

An Analysis of Factors Affecting ICT Co-ordination and Integration in Schools

Raymond Montalban

Department of Educational Studies

Faculty of Human Sciences

Macquarie University, Sydney, Australia

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Author Note

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Abstract

ICT integration, or the use of these ICTs in everyday classroom practice, has become mandatory in many education systems. ICT integration is often but not exclusively led by ICT co-ordinators. Others may be assigned the role due to local constraints.

However, ICT integration may not always benefit schools due to factors such as leadership, teachers' beliefs and ICT infrastructure provision. Using a case study method and Engeström's Activity Systems Analysis, the effect of school interactions and environmental elements on ICT co-ordination in two government high schools was investigated.

The study revealed elements in these schools such as NSW Department of Education policies, conflicting responsibilities and lack of funding as important factors influencing ICT co-ordination. Interactions between the rules governing these schools, the available tools and the division of labour also influence ICT co-ordination efforts. This study holds implications for future research and for schools who may be wishing to improve the depth and efficiency of their ICT integration by improving the status of their ICT co-ordinators.

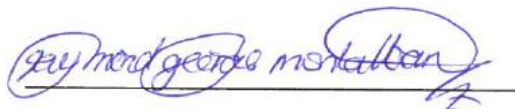
Key words: *ICT co-ordinator, ICT co-ordination, ICT integration, Thematic Analysis, Activity Systems Analysis, interactions, elements*

Authorship Statement

I hereby certify that this work titled *An Analysis of Factors Affecting ICT co-ordination and integration in Schools* has not been submitted for a degree nor has it been submitted as part of the requirements for a degree to any other university or institution other than Macquarie University.

I also certify that this thesis is an original piece of research and it has been written by me. In addition, I certify that all information sources and literature used are indicated in the thesis. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

The research presented in this thesis was approved by the Macquarie University Faculty of Human Sciences, Human Research Ethics Sub-Committee with approval number #5201700981 (See Appendix 11.1).

A handwritten signature in blue ink, reading "Raymond George Montalban", is written over a horizontal line. The signature is stylized with a large loop at the end.

Date: 15/5/18

Raymond George Montalban

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1. Introduction

The use of Information and Communication Technologies (ICTs) to augment classroom pedagogy is the catalyst for a major shift in teacher-student relations, how knowledge is disseminated and how teachers prepare students for the 21st century (Caetano, 2015; Moyle, 2014; Rabah, 2015). ICT skills are now so embedded in educational discourse that various education systems such as the International Baccalaureate and Australian Curriculum mandate their explicit integration (ACARA, 2013; International Baccalaureate, 2015). The benefits that this ICT integration can bring to the classroom are numerous: higher student engagement levels, globalisation of the educational experience and enhancement of the actual process of learning (Rabah, 2015).

For ICT integration to be most effective, teachers themselves have to develop an understanding of what ICT can do for them (Lai, Trewern, & Pratt, 2002). Proposed benefits of ICT integration have not always become reality as the sociocultural settings of the school are not taken into account (Demiraslan & Usluel, 2008). In other words, school and staff characteristics like teacher technical knowledge, administrative support and principal leadership, professional development and collegial support all need to be factored into plans when integrating ICT (Divaharan & Ping, 2010; Flanagan & Jacobsen, 2003; Webb, 2005). Roberston, Grady, Fluck and Webb (2006) raised additional concerns with how schools were governed, stating “governance [is] a key component of policy interacting with the system to achieve certain outcomes” (p. 73). Governance, from the principals and deputy principals down to the classroom level, is thus a major determinant in ICT integration success.

1.1. Rationale for this Study

The researcher's deep professional experience as an ICT co-ordinator provided the interest in exploring the possible factors affecting ICT integration. As an ICT co-ordinator, he witnessed decisions that both contributed to and challenged ICT integration efforts. Exploring possible factors that affected decisions regarding ICT integration and co-ordination in secondary schools in the Australian state of New South Wales (NSW) provided the opportunity for deep reflection and improvement on practice. In addition, this reflection provided him with the knowledge and expertise to more effectively contribute to ICT integration practices in any school.

2. ICT integration

2.1. Definition

Despite the importance placed on ICT integration by previous studies, schools (e.g. New South Wales Government Department of Education, 2017), national and international curricular bodies (e.g. Australian Curriculum, Assessment and Reporting Authority [ACARA], 2013; International Baccalaureate, 2015) and governments (Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA], 2008), a clear definition of ICT integration is not always apparent. The research literature takes the definition of ICT integration for granted, even though it is not always clearly defined (e.g. Becuwe et al., 2017; McDonagh & McGarr, 2015; Tondeur, Cooper, & Newhouse, 2010). In addition, the terms “integration” and “use” are often interchangeable (Lloyd, 2005a, p. 5), even though they refer to different aspects of ICT in schools. It is therefore important to establish a definition of ICT integration for the purposes of this study. For Wang and Woo (2007), ICT integration is the “process of using any ICT to enhance student learning” (p. 149). Lloyd (2005a) agrees with this definition, adding that ICT integration “speaks of processes rather than of hardware infrastructure and is exclusive of operational skills” (p. 6). In other words, they emphasise ICT integration as a process rather than an end product. Wang and Woo (2007) illustrate what this ‘looks like’ in a classroom, where the usage of software such as internet web browsers are *mixed into* the learning goals, rather than learning how to *use software* as the end goal. Their example illustrated students *assimilating* information from the US Energy Information Administration website on Singaporean energy use into group discussions. This led to students designing solutions to Singapore’s energy issues. The aim of this lesson was *not how to use* a web browser. Thus Wang and Woo’s (2007) definition of the term ***ICT integration***, as illustrated by the aforementioned example, will be used in this paper to ensure clarity and emphasise integration rather than use.

2.2. Factors Affecting Integration

Research into ICT integration emphasises that solutions used to integrate ICT into everyday teaching and learning practice need to be relevant to the school in which they take place (Robertson, Webb, & Fluck, 2007). No one size fits all contexts or situations. Despite this, literature points to common factors that can be considered determinants of success. These include but are not limited to:

1. The attitude of the school leaders (Judge, 2013; Mooij & Smeets, 2001; Yuen et al., 2003).
2. Classroom teachers' beliefs about the purpose and role of ICT integration in their own teaching practices (De Aldama & Pozo, 2016; Ertmer, 2005; Neyland, 2011; Prestridge, 2012; Sang, Valcke, Braak, Tondeur, & Zhu, 2011).
3. The reliability and adequacy of hardware and software for ICT integration (Blin & Munro, 2008; Hsu, 2017; Robertson, Grady, Fluck, & Webb, 2006)
4. The competency and role of the ICT co-ordinator (Karagiorgi, 2005; Lim & Oakley, 2015; Papaioannou & Charalambous, 2011)

It is this last factor that this thesis seeks to address. The role of the ICT co-ordinator in ICT integration is seen as being pivotal in determining its success or failure. Papaioannou and Charalambous (2011) explicitly listed having a “capable school ICT coordinator” (p. 260) as one of the most prominent internal factors affecting ICT integration while concurring with the list of common factors of successful ICT integration efforts given above. Additionally, Lim and Oakley (2015) positioned ICT co-ordinators’ impact on ICT integration as one of guiding “communities of teachers in the implementation of ICT-based teaching and learning” (p. 15). ICT co-ordinators mediated between classroom teachers’ beliefs and the reliability of hardware and software used in ICT integration. Neither Papaioannou and Charalambous (2011) nor Lim and Oakley (2015) took the opportunity to further explain how having a capable ICT co-ordinator affected ICT integration.

3. Responsibility for ICT Co-ordination

ICT integration is seen as an important part in the acquisition of 21st century skills. Support for this link between 21st century skills and ICT integration is made at all stages of education: from pre-service teachers (e.g. Brun & Hinostroza, 2015; Kim, Kim, Lee, Spector, & DeMeester, 2013), to primary classrooms (e.g. Blair, 2012) and beyond (e.g. van Laar, van Deursen, van Dijk, & de Haan, 2017). The assumption that this ICT integration is managed and led by an ICT co-ordinator is pervasive (see Lai & Pratt, 2004; Lai, Trewern, & Pratt, 2002; Lloyd & Cronin, 2002; McDonagh & McGarr, 2015; Wong, 2007). This assumption even extends historically back to Tearle's (2003) research into factors which attributed having an ICT co-ordinator to ICT integration success. This assumption is explored further in Section 3.2.

However, this assumption may not always be appropriate. Earlier research such as that from Flanagan and Jacobsen (2003) into ICT integration efforts in Alberta, Canada, made absolutely no mention of ICT co-ordinators. Other models of success in the literature are more nuanced as to whom they attribute the responsibility of ICT co-ordination (e.g. Goktas, Gedik, & Baydas, 2013; Tay, Lim, & Lim, 2015). Therefore, for the purposes of this thesis, no assumptions are made as to the title or role of the person responsible for ICT integration. Instead, what follows in this chapter is a treatise into the current state of nomenclature, key definitions, the role and key interactions of those in charge of ICT co-ordination, factors which affect co-ordinators' roles and other models of ICT co-ordination.

3.1. Definitions and Nomenclature

3.1.1. Role.

The word ‘role’ is used in the literature to describe the pivotal nature of the ICT co-ordinator in leading and managing ICT integration efforts (e.g. Conley & You, 2014; Devolder, Vanderlinde, Van Braak, & Tondeur, 2010; Sugar & Holloman, 2009; Tirado Morueta, Fandos Igado, & Aguaded-Gómez, 2010; Vanderlinde, Van Braak, & Dexter, 2012). It is even used to describe the ‘role of ICT’ in ICT integration to improve the teaching and learning outcomes for students (e.g. Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015; Albugami & Ahmed, 2015; Ghavifekr, Kunjappan, Ramasamy, & Anthony, 2016). However, there does not appear to be a standard definition on what a ‘role’ is as used in the literature. The word ‘role’ in the given examples above generally appears next to either descriptions or listings of responsibilities or to emphasise the importance of a particular person such as a teacher or ICT co-ordinator. Therefore, to ensure clarity in this thesis, the usage of the term **role** will follow convention and refer to the responsibilities given to particular people.

3.1.2. Function.

In the literature, the word ‘function’ appears in two main contexts with respects to ICT co-ordination and integration: technical and leadership. The technical literature discusses the ‘function’ of ICTs in the context of starting or improving ICT integration efforts with a focus on particular types of schools, software or hardware (e.g. Demiraslan & Usluel, 2008; Liu, 2011; Stevenson, 2013; van Laar et al., 2017). The leadership literature focusses on the ‘functions’ of the ICT co-ordinator in leading ICT integration efforts and managing school processes to suit (e.g. Broadbent & Gurr, 2004; Comber & Lawson, 2003; Karasavvidis, 2009; McDonagh & McGarr, 2015; Tan, 2010). In either case, no clear definition of the word function is given. In both technical and leadership contexts, the word ‘function’ appears when describing

what needs to be done. So, for the purposes of this thesis, the term **function** will follow convention and refer to actual tasks to be completed.

3.1.3. ICT co-ordinator.

The term used to refer to the person responsible for ICT integration differs between schools and education systems. Studies that use the terms *ICT HOD* (e.g. Baskin & Williams, 2006; Broadbent & Gurr, 2004), *HOD/ICT* (e.g. Divaharan & Ping, 2010), or *Computer Co-ordinator* (e.g. Lai, Trewern & Pratt, 2002) placed the execution of their role and responsibilities with the school leadership team. Other studies using the term *ICT co-ordinator* (e.g. McDonagh & McGarr, 2015; Phelps & Maddison, 2008; Rodríguez-Miranda, Pozuelos-Estrada, & León-Jariego, 2014) emphasised the leadership component of their role and their capacity to be the catalyst for ICT integration. Sugar and Hollowman (2009) used the term *Technology Coordinator*. McDonagh and McGarr (2015) even acknowledged the interchangeability of the terms. To ensure clarity in this thesis, the term **ICT co-ordinator** refers to the person in the school leadership team who has the pedagogical and technical responsibility for facilitating ICT integration. The other terms listed here will only be used where a specific school context requires it.

Nevertheless, very few studies using activity systems analysis explicitly mentioned the execution of ICT co-ordination being done by ICT co-ordinators. Lloyd and Cronin's (2002) study was one of those exceptions. They analysed the role of ICT integration in facilitating communications between indigenous students undertaking secondary schooling in major regional centres in the Australian state of Queensland, and their regional communities on the Lockhart River. The ICT co-ordinator in their study was considered so central to the success of their *Reach In-Reach Out* project, Lloyd and Cronin (2002) declared that "The ... appointment of a dedicated ICT co-ordinator ... has been critical in the success of this project" (p. 21). In other words, the ICT integration project analysed in their study may not have been

as successful were it not for the role of the ICT co-ordinator. Another study into Turkish ICT integration efforts by Demiraslan and Usluel's (2008) also recognised their importance by analysing their role within the school community. Nevertheless, though ICT co-ordinators are recognised by these examples as being important in effectuating integration, how the ICT co-ordination role is executed is not clear. The next section aims to unpack what is currently known about how the role of ICT co-ordination as discharged in schools.

3.2. Effect of ICT Co-ordination on ICT Integration

The role of ICT co-ordinator is multifaceted, being spread over pedagogical and technical domains (Rodríguez-Miranda, Pozuelos-Estrada & León-Jariego, 2014). One part of their long list of responsibilities is the management of resources required to ensure that ICT facilities are as functional as is possible (Sugar & Holloman, 2009). Easily accessible and well-supported ICT infrastructure is noted by the literature as one important factor in improving and maintaining ICT integration efforts by staff (Blin & Munro, 2008; Hsu, 2017; Robertson et al., 2006). Resourcing the ICT co-ordinator with the funds, the technical support staff, the status and appropriate time release ensures the success of ICT integration efforts in schools (Mulkeen, 2002; Sugar & Holloman, 2009; Tirado Morueta, Fandos Igado & Aguaded-Gómez, 2010). If the role of ICT co-ordinator is given proper status and resourcing, then ICT integration can have a greater chance of success.

The unique position of the ICT co-ordinator means that they can change educational discourse around how ICT integration is perceived (McDonagh & McGarr, 2015). They can provide the conditions for collaboration for staff training in developing and maintaining ICT knowledge and skill (Vanderlinde et al., 2012). Staff skill and knowledge of ICTs is a known determinant of ICT integration success (Ghavifekr et al., 2016; Lawson & Comber, 1999; Robertson et al., 2007). Additionally, staff attitude, especially in the acquisition of new ICT skills, can greatly influence whether ICT integration takes place at all (Hsu, 2017). The ICT

co-ordinator can therefore be positioned to interact between staff skill and attitude, and thus change educational discourse. It is this effect of the ICT co-ordinator on educational discourse that may directly influence the success or failure of ICT integration efforts. How their influence on educational discourse combined with a greater respect for the role of ICT co-ordination in ICT integration is explored both further on this section and throughout the rest of this thesis.

3.3. Function of ICT Co-ordination

ICT co-ordination is key in implementing ICT integration in schools (Rodríguez-Miranda et al., 2014). In particular, its place in schools means that people with ICT co-ordination duties (such as ICT co-ordinators) have the power to influence educational discourse on ICT knowledge and use (McDonagh & McGarr, 2015). Interactions between these people and their staff may determine the success or failure of ICT integration efforts. Broadbent (2005) and Moyle (2006) acknowledged the importance of these interactions on school climate and thus how loosely or closely aligned teachers saw ICT integration to their daily work. Schools with high levels of ICT integration generally had greater levels of ICT support that required “co-ordination, management and leadership” (Tondeur, Cooper & Newhouse, 2010, p. 297). Lawson and Comber (1999) also stressed the importance of ICT co-ordination in creating exemplary or innovative users of ICT in the classroom.

Notably absent from the research is any consideration of *how* successful ICT integration is achieved. Successful ICT implementation and integration is dependent on a school’s leadership team (Keane & Keane, 2017) providing the conditions for classroom teachers to do so. Though people such as ICT co-ordinators are acknowledged as an important factor in ICT integration (Mooij & Smeets, 2001), their inclusion and location within a school’s administrative structure isn’t always clear. Research has tended to focus on either their technical roles (Comber & Lawson, 2003; Lai et al., 2002) or their pedagogical role in driving ICT integration (Lai & Pratt, 2004; Wong, 2008). Either role requires meaningful interactions

built through relationships in order to influence decisions (Julius, Baldrige, & Pfeffer, 1999). These interactions have the potential to disrupt existing patterns and introduce newer pedagogies that can democratise the learning process (Blin & Munro, 2008). Furthermore, even whether interactions were face-to-face or virtual could determine the success of ICT integration efforts (Comber & Lawson, 2003). As these interactions are so important in ICT co-ordination, further study about how these interactions can change educational discourse is needed. Understanding this link between interactions and change in educational discourse permits the exploration of their influence on the function of ICT co-ordination.

3.4. Interactions with ICT Co-ordinators

Interactions produce tensions between the function of ICT co-ordination and various internal and external factors of their schools. ICT co-ordinators' complex internal interactions are compounded by the requirements of external stakeholders who may hold different perspectives on ICT integration and how this takes place (Baskin & Williams, 2006; Comber & Lawson, 2003; Lai et al., 2002). For example, the compatibility of software and hardware solutions provided by external providers can have a direct impact on the type of ICT integration and the extent to which integration occurs in the classroom (Baskin & Williams, 2006; Ingram, 2016; Taylor & Corrigan, 2007). In the Australian context, the requirement to integrate ICT (ACARA, 2013) further exacerbates tensions between what is possible and what the Australian Government expects of students and teachers in their use of ICT (Moyle, 2014). Even in the early 21st century, Lynch, Hobbs and Hollanders (2002) were asking how ICT co-ordinators were supposed to reconcile the interpersonal demands of their job with the external curriculum they were required to deliver. This tension between the interactions arising from ICT co-ordination and internal and external in schools means that even with staff allocated appropriate time release, only a few of these tensions can ever be resolved (Devolder et al., 2010; Rodríguez-Miranda et al., 2014).

