
- Disagree 0%
- Strongly Disagree 9.091%
  Unanswered 0%

**Question 38 Opinion Scale/Likert**
I regularly utilise technology to help with administrative duties
- Strongly Agree 68.182%
- Agree 31.818%
- Neither Agree nor Disagree 0%
- Disagree 0%
- Strongly Disagree 0%
  Unanswered 0%

**Question 39 Opinion Scale/Likert**
I regularly read articles about technology
- Strongly Agree 9.091%
- Agree 36.364%
- Neither Agree nor Disagree 22.727%
- Disagree 27.273%
- Strongly Disagree 9.091%
  Unanswered 0%

**Question 40 Opinion Scale/Likert**
I regularly utilise the internet as a source of support
- Strongly Agree 59.091%
- Agree 36.364%
- Neither Agree nor Disagree 0%
- Disagree 4.545%
- Strongly Disagree 0%
  Unanswered 0%

**Question 41 Opinion Scale/Likert**
I believe I have sufficient technological resources available to support my needs
- Strongly Agree 4.545%
- Agree 36.364%
- Neither Agree nor Disagree 4.545%
- Disagree 31.818%
- Strongly Disagree 22.727%
  Unanswered 0%

**Question 42 Opinion Scale/Likert**
I feel comfortable helping others (e.g. students) with technological problems
- Strongly Agree 18.182%
- Agree 59.091%
- Neither Agree nor Disagree 9.091%
- Disagree 13.636%
- Strongly Disagree 0%
  Unanswered 0%

**Question 43 Opinion Scale/Likert**
I believe that sufficient technological training is available
- Strongly Agree 0%
- Agree 22.727%
- Neither Agree nor Disagree 22.727%
- Disagree 36.364%
- Strongly Disagree 18.182%
  Unanswered 0%

**Question 44 Opinion Scale/Likert**
I am able to allocate time to technological training
- Strongly Agree 0%
- Agree 40.909%
- Neither Agree nor Disagree 22.727%
- Disagree 18.182%
- Strongly Disagree 13.636%
  Unanswered 0%

**Question 45 Opinion Scale/Likert**
I feel that technology is utilised well in my workplace
- Strongly Agree 4.545%
- Agree 36.364%
- Neither Agree nor Disagree 22.727%
- Disagree 18.182%
- Strongly Disagree 9.091%
  Unanswered 0%

**Question 46 Opinion Scale/Likert**
I believe I have a good understanding of how technology can be used as an educational aid in music teaching
- Strongly Agree 36.364%
- Agree 40.909%
- Neither Agree nor Disagree 13.636%
- Disagree 9.091%
- Strongly Disagree 0%
  Unanswered 0%

**Question 47 Opinion Scale/Likert**
I believe I am able to cope with technological change
- Strongly Agree 45.455%
- Agree 40.909%
- Neither Agree nor Disagree 4.545%
- Disagree 9.091%
- Strongly Disagree 0%
  Unanswered 0%

**Question 48 Opinion Scale/Likert**
I am satisfied with my own level of technology literacy
- Strongly Agree 4.545%
- Agree 50%
- Neither Agree nor Disagree 18.182%
- Disagree 18.182%
- Strongly Disagree 9.091%
  Unanswered 0%
Appendix C – Survey Free Text Responses (Q49-Q50)

Note: All responses are unedited and provided in full. Formatting has been adjusted to suit this documentation. Responses are numbered to accommodate referencing and are not related to the participant number or placed in a rated order.

The key factor identified in each response by frequency or expression (often the first issue mentioned) is identified by bold type.

**Question 49 – What do you consider to be the single most influential factor affecting the use of technology in your work environment?**

1. **Money** for hardware that actually works. I have the software, but there is no money to purchase decent hardware.