Attempts at resolving at least some of these tensions have already been made. For example, Sang, Valcke, Braak, Tondeur and Zhu (2011) created an integrated model of the impact of teacher variables on ICT integration. Their model attempted to study the interplay between these teacher variables (i.e. the interactions and tensions) and ICT integration within the context of the Chinese education system. They found that the level of ICT integration depended on the teachers' motivation to integrate computers into lessons, their own personal constructivist beliefs and perceptions of school ICT policy. Going further back, Karagiorgi (2005) looked at ICT integration from a phenomenological 'change' (p. 20) perspective. This perspective focussed on how the individual teachers in the school system perceived the change and how that affected the level of ICT integration in classrooms. In Kargiorgi's (2005) study, ICT co-ordinators were seen as vital to integration efforts. Yet how and why their interactions with their schools affected integration efforts is not clear. Factors that affect interactions in ICT co-ordination efforts also warrant further exploration.

3.5. Factors Affecting ICT Co-ordination

ICT co-ordination is most effective when it is not done in isolation from their school communities. Lai and Pratt (2004) and McDonagh and McGarr (2015) emphasise the role that people such as ICT co-ordinators have in determining whole-school attitudes towards ICT integration. Furthermore, their influence on educational discourse surrounding the training and use of ICTs can directly affect classroom pedagogy and the level to which ICT integration occurs. Notwithstanding their effect, the influence of ICT co-ordinators is not one-sided – rather, a combination of factors between the ICT co-ordinator and the school directly impact on the effectiveness of integration efforts. A non-exhaustive list of these factors is given in Table 1 on the next page.

Table 1.

Karagiorgi's (2005) and other authors' factors affecting ICT co-ordinators.

Karagiorgi's factors list	Other authors
Access to information	Leadership, roles and responsibilities (Lai &
Advocacy from central administrators	Pratt, 2004; Lawson & Comber, 1999; McDonagh
Consultants and change agents	& McGarr, 2015; Rodríguez-Miranda et al., 2014; Sugar & Holloman, 2009; Tondeur et al., 2010; Wong, 2008)
Bureaucratic incentives for adoption	Government policy (Cartwright & Hammond,
Availability of federal or other funds	2007; McDonagh & McGarr, 2015)
New central legislation or policy	
Teacher pressure, support	Teacher support and training (Lawson & Comber, 1999; Robertson et al., 2007) Teacher attitudes (Lynch et al., 2002)
Problem-solving incentives for adoption	
Community pressure, support, apathy, opposition	
Existence and quality of innovations	
(Karagiorgi, 2005, p. 22)	Time constraints (Lawson & Comber, 1999; McDonagh & McGarr, 2015) Specificity to school teaching and learning needs (Tondeur et al., 2010)

Common factors include the role of teacher support and training, government policy and leadership responsibilities. This suggests that interpersonal factors have some of the greatest effect on ICT integration efforts. Tan's (2010) review of empirical studies into technological leadership affirms the effect of interpersonal factors, with three out of four of Tan's "areas of change" (2010, pp. 899 – 900) focussing on organisational structure and policy, pedagogy and learning, and school culture. Similarly, the case study school in Tearle's (2003) paper emphasised interpersonal factors as a determining factor of success as "by focussing in on one or two departments at a time, it was possible to attend to their specific needs" (p. 576).

This study aims to unpack how these interpersonal factors and interactions affect ICT co-ordination efforts inside schools. These factors can also provide different models of what ICT integration looks like in the classroom.

3.6. Other Models of ICT Co-ordination

The local context should play an important role in deciding which model of ICT co-ordination is used. This context may determine leadership style and ICT leadership team composition. In the literature, leadership styles employed in the role of ICT co-ordination are divided into two camps: Spillane's (2005) *distributed leadership* and *transformational leadership* as promoted by Heck and Hallinger (1999). For example, Chen (2013), Ghamrawi (2013) and Moyle (2006) speak of transformational leadership being used to improve staff capacity for the adaptation and change needed to transform pedagogy inside schools. Similarly, others such as Broadbent and Gurr (2004) and Finger and Lee (2014) point to the ability of distributed leadership to divide labour between organisational units more effectively. This more effective distribution of labour, supported by Webb (2005), may permit a more flexible spread of ICT expertise around a school. What matters then are the key interactions between the organisational units needed to get ICT integration done (Ho, Yuen, Chen, & Ng, 2016) rather than the title or role of a person assigned to manage and lead ICT co-ordination efforts.

Hayes' (2007) work into the link between ICT integration and local primary school context in New South Wales (NSW), Australia, highlighted many different methods with which the functions of ICT co-ordination was discharged. Examples included:

- the principal advocating the inclusion of technology into classroom practices
- ICT leadership being shared between the deputy principal, curriculum co-ordinator and the technology committee
- an individual teacher, referred to as a computer enthusiast, initiating a 'bottom-up' approach and developing the use of ICT approved by the executive

- the use of a technology committee with a key ‘motivator’

(Hayes, 2007).

In a similar vein, Gotkas, Gedik and Baydas’ (2013) research into ICT integration efforts in Turkish primary schools concluded that very little emphasis was placed on a person called the *ICT co-ordinator*. They only made brief mention of ‘tutor teachers’ (p. 221) as being important sources of knowledge and skills required to further ICT integration efforts. In Cyprus, other methods of executing the role of ICT co-ordination were employed: using school-wide implementations of policy driven by a principal and ‘islands of innovation’ where small groups of leaders promoted ICT innovations through relationships between teachers and students (Hadjithoma & Karagiorgi, 2009).

None of the methods described here for discharging the role of ICT co-ordination specifically refer to an ICT co-ordinator. The common thread in the studies discussed in this section presents the need for ICT integration and co-ordination to be suited to the school and education system. The emphasis in this study is therefore placed on how the role of ICT co-ordination is affected by interactions inside schools as organisations.

4. Research Problem and Question

At present, there is a lack of research into those responsible for ICT co-ordination within their schools – and the factors that affect the execution of their role – when the school is conceptualised as an activity system. Firstly, there is still an emphasis on what those responsible for ICT co-ordination do, such as ICT co-ordinators, with regards to ICT integration efforts. This is in contrast to how their efforts are influenced by interactions, internal and external factors. Secondly, the emphasis on the pedagogical and technical leadership roles of those involved in ICT co-ordination means that tensions and contradictions arising from their attempts to reconcile their dual roles in their schools are not known. Additionally, research into ICT co-ordination in schools illustrates the importance of those responsible for ICT co-ordination and their effect on ICT integration but not how and why they're important. Often, commentary relating to these factors is presented as a by-product of analysis rather than the focus of the analysis itself. Thirdly, as a consequence, the influence of interactions, contradictions and activity system elements of those involved in ICT co-ordination, is at present unclear.

Despite this, Lloyd and Cronin (2002) and Yamagata-Lynch and Smaldino (2007) point to a method of reducing the opacity of activity systems analysis to instead focus analysis efforts onto interactions between key elements in their specific educational institutions. Pivotal tensions influencing how those people execute the ICT co-ordination role in schools can therefore be highlighted more easily. Given the effect of interactions in schools between internal and external factors and the tensions arising from ICT co-ordination activities, the research question then becomes:

Which factors affect ICT co-ordination and integration efforts in Australian schools?

5. Research Methodology

This chapter will present the research methodology underpinning this thesis. ICT integration success is attributed to the deployment of staff responsible for ICT co-ordination to facilitate pedagogical change (Devolder et al., 2010; Rodríguez-Miranda et al., 2014). Rodríguez-Miranda et al (2014) go one step further and see the multiple roles they hold within a school as influential in improving efficiency in teaching and learning. These multiple roles may then bring those responsible for ICT co-ordination into direct contact with both school-based internal and external elements. One internal factor that plays a large role in determining ICT integration success is that of teacher beliefs and values (Albion et al., 2015; Vermeulen, Kreijns, van Buuren, & Van Acker, 2017). External factors affecting the role of ICT co-ordination can be present in the form of community pressure (e.g. Karagiorgi, 2005), curriculum policy (e.g. ACARA, 2013; International Baccalaureate, 2015), government policy and government incentives for ICT integration (e.g. Avidov-Ungar & Hanin-Itzak, 2017). In addition, interactions between the multitude of factors and roles are deemed to give those responsible for ICT co-ordination the ‘soft power’ to influence educational discourse around ICT (McDonagh & McGarr, 2015). It is this effect of interactions between internal and external factors on the role of ICT co-ordination that this study aims to unpack.

5.1. Case Study Methodology

Case study methodology concentrates on understanding how a given phenomenon interacts within its context (Yin, 2014). It is particularly useful for unpacking how and why a phenomenon occurred (Thomas, 2011). Moreover, it allows for an in-depth understanding of phenomena inside a given context in which the researcher has no control (Ali, Yang, Button, & McCoy, 2012). The use of a case study methodology fits naturally for the study of the interactions between the ICT co-ordination role and their schools. In addition, this methodology supports a rich, in situ description of how and why these interactions occur

(Hughes, Boklage, & Ok, 2016). The ability to capture the real-life complexity of a school as a unit of analysis also lends itself to the use of case study methodology. What matters in the case study is only the case itself (Romero, Peirats, Gallardo, & San Martín Alonso, 2014) as generalisation isn't always the primary goal (Harland, 2014; Thomas, 2011). The focus can then be on interactions between ICT co-ordinators and their schools. Case study methodology is also very open to unexpected discoveries without them being interpreted in a conceptually or methodologically constrained manner (Harland, 2014). The lack of constraint on discoveries made and the deep description of interactions using case studies permit the use of Activity Systems Analysis (ASA) to provide deeper understanding of how and why interactions within schools may have an effect on ICT co-ordination efforts. ASA is described in the next section.

5.2. Activity Theory

Activity Systems Analysis (ASA) as espoused by Engeström's (2015) *Learning by Expanding*, based on Vygotsky's and Leontev's Activity Theory (AT), provides an analytical framework that unpacks the complex interactions between human activity and context. This context is referred to as an *activity system*. This unpacking of interactions has proven useful in educational settings (Blin & Munro, 2008; Engeström, 2000; Roth & Tobin, 2002; Yamagata-Lynch & Haudenschild, 2009). In social situations such as schools, context is vital in explaining the reasons what, why and how interactions between organisational units occur (Douglas, 2011). Other settings that have made use of activity systems analysis include: (a) workplace settings (e.g. Engeström, 2000; Marken, 2006), (b) distribution of leadership in ICT projects (e.g. Ho et al., 2016) and (c) ICT integration (e.g. Demiraslan & Usluel, 2008; Divaharan & Ping, 2010; Lim & Chai, 2004; Lim & Hang, 2003). In each of these settings, activity systems analysis permitted the identification of tensions and thus the strategies to overcome them (Yamagata-Lynch & Smaldino, 2007). What follows is a discussion of how the case study methodology is used to define the school as the unit of study. This is then followed by a brief

description of the derivation of Activity Theory, its incorporation into ASA and in terms of this study, how ASA is positioned as a way to unpack how interactions may influence ICT co-ordination in schools.

5.3. Background: Activity Theory

Activity Theory (AT) was derived from research by Vygotsky and Leontev that questioned the prevailing behaviourist psychological models of human activity of the early to mid-20th century (Engeström, 2015). Research into these psychological models gave rise to Vygotsky's mediated stimulus-response (*S-R*) link. This mediation was done through an intermediary labelled *X*, meaning that every stimulus and response cycle was affected by *X* in some form (Marken, 2006). This *X*, as shown in Figure 1, enabled the role of external stimuli “to control behaviour from the outside” (Vygotsky, 1978, p. 40). In AT, an activity was deemed to be initiated by a motive, often referred to as the “need” (Karasavvidis, 2009, p. 438) of an activity. This way of looking at activity was in stark contrast to earlier approaches such as the behaviourist tradition of stimulus-response association (Yamagata-Lynch, 2003). This shift in psychological models to integrate behaviour controlled from the outside allowed for “universals” (p. 126) or common activities and interactions above consideration of individual or group variations (Göncü & Gauvain, 2012).

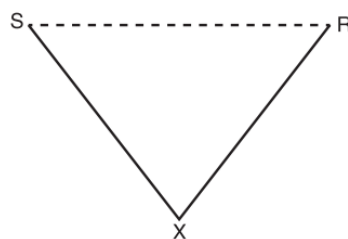


Figure 1. Vygotsky's mediated act (Vygotsky, in Engeström, 2015, p. 47)

One consequence of this mediating factor or tool was that it permitted *X* to be seen as a social product, created by “society’s organisations and institutions” (Lorenz, 2001, p. 322). By explicitly referring to physical or psychological *tools* to work on a “shared object” (Douglas, 2011, p. 198), it became possible to study human activity in societal contexts (Marken, 2006). This allowed organisations such as schools to be studied as a unit of activity. It is this contextualised human activity and the interactions that this entails which are of most relevance to this study. These interactions can either be constrained or enabled by the total activity in which ICT co-ordination is executed (Ho et al., 2016). Unpacking the elements that make up these interactions in this study between those responsible for ICT co-ordination and their schools allows their effect on ICT co-ordination to be more accurately described.

5.4. Elements of the Activity Systems Model

Activity systems as recognised in the West is most closely associated with Engeström’s (2015) text *Learning by Expanding*. The activity systems model, derived from AT, is a model of human activity based on the interaction between the *subject* of a system under analysis, actions mediated with *instruments* or *tools*, and an *object* leading to an *outcome*. Figure 2 demonstrates this interaction:

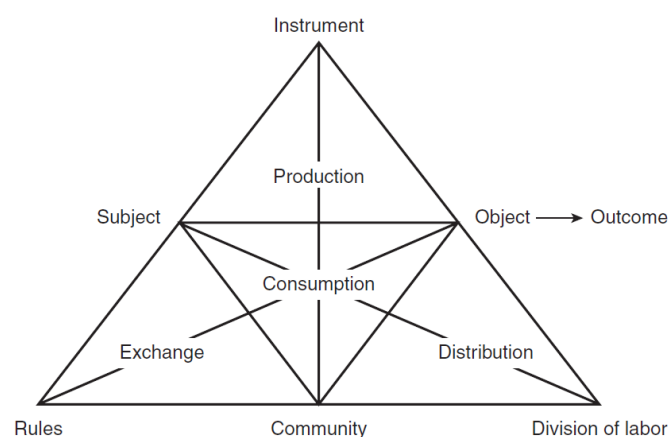


Figure 2. Structure of human activity (Engeström, 2015, p. 63)

The basic components or elements of a human activity system are explained below:

- The *subject* are the participants in the activity system motivated to reach the *object*.
- The *object* is the goal or motivation for the activity.
- The *instrument* or *tool* is a shared resource that can be used to reach the object.
- The *rules* are the norms or conventions which need to be followed in an activity system.
- The *community* refers to the groups or stakeholders of an activity system of which the *subject* is a part.
- The *division of labour* refers to how tasks to achieve the object or goal are distributed by the community. (Yamagata-Lynch & Haudenschild, 2009).

It is important to note that this model represents the “smallest and most simple unit” (Engeström, 2015, p. 65) that most adequately describes any human social and collective activity without over-simplifying or distorting the activity itself (Engeström, 2015; Ho et al., 2016). Activity itself is a system that possesses “structure, inner transformations, conversions and development” (Leontiev, 1974, p. 10). Though at first glance the activity system model presented in Figure 2 may appear static, the model is dynamic and under continuous change, in part due to the relationship between the subject and the object (Roth, 2004; Roth & Tobin, 2002). Additionally, although individual actions may be *void* of a production element, the activity system, represented by Figure 2, cannot (Engeström, 2015). Activities are realised through actions but actions cannot stand alone or be understood without a context or frame of reference (Barab, Barnett, Yamagata-Lynch, Squire, & Keating, 2002; Engeström, 2015; Ho et al., 2016). The simultaneous irreducibility of the activity system (Engeström, 2015) and the ability to zoom in and out of key interactions and contradictions make it suitable for studies that are situated in schools.

5.5. Contradictions and Tensions

Parts or components of an activity system that produce tensions are known as contradictions (Barab et al., 2002; Lim & Hang, 2003). These contradictions are borne out of deviations from standard scripts of work patterns called “disturbances” (Engeström, 2000, p. 964). In other words, tensions or disturbances arising from different sources or components may affect how the activity system responds. Changing the nature of the activity may resolve these tensions (Yamagata-Lynch & Haudenschild, 2009; Yamagata-Lynch & Smaldino, 2007). Thus contradictions and tensions identified as a result of activity systems analysis then become the basis for concrete change (Roth, 2004). It is this ability for tensions to highlight or suggest concrete changes that provide the basis for their inclusion in this thesis. Furthermore, the analysis of these tensions allows the exploration of how the role of ICT co-ordinator interacts with their schools as discussed in the next section.

5.6. Understanding ICT Co-ordination Through Activity Systems Analysis (ASA)

ASA ensures that ICT integration efforts are seen as a whole-school activity reliant upon interdependent components (Divaharan & Ping, 2010; Lloyd & Cronin, 2002). These components either help or hinder the ICT integration process inside schools. Research highlights the usefulness of activity systems theory in the identification of important or key interactions (e.g. Divaharan & Ping, 2010; Lloyd & Cronin, 2002). It also highlights contradictions and tensions hindering integration efforts at either the classroom level (Lim & Hang, 2003) or the school level (e.g. Blundell, Lee, & Nykvist, 2016; Divaharan & Ping, 2010; Karasavvidis, 2009). In addition, other examples of research into ICT integration in schools, when seen as an activity system, explicitly mention the importance of a staff member referred to as the ICT co-ordinator in making ICT integration happen (e.g. Karagiorgi, 2005; Lim & Oakley, 2015; Papaioannou & Charalambous, 2011). Despite their importance in these examples, they did not go any further. Analysis of how and in what ways contradictions and

tensions affected the work of those responsible for ICT co-ordination was not explored. Using ASA to understand how and why these contradictions and tensions influence ICT co-ordination will allow a further exploration of its effect on ICT integration efforts inside schools.

5.7. Why Activity Systems Analysis

The act of ICT integration brings with it the possibility of contradictions (Demiraslan & Usluel, 2008). Rather than being seen as a problem, contradictions and tensions are used in activity systems analysis to point or focus in on problems that are not always readily apparent (Karasavvidis, 2009). In doing so, key bottlenecks may be identified which can provide the basis for solutions to these problems (Engeström, 2015; Roth, 2004). It is this capability of the activity systems model to identify the origin of contradictions otherwise buried in the complexity of everyday activity that has proven very useful in studies into ICT integration (e.g. Blundell, Lee & Nykvist, 2016; Karasavvidis, 2009). Though other studies in this literature review have explicitly referenced the role of the ICT co-ordinator in ICT integration (e.g. Demiraslan & Usluel, 2008; Lloyd & Cronin, 2002), the contradictions and tensions directly affecting the role of ICT co-ordination have not been explored.

One example where activity systems analysis was used to explore teacher actions and interactions was Lloyd and Cronin's (2002) analysis of the *Reach In – Reach Out project* for Aboriginal students from the Lockhart River region, who were continuing their secondary education in boarding schools located within major Northern Queensland regional centres. Using a case study approach, activity systems analysis became the method by which interactions were analysed. They highlighted key interactions between components of the *school conceptualised as an activity system* in a systematic manner.

Interactions highlighted included:

1. Subject – Object – Community
2. Subject – Instrument – Object
3. Interactions concerning Rules (e.g. Subject – Rules – Community, Subject – Rules – Object etc.)
4. Object – Division of Labour – Community
5. Subject – Instruments – Division of Labour

(Lloyd & Cronin, 2002, p. 5)

The interactions represented in their study were used to map the relationships between “people, technology, pedagogy and environment” (Lloyd & Cronin, 2002, p. 3). Doing this permitted the identification and analysis of key interactions that made *Reach In – Reach Out* possible. For example, the Subject – Rules – Community interaction highlighted the fact that “all known rules were changed or dispensed with as the project called for new rules, trust in new people, and an expanded definition of what constituted the school's community” (Lloyd & Cronin, 2002, p. 10). In other words, in order for the Reach In – Reach Out project to be successful, the entirety of the system needed to be reconsidered. Teachers had to challenge their understandings of ICT integration, Indigenous education and who was included in the school community (Lloyd & Cronin, 2002). Engeström’s (2015) assertion that the “[activity systems] model is actually the smallest and most simple unit that still preserves the essential unity and ... quality behind any human activity” (p. 65) may then seem to match Lloyd and Cronin’s (2002) observations. Although the importance of the ICT co-ordinator is not fully explored by Lloyd and Cronin (2002), it is this situated analysis that allowed the role of ICT co-ordination to be noted in key interactions and between components of the school as an activity system.

Notwithstanding the usefulness of activity systems analysis, Yamagata-Lynch and Smaldino (2007) raised the issue of the opacity of Engeström's (2015) activity systems model. Terms such as *subject*, *instrument/tool*, *object*, *rules*, *community* and *division of labour* were found not to be understood unless a detailed study of the literature was undertaken. The theoretical meaning of each component versus how it is interpreted in practice becomes obfuscated when questions on what the lines between each component actually indicated are raised (Bakhurst, 2009). Another issue raised by Avis (2009) is the assumption of contradictions being resolved consensually. On the surface, these issues may put into question the usefulness of the activity systems model. However, Yamagata-Lynch and Smaldino's (2007) modification of the model aimed to make it more accessible and understandable, and in doing so, provided clarity for the components of the activity systems model. Their modified model is presented in Figure 3.

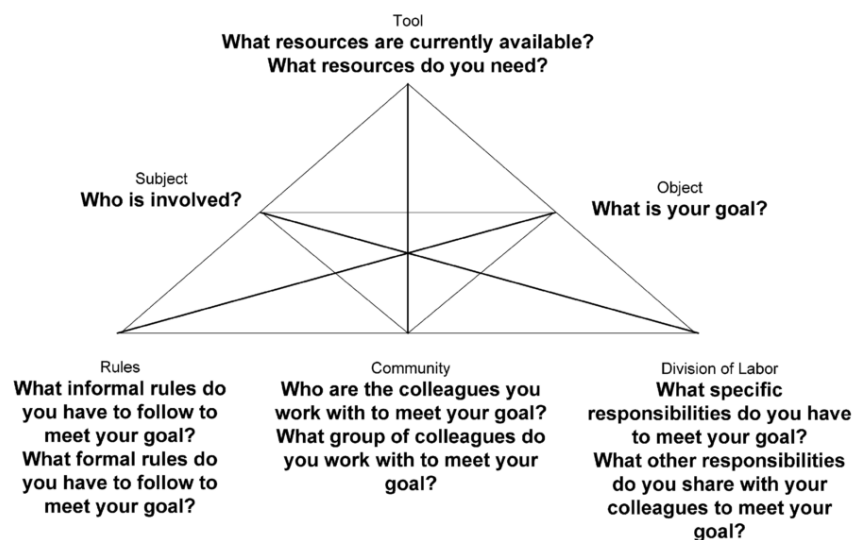


Figure 3. Yamagata-Lynch and Smaldino's (2007, p. 369) modified activity systems model.

The modified model presented in Figure 3 was created for the participants of their study into school-university partnerships. The primary aim of the study was to investigate ways to overcome institutional tensions and establish a communications channel that would allow evaluations and improvements to be made to pre-service teacher placement programs. Research participants in the groups were also given the responsibility to highlight contradictions or tensions by using the convention of a squiggly broken or unbroken line (see Barab, Barnett, Yamagata-Lynch, Squire, & Keating, 2002; Blundell, Lee, & Nykvist, 2016; Demiraslan & Usluel, 2008; Karasavvidis, 2009). The participants were then able to use the modified model in Figure 3 to conceptualise and communicate the complex components, interactions and relationships necessary to make school-university partnerships work.

Yamagata-Lynch and Smaldino's (2007) modifications to the activity systems model can be used to clarify the meaning of each of the individual components with respects to the current study. Lloyd and Cronin's (2002) focus on key interactions inside the school as an activity system points to a systematic method to unpack and present those interactions that may affect the role of ICT co-ordination directly and in what ways. The simultaneous irreducibility of the activity system (Engeström, 2015) and the ability to zoom in and out of key interactions and possibly contradictions ensure that all actions are firmly situated in the school. Activity systems analysis is therefore posited as a way in this study to unpack how interactions may influence the role of ICT co-ordination in schools.

6. Methods

6.1. Data Collection

6.1.1. Semi-structured interviews.

Semi-structured interviews were carried out with participants who identified as or who had a significant responsibility as ICT co-ordinator. These types of interviews use a guide (also referred to as an *interview schedule* or *protocol*) to structure the progression of the interview via an outline of topics with suggested questions (Kvale, 2011). The decision to use semi-structured interviews was also driven by two main factors: firstly, the variations of the roles in which the responsibility of ICT co-ordination was executed (e.g. Rodríguez-Miranda et al., 2014); and secondly, the flexibility and space that a semi-structured interview gives the research participant to raise pertinent or significant issues in a detail-rich manner (Bryman, 2012). The flexibility of semi-structured interviews allowed the interviewer to go deeper into key issues raised in a spontaneous manner without affecting the overall direction of the interview. Pertinent issues in the form of repeated themes came through the data set, permitting deeper analysis of key interactions, contradictions and tensions that occurred while carrying out the functions of ICT co-ordinator.

6.1.2. Document Analysis.

Documents such as school strategic plans were considered as secondary data sources used for the purpose of ensuring internal validity and triangulation (Bryman, 2012). Internal validity in this study was achieved by matching interview data, document analysis data and researcher observations and analysis. Triangulation of interviews and documents analysed allowed for a more complete picture of what is being studied (Liamputtong & Ezzy, 2005). This supported a comparison between theory-in-use and espoused theory in the research participants, which can be quite different (Blundell, Lee & Nykvist, 2016; Prestridge, 2012). In addition, triangulation provided a cross-check to ensure whether there had been any

misunderstandings or details lost in the data analysis process (Bryman, 2012). Salient or important issues in the form of repeated themes across both the documents analysed and the semi-structured interviews presented opportunities to further confirm and analyse the key interactions, contradictions and tensions in ICT co-ordination.

6.1.3. Sampling.

School sites were chosen through a method called *convenience sampling*. This method was chosen as it permitted maximum flexibility in terms of who would be available at any one time (Gay, Mills, & Airasian, 2012). In turn, the schools could be chosen based on availability and the limited time frame of the data collection period. Convenience sampling also permitted the consideration of physical school site access and the perceived ability of selected school sites to generate quality data (Bryman, 2012; Gorman & Clayton, 2005). Additionally, the research participants interviewed were selected based on whether they were either an ICT co-ordinator in a stand-alone position or whose responsibilities included ICT co-ordination.

Two schools were chosen for participation in this study. Recruitment of the schools took place over a period of a month. Both schools chosen were government comprehensive high schools in the Australian state of New South Wales (NSW) from fairly affluent metropolitan areas with a high socio-economic status (SES): School A was a co-educational mixed-gender high school newly established to cope with increasing demand for public education in its area with a growing cohort of students; School B was a large, well-established single-sex high school that had recently made it a priority to integrate ICT into pedagogical practices. Both NSW Department of Education and university ethical clearances were received before recruitment of schools began (see Appendix 11.1). The principals and research participants at each of the schools completed and signed information and consent forms ensuring their full and informed consent to the research taking place.

6.1.4. School Comparison.

The table below outlines the school population, school establishment date, gender composition, ethnicity composition and the number of teaching staff in both schools.

Table 2.

Comparison between School A and School B.

	School A	School B
Number of Students	370	973
Number of Teaching Staff	15	58
Gender		
• M	206	N/A
• F	164	973
Student Composition		
• Indigenous	1%	0%
• Language background other than English	42%	53%
School Established	2015	1934

Note. All data shown here were retrieved from the MySchool website (<http://myschool.edu.au>).

6.2. Analysis

6.2.1. Thematic Analysis.

Thematic Analysis (TA) is a flexible method to analyse, organising, describing and reporting themes across a data set (Braun & Clarke, 2012). TA was used in this study for the identification of pertinent or important themes. This focus on identification of themes rather than adherence to any particular theoretical paradigm allows it to be used in a wide variety of research projects (Guest, MacQueen & Namey, 2014; Nowell, Norris, White, & Moules, 2017) and thus by extension, applied to different forms of data. TA permitted this study to uncover relationships between concepts and themes embedded in the data across the entire data set (Alhojailan & Ibrahim, 2012). The flexibility inherent in being paradigm-agnostic meant that data could be analysed from a large variety of different types of sources (Braun & Clarke, 2012). It was this ability to work across different data types, such as the semi-structured interviews and documents used in this study, which proved itself valuable for this study.

However, for all its flexibility, TA also required the researcher to use a structured approach to handle the data (Nowell et al., 2017). TA starts off with a precise association of codes to data, then through a process of abstraction, codes became grouped to form blocks of meaning or *themes*. As TA starts with the data and ends with abstraction taking place, themes were more easily traceable back to the original data source (Alhojailan & Ibrahim, 2012). The process to derive these themes is discussed in further detail in the next section. Furthermore, TA enabled the interviews and document analyses to be treated as one data set (e.g. Due, Riggs, & Mandara, 2015). The ability of TA to handle many different data types simultaneously, while zooming in and out from the raw data to codes to themes, meant that key themes were more easily unpacked when needed. As a result, ASA performed on these themes produced the key interactions, contradictions and tensions necessary to unpack the effect of school interactions on those responsible for performing ICT co-ordination.

6.2.2. Approach.

Nowell et al. (2017) detailed a six-phased approach to data analysis in TA based on Braun and Clarke's (2012) model:

1. Phase 1: Familiarising yourself with the data
2. Phase 2: Generating initial codes
3. Phase 3: Searching for themes
4. Phase 4: Reviewing themes
5. Phase 5: Defining and naming themes
6. Phase 6: Producing the report (p. 4)

The first phase involved rereading the data multiple times to ensure that the researcher considered the full picture presented by the collected data (Alhojailan & Ibrahim, 2012). Connections between what the participants said in the interviews, the documents analysed, and observational notes taken during the interview were made at this point to facilitate the accuracy of code generation later on.

The second phase started with the initial data analysis, turning pertinent phrases or paragraphs into codes. NVivo was used for the coding and data analysis in this study. The codes generated from the documents analysed and the interviews stayed close to the “content of the data and to the participants’ meanings” (Braun & Clarke, 2012, p. 61). This closeness to the data itself meant that key interactions, contradictions and tensions, where present, were based on what was in the original dataset.

It was at the third and fourth phases of data analysis where over-arching themes across the data set were ascertained and reviewed from the codes generated in the second phase. At this point, the initial set of themes generated were analysed inductively. These themes were not moulded into a pre-existing coding frame or researcher viewpoint (Nowell et al., 2017), but

based on what was in the dataset itself. It is important to note that the themes at this point were only included in the final analysis if they were judged to be useful for the research question and supported by enough data (Nowell et al., 2017). Marín, Duarte, Galvis and Zawacki-Richter (2018) provided a useful example for how this strength and usefulness to the research problem could be presented graphically. Focussing on the richness and accuracy of the themes presented improved the description of key interactions with ICT co-ordination efforts.

The fifth involved modifying and defining themes until all relevant text could be described by the themes derived from the dataset (e.g. Nowell, Norris, White, & Moules, 2017). This step was performed in an iterative manner once the codes and the first set of over-arching themes were established in the previous phases. There were two main reasons for modifying and defining themes in this manner: themes could be collated in a logical order (e.g. Due, Riggs, & Mandara, 2015) and to ensure that errors and mistakes are caught before the application of ASA later on.

The sixth phase in the Nowell et al. (2017) study involved the use of these themes in the final report. For the purposes of this thesis, the over-arching themes were aggregated with their constituent codes. This aggregation allowed NVivo to perform matrix queries aligning over-arching themes to both the interviews and school plans on a per school basis while still allowing a close connection to the original data. A verification of the data from the interviews using the school plans could then take place. From these identified themes, tensions were identified through Activity Systems Analysis (ASA) being performed on each theme for both School A and School B. This is further described in Section 6.2.3.

6.2.3. Identification of Tensions.

Tensions in Activity Systems Analysis (ASA) occur as a result of contradictions in standard work patterns (Barab et al., 2002; Engeström, 2000; Lim & Hang, 2003). For example, having both government policy and the means to implement their policy imposed externally yet expecting the school to decide how it's done is considered a contradiction that results in tensions. Data excerpts, grouped by theme from both the interviews and school plans, were further analysed using the Activity Systems Analysis (ASA) framework to provide a more holistic view for each school. ASA elements such as Subject, Object, Tools, Rules, Division of Labour and Community for both School A and B were carefully considered. As a result of the interrelationships identified between the ASA performed on both schools and the seven themes from the Thematic Analysis (TA), five tensions were identified:

1. Resourcing ideals vs. resourcing reality
2. Conflicting responsibilities
3. Gap in responsibilities
4. Obsolescence vs. opportunity
5. Priorities and purchases

Previous studies followed similar analysis processes (e.g. Demiraslan & Usluel, 2008; Lloyd & Cronin, 2002; Yamagata-Lynch & Haudenschild, 2009). These studies identified tensions and contradictions in educational settings (Barab et al., 2002), such as universities and schools, which could then be used to suggest concrete change (Roth, 2004). These tensions are defined in more detail in the Results Chapter.

7. Results

This chapter will present the results of the Thematic Analysis (TA) and Activity Systems Analysis (ASA) for both School A and B. Table 3 presents the six major themes derived from the TA. Each theme is then analysed in more depth to highlight similarities and differences between both schools. These themes, having highlighted both similarities and differences, will be grouped into internal and external factors to address the research question. The final section of this chapter will focus on the ASA with an emphasis on the tensions identified in both schools. These tensions will then be described in Section 7.9. A glossary of Department of Education (DOE) specific terminology used by the research participants in this chapter is given in Appendix 11.4.

Table 3.

Identified themes from TA for School A and School B.

Number	Theme	Definition
1	ICT Implementation	Applicability or usefulness of existing, new or suggested ICTs to classroom settings.
2	Community Relationships	Issues that affect the relationship between the school, parents, students, and the wider neighbourhood. This can include but is not limited to the perceptions and opinions of parents, the effect of government policies and regulations etc.
4	Decision Making	The processes or mechanics of how decisions are made.
5	Resources	The means or tools with which decisions are executed. Items considered for this theme can include but are not limited to staff task allocations, timetabled release time, budgets, existing ICTs etc.
6	Staff Attitudes and Beliefs	Values and thoughts that make up beliefs towards ICT integration. Staff attitude is seen as a factor that can either facilitate (Fishbein & Raven, 1962) or hinder ICT integration efforts.

7	Staff Knowledge	The skills or prior understanding that staff bring to any exercise or implementation of ICT integration.
8	Technical Support	Any situation that requires technical information or support as identified by the schools in this study.

7.1. ICT Implementation

This theme was the first to be identified from the Thematic Analysis of the interviews and school plans. In all the interview excerpts given in Table 4, Q refers to the interviewer's question and A refers to the interviewee's answer. Interviewees identified for the purposes of this study were Deputy Principals (DPs). They were identified as the primary people responsible for ICT co-ordination in both schools. These DPs emphasised the need for ICTs to fit into their school context. Both of these schools placed a high value on vetting and testing hardware or software chosen or requested by staff. The approach used by these schools in vetting suitable ICTs differed. The table below provides an example of these different approaches and what, if any, mention is made in their respective school plans.

Table 4.

Data excerpts for ICT Implementation.

School	Interview Excerpts	School Plan Excerpts
A	<p>"I think the Google Apps for Education project across the school has been successful. I mean the fact that every class has a Google Classroom, they submit their assessments, their assessments are marked and returned"</p> <p>(School A DP interview, 10:00am, December 12, 2017)</p> <p>"We have a blended learning environment. So, the students are expected to have their devices with them every day ... They're not allowed to have their devices out at recess and lunch</p>	<p>"Creative and engaged learners who are empowered to achieve ... [through] whole school approaches to the respectful use of technology, using social media and dealing with plagiarism."</p> <p>(School A's School Plan, 2015, p. 3).</p>

... It's also partly because our parent body is ... quite naïve ... [that] the parents were anxious for their children just using devices all the time." (School A DP interview, 10:00am, December 12, 2017)."

"Q: Besides money, are there any other staffing or government policy issues that get in the way of [ICT integration]? Or ...?"

A: "... More support ... Umm ... some kind of provision to put us on a level playing field with private schools. Issue MacBook Airs to the kids ..." (School A DP interview, 10:00am, December 12, 2017).

B Q: "Would you be able to guesstimate how long the process might be [to test new ICTs]? Say, for example, a simple addition to Microsoft Word?"

A: "It's hard to put a timeline ... Say I show someone, they feel comfortable. We can trial it for two weeks and there's no issue, then that's it. It depends"

(School B DP interview, 4:00pm, March 6, 2018).

"High quality teaching and learning to maximise student outcomes ... using evidence-based teaching practices and innovating teaching and learning strategies"

(School B's School Plan, 2015, p. 5)

"I've got another guy who's really knowledgeable, who works across all other schools as well. So he knows what's most advanced out there. So just because we've got these IWBs [Interactive Whiteboards], they're not necessarily good, they could be obsolete. And he'll go 'No, I've got a different spec' and that's exactly what happens here." (School B DP interview, 4:00pm, March 6, 2018).

Both the school plan and the interview for School A highlight a school-wide approach to ensuring that ICT integration occurs. A whole school approach meant that it was easier for School A to achieve the standardisation it desired in its approach to ICT integration. Despite the implementation of a Bring Your Own Device (BYOD) programme for students, standardisation for both staff and student was achieved through the use of Google Classroom. This was something that the DP at School A was particularly upbeat about as illustrated in the interview excerpt for School A in Table 4. This standardisation was also noted in School A's Plan also shown in Table 4.

School A's Plan went much further than the simple standardised use of Google Apps for Education. However, the respectful use of social media and plagiarism as given in their school plan weren't even touched on by the DP in their interview for School A. As no mention of this was made during the interview, no further exploration of the issue occurred.

School A decided to use a blended learning environment, using both technology-based and more traditional paper-based pedagogies to ensure a more balanced approach to ICTs. Parental concerns over screen time were seen to be addressed by both this policy as well as the school rule banning use of students' own devices during break times as noted in Table 4. In spite of these parental concerns, School A identified a desire to improve ICT integration by running a school-based laptop programme with MacBook Airs. They also wanted to be given an opportunity to be on a more level playing field with the private schools of the area.

School B emphasised the need for any new ICTs to be 'comfortable' and integrate into existing practices within the school. Teachers were also given the opportunity to trial out new technologies with feedback given to the senior executive team before final decisions were made regarding technology acquisitions (see Appendix 11.3). Minimising obsolescence drove school ICT acquisition decisions as can be seen in School B's interview excerpts in Table 4.

However, unlike School A, only a vague reference was made to ICT integration in School B's school plan through its inclusion of "innovating teaching and learning strategies" (School B's School Plan, 2015, p. 5). Standardisation in either ICT integration approach or learning platform was not apparent in neither their school plan, nor their interview. The relationships in both School A and B between the teaching staff and the Technical Support Officers (TSO) that are so important in permitting ICT integration hinted at here are explored in detail in the next section.

7.2. Community Relationships

This theme of Community Relationships was the second to be identified from the TA in both interviews and school plans for Schools A and B. These relationships were seen to varying levels of importance in both schools. Their school plans highlighted the need to incorporate external stakeholders like parents. Parents in School B were seen as pivotal in ensuring their student bodies were well-adjusted, supported and nurtured towards their schooling goals. In School A, the link between ICT Implementation and Community Relationships could be seen in their decision to use a blended learning environment based upon parental concerns for their children (also see Section 7.1). In addition, each school's individual school plan also referred to how they wanted their schools to be perceived in the community (i.e. their brand power). The example excerpts given in Table 5 illustrated the importance of their parent community.

Table 5.

Data excerpts for Community Relationships.

School	Interview Excerpts	School Plan Excerpts
A	“The parents like to give feedback, but it’s not always ... it’s considered but it’s not always acted upon ... But ultimately, most of those decisions are made by [the DP] and the principal” (School A DP interview, 10:00am, December 13, 2017).	“A highly energised parent community will support the school’s initiatives, priorities and innovative programs which will include 21 st Century education, creative and performing arts, technology for learning and student leadership programs.” (School A’s School Plan, 2015, p. 1).
B	N/A	“Parents/Carers: Parents support school-based well-being initiatives by being actively informed of well-being programs through parent information sessions, newsletter items and the use of the parent portal on Sentral ... Parents/Carers: support students in taking responsibility for their own learning through the use of the parent portal.” (School B’s School Plan, 2015, p. 5).

Note. No interview data for School B was found to correspond with the theme of Community Relationships.

School A’s plan appeared more aspirational, driven by the 21st Century Education paradigm in its approach to ICT maintaining relationships with parents. The explicit inclusion of parents again by School A in both ICT Implementation and Community Relationships further highlighted their importance to School A. Moreover, parents’ feedback was referred to in the interview with the DP from School A.

School B’s plan encouraged parents to be more informed about the school’s initiatives through their parent portal. Parents in School B’s plan were directed to avail themselves of the information available on Sentral as illustrated in Table 5. In addition, parents were expected to support their children develop more independent learning through their use of this portal. Nevertheless, the DP of School B did not make any reference to parents during their interview.

However, when parents in School A gave feedback on the result of ICT co-ordination efforts, their feedback was not always factored into ICT decisions (see Table 5). Parents of School B only engaged with ICT co-ordination efforts through the set up and use of their School Portal. More detail on decision-making processes is given in the next section.

7.3. Decision Making

This theme across both School A and B produced a large amount of data. The amount of data itself may be indicative of the importance of decision-making processes inside School A and B affecting ICT integration efforts. Despite the large amount of data from the interviews, their respective school plans did not include relevant data around this theme (refer to Table 6).

School A and B involved the entire Senior Executive Team (i.e. Principal, DP and Headteachers) in decision-making. Other staff members in School B, such as the Computing Teacher and the ICT Committee, had a more consultative role in that they provided the Senior Executive Team with additional information to make key decisions.

In School A, ‘James’ (pseudonym used) from the New South Wales Department of Education (DOE) acted as an external advisor on ICT integration matters. James featured very significantly in their decision-making processes. See Appendices 11.2 and 11.3 for sample extracts from each school’s interview that illustrate the role of these other staff members. There was also a high degree of overlap between decision-making and resourcing of ICT initiatives in both schools. The table below details interview excerpts around the theme of Decision Making.

Table 6.

Data excerpts for Decision Making.

School	Interview Excerpts	School Plan Excerpts
A	<p>“I guess I decide what new hardware we need to purchase. And I put purchase orders through. So I pick the product and then ask the finance staff to order them. I liaise with the TSOs and say, ‘okay this machine needs to go here, this machine needs to go here’ [gestures pointing at two different machines being placed in different locations], ‘prioritise this’” (School B DP interview, 4:00pm, March 6, 2018).</p> <p>“I’m the only DP in the school, I’m doing EVERYTHING and my decisions are often budget-driven. And still, they’re always going to be budget driven, but I’d really like ... ahh ... to see one member of the executive who it is essentially their job to kind of take ownership of [ICT co-ordination]” (School A DP interview, 10:00am, December 12, 2017).</p>	N/A
B	<p>“So basically what happens is you have to go back to this, the year before. As a faculty Headteacher, whatever assets are needed, whether it’s hardware like a printer, they need to put it in their budget. The budget sheets are submitted to the principal. The principal and the Senior Exec analyse the data, prioritise the items. And then I (as IT Co-ordinator) get a list on IT requirements, and then we prioritise as a team” (School B DP interview, 4:00pm, March 6, 2018).</p>	N/A

“The guy that does one day a week has worked for many years at other schools in the same capacity ... I rely on him a lot when we’re making decisions to ask his advice. Because he’s got lots of experience in schools and he can also say ‘Well that’ll work but that won’t work’” (School B DP interview, 4:00pm, March 6, 2018).

“I also have a Computing Teacher... So that if I feel, cause, I don’t really quite know, like, I’m not a computer teacher, but I’ll say to her “Can you have a play?”... And she can trial the product from a teacher’s point of view” (School B DP interview, 4:00pm, March 6, 2018).

Note. No school plan data for School A or B was found to correspond with Decision Making.

In School B, there was a high level of emphasis placed on consultation to make decisions and thus install resources in their school. The DP referred to both past and present requests from each faculty for ICT acquisitions to be made on their behalf. School B, being more established, had access to existing ICT assets, budget submissions from the Headteachers of each faculty based on existing infrastructure, priority lists from previous budgetary iterations, and the TSO’s log of issues. The decision-making process in their school was quite methodical (see School B’s interview excerpts in Table 6). An additional role for the Computing Teacher in School B further expanded the staff members consulted on ICT acquisitions.

This contrasts with School A, where a lot of this process ended up on the shoulders of their DP. The lack of wide-ranging consultation in School A may be indicative of the time constraints their DP had to discharge ICT co-ordination duties. Often decisions were made

based upon budgetary considerations rather than pedagogical or technical issues as illustrated by the interview excerpts in Table 6 for School A.

Great value was also placed on the advice from the TSOs in both schools. For School B, their TSOs provided valuable information on how other schools in the area achieved the same ICT goals. Their information on technical problems and issues inside their school was used to prioritise items for repair or purchase. School A also relied on their TSOs to provide strategic information for ICT co-ordination efforts inside their school. One of them in particular at School A, due to his experience with other schools, was relied upon for advice (see Table 6).

In both cases, TSOs were often the difference between requests for ICTs being acquired, repaired or rejected. This in turn led to the resources being made available to both schools. The importance of the TSOs underlined the critical nature of the technical information provided by the TSOs in ICT co-ordination decisions. The inclusion of these resources and their use in decision-making processes are discussed in more detail in Section 7.4.

7.4. Resources

For both DPs in School A and B, the theme of resourcing generated a lot of discussion in their interviews. They emphasised their responsibility to balance school political needs, government requirements and the financial reality of what their respective schools could afford. The effect of decision-making on resourcing and vice versa was evident throughout their interview responses. The use and need of ‘experts’ in ICT decision-making and thus resourcing featured prominently in their interview responses and reinforced just how interlinked these two themes were. Interview excerpts from both School A and B as given in Table 7 on the next page reinforce the level of importance given to the question of resourcing.

Neither School A nor School B's school plans made direct references to ICT resourcing. Only vague mentions appeared in their school plans. In both school plans, these references to people as resources occurred within the context of school improvement.

Table 7.

Data excerpts for Resources.

School	Interview Excerpts	School Plan Excerpts
A	<p>"I tell you what, that Futures Learning Unit – is it the Futures Learning Unit? It's the Futures Learning Unit in the Department. It's been set up not that long ago. Supremely unhelpful. ... There was nowhere in the department that seemed to be able to provide support for what you need to do as a new school, so every time we would phone a section of the department to find out our T4L [Technology for Learning] roll-out ... they wouldn't be able to point us in the direction of support for developing policies or anything like that" (School A DP interview, 10:00am, December 12, 2017)</p> <p>"I think the department got rid of Computer Co-ordinator roles in schools a few years ago ... I think it ends up being the TAS Headteacher because, you know, you assume that the TAS Headteacher who can teach ICT is obviously best placed to do that. But, umm ... you know, in a lot of schools, it is the DP that ends up with it ... I think having that Computer Co-ordinator role as an established role with [time release] and with a financial compensation was a good thing and it's a shame they got rid of it" (School A DP interview, 10:00am, December 12, 2017).</p>	<p>"[Teachers are] encouraged to take on roles and responsibilities beyond the classroom" (School Plan for School B, February 2018, p. 5)</p>

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| B | <p>So my list actually tells me how old things are, and where to, and how often to replace, and how many people have. Like, how many staff in English, how many in Science. And then we look at how many, based on equity, right?</p> <p>(School B DP interview, 4:00pm, March 6, 2018).</p> | <p>“Teachers will work together to incorporate 21st Century Learning Skills” (School Plan for School A, December 2017, p. 3)</p> |
|---|--|--|
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Each school’s focus on resourcing was different. It was clear to School A from the outset that they needed expertise from the DOE. Yet attempts to request any resources and expertise to help with the set-up of a new school only resulted in frustration. The DP for School A was especially critical at the lack of support from the Futures Learning Unit in setting up ICT facilities for a new and growing school such as School A (see Table 7). The Futures Learning Unit was set up as a part of the DOE to implement their Future Focussed Schools policy (see Appendix 11.4). This unit was supposed to be a resource for new schools to guide them through ICT hardware, software and policy implementation.

The DP at School A also lamented not having a dedicated person for ICT co-ordination. Citing the competing demands of the role of DP inside a school, ICT co-ordination responsibilities ended up being moved down the priority list as other more pressing matters had to be dealt with. The DP expressed how useful an ICT co-ordinator would be in their context (see Table 7).

Conversely, School B’s DP indicated that all ICTs acquired had to fit in with what was already there in the school based on “equity” between the faculties or departments inside the school, as the interview excerpt in Table 7 for School B demonstrates. “Equity” for School B meant that factors such as faculty size, class sizes, previous ICT requests and budgetary constraints were balanced against overall needs of the school. Being more established, School B’s focus was ensuring that the ICTs used fit their school context.

Getting ICTs which were effective, trialled by others and eventually used were indicative of School B's approach to ICT co-ordination. A careful approach was adopted as budgetary constraints were an important consideration for School B. These budgetary constraints may have prevented a more adventurous attitude of experimentation with ICTs and pedagogical practices. In turn, the effect of ICT resourcing on staff attitudes and beliefs is explored in Section 7.5.

7.5. Staff Attitudes and Beliefs

School A and B dedicated a significant proportion of their school plans on the importance and promotion of school culture. Staff themselves were seen as purveyors of school attitudes and beliefs. Collegiality, collaboration and sharing are the hallmarks of how teaching and learning within both schools were improved. The central focus on beliefs and attitudes in driving any change, especially in teaching, learning and ICT integration, is mirrored in the interviews with both DPs. The excerpts in the table given below illustrate how similar their beliefs in school culture driving change were:

Table 8.

Data excerpts for Staff Attitudes and Beliefs.

School	Interview Excerpts	School Plan Excerpts
A	<p>“We draw upon the expertise that we do have in the staff. I get them to present because we don't have heaps of teachers who have been teaching twenty years here to draw upon. So, umm ... I think, it contributes to that willingness to try new things. That people see that other people's enthusiasm is validated and appreciated. I think that it's a good Petri dish for technology.”</p> <p>(School A DP interview, 10:00am, December 12, 2017).</p> <p>“Teachers are likely to be moving between the two campuses quite frequently. There's a</p>	<p>“Teachers will develop a culture of collegiality and peer observation using the Quality Teaching Framework to encourage reflective, self-evaluative practice.” (School A's School Plan, 2015, p. 3).</p>

desktop computer on both sites. They can access the same files, so I think it's about trying to shift ... people I guess to think less about the hardware and to think more in a cloud, that their files are all available to them (School A DP interview, 10:00am, December 12, 2017)."

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| B | <p>"Q: Okay. And would you be able to say what those different platforms, overall, not make them successful? I.e. what specifically made those teachers want to use them?</p> <p>A: I think it depends on the faculty. Because if you have someone using it, then and the others can actually –you know how you learn from each other? ... So they then are more successful with certain faculties than with others."</p> <p>(School B DP interview, 4:00pm, March 6, 2018).</p> | <p>"Teacher engagement in professional learning and collaborative sharing of learning – teacher professional learning realised in annual evaluations" (School B's School Plan, 2015, p. 5).</p> |
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In School A, the collegial culture outlined in the school plan corresponded to a desire by the DP at School A to shift staff thinking into a more cloud-based future. Being an open platform school, cloud-based thinking was seen as vital to ensuring maximum flexibility as the school grew in size across two campuses.

The shift in staff belief towards cloud-based computing so desired by the DP may then have permitted a more flexible and less costly ICT acquisition process for the new campus. ICT co-ordination efforts then would also have been reduced from having to manage both laptops and desktop machines across two sites to just the provision of desktop machines accessing the same materials on both campuses. The next section discusses how these staff attitudes and beliefs could affect staff knowledge of ICT integration techniques.

7.6. Staff Knowledge

Both School A and B featured drawing on staff knowledge to transform teaching and learning practice. They also emphasised the need for that knowledge to be shared with other staff in a collegial manner. There was significant overlap between the themes of Staff Knowledge and Staff Attitude and Beliefs. Each of their School Plans underlined the importance of training and professional development to improve their teachers' pedagogical practices. School A linked teacher training and thus Professional Learning to their whole-school curricular programming and direction. School B linked teacher training to teacher-led goalsetting, involvement in Professional Learning and teacher improvement. The approach taken by each school to the development and maintenance of staff knowledge is illustrated by Table 9 below.

Table 9.

Data excerpts for Staff Knowledge.

School	Interview Excerpts	School Plan Excerpts
A	“And we have a two minute training where someone gets up and does a professional learning activity for everyone. And a lot of those are ICT-based. Umm ... and our professional learning generally as a school ... I think our teachers find it very helpful and very practical.” (School A DP interview, 10:00am, December 12, 2017).	“Teacher training occurs on whole school programming. This is linked to strategic directions and linked to the PDPs and include negotiated class room observations using an agreed proforma developed by the school.” (School A’s School Plan, 2015, p. 5).
B	“I’ve got another [TSO] who’s really knowledgeable, who works across all other schools as well. So he knows what’s most advanced out there ... And he’ll go “No, I’ve got a different spec” and that’s exactly what happens here ... He then has a bigger picture.” (School B DP interview, 4:00pm, March 6, 2018).	“The school has embedded and explicit systems, such as scheduled lesson observations, Thursday afternoon professional learning meetings, timetabled opportunities for teacher reflection and sharing of successful pedagogy, ... the modelling of effective practice.” (School B’s School Plan, 2015, p. 5).