2. The most influential factor that determines the use of technology in my school is the hit and miss support given by the head teacher who looks after technology. My 15 site licensed copy of Acid Music Suite is still sitting on my desk because he can't seem to load and register it and will not allocate the time to fix the problem with Paul Smythe from Sony. It is also frustrating that instead of spending money employing someone specifically to support technology in school (just like they do in the science faculty and food tech/hospitality as they have a person that just preps) They just seem to keep on spending money on new stuff like our 6 smart boards. That is great but who is going to train us? Our computer labs are atrocious with only maybe 65% of the kiosks working at any given time. The students always get the blame but I know they are just as frustrated as I am. I am also campaigning to have a computer room timetabled into the music timetable so that I don't have to keep booking a room and hoping to get lucky in getting a good one. It is the same with the laptop project. Sorry Nathan….. you really got me going then........ Hope this helps a bit though. Having a dedicated tech support person or team in school would be the most beneficial influencing factor in creating an effective technological working environment.

3. **The availability of computers** for use by students. In my workplace access to computers is very difficult. The fact that computers are not present in the music room makes it hard to incorporate technology as much as you would if access was readily available.

4. **Lack of funding** to purchase hardware and software. I currently have 7 old computers that hardly work and am limited to one copy of sibelius and acid. I am frustrated with the lack of support from the principal. In my 5 years at the school and consistent applications for technical funding, she has never allocated any substantial computer funding to music. Also the computer technician at my school is a teacher with limited time and therefore another frustration for me is technical support even with installing free software in a computer lab.

5. **Willingness** of teachers to engage with it.

6. There is no single factor. In my work environment it is the initiative and drive of the staff which enables progress in the field of technology. The greatest stumbling block is the lack of resources. We get the oldest computers and currently only have 8. There is no money for software updates. Time is an issue as there is no time set aside in the workplace for learning and setting up resources. I had to take the initiative myself outside of the workplace to complete a Masters of Music Technology at considerable personal financial and emotional cost.

7. I have been unable to integrate technology to the extent that I would like to due to insufficient computers in the music room, inadequate access to general computer rooms as they are mostly timetabled to take computer classes. We have been unable to access free software such as Finale Notepad & Acid Xpress as our computer administrator could or would not enemble them to get past the firewall.

8. Too little technology for the number of students and the available technology is years old eg computers run too slow to allow the use of audio/visual programs.

9. **Available resources** - we can only use what we have, have to "share" with all other faculties, no computers in classroom, booking the computer room is almost impossible. Read about new resources but rarely have the funds to purchase. We have a "whole school" thinking in our school and are encouraged to buy things that benefit the whole school, rather than an individual faculty.
10. I teach students via distance ED and these students come from all over NSW. Therefore technology is used to deliver resources and for teaching methods.

11. Availability. For me to use 'technology' as in computers for the classroom I either have to bring in my laptop from home and borrow a data projector from the library or move the whole class to another part of the school. There are times when students need to access things here and now as part of the natural learning process in the classroom. Currently, our setup of resources does not allow this to happen. We also only have 10 computers per computer room and so this makes a 1:3 ratio – not productive or efficient (assuming that all these computers are working, students access log in are correct and there are speakers attached- highly unlikely and not very often) ideally there would be a smartboard for the teacher to use - sequencing equipment and internet access for each student in the classes.

12. FUNDING issues stemming from national, state and in school levels. They all flow to each other and end up affecting the core line of our occupation which is teaching and learning. Without adequate funding the ideals of delivering mandatory technology requirements, having interactive classrooms, students on computers learning with technology, equity of access to computers and programs needed is nothing but a pipe dream for most public schools. This may sound cynical but when you are in the system working everyday, trying to do your best with what ever limited resources your school happens to have at it's access it is often difficult, if not impossible. Inadequate funding affects the larger picture of systems set up - Maintenance and running of computers - having 1 computer teacher (who is expected to teach) plus fix any computer maintenance problems, network issues etc jams the inschool day to day system to a halt before you've even started. We recently swapped to having the DET technological teams take over our network running. If they think for one second that it has made a general teachers job in delivering technology any easier they are kidding themselves. Sure this may of helped the overworked computer teacher but at present I don't feel it has helped me as teacher have better access to working computers to be able to use them. For example - we've been waiting 6 months ot have a printer re installed by the Sydney technology wonders, 14 weeks to have sound re installed on the music computers after they deleted all sound off all school computers and we're still waiting to have programs loaded back on and everyday our computers crash and sometimes the whole network crashes for days at a time! With legal requirements and use of the internet us everyday teachers can't even load a program on the computers ourselves! We shan't even mention what happens when a computer screen dies, or a disc drive jams, or a power lead fails...... Funding affects the ability to have reasonable and adequate levels of equipment for students, staff, schools,etc For example in my current workplace here are a few alarming statistics that directly affect the ability to deliver technology related activities to music classes.

1. 1000+ students in the school with 2 working computer labs of 30 computers. Remembering that in a school this size most classes are packed to 30. 2. Smatterings of 3 more places where there are 10-17 computers for use with classes of 30. Once again a numbers problem! 3. Our music department has 9 computers yet only 3 of these have adequate soundcards or running speeds to operate music technology programs. We often have 3 music classes running at once so the ratio is 3:90. Once again a numbers and equity problem. 4. Funding affects ability to buy correct licenses for class use. It is impossible at the present moment in any government school to have 30 licences for music programs, such as FINALE - it's simply too expensive. The compromise we all make is "just let us have 1-3 licences per year and we'll build it up". Of course this isn't helping our students - only 3 at a time! 5. Funding affects the numbers of available of computers within a school - politics within a school affect where they are placed! 6. Political agendas of funding affect what we can deliver, when and how. I'm still waiting for the laptop computer for staff that was promised about 5 yrs ago! only 2 schools in each district got this! What about the rest of us unlucky schools! The recent one is the promising of 1-2 smartboards for every school by 2011. By the time the schools listed for 2009,10 and 11 are issued (if at all) this technology will be superseded. It's ridiculous to think that us teachers are OK with this elitist and lucky draw system of being issued with resources that we needed yesterday! I'm currently in one of the biggest high schools in the state and it should be the governments shame that we don't even have 1 smartboard that we can access! The claim of giving every senior student a laptop is great, but there are huge ramifications for this and once again, what about us staff??? I believe that until funding comes through that reflects the true cost of setting up adequate systems at state, local and internal levels that we are going to keep struggling and beating the impossible odds everyday. This is why public school teachers are the best! This is why we hope our students have computers at home that they can access!

13. The availability of hardware to do the job. (And appropriate software too but without the access to hardware this is pointless)

14. Students are very much in tune with that style of learning
15. The **availability** of the few computer rooms and whether they are up and running without errors.

16. **Funding** .........we have only one music dedicated computer with an outdated sound card using a discarded copy of cubase vst So many good programs now available but so expensive and how do you justify big expense when only one student at a time can benefit.

17. Both for myself and other staff in my work environment, there would have to be two influential factors affecting the use of technology and often they cannot be separated: **Time** and **Money!!!** It's always difficult finding enough time to devote to setting up / training staff in the use of technology for our subject area (e.g. small keyboard lab of 7 in our prac room - just keyboards connected to a master console - no computers!!!); and not enough money to purchase and/or maintain music technology equipment, or pay for adequate T&D time to learn how to use it - things are always tight and rushed. Having said that, my campus has actually paid the $495 registration fee enabling me to attend mtec09 in Melbourne in January - for which I am greatly appreciative and looking forward to it!

18. **Availability** of decent computers, classroom space for them and software to run on them.

19. There are obviously a number of factors but probably the most important is **COST**. I am in an enviable position of having 15 PC'S in the music class room with Finale, but this was initially achieved by taking 15 old MACS that were going to be thrown out. Having taken these they were replaced by new PC'S 2 years later as I was able to demonstrate their use in work samples created by the students. This seems to be a common practice in State schools.

20. The single factor is the **availability** of computers on which to install software. At the moment there are 7 computers available to music students. Only 2 of these computers are networked so there is no access to the internet on the other 5. I have requested that when there is a computer rollout (replacing old computers in the school) I would like some of the old computers for the music room.i do have small classes but my ideal situation would be to have 15 computers available for use.

21. **Access** to "working" technology + training

22. **Time**

**Question 50 – Do you have any reservations or concerns about using technology? If so, what?**

1. Some times feel the students know more than I do. It's great to use, but there are always so many technical problems such as hardware being serviced, waiting for IT person to install programs, access etc. Wish I new more, and had the funds needed to purchase the equipment.