7.7. Technical Support

School A and B referred to the support and maintenance of their ICT infrastructure and staff in their interviews only. No mention of it was made in either of their school plans. This is shown in Table 10 below. Technical Support was often overlapped with the execution of other duties inside the theme of Resourcing, demonstrating how technical support was restrained by school resourcing and vice versa. In School B, evidence was taken from TSO's support logs of ICT issues around the school in decisions to maintain technical capability (see Table 10 and Appendix 11.3).

Table 10.

Data excerpts for Technical Support.

School	Interview Excerpts	School Plan Excerpts
A	<p>“We don’t provide any technical support. That’s a part of the contract that they sign when the first come on board.” (School A DP interview, 10:00am, December 12, 2017).</p> <p>“Although I do think that there are still issues with the wireless that do happen that teachers don’t report, and they just work around it, and they say ‘Oh I just won’t do that today’. But the reason why we got the TSOs for three days was so that we could get them to go in and fix these issues. But I think that sometimes teachers just don’t bother reporting those” (School A DP interview, 10:00am, December 12, 2017).</p> <p>“But technical support is the parents’ responsibility and they have to take it to an external provider because the Department doesn’t pay for that.” (School A DP interview, 10:00am, December 12, 2017).</p>	N/A

B	<p>“So my tech support person, so he’s got a log. So he knows. We’ve got so many in the whole school. So I basically say to him – they give me a list at the end last year, they give me a back story as to how often they have to fix things.” (School B DP interview, 4:00pm, March 6, 2018).</p>	N/A
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Note. No school plan data was found to correspond with Technical Support.

The DP of School A referred to how resourcing restraints affected the level of technical support (see Appendix 11.4 for a definition) which the school could offer its students. The same DP also expressed frustration at staff not reporting issues with ICT infrastructure such as Wifi problems around the school (see Table 10). This was in spite of the DP’s ICT co-ordination efforts focussed on acquiring as much technical support via the TSOs as was allowed under DOE school funding rules.

Additionally, technical support for the students’ own BYOD machines was provided by the parents of their students, also due to these funding rules (see Table 10). Technical Support Officers (TSOs) were only permitted to help students connect their own Bring Your Own Device (BYOD) machines to the wireless network. This restriction on their duties was discussed in School A’s interview shown in Table 4. The effect of this lack of support for students and reporting of ICT infrastructure issues for staff members is explored further in the Discussion Chapter of this thesis.

7.8. Internal and External Factors

To identify the most prominent factors affecting ICT co-ordination, the themes listed in Table 3 were revisited, synthesised and re-categorised. This re-categorisation lead to the emergence of two groups of themes: internal and external factors. Internal school-based factors referred to those themes which had a direct impact on ICT co-ordination. These included the themes of Decision Making, ICT Implementation, Staff Attitudes and Staff Knowledge.

External factors referred to those themes where indirect influences such as school context, parents, DOE policy, socio-economic variables etc affected ICT co-ordination. These external factors included the themes of Resources, Community Relationships and Technical Support. Both internal and external factors will be further analysed in the Discussion Chapter.

7.9. Activity Systems Analysis (ASA)

This section is structured around the Activity Systems Analysis (ASA) of both School A and School B. Tensions are described for each school in Table 11. The ASA triangles for both schools are presented side-by-side on the next page to facilitate understanding and comparisons between the two schools.

School A's ICT co-ordination efforts were constrained by the interactions between the rules and tools available. These constraints were imposed by NSW Department of Education (DOE) through their own policies and regulations (see Appendix 11.2). Data for School A suggests that decision-making processes were about navigating the rules imposed on them by the DOE. Their focus as a new school was to increase resources available to their student and staff body. The three tensions that arise because of restricted funding and external government policy are shown in School A's ASA triangle in Figure 4.

School B shared similarities with School A. They shared a similar subject in that the Deputy Principal (DP) was also in charge of ICT co-ordination efforts inside their school. The principal rule for ICT integration in School B was that it had to fit in with existing infrastructure and practices (see Section 7.1 and 7.4). However, this meant more extensive consultation than in School A (see Section 7.3). The object of School B focussed on decision-making processes that aided the acquisition of ICTs to facilitate ICT integration. Two tensions that arose because of this consultative approach and the need to reduce obsolescence are shown in Figure 5.

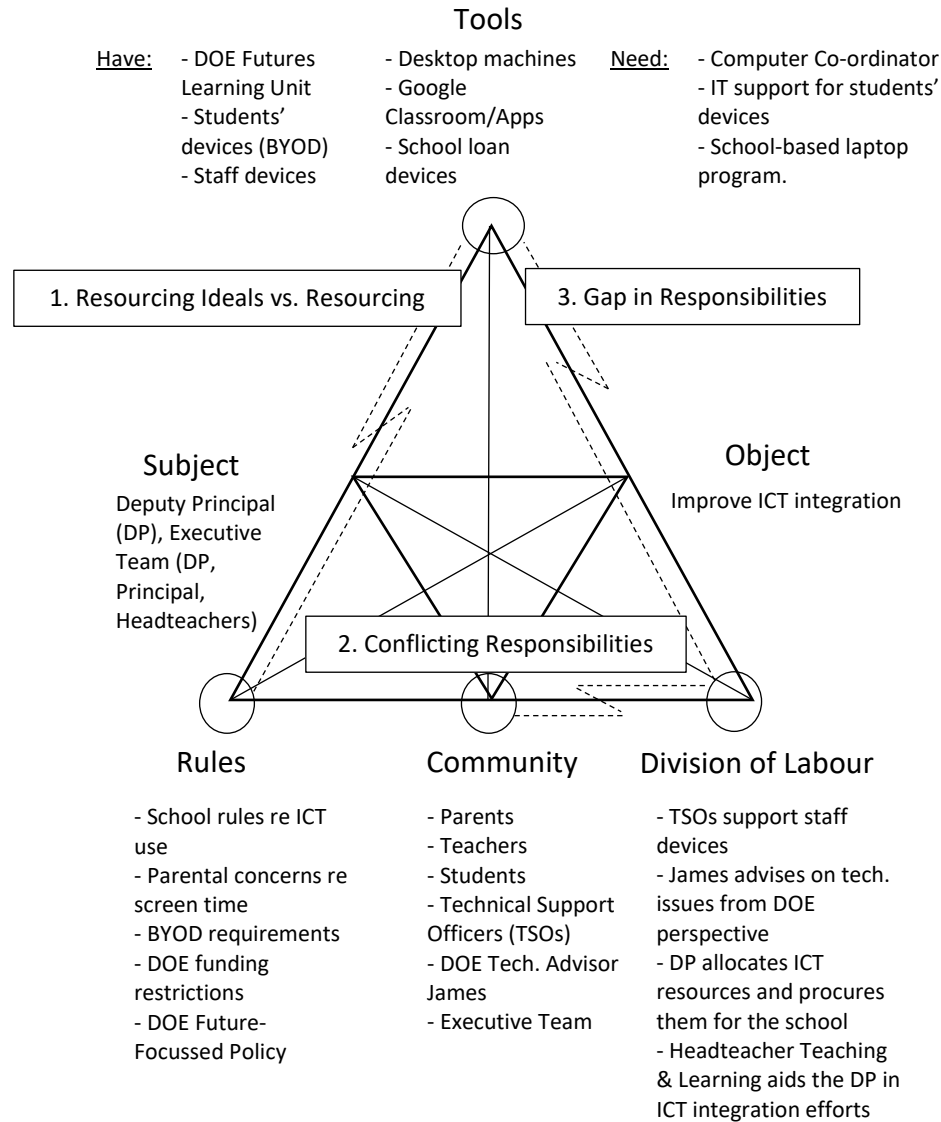


Figure 4. Activity Systems Analysis (ASA) for School A.

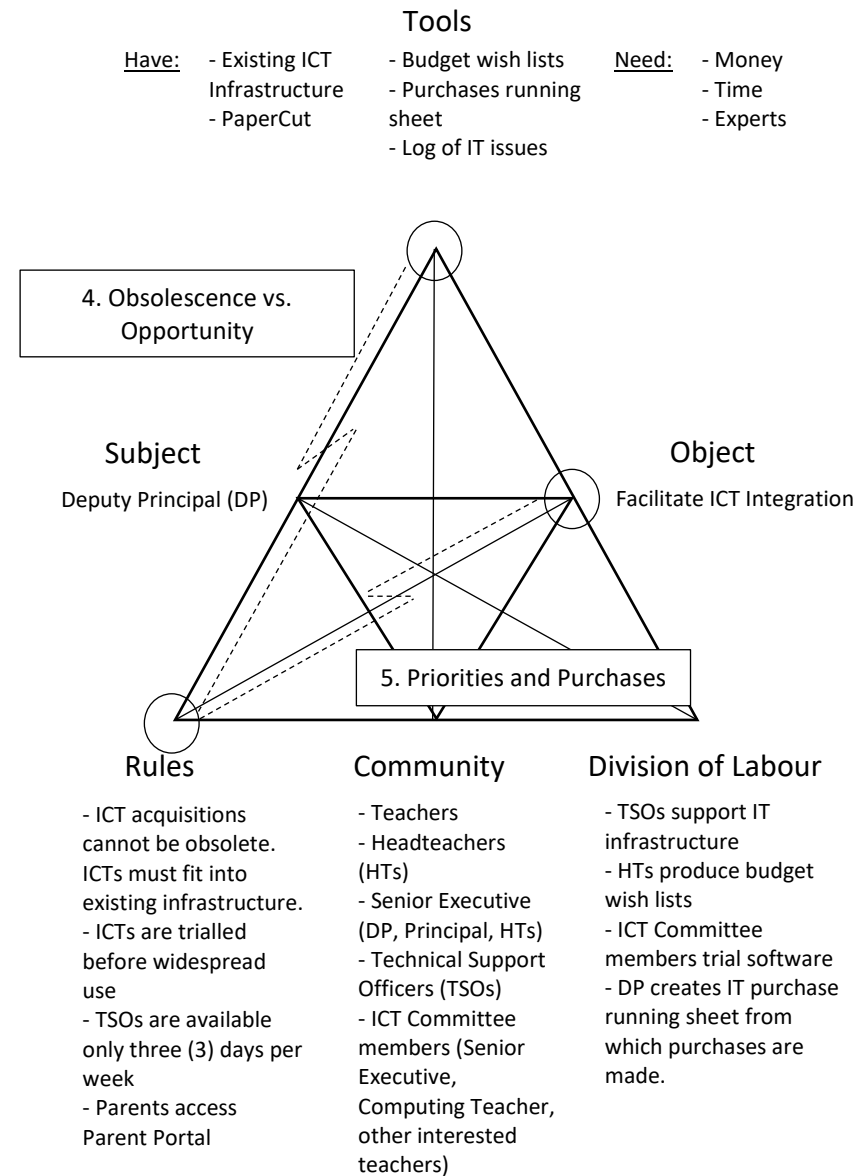


Figure 5. Activity Systems Analysis (ASA) for School B.

The tensions defined in Table 11 below were the result of a second analysis of each of the themes with their associated data excerpts. Interview questions probed for which interactions worked and which ones posed problems for the schools. Problematic interactions which caused contradictions between components of each school's Activity System became the tensions given here. School plans either confirmed or provided additional information as to how and why these tensions occurred. How these tensions affect internal and external factors in both School A and B are discussed further in the next section.

Table 11.

Tensions in School A and B.

Number	Tension	School	Definition
1	Resourcing ideals vs. resourcing reality	A	The impact of externally-imposed rules and tools on School A. The interview excerpt in Section 7.4 provided an insight into how having both a rule and a tool externally imposed adversely impacted School A's ICT integration efforts and thus ICT co-ordination more generally.
2	Conflicting responsibilities	A	The blurred lines between who was considered employed by the school and who was considered external staff. One pertinent example was the responsibility level of James from the DOE. James was responsible for overall ICT technical advice for a region of schools (see Appendix 11.2).
3	Gap in responsibilities	A	Impacts of externally-imposed resourcing policies and tools on the division of labour, or how schools assigned tasks to school community members. One effect of this tension in interaction between tools and division of labour was on the need for individualised support for pedagogical and technical issues around ICT integration. The lack of a Computer Co-ordinator to provide this support (see Section 7.4) may have reduced the effectiveness of ICT integration efforts.

4	Obsolescence vs. opportunity	B	The conflict in trying to both ensure that all ICTs fit within existing infrastructure as well as not be obsolete by the time they're purchased. The need to ensure 'fit' was seen by the school to go couple with more extensive consultation with their community than School A (see Section 7.1).
5	Priorities and purchases	B	How school processes dictate that information from the community plus known IT issues directly factored in the creation of priority lists for purchase (see Appendix 11.3). They facilitated ICT integration efforts using an IT Committee (see Section 7.3).

8. Discussion

The findings of this study revealed that the role of ICT co-ordination in School A and B rested on the success of the Deputy Principal (DP) balancing ICT co-ordination activities with the other aspects of their roles inside schools. The complexity of their role meant that a case study methodology was applied to interrogate each school's particular context without methodological or conceptual constraints (Harland, 2014). Prominent factors and tensions will be discussed and how they affect affecting ICT co-ordination. In addition, a comparison of similarities and differences between both School A and B and Australian versus overseas schooling contexts – such as those between Australia, Singapore, Turkey and Cyprus noted in Chapters 2 and 3 – will also be highlighted.

8.1. Internal Factors

8.1.1. Decision Making.

Decisions in both School A and B had to balance their wishes against what the DOE would provide them. For example, in School A, their DP lamented the lack of a dedicated Computer Co-ordinator. They saw this role as vital in being able to facilitate better technological, pedagogical and training choices for teachers (see Section 7.4). This tension between the 'rules' and 'tools' in School A's Activity System, indicated by *Tension 1: Resourcing Ideals vs. Resourcing Realities* in Section 7.9, meant that decisions were made based on budgetary constraints and on-the-fly rather than addressing technological or pedagogical concerns (see Appendix 11.2). Research by authors such as McDonagh and McGarr (2015) supported the position taken by School A's DP with respects to ICT Co-ordinators. Furthermore, they would have facilitated the interaction between the rules and tools as they provided the pedagogical and technical skills to further ICT integration (Rodríguez-Miranda et al., 2014; Sugar & Holloman, 2009). This meant that the overall 'object' of improving ICT integration took second place to actually procuring enough funding for ICT

acquisitions. In other words, the tension between tools, rules and the division of labour were not reconcilable in the opinion of School A's DP without a dedicated ICT co-ordinator.

In School A, this tension could have been a left-over from when decision-making was more centralised (Gavin & McGrath-Champ, 2017). The impact of government policy and regulations on how ICT integration is implemented in schools is well-known (Cartwright & Hammond, 2007; Karagiorgi, 2005; McDonagh & McGarr, 2015). For example, Computer Co-ordinators' time release was seen as 'concessional periods' (NSW Department of Education, 2018b). This meant that schools could decide whether to use these periods to have someone do this role or redistribute these periods to what they saw as 'needier' parts of the school. This redistribution of periods appeared to echo the intent of the NSW Department of Education's (DOE) *Local Schools, Local Decisions* (LSLD) policy. This policy devolved significant financial and staffing powers to government schools to make better choices on curriculum, student achievement, and staffing suited to their specific schooling contexts (Caldwell, 2016; Gavin & McGrath-Champ, 2017; Reynold & Macpherson, 2015). Notwithstanding this, the number of staff and concessional period allocations are still externally determined by the DOE (e.g. NSW Department of Education, 2018b). In turn, School A could encounter more internal processes at the DOE end which may not have as yet fully aligned themselves with the reality of schools administering themselves.

For School B, the process of prioritising school ICT requirements against the dual rules of non-obsolescence and best fit ensured that a balance between the faculties and items which needed urgent repair could be struck (see Section 7.3 or Appendix 11.3). This tension, captured in *Tension 5: Priorities and Purchases* between the 'rules' and the 'object' in Section 7.9, mirrored the literature in explaining the competing demands on an ICT Co-ordinator (Lynch et al., 2002; Rodríguez-Miranda et al., 2014; Vanderlinde et al., 2012). In addition, tensions around meeting budgetary requirements while reducing obsolescence, as expressed by *Tension*

4: *Obsolescence vs. Opportunity*, also played an important role as to what was eventually acquired for the school. Vanderlinde et al (2012) even placed the responsibility for balancing policy requirements against the object of facilitating ICT integration on those in the ICT co-ordination role. Like School A, without a dedicated ICT or Computer Co-ordinator, this decision-making was left to the DP of School B. More money and more access to experts was seen by the DP at School B as a way of improving ICT co-ordination in the school (see Appendix 11.3 and Table 1) and thus alleviating *Tensions 4* and *5*. Decisions made by both schools with regards to their respective tensions have a direct effect on how ICT was implemented. ICT implementation is discussed further in the next section.

8.1.2. ICT Implementation.

ICT implementation in School A was affected by *Tension 1: Resourcing ideals vs. resourcing realities*. DOE funding rules and the fact that they were an academically non-selective government (comprehensive) school meant that they could not expect parents to fund a student laptop programme. The ‘rules’ and the ‘tools’ were again in conflict. Nevertheless, School A’s preference for a full school-based laptop programme would have provided the best opportunity to embed ICTs as a natural extension of best practice rather than an add-on (see Appendix 7.1). In addition, whole-school accessibility to ICTs was noted earlier in this thesis as a determinant of ICT integration success (see Table 1). The rules governing what schools do with funding as against how much funding (i.e. the ‘tools’) they actually get may directly influence the effectiveness of ICT integration inside schools (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Tubin, 2007). For School A, this meant an increased focus on the budget at the expense of improving ICT integration.

Additionally, DOE rules on device support specifically excluded students’ own BYOD machines (see Appendix 11.2). The seamless use of ICTs in classroom practice may not have occurred as there were times that the students’ devices were either not available or not in

working order, especially at the end of the year. The object of improving ICT integration may also be hindered as a result (see also Section 2.2) due to a lack of consistent access to ICTs. This lack was noted by the literature as a major impediment to ICT integration (Blin & Munro, 2008; Hsu, 2017; Robertson et al., 2006). Thus, teacher support and training, a major factor in ICT co-ordination (Lawson & Comber, 1999; Robertson et al., 2007), could also not take place. As a result, it was difficult for School A to compete on a level playing field with the better resourced private and other public schools in the neighbourhood.

The need to alleviate *Tension 4: Obsolescence vs. opportunity* in School B's ICT co-ordination processes aimed to integrate ICTs into what already existed inside the school. This was from both a technical and pedagogical viewpoint, designed to ensure maximum usability and comfort for the teachers attempting ICT integration (see Section 7.1). Their decision to ensure maximum incorporation of existing practices and technologies was supported by research into the success of ICT integration practices (Cartwright & Hammond, 2007; Ingram, 2016; Karasavvidis, 2009; Tearle, 2003). Simultaneously, School B identified the need to ensure that all acquired ICTs were up-to-date and in line with models and specifications from other schools (see Section 7.1). The literature supported the school's decision to proactively counter obsolescence (Cuban, Kirkpatrick, & Peck, 2001; Flanagan & Jacobsen, 2003; Tirado Morueta et al., 2010). Meeting the need to incorporate existing technologies and practices as well as reduce or eliminate obsolescence might at first appear to be impossible to reconcile. The extensive consultation and ICT trialling processes (see Section 7.4) may have gone some way to balance progress versus best 'fit' i.e. to alleviate *Tension 4*. The implementation of ICT in both School A and B was affected by the amount resources the DOE would provide.

In Australia and thus New South Wales, a large roll-out of ICTs for schools was executed through the Australian federal government's Digital Education Revolution (e.g. Nielsen, Miller, & Hoban, 2015). This mirrors large-scale ICT roll-out approaches used in

countries like Turkey and Cyprus (e.g. Aydin, Gürol, & Vanderlinde, 2016; Hadjithoma & Karagiorgi, 2009). After the initial roll-out of ICTs, the DOE in New South Wales moved towards its *Future-Focussed Schools* policy, which focussed on the arrangement of spaces and infrastructure to facilitate new technology-enabled pedagogies (Stevens, Ructtinger, Liyanage, & Crawford, 2018). There was no direct articulation from one ICT programme to another. This piecemeal approach has meant that there has been no system-wide emphasis or focus on ICT integration, even though the Australian National Curriculum requires this (ACARA, 2013). This approach contrasts with international practice in countries such as Singapore and Israel. Singapore implemented a plan that included both ICT Co-ordinators and a focus on teacher training (Lim & Hang, 2003; Tay, Lim, Lim, & Koh, 2012). Israel recognised the central role that ICT co-ordinators with effective administrative structures could play in facilitating ICT integration (Avidov-Ungar & Hanin-Itzak, 2017). The lack of a whole system approach could also account for the difficulties that School A experienced in obtaining help to set up their ICT infrastructure and the somewhat cautious approach used by School B in ICT acquisitions. The effect this lack of cohesive approach for ICT integration is discussed further with respects to resourcing for schools in the next section.

8.2. External Factors

8.2.1. Resources.

School A encountered *Tension 1: Resourcing ideals vs. resourcing realities* when attempting to understand what the DOE Futures Learning Unit could provide their school. The Futures Learning Unit was borne out of the NSW State Government's *Innovative Education, Successful Students* (IESS) initiative in 2016, supporting NSW public schools to "implement future-focussed learning and teaching practice" (NSW Department of Education, 2018a, para. 1). In other words, their role was to facilitate ICT integration efforts in NSW public schools. On the surface, this initiative would provide the needed support for ICT co-ordinators to

improve ICT integration efforts in their school (Cartwright & Hammond, 2007; Karagiorgi, 2005; McDonagh & McGarr, 2015). However, when asked by School A as to what support they could provide, they left the question unanswered (see Appendix 11.2). School A was often left to their own devices to try and navigate decisions around ICT hardware and software resourcing while still adhering to the rules around the DOE's Future-Focussed Schools policy.

Issues around *Tension 2: Conflicting responsibilities* arose in School A due to the lower number of allocated staff available to undertake ICT integration activities. Headteachers and the DP were required to fulfil multiple roles inside the school (e.g. Section 7.4, Figure 4 and Appendix 11.2) to bridge the gap. The conflict around who was considered a part of the 'community' from which a 'division of labour' could be pulled added to this tension. School A saw having a dedicated Computer Co-ordinator as key to resolving at least some of the tensions around conflicting responsibilities. The lack of recognition of a proper leadership role for ICT or Computer Co-ordinators reduced the effectiveness of those in those roles to improve ICT integration (Judge, 2013; Lai & Pratt, 2004). The model of ICT leadership being shared by the DP and Headteachers, though aligning with those suggested by Hayes (2007), still may not solve the problem of role and task assignment. In addition, external DOE funding rules at the time of this study did not appear to include scope for proper funding of a Computer Co-ordinator role (see Section 7.4) to resolve this tension.

School B's resourcing was dependent on the decisions made to acquire ICTs (see Section 7.4 and 8.1.1). Though not emphasised, the role that the budget given to the school by the DOE was mentioned as playing a part in decisions to do with ICT acquisitions (see Section 7.4 and Appendix 11.3). The importance of the link between resourcing and decision-making in the execution of ICT co-ordination efforts was noted by Lai and Pratt as far back as 2004. Moreover, for ICT co-ordination to be effective, a balance between resources in the form of funds (Karagiorgi, 2005) and decisions made by leadership (Rodríguez-Miranda et al., 2014;

Tondeur et al., 2010; Wong, 2008) needed to be reached. The resourcing and decision-making processes in School B were designed so that one could not occur without the other. The possibility of tensions around budgetary constraints and what ICT acquisitions are made may then have been reduced by the interlocking of these two processes.

At a broader level, the conflict between how much autonomy or devolution is given to schools and how much remains in the hands of central education authorities here in New South Wales (NSW), Australia, reflects a world-wide trend with countries dealing with this conflict in different ways (Eacott, 2011). One way is through decentralisation programmes like *Local Schools, Local Decisions* (LSLD) in NSW, started in 2013 (Caldwell, 2016; Gavin & McGrath-Champ, 2017). In this context, the fact that both School A and B belong to the DOE, which is a large centralised education authority, should be considered an anomaly with the trend away from large bureaucracies. However, the opposite is happening: countries like Singapore, Turkey, Cyprus and Israel, have kept their large centralised education authorities (e.g. Avidov-Ungar & Hanin-Itzak, 2017; Aydin, Gürol, & Vanderlinde, 2016; Karagiorgi, 2005; Lim & Hang, 2003). The centralisation of the rules, especially around budgets and resourcing, may have contributed to the issues around staffing and acquisition of ICTs for each of these schools as they cannot make decisions without considering DOE policy.

8.2.2. Community Relationships.

School A valued and depended on parents in the school's community in driving ICT integration efforts. This dependence was reflected in both interview and school plan data for School A as given in Section 7.3. The success of ICT co-ordination efforts in School A may have – at least in part – been driven by the amount of parental involvement in the types of devices they purchased for their children. As a relatively new school, involving parents right from the beginning represented best practice as supported by previous research (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). This was an especially pertinent decision given that they were

responsible for the supply and technical support of their children's BYOD machines (see Appendix 11.2).

Conversely, while parental feedback was considered in ICT use in School A, the ultimate decision regarding ICT issues laid with the School Executive, the Deputy Principal and the Principal (see Section 7.2). Parents were given the responsibility of providing the tool (i.e. the BYOD machine) but not the direct input into decision-making they may have preferred. This caused a tension between how the community and division of labour were used in ICT co-ordination efforts to lead improvements in ICT integration. This is shown in *Tension 2: Conflicting Responsibilities* in Figure 4 between who is in the 'community' and what is involved in the 'division of labour'. In addition, parental feedback in relation to ICT use might have provided additional pressure on ICT co-ordination efforts to meet their expectations (Sweeney, 2009). This could have reduced the school's influence in educational discourse on ICT knowledge and use by staff (McDonagh & McGarr, 2015). However, interpersonal factors such as the interaction between parents and the school were seen as necessary to ensure ICT co-ordination success (Karagiorgi, 2005; Tan, 2010). Therefore, a resolution to *Tension 2* could be had by providing a more structured way for parents to engage with school ICT integration efforts (Blau & Shamir-Inbal, 2017; Lewin & Luckin, 2010).

School B saw their Parent Portal provided through Sentral as a way to drive more independent learning behaviour from their student body (see Section 7.3). Parents were used as a gateway to model more independent learning behaviour (Divaharan & Ping, 2010) through them accessing Sentral for school information. This 'rule' is reflected in School B's school plan but not in their interview data. Thus parental impact on their school community made may be lower than what is considered best practice (Lim et al., 2013). Like School A, a reason for this lack of parental impact may be due to the school wanting to avoid additional pressure on ICT co-ordination efforts to meet their expectations (Sweeney, 2009). The complete absence

of parent consideration in the interview data suggested a lower level of importance placed on parents in ICT co-ordination efforts.

8.3. Limitations of this Study

This thesis is based on a case study methodology with two schools chosen using convenience sampling. This approach allowed a more in-depth analysis of the interactions and elements that drove ICT integration. In addition, it was deemed most effective due to the limited timeframe and scope of this Master of Research thesis. The limited timeframe, the focus on only two schools and their perceptions of their school's respective ICT co-ordination efforts limit the generalisability of any findings.

In addition, Thematic Analysis (TA) was performed across interviews and school plan data for each school to dissect the recurring issues in each school's ICT co-ordination story. Extracted themes were then grouped into internal and external factors, allowing identification of the most prominent factors between both schools to be discussed. Engeström's Activity Systems Analysis (ASA) was then used to analyse these schools as whole systems, breaking them down into their constituent elements and interactions. These tensions, in combination with the internal and external factors, meant that they both could be analysed separately at a micro level and within the context of how parts of both these schools interact with each other at a more macro level. The ability to look at the macro and micro level meant that more analysis across both schools was possible than would otherwise occur with a straight case study methodology.

Although a case study methodology is very useful as it focusses on depth rather than generalisability (Harland, 2014; Thomas, 2011), in future studies more schools could be analysed, across both the private and public sectors and across multiple socio-economic brackets. This would facilitate comparisons and acquire more generalisable results. Schools whose student bodies come from families in low, middle and higher income brackets could

then be compared. More pertinent groupings of the themes, other than those internal and external factors, could then occur. The interactions between ICT integration efforts, the role of ICT co-ordination and their schools could then be compared and contrasted along socio-economic and sectorial (i.e. public or private) lines. More generalisable findings could then be used to guide schools to improve processes, improve the status of ICT co-ordination thus making ICT integration more efficient and effective. Moreover, further consideration of the socio-political climate in which schools operate could be better explored, increasing the likelihood of generalisable findings. Implications of this research, despite these limitations, are given in the next section.

8.4. Implications

In both School A and School B, decisions on ICT co-ordination were made by the DP. There was no budgetary provision by the DOE for either school to have a Computer Co-ordinator, or a person designated solely to facilitating ICT integration. Though Hayes (2007) details how the function of ICT co-ordination can occur without a dedicated person, most of the other literature noted here in this thesis assumes their existence. For these researchers, an ICT co-ordinator with properly assigned leadership responsibilities is seen as vital to facilitate ICT integration (Mulkeen, 2003; Sugar & Holloman, 2009; Tirado Morueta et al., 2010). More research is necessary to ascertain a more efficient model of ICT co-ordination in NSW schools and how tensions around budgetary constraints and pedagogical visions for ICT integration could be resolved. In addition, policy settings should be explored that would allow someone to hold the role of ICT co-ordinator or to execute the function of ICT co-ordination more effectively.

Though parental involvement plays a significant role in successful ICT integration (Blau & Shamir-Inbal, 2017; Elgali & Kalman, 2010), their involvement was not evident in this study. Schools were worried about not meeting parental expectations as well as controlling

the information flow. Future studies should also focus on how ICT co-ordinators could better communicate and collaborate with parents to set up sustainable, efficient and pedagogically appropriate ICT integration practices for students.

The focus of ICT co-ordination processes differed in School A and B. School A's processes were targeted to acquire ICTs to improve ICT integration by their teachers. The role of ICT co-ordination and thus their decisions on ICT integration in areas like school-based laptop programmes were noted as major factors in determining its success (Karagiorgi, 2005; Lim & Oakley, 2015; Papaioannou & Charalambous, 2011). Conversely, School B focussed ICT co-ordination efforts on ensuring that ICTs acquired by the school integrated into existing infrastructure and teaching practices. Ensuring 'fit' into existing infrastructure and practices were also noted by the literature as a factor of ICT co-ordination success (Tondeur et al., 2010). Future studies should aim to provide possible solutions to balance the need to improve ICT integration and incorporate acquired ICTs into existing practices. Furthermore, policy settings that enable schools to be more flexible with how ICT co-ordination decisions are executed could also be explored considering the DOE's LSLD initiative.

9. Conclusion

The main concern for the schools discussed in this thesis is how to most effectively use external factors such as resources from the DOE in their classrooms. With both the tools and rules controlled by external bodies like the DOE, the amount of autonomy and flexibility in provisioning for someone like an ICT co-ordinator is limited. This means that the DPs handle ICT co-ordination responsibilities on top of all their other administrative duties in the day to day running of a school. As other parts of the school get priority, ICT co-ordination and thus improving ICT integration may get lost. Decisions become more about the budget rather than how existing and new ICTs can be used to improve staff pedagogy and thus student engagement. This narrow focus potentially leaves ICT integration practices behind that of other countries. In newer schools, such as School A in this study, establishing networks and relationships to ensure greater access to resources present another layer of challenge in improving ICT integration practices. Not having a dedicated person or mechanism for ICT co-ordination reduces the status and thus the capacity for better ICT integration to occur.

In an environment of multi-tasking DPs, community relationships don't get a chance to be fostered. Parental input into ICT co-ordination decisions is limited. Information flow is generally one way, from the school to the parent. The status of parents and other community relationships is relegated to being on the school plan i.e. words in a report. Maintenance of community relationships, such as those between schools and parents, could increase parent engagement and thus further ICT integration efforts through community pressure. Yet without a dedicated ICT co-ordination mechanism or person, the time needed to improve communications, parental involvement and perhaps even ICT integration is simply not enough.

Internal factors such as decision-making and ICT implementation are shaped by external factors. Decisions on the 'nuts and bolts' of ICT implementation such as ICT acquisitions or what model of ICT integration to use are made with budgets in mind, rather

than pedagogy or even student benefit. With no official ICT co-ordinator or mechanism, the DPs in this study are then forced to use their own frame of reference and either make decisions quickly and on the fly or spend extended periods of time in consultation to ensure that meagre resources are used most effectively. The ability to co-ordinate or even supply any form of technical support and training is limited. Moreover, the access to ‘experts’ and other such resources requested by schools can more readily be resolved were an ICT co-ordinator given the responsibility to conduct such research from a pedagogical point of view rather than just focussing on the acquisition of ICTs.

International experience in countries such as Israel, Singapore, Turkey and Cyprus may provide schools in Australia with other models of how having an ICT co-ordinator can improve ICT integration. The role, function and status of this ICT co-ordinator can determine the effectiveness of teacher training into technology-centred pedagogies, as well as the reasons and types of ICT acquisitions. Moreover, an ICT co-ordinator with the correct role, function and status is able to provide the type of influence necessary to embed change and improve teacher practices. This improvement would occur through their knowledge and control over the link between pedagogy and technology. Additionally, the effect of a centralised versus a more decentralised model of school administration on ICT co-ordination warrants further investigation. This can benefit schools implementing a policy like the DOE’s *Future Focussed School* in driving improved pedagogical outcomes.

10. References

- Australian Curriculum, Assessment and Reporting Authority [ACARA]. (2013). General Capabilities in the Australian Curriculum: Personal and social capability. *Australian Curriculum Assessment and Reporting Authority*, (January), 1–125. Retrieved from <http://www.acara.edu.au>
- Albion, P. R., Tondeur, J., Forkosh-Baruch, A., & Peeraer, J. (2015). Teachers' professional development for ICT integration: Towards a reciprocal relationship between research and practice. *Education and Information Technologies*, 20(4), 655–673. <https://doi.org/10.1007/s10639-015-9401-9>
- Albugami, S., & Ahmed, V. (2015). Success factors for ICT implementation in Saudi secondary schools: From the perspective of ICT directors, head teachers, teachers and students. *International Journal of Education and Development Using Information and Communication Technology*, 11(1), 36–54.
- Alhojailan, M. I., & Ibrahim, M. (2012). Thematic Analysis: a critical review of its process and evaluation. *West End Journal of Social Sciences*, 1(1), 39–47. <https://doi.org/10.1177/1525822X02239569>
- Ali, S. R., Yang, L. Y., Button, C. J., & McCoy, T. T. H. (2012). Career education programming in three diverse high schools: a critical psychology-case study research approach. *Journal of Career Development*, 39(4), 357–385. <https://doi.org/10.1177/0894845311398131>
- Avidov-Ungar, O., & Hanin-Itzak, L. (2017). Sense of empowerment among school ICT Coordinators: Personal, subject-area and leadership empowerment. *Technology, Knowledge and Learning*. <https://doi.org/10.1007/s10758-017-9346-8>
- Avis, J. (2009). Transformation or transformism: Engeström's version of activity theory? *Educational Review*, 61(2), 151–165. <https://doi.org/10.1080/00131910902844754>

- Aydin, M. K., Gürol, M., & Vanderlinde, R. (2016). Evaluating ICT Integration in Turkish K-12 Schools through teachers' views. *EURASIA Journal of Mathematics, Science & Technology Education*, 12(7), 747–766. <https://doi.org/10.12973/eurasia.2016.1227a>
- Bakhurst, D. (2009). Reflections on activity theory. *Educational Review*, 61(2), 197–210. <https://doi.org/10.1080/00131910902846916>
- Barab, S., Barnett, M., Yamagata-Lynch, L., Squire, K., & Keating, T. (2002). Using Activity Theory to understand the systemic tensions characterizing a technology-rich introductory astronomy course. *Mind, Culture and Activity*, 9(2), 76–107. <https://doi.org/10.1207/S15327884MCA0902>
- Baskin, C., & Williams, M. (2006). ICT integration in schools : Where are we now and what comes next ? Schools and ICT integration : The Australian policy context. *Australasian Journal of Educational Technology*, 22(4), 455–473.
- Becuwe, H., Roblin, N. P., Tondeur, J., Thys, J., Castelein, E., & Voogt, J. (2017). Conditions for the successful implementation of teacher educator design teams for ICT integration: A Delphi study. *Australasian Journal of Educational Technology*, 33(2), 159–172. <https://doi.org/10.14742/ajet.2789>
- Blair, N. (2012). Technology integration for the new 21st century. *Principal*, (February), 8–13. Retrieved from <http://www.naesp.org>
- Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies*, 22(3), 769–787. <https://doi.org/10.1007/s10639-015-9456-7>
- Blin, F., & Munro, M. (2008). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education*, 50, 475–490. <https://doi.org/10.1016/j.compedu.2007.09.017>

- Blundell, C., Lee, K.-T., & Nykvist, S. (2016). Digital learning in schools: Conceptualizing the challenges and influences on teacher practice. *Journal of Information Technology Education, 15*, 535–560. Retrieved from <http://www.jite.org/documents/Vol15/JITEv15ResearchP535-560Blundell2717.pdf>
- Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper (Ed.), *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. (Vol. 2, pp. 57–71). American Psychological Association. <https://doi.org/10.1037/13620-004>
- Broadbent, D., & Gurr, D. (2004). Interaction between ICT and School Leadership. *Leading & Managing, 10*(2), 18–31.
- Brun, M., & Hinostroza, J. E. (2015). Learning to become a teacher in the 21 st century : ICT integration in Initial Teacher Education in Chile. *Educational Technology & Society, 17*(3), 222–238.
- Bryman, A. (2012). *Social Research Methods* (4th Ed.). Oxford, England: Oxford University Press.
- Caetano, M. D. (2015). *Tecnologia e Educação : quais os desafios ? Tecnologia e Aprendizagem* [Technology and education: what are the challenges? Technology and learning]. *Educação, 40*(2), 295–309.
- Caldwell, B. J. (2016). Impact of school autonomy on student achievement: cases from Australia. *International Journal of Educational Management, 30*(7), 1171–1187. <https://doi.org/10.1108/IJEM-10-2015-0144>
- Cartwright, V., & Hammond, M. (2007). “Fitting it in”: A study exploring ICT use in a UK primary school. *Australasian Journal of Educational Technology, 23*(3), 390–407.

- Chen, W. (2013). School leadership in ICT implementation: Perspectives from Singapore. *Asia-Pacific Education Researcher*, 22(3), 301–311. <https://doi.org/10.1007/s40299-012-0055-8>
- Comber, C., & Lawson, T. (2003). Education for managing ICT : Professional Development for school leaders impact. In *Society for Information Technology & Teacher Education International Conference 2003* (pp. 1274–1281). Retrieved from <http://www.editlib.org/d/18152>
- Conley, S., & You, S. (2014). Role stress revisited: Job structuring antecedents, work outcomes, and moderating effects of locus of control. *Educational Management Administration and Leadership*, 42(2), 184–206. <https://doi.org/10.1177/1741143213499264>
- Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38(4), 813–834. <https://doi.org/10.3102/00028312038004813>
- D’cruz, C. (2016). School Governance - The role of the Deputy Principal. Retrieved August 19, 2018, from <http://www.schoolgovernance.net.au/2016/12/01/the-role-of-the-deputy-principal-when-you-are-up-to-your-neck-in-alligators-its-hard-to-remember-the-original-objective-was-to-drain-the-swamp/>
- De Aldama, C., & Pozo, J. I. (2016). How are ICTs used in the classroom? A study of teachers’ beliefs and uses. *Electronic Journal of Research in Educational Psychology*, 14(39), 253–286. <https://doi.org/10.14204/ejrep.39.15062>
- Demiraslan, Y., & Usluel, Y. K. (2008). ICT integration processes in Turkish schools : Using activity theory to study issues and contradictions. *Australasian Journal of Educational Technology*, 24(4), 458–474.

- Devolder, A., Vanderlinde, R., Van Braak, J., & Tondeur, J. (2010). Identifying multiple roles of ICT coordinators. *Computers and Education*, 55(4), 1651–1655.
<https://doi.org/10.1016/j.compedu.2010.07.007>
- Divaharan, S., & Ping, L. C. (2010). Secondary school socio-cultural context influencing ICT integration: A case study approach. *Australasian Journal of Educational Technology*, 26(6), 741–763.
- Douglas, A. S. (2011). Learning on the job: a Cultural Historical Activity Theory approach to initial teacher education across four secondary school subject departments. *Ethnography and Education*, 6(2), 195–211. <https://doi.org/10.1080/17457823.2011.587359>
- Due, C., Riggs, D. W., & Mandara, M. (2015). Educators' experiences of working in Intensive English Language programs: The strengths and challenges of specialised English language classrooms for students with migrant and refugee backgrounds. *Australian Journal of Education*, 59(2), 169–181.
<https://doi.org/10.1177/0004944115587365>
- Eacott, S. (2011). Liberating schools through devolution: The Trojan horse of the state. *Leading & Managing*, 17(1), 75–83.
- Elgali, Z., & Kalman, Y. M. (2010). The construction of failure and success concepts in K-12 ICT integration. *Interdisciplinary Journal of E-Learning and Learning Objects*, 6, 281–292.
- Engeström, Y. (2000). Activity theory as a framework for analyzing and redesigning work. *Ergonomics*, 43(7), 960–974. <https://doi.org/10.1080/001401300409143>
- Engeström, Y. (2015). *Learning by Expanding, Second Edition. Learning by Expanding: An Activity - Theoretical Approach to Developmental Research* (2nd ed.). New York: Cambridge University Press. <https://doi.org/10.1017/CBO9781139814744>

- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25–39. <https://doi.org/10.1007/BF02504683>
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers and Education*, 59(2), 423–435. <https://doi.org/10.1016/j.compedu.2012.02.001>
- Finger, G., & Lee, M. (2014). Leadership and reshaping schooling in a networked world. *Education Sciences*, 4, 64–86. <https://doi.org/10.3390/educsci4010064>
- Fishbein, M., & Raven, B. H. (1962). The AB Scales: An Operational definition of belief and attitude. *Human Relations*, 15(1), 35–44.
<https://doi.org/https://doi.org/10.1177/001872676201500104>
- Flanagan, L., & Jacobsen, M. (2003). Technology leadership for the twenty-first century principal. *Journal of Educational Administration*, 41(2), 124–142.
<https://doi.org/10.1108/09578230310464648>
- Gavin, M., & McGrath-Champ, S. (2017). Devolving authority: the impact of giving public schools power to hire staff. *Asia Pacific Journal of Human Resources*, 55(2), 255–274.
<https://doi.org/10.1111/1744-7941.12110>
- Gay, L. R., Mills, G. E., & Airasian, P. (2012). *Educational Research: Competencies for Analysis and Applications* (10th ed.). Boston, USA: Pearson Education, Inc.
- Ghamrawi, N. (2013). The Relationship between the leadership styles of Lebanese public school principals and their attitudes towards ICT versus the level of ICT use by their teachers. *Open Journal of Leadership*, 02(01), 11–20.
<https://doi.org/10.4236/ojl.2013.21002>

- Ghavifekr, S., Kunjappan, T., Ramasamy, L., & Anthony, A. (2016). Teaching and learning with ICT tools: Issues and challenges from teachers' perceptions. *Malaysian Online Journal of Educational Technology*, 4(2), 38–57. Retrieved from <http://bit.ly/2fRI88H>
- Goktas, Y., Gedik, N., & Baydas, O. (2013). Enablers and barriers to the use of ICT in primary schools in Turkey: A comparative study of 2005-2011. *Computers and Education*, 68, 211–222. <https://doi.org/10.1016/j.compedu.2013.05.002>
- Göncü, A., & Gauvain, M. (2012). Sociocultural approaches to Educational Psychology: Theory, research and application. In K. R. Harris, S. Graham, & T. Urdan (Eds.), *APA Educational Psychology Handbook: Theories, Constructs and Critical Issues* (Vol. 1, pp. 125–154). <https://doi.org/10.1037/13273-006>
- Gorman, G. E., & Clayton, P. (2005). *Qualitative Research for the Information Professional* (2nd Ed.). London, United Kingdom: Facet Publishing.
- Guest, B. G., MacQueen, K. M., Namey, E. E. (2014). *Applied Thematic Analysis*. Thousand Oaks, USA: SAGE Publications. <https://doi.org/10.4135/9781483384436>
- Hadjithoma, C., & Karagiorgi, Y. (2009). The use of ICT in primary schools within emerging communities of implementation. *Computers and Education*, 52(1), 83–91. <https://doi.org/10.1016/j.compedu.2008.06.010>
- Harland, T. (2014). Learning about case study methodology to research higher education. *Higher Education Research and Development*, 33(6), 1113–1122. <https://doi.org/10.1080/07294360.2014.911253>
- Hayes, D. N. A. (2007). ICT and learning: Lessons from Australian classrooms. *Computers and Education*, 49(2), 385–395. <https://doi.org/10.1016/j.compedu.2005.09.003>

- Heck, R. H., & Hallinger, P. (1999). Conceptual models, methodology, and methods for studying school leadership . In J. Murphy & K. Seashore-Louis (Eds.), *The 2nd handbook of research in educational administration* (2nd ed., pp. 141–162). San Francisco, USA: McCutchan.
- Ho, J., Yuen, P., Chen, D. V., & Ng, D. (2016). Distributed leadership through the lens of activity theory. *Educational Management Administration & Leadership*, 44(5), 814–836. <https://doi.org/10.1177/1741143215570302>
- Hsu, S. (2017). Developing and validating a scale for measuring changes in teachers' ICT integration proficiency over time. *Computers & Education*, 111, 18–30. <https://doi.org/10.1016/j.compedu.2017.04.001>
- Hughes, J. E., Boklage, A., & Ok, M. W. (2016). A case study of technology leadership in situ: a high school iPad learning initiative. *Journal of School Leadership*, 26, 283–313.
- Ingram, N. R. (2016). Time past: impacts of ICT on the pedagogic discourse in the Interactive project Interactive project. *Technology, Pedagogy and Education*, 25(1), 1–18. <https://doi.org/10.1080/1475939X.2014.972440>
- International Baccalaureate. (2015). MYP: From Principles Into Practice, (January), 46–49. Retrieved from http://occ.ibo.org/ibis/occ/Utils/getFile2.cfm?source=/ibis/occ/home/subjectHomeMYP.cfm&filename=myp/m_0_mypxx_guu_1405_3_e.pdf
- Judge, M. (2013). Mapping out the ICT integration terrain in the school context : identifying the challenges in an innovative project. *Irish Educational Studies*, 32(3), 309–333. <https://doi.org/10.1080/03323315.2013.826398>
- Julius, D. J., Baldridge, J. V., & Pfeffer, J. (1999). A Memo from Machiavelli. *The Journal of Higher Education*, 70(2), 113–133. <https://doi.org/10.2307/2649124>

- Karagiorgi, Y. (2005). Throwing light into the black box of implementation: ICT in Cyprus elementary schools. *Educational Media International*, 42(1), 19–32.
<https://doi.org/10.1080/09523980500116654>
- Karasavvidis, I. (2009). Activity Theory as a conceptual framework for understanding teacher approaches to Information and Communication Technologies. *Computers and Education*, 53(2), 436–444. <https://doi.org/10.1016/j.compedu.2009.03.003>
- Keane, T., & Keane, W. (2017). Achievements and challenges: Implementing a 1:1 program in a secondary school. *Education and Information Technologies*, 22(3), 1025–1041.
<https://doi.org/10.1007/s10639-016-9470-4>
- Kim, C. M., Kim, M. K., Lee, C. J., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education*, 29(1), 76–85.
<https://doi.org/10.1016/j.tate.2012.08.005>
- Kvale, S. (2011). Conducting an interview. In *Doing Interview* (pp. 52–66). London, England: SAGE Publications. <https://doi.org/10.4135/9781849208963>
- Lai, K., & Pratt, K. (2004). Secondary schools: the role of the Computer Coordinator. *British Journal of Educational Technology*, 35(4), 461–475.
- Lai, K., Trewern, A., & Pratt, K. (2002). Computer Coordinators as change agents: Some New Zealand observations. *Journal of Technology and Teacher Education*, 10(4), 539–551.
- Lawson, T., & Comber, C. (1999). Superhighways technology: personnel factors leading to successful integration of information and communications technology in schools and colleges. *Journal of Information Technology for Teacher Education*, 8(1), 41–53.
<https://doi.org/10.1080/14759399900200054>
- Leontiev, A. N. (1974). The problem of activity in Soviet psychology. *Soviet Psychology*, 13(2), 4–33. <https://doi.org/10.2753/RPO1061-0405300437>

- Lewin, C., & Luckin, R. (2010). Technology to support parental engagement in elementary education: Lessons learned from the UK. *Computers and Education*, 54(3), 749–758.
<https://doi.org/10.1016/j.compedu.2009.08.010>
- Liamputtong, P., & Ezzy, D. (2005). *Qualitative Research Methods* (2nd Ed.). South Melbourne, Australia: Oxford University Press.
- Lim, C. P., & Chai, C. S. (2004). An activity-theoretical approach to research of ICT integration in Singapore schools: Orienting activities and learner autonomy. *Computers and Education*, 43(3), 215–236. <https://doi.org/10.1016/j.compedu.2003.10.005>
- Lim, C. P., & Hang, D. (2003). An activity theory approach to research of ICT integration in Singapore schools. *Computers & Education*, 41, 49–63. [https://doi.org/10.1016/S0360-1315\(03\)00015-0](https://doi.org/10.1016/S0360-1315(03)00015-0)
- Lim, C. P., & Oakley, G. (2015). Information and Communication Technologies (ICT) in primary education: Opportunities and supporting conditions. In L. Y. Tay & C. P. Lim (Eds.), *Creating Holistic Technology-Enhanced Learning Experiences: Tales from a Future School in Singapore* (pp. 1–19).
<https://doi.org/10.1017/CBO9781107415324.004>
- Lim, C. P., Zhao, Y., Tondeur, J., Chai, C. S., & Tsai, C. (2013). Bridging the gap: Technology trends and use of technology in schools. *Educational Technology & Society*, 16(2), 59–68.
- Liu, S. H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers and Education*, 56(4), 1012–1022.
<https://doi.org/10.1016/j.compedu.2010.12.001>
- Lloyd, M. (2005a). Towards a definition of the integration of ICT in the classroom. In *Proceedings AARE '05 Education Research - Creative Dissent: Constructive Solutions* (pp. 1–18). Retrieved from <https://www.aare.edu.au/data/publications/2005/llo05120.pdf>

- Lloyd, M. (2005b). Towards a definition of the integration of ICT in the classroom. *Proceedings AARE '05 Education Research - Creative Dissent: Constructive Solutions*, 1–18.
- Lloyd, M., & Cronin, R. C. N. (2002). A community of teachers: Using activity theory to investigate the implementation of ICTE in a remote Indigenous school. *Australian Association for Research in Education*, 1–28.
- Lorenz, E. (2001). Models of cognition, the contextualisation of knowledge and organisational theory. *Journal of Management and Governance*, 5(3–4), 307–330. <https://doi.org/10.1023/A:1014098928477>
- Lynch, W., Hobbs, B., & Hollanders, H. (2002). The role of the ICT co-ordinator in the primary school. *Research in Education*, 62(1), 32–40. <https://doi.org/10.7227/RIE.62.4>
- Marín, V. I., Duart, J. M., Galvis, A. H., & Zawacki-Richter, O. (2018). Thematic analysis of the international journal of Educational Technology in Higher Education (ETHE) between 2004 and 2017. *International Journal of Educational Technology in Higher Education*, 15(1). <https://doi.org/10.1186/s41239-018-0089-y>
- Marken, J. A. (2006). An application of Activity Theory. *Performance Improvement Quarterly*, 19(2), 27–50.
- McDonagh, A., & McGarr, O. (2015). Technology leadership or technology somnambulism? Exploring the discourse of integration amongst information and communication technology coordinators. *Irish Educational Studies*, 34(March), 55–68. <https://doi.org/10.1080/03323315.2015.1010292>
- Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA]. (2008). Melbourne Declaration on Educational Goals for Young Australians. *Education*, (December), 20. [https://doi.org/10.1016/0738-0593\(81\)90019-5](https://doi.org/10.1016/0738-0593(81)90019-5)

- Mooij, T., & Smeets, E. (2001). Modelling and supporting ICT implementation in secondary schools. *Computers and Education*, 36(3), 265–281. [https://doi.org/10.1016/S0360-1315\(00\)00068-3](https://doi.org/10.1016/S0360-1315(00)00068-3)
- Moyle, K. (2006). *Leadership and learning with ICT: Voices from the profession. Leadership*. Retrieved from <http://www.aitsl.edu.au/>
- Moyle, K. (2014). Technologies, democracy and digital citizenship: Examining Australian policy intersections and the implications for school leadership. *Education Sciences*, 4(1), 36–51. <https://doi.org/10.3390/educsci4010036>
- Mulkeen, A. (2003). What can we do to encourage ICT integration? Evidence from the Irish school system. *Technology, Pedagogy and Education*, 12(2), 277–293.
- Neyland, E. (2011). Integrating online learning in NSW secondary schools: Three schools' perspectives on ICT adoption. *Australasian Journal of Educational Technology*, 27(1), 152–173. <https://doi.org/10.1017/CBO9781107415324.004>
- Nielsen, W., Miller, K. A., & Hoban, G. (2015). Science teachers' response to the Digital Education Revolution. *Journal of Science Education and Technology*, 24(4), 417–431. <https://doi.org/10.1007/s10956-014-9527-3>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1), 1–13. <https://doi.org/10.1177/1609406917733847>
- NSW Department of Education. (2013a). School jargon busters - School A to Z. Retrieved from <http://www.schoolatoz.nsw.edu.au/homework-and-study/homework-tips/school-jargon-busters>
- NSW Department of Education. (2013b). Student Bring Your Own Device (BYOD) Guidelines. Retrieved from https://education.nsw.gov.au/policy-library/associated-documents/Student_BYOD_Guidelines.doc

NSW Department of Education. (2017). Learning across the curriculum: integrating guided inquiry and ICT at Caddies Creek Public School. Retrieved September 28, 2017, from <https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/school-libraries/teaching-and-learning/case-studies/case-studies/integrating-guided-inquiry-and-ict-at-caddies-creek-public-school>

NSW Department of Education. (2017). Role Description - Technical Support Officer. Retrieved from <https://education.nsw.gov.au/human-resources/media/documents/recruitment/3.-role-description/Technical-Support-Officer-5-6-Role-Description.pdf>

NSW Department of Education. (2018a). About Futures Learning. Retrieved April 18, 2018, from <https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-for-the-future/about-futures-learning>

NSW Department of Education. (2018b). Frequently Asked Staffing Question - Secondary Schools. Sydney, Australia: NSW Department of Education. Retrieved from <https://www.teach.nsw.edu.au/documents/faqsec.pdf>

NSW Department of Education. (2018c). Leading and managing the school. Retrieved from <https://education.nsw.gov.au/policy-library/policies/leading-and-managing-the-school>

NSW Department of Education. (2018d). School research and evaluation. Retrieved from <https://education.nsw.gov.au/about-us/educational-data/school-research-and-evaluation/what-we-do/research-collaborations/who-we-collaborate-with>

NSW Department of Education. (2018e). Staffing procedure for the teaching service in NSW Public Schools. Retrieved from <https://education.nsw.gov.au/human-resources/media/documents/recruitment/Staffing-Procedure-for-the-Teaching-Service-in-NSW-Public-Schools-2018-July-2018-FINAL.pdf>

- NSW Teachers Federation. (2018). Understanding staffing entitlements. NSW Teachers Federation. Retrieved from https://www.nswtf.org.au/files/17336_sak_05_v04.pdf
- Papaioannou, P., & Charalambous, K. (2011). Principals' attitudes towards ICT and their perceptions about the factors that facilitate or inhibit ICT integration in primary schools of Cyprus. *Journal of Information Technology Education: Research*, 10(1), 349–369. Retrieved from <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84859168438&partnerID=40&md5=1fbc6cd802a8dac2bcd741cd7a53638f>
- Phelps, R., & Maddison, C. (2008). ICT in the secondary visual art classroom: A study of teachers' value, attitudes and beliefs, 24(1), 1–14. Retrieved from http://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1053&context=educ_pubs
- Prestridge, S. (2012). The beliefs behind the teacher that influences their ICT practices. *Computers & Education*, 58(1), 449–458. <https://doi.org/10.1016/j.compedu.2011.08.028>
- Rabah, J. (2015). Benefits and challenges of Information and Communication Technologies (ICT) integration in Québec English schools. *Turkish Online Journal of Educational Technology - TOJET*, 14(2), 24–31. Retrieved from <http://search.proquest.com/docview/1697503442?accountid=8144>
- Reynold, N., & Macpherson, R. (2015). The politics of the Local Schools Local Decisions policy in a New South Wales public school: Implications for principals and the state. *Leading & Managing*, 21(1), 36–52. Retrieved from <https://search.informit.com.au/documentSummary;dn=415183995990943;res=IELHSS>
- Robertson, M., Grady, N., Fluck, A., & Webb, I. (2006). Conversations toward effective implementation of information communication technologies in Australian schools. *Journal of Educational Administration*, 44(1), 71–85. <https://doi.org/10.1108/09574090910954864>

- Robertson, M., Webb, I., & Fluck, A. (2007). *Seven Steps to ICT Integration*. Camberwell, Victoria, Australia: Australian Council for Educational Research.
- Rodríguez-Miranda, F. P., Pozuelos-Estrada, F. J., & León-Jariego, J. C. (2014). The role of ICT coordinator. Priority and time dedicated to professional functions. *Computers and Education*, 72, 262–270. <https://doi.org/10.1016/j.compedu.2013.11.009>
- Romero, M., Peirats, J., Gallardo, I., & San Martín Alonso, Á. (2014). *Percepciones en torno al coordinador TIC en los centros educativos inteligentes. Un estudio de caso*. [Perceptions of an ICT co-ordinator in smart education centres. A case study.] *Educación*, 50(1), 167–184.
- Roth, W. (2004). Activity Theory and education: an introduction. *Mind, Culture and Activity*, 11(1), 1–8. <https://doi.org/10.1207/s15327884mca1101>
- Roth, W., & Tobin, K. (2002). Redesigning an "urban" teacher education program: an Activity Theory perspective. *Mind, Culture and Activity*, 9(2), 108–131. <https://doi.org/10.1207/S15327884MCA0902>
- Sang, G., Valcke, M., Braak, J. Van, Tondeur, J., & Zhu, C. (2011). Predicting ICT integration into classroom teaching in Chinese primary schools: exploring the complex interplay of teacher-related variables. *Journal of Computer Assisted Learning*, 27(2011), 160–172. <https://doi.org/10.1111/j.1365-2729.2010.00383.x>
- Savert, B. (2013). Bring Your Own Device (BYOD) in Schools - 2013 Literature Review. NSW Department of Education.
- Sentral Education. (2018). Sentral. Retrieved from <https://www.sentral.com.au/>
- Spillane, J. P. (2005). Distributed leadership. *Educational Forum*, 69(2), 143–150. <https://doi.org/10.1080/00131720508984678>

- Stevens, R., Ructtinger, L., Liyanage, S., & Crawford, C. (2018). Future focussed pedagogies and learning approaches. NSW Department of Education. Retrieved from <https://education.nsw.gov.au/about-us/educational-data/school-research-and-evaluation/research-and-evaluation-projects/past-research-projects/future-focused-pedagogies-and-learning-approaches>
- Stevenson, I. (2013). Does technology have an impact on learning? A Fuzzy Set Analysis of historical data on the role of digital repertoires in shaping the outcomes of classroom pedagogy. *Computers and Education*, 69, 148–158.
<https://doi.org/10.1016/j.compedu.2013.07.010>
- Sugar, B. W., & Holloman, H. (2009). Acknowledging the leadership role of a Technology Coordinator. *TechTrends*, 53(6), 67. Retrieved from <http://ehis.ebscohost.com.librarylink.uncc.edu/eds/pdfviewer/pdfviewer?vid=8&hid=22&sid=c66d2460-9eca-4069-9265-5f64505fbba8@sessionmgr111>
- Sweeney, T. (2009). Transforming pedagogy through interactive whiteboards: Using activity theory to understand tensions in practice. *Australian Educational Computing*, 24(2), 28–34.
- Sydney Distance Education High School. (2017). Sydney Distance Education High School - Roles and Responsibilities: Deputy Principals. Retrieved from [file:///C:/Users/USER/Downloads/2018_DPs_R&R_\(web\).pdf](file:///C:/Users/USER/Downloads/2018_DPs_R&R_(web).pdf)
- Tan, S. (2010). School technology leadership: lessons from empirical research. In *Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) Conference 2010* (Vol. 2010, pp. 896–906). Retrieved from <https://repository.nie.edu.sg/handle/10497/4622>

- Tay, L. Y., Lim, C. P., & Lim, S. K. (2015). Differences in ICT usage across subject areas: A case of an elementary school in Singapore. *Journal of Educational Computing Research*, 53(1), 75–94. <https://doi.org/10.1177/0735633115585930>
- Tay, L. Y., Lim, S. K., Lim, C. P., & Koh, J. H. L. (2012). Pedagogical approaches for ICT integration into primary school English and Mathematics: A Singapore case study. *Australasian Journal of Educational Technology*, 28(4), 740–754.
- Taylor, N., & Corrigan, G. (2007). New South Wales primary school teachers' perceptions of the role of ICT in the primary science curriculum - a rural and regional perspective. *International Journal of Science and Mathematics*, (5), 85–109. <https://doi.org/10.1007/s10763-005-9025-4>
- Tearle, P. (2003). ICT implementation: what makes the difference? *British Journal of Educational Technology*, 34(5), 567–583.
- Thomas, G. (2011). *How to do your case study: a guide for students & researchers*. Bodmin, Cornwall UK: SAGE Publications.
- Tirado Morueta, R., Fandos Igado, M., & Aguaded-Gómez, J. I. (2010). ICT integration in Primary and Secondary Education in Andalusia, Spain: Curricular and Organizational Implications. *Eft (Educação, Formação & Tecnologias)*, 3(2), 18–44.
- Tondeur, J., Cooper, M., & Newhouse, C. P. (2010). From ICT coordination to ICT integration: A longitudinal case study. *Journal of Computer Assisted Learning*, 26(4), 296–306. <https://doi.org/10.1111/j.1365-2729.2010.00351.x>
- Tubin, D. (2007). When ICT meets schools: differentiation, complexity and adaptability. *Journal of Educational Administration*, 45(1), 8–32. <https://doi.org/10.1108/09578230710722430>

- van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, 72, 577–588. <https://doi.org/10.1016/j.chb.2017.03.010>
- Vanderlinde, R., Van Braak, J., & Dexter, S. (2012). ICT policy planning in a context of curriculum reform: Disentanglement of ICT policy domains and artifacts. *Computers and Education*, 58(4), 1339–1350. <https://doi.org/10.1016/j.compedu.2011.12.007>
- Vermeulen, M., Kreijns, K., van Buuren, H., & Van Acker, F. (2017). The role of transformative leadership, ICT-infrastructure and learning climate in teachers' use of digital learning materials during their classes. *British Journal of Educational Technology*, 48(6), 1427–1440. <https://doi.org/10.1111/bjet.12478>
- Vygotsky, L. S. (1978). *Mind in society. The development of higher psychological processes*. (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Cambridge, Massachusetts; London, England: Harvard University Press.
- Wang, Q., & Woo, H. L. (2007). Systematic planning for ICT integration in topic learning. *Educational Technology and Society*, 10(1), 148–156.
- Webb, R. (2005). Leading teaching and learning in the primary school: From “Educative Leadership” to “Pedagogical Leadership.” *Educational Management Administration & Leadership*, 33(1), 69–91. <https://doi.org/10.1177/1741143205048175>
- Wong, K. P. (2007). A study of the leadership role of ICT Coordinators in primary schools in Hong Kong and England. In C. Montgomerie & J. Seale (Eds.), *Proceedings of ED-MEDIA 2007--World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 2116–2123). Vancouver, Canada: Association for the Advancement of Computing in Education (AACE). Retrieved from <https://www.learntechlib.org/p/25663>

- Wong, K. P. (2008). School-based technology coordinators and other human factors in the implementation of ICT in primary schools: A comparative study. *International Journal of Educational and Development Using Information and Communication Technology*, 4(1), 13–26.
- Yamagata-Lynch, L. C. (2003). Using Activity Theory as an Analytic Lens for Examining Technology Professional Development in Schools. *Mind, Culture and Activity*, 10(2), 100–119. <https://doi.org/10.1207/S1532-7884MCA1002>
- Yamagata-Lynch, L. C., & Haudenschild, M. T. (2009). Using activity systems analysis to identify inner contradictions in teacher professional development. *Teaching and Teacher Education*, 25(3), 507–517. <https://doi.org/10.1016/j.tate.2008.09.014>
- Yamagata-Lynch, L. C., & Smaldino, S. (2007). Using activity theory to evaluate and improve K-12 school and university partnerships. *Evaluation and Program Planning*, 30, 364–380. <https://doi.org/10.1016/j.evalprogplan.2007.08.003>
- Yin, R. K. (2014). *Case Study Research: Design and Methods* (5th ed.). Thousand Oaks, USA: SAGE Publications.
- Yuen, A. H. K., Law, N., & Wong, K. C. (2003). ICT implementation and school leadership. *Journal of Educational Administration*, 41(2), 158–170. <https://doi.org/10.1108/09578230310464666>

11. Appendices

11.1. Ethics

11.1.1. Ethics Approval Letter.

From: Kay Bowes-Tseng <kay.bowes-tseng@mq.edu.au> on behalf of FHS

Ethics <fhs.ethics@mq.edu.au>

Sent: Wednesday, 1 November 2017 3:23 PM

To: Garry Falloon

Cc: Laurie Field; Mr Raymond George Montalban

Subject: RE: HS Ethics Application - Approved (5201700981)(Con/Met)

Dear Professor Falloon,

Re: "An analysis of the role of ICT co-ordinators in schools as Activity Systems" (5201700981)

Thank you very much for your response. Your response has addressed the issues raised by the Faculty of Human Sciences Human Research Ethics Sub-Committee and approval has been granted, effective 1st November 2017. This email constitutes ethical approval only.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

<https://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

The following personnel are authorised to conduct this research:

Professor Garry Wayne Falloon

Dr Laurie Field

Mr Raymond George Montalban

NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 1st November 2018

Progress Report 2 Due: 1st November 2019

Progress Report 3 Due: 1st November 2020

Progress Report 4 Due: 1st November 2021

Final Report Due: 1st November 2022

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/resources

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Sub-Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Sub-Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

5. Please notify the Sub-Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

<http://www.mq.edu.au/policy>

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of approval to an external organisation as evidence that you have approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of ethics approval.

Yours sincerely,

Dr Naomi Sweller

Chair

Faculty of Human Sciences

Human Research Ethics Sub-Committee

FHS Ethics

Faculty of Human Sciences Ethics

C5C-17 Wallys Walk L3

Macquarie University, NSW 2109, Australia

T: +61 2 9850 4197 | <http://www.research.mq.edu.au/>

11.1.2. Example Information and Consent Form.

Department of Educational Studies
Faculty of Human Sciences
MACQUARIE UNIVERSITY NSW 2109



Principals' Information and Consent Form

Name of Project: Analysis of the Role of ICT co-ordinator in Schools

Chief Supervisor: Professor Garry Falloon

Researcher: Raymond Montalban

Dear Principal,

My name is Raymond Montalban and I am a Master of Research student in the Department of Educational Studies at Macquarie University. I am undertaking a pilot study into the role of Information and Communications Technology (ICT) Co-ordinators to investigate how they see their role and the influences that affect their role inside schools. As ICT integration, or the use of ICTs to enhance classroom teaching and learning, is mandated both in Australia and overseas, it is important that factors affecting ICT integration and the work of ICT co-ordinators in this process are identified. This pilot study is to gain an understanding of how these factors affect ICT integration efforts in schools and thus the role of the ICT co-ordinator.

This research is being conducted under the supervision of Professor Garry Falloon from the Department of Educational Studies at Macquarie University.

What will the study mean for you?

One staff member identified as your school's ICT co-ordinator or acting in that capacity in conjunction with another role inside the school will be invited to participate in an interview discussing key factors and interactions central to their role. The interview is expected to take about forty-five (45) minutes but no more than an hour. Additionally, other documents that directly affect the role of ICT co-ordinator, including job descriptions, ICT and school strategic plans, and school vision statements will be analysed. These documents will be used to identify

the rationale for ICT integration efforts, how schools intend to implement them, and the role of those involved.

Your school should only take part in the interview if you feel free and willing to do so. If you have any questions or concerns about the study or the nature of the invitation you have received for your school to participate, please contact myself or my supervisor. Our contact details are given on the next page.

If you agree, the interviews with the study participants will take place at either Macquarie University, your school, or another mutually agreeable public place.

Do I have to participate?

No. Participation in these studies is entirely voluntary. If you decide your school would like to participate but then change your mind at a later time, you are free to withdraw at any time without having to give a reason, and without consequence.

What about privacy and security?

An audio recorder will be used during the interview. Recordings from these interviews will be transcribed for analysis. 1 to 1 interview participants will receive, via e-mail, a copy of the transcript for amendment and/or verification. Research participants will be given no less than two weeks to confirm their data and/or make any amendments and return the amended transcript/confirmation to the researcher. After this period, data will be considered useful for analysis. Data will be anonymised at the point of collection. The researcher will be the only one with access to any data gathered from the teachers at your school.

Do you have any questions?

Many thanks for reading this information. If at any time you have questions about the study, please do not hesitate to contact my supervisor or myself using the contact details given.

I hope your school is able to participate in the study.

INTERVIEW CONSENT FORM

I, principal's name have read and understand the information above and any questions I have asked, have been answered to my satisfaction. I agree to my school's participation in this research, knowing that I can withdraw my consent at any time without consequence. I have been given a copy of this form to keep.

Principal's Signature: _____ Date: _____

Yours sincerely,

Professor Garry Falloon

(Chief Supervisor)

Department of Educational
Studies

Dr. Laurie Field

(Associate Supervisor)

Department of Educational
Studies

Raymond Montalban

(Researcher)

Master of Research Student

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics & Integrity (telephone (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

11.1.3. NSW Department of Education Ethics Approval (SERAP).



Mr Raymond Montalban

DOC17/1198513
SERAP2017548

Dear Mr Montalban

I refer to your application to conduct a research project in NSW government schools entitled *An analysis of the role of ICT Co-ordinators in schools as Activity Systems*. I am pleased to inform you that your application has been approved.

You may contact principals of the nominated schools to seek their participation. You should include a copy of this letter with the documents you send to principals.

This approval will remain valid until 22-Nov-2018.

The following researchers or research assistants have fulfilled the Working with Children screening requirements to interact with or observe children for the purposes of this research for the period indicated:

Researcher name	WWCC	WWCC expires
Raymond Montalban	WWC1074858E	26-Jul-2021

I draw your attention to the following requirements for all researchers in NSW government schools:

- The privacy of participants is to be protected as per the NSW Privacy and Personal Information Protection Act 1998.
- School principals have the right to withdraw the school from the study at any time. The approval of the principal for the specific method of gathering information must also be sought.
- The privacy of the school and the students is to be protected.
- The participation of teachers and students must be voluntary and must be at the school's convenience.
- Any proposal to publish the outcomes of the study should be discussed with the research approvals officer before publication proceeds.
- All conditions attached to the approval must be complied with.

When your study is completed please email your report to: serap@det.nsw.edu.au
You may also be asked to present on the findings of your research.

I wish you every success with your research.

Yours sincerely

Sandi Simpkins
Director, School Policy and Information