2. Two in particular: one is that technology should be used to serve a clear purpose, as opposed to finding exciting things to do with technology just for the sake of it - in my experience some students are genuinely engaged more through the presence of smartboards and other access to technology, but by no means all of them are. The second is that the Board of Studies (or whomever writes the syllabi) consults with teachers and schools to see what technology is actually available on the ground in school environments to meet with syllabus needs and industry standards - as music educators, from top to bottom we are in the position of creating a balance between preparing students for industry and locating/ allocating the funding & resources to provide that preparation. At my school we currently do not have anywhere near the funding to fully meet syllabus requirements or adequately prepare students for the real world.

3. getting stuck with crap gear that is slow and time wasting.....if we are to embrace technology we need to be adequately funded to allow it to happen. We need at least 15 music dedicated well set up computers to allow all students to have a try otherwise it is self defeating and turns students and staff off

4. The only reservation I have about using technology is that systems and support and in place, which I have addressed in my previous questions response. The best way I've found to get over any fears re technology is to get in an learn how to use it and give it a go! It's amazing what these two simple steps can achieve in your teaching when this is done! I'm all for the ideals of using and delivering technology based programs and lessons to our students however at the present the ideals have got a few blocking points. I look forward to the day of our teaching within public schools will be fully incorporated within every classroom. (In every room - 30 computers, data projector, speakers, 30 sets of licenses for every program we need, internet access for all 30 computers, printers always full with ink, bluetooth incorporated, smartboards in the classroom and smartboards linked between rooms (esp in music), recording studios..etc - This means the rooms would have to be twice to triple thier size to fit all this in and to be able to maintain the performing areas and areas for instruments) and none of this coming at the cost of delivering
any other part of our curriculum or maintaining performing groups/instruments. We can do wonderful things with technology and our students are switched on and geared to technology!

Today's students are interactive learners and technology based.

5. My reservations are only governed by time and money.

6. Lack of time to trian myself on the various software we own so that i can teach it and fix problems instead of experimenting to fix problems.

7. I am happy to learn new technology skills and I have embraced the way technology has affected students. My main concern is the ongoing cost of keeping up with it and how quickly it becomes Outdated.

8. Time restraints mean that sometimes I run a class learning to deliver as I go.

9. Not really. I like to experiment with new stuff but it's simply a case of I don't know what I don't know. There is just stuff which would be possible that I haven't dreampt of and so have not looked into.

10. Not overall, I'm keen to embrace new technology and am keen to move our faculty forward in this area. (The only reservation I have is using a hard-disk recorder that I never really learnt how to properly use!!)

11. Yes. my confidence needs to be enhanced through becoming more skilled. It is difficult to acess computer technology, data projectors and the like on a regular basis to refine my skills. Technology resources and management ideas need to be included as part of the infrastructure of each classroom not just going to a computer room to acess a computer some where else in the school. This is both restrictive to the natural learning cycle and the physical demands of the student to computer ratio does not allow for a meaningful learning experience.

12. I would like to be able to troubleshoot more hardware issues as I'm confident with the software side. At the moment our computer containing HSC compositions, recorded viva voces etc. is not working and has been with the administrator for 3-4 weeks. At this rate it is unlikely that it will be working at the beginning of next year.

13. No, but due to the nature of my work place it is not feasible for the school to purchase multiple copies of programs to send out to students unless they are freeware software programs.

14. The concern I have which applies to any form of learning is that the lesson is properly structured so that effective learning takes place. Without proper structure students can see it as a time to just play around without a clear idea of what they are supposed to be achieving

15. XSively cerebral. Eyestrain >> cranky children. I fear an overemphasis on use of technology. Real life music making, whethuer using digital, amplified or acoutic instruments uses physical & interpersonal skills that use of computers doesn't. Similarly, acoutic instruments, including voice, are different to hear & to play than their electronic counterparts, and, again, different when amplified as compared to not amplified. Overall I would emphasise a balance of experiences, weighted in the direction of live minimaly amplified playing. Use of technology is fun and extends the possibilities enormously, but I want us to keep sight of the basic art of music sharing on a humble human level. More open in Yrs 11/12. I haven't found ear-training software to be very useful. How to find out what software will really be usefull for my needs.

16. My only reservation in lack of resources and therfore inability to provide access to music technology to my students.

17. I am concerned about copyright issues and privacy issues

18. I still don't feel as comfortable as I would like to about using technology. I find if I don't keep using new things that I learn I quickly forget how to do it. There is also the matter of having enough time to sit down and experiment with different programs or find various things on the internet. With the demands of music teaching and everyday life I find time is a big factor in not being as proficient with technology as I would like to be. I worry about becoming too reliant on it. While it allows independent learning in the classroom I often feel I have to have a plan B to fall back on if the technology does not work effectively.

19. No, but far greater training and support (from DET) is required (eg release time to play with tech)

20. No. I think the use of technology is of high importance in teaching today.

21. My reservations about using technology are based on how quickly technology changes and how little time I have to keep myself current in this area. In a single subject teacher school there is no-one else who has much idea about music technology. OK so they all know how to download music etc. but that's it. When I did the music technology online course I realised how little I knew and I had to cover these gaps in my knowledge through a process of trial and error. This was very time consuming. Also there is a thousand and one workshops on Sibelius and some basic music technology workshops but it's never enough. What we really need is some sort of dept.music tech. help desk or at least an online newsletter with helpful hints. Yes we could do the Newcastle uni course but time and money is an issue here.
Appendix D – Survey Information Sheet

INFORMATION SHEET

CASE STUDY OF A COLLABORATIVE ONLINE NON-TERTIARY MUSIC TECHNOLOGY PROJECT OPERATED BY THE UNIVERSITY OF NEWCASTLE AND THE NSW DEPARTMENT OF EDUCATION AND TRAINING

My name is Nathan Scott, and I am a Master of Arts (Music) student at the University of Newcastle under the supervision of Dr Phillip McIntyre. As part of my course I am undertaking a case study into technology literacy in music education.

In 2004 the Federal Minister for Education, Science and Training (Hon Dr Brendan Nelson MP) commissioned a report into the delivery of music education in the Australian schools. The report entitled The National Review of School Music Education indicated that technology should be an integral part of the music education process, and that music educators must equip themselves with the necessary skills to deliver such education.

This research aims to investigate the variable technological literacy rates relevant to music educators as they engage with music technology. The case study will consist of a survey, collection of documents and secondary data, to find patterns in the data and provide subsequent answers to the problem. Observation of an online course will also be undertaken by the researcher Nathan Scott who will be coordinating (but not presenting) the course. The research findings will be collated and made available as a resource via the Department of Education and Training. You are invited to participate in this research project.

One survey will be completed following the conclusion of the online program. It will be approximately 30-45 minutes in duration and be undertaken online. The data will be stored electronically at the University of Newcastle. During the study, the collected data will be stored in a secure room in the Project Supervisor’s office. The raw data will be retained until the student’s thesis is accepted and then destroyed. In the case of course material existing on the Blackboard server, this will be destroyed in line with the current Records Management Policy - Policy 000285 (Sept 11, 2006) http://www.newcastle.edu.au/policylibrary/000285.html (accessed 30/11/06).

All individual responses will be treated as confidential and when the results are published, this will only be as a summary of all responses so that your privacy will be protected in relation to your individual responses.

Your online communications and interactions in the program will be recorded and be examined. This will include the observation of online activities such as the online discussion forums, email communication relevant to the course and observation of work submissions.

Please note that participation in the research is optional and voluntary. Should you choose to participate in this study, please complete the attached Consent Form and return these via mail to the address below. Please note that if you choose to withdraw at any time there will be no disadvantage to you.
Thank you for the time you have taken to consider this invitation. Please keep this Information Sheet. Any enquiries about the study may be directed to Dr Phillip McIntyre, School of Design, Communication and Information Technology, Faculty of Science and Information Technology, The University of Newcastle, telephone: (02) 4985 4522.

Nathan Scott

Dr Phillip McIntyre

Complaints about this research

This project has been approved by the University’s Human Research Ethics Committee, Approval No. H-347-1206. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (02) 49216333, email Human-Ethics@newcastle.edu.au.

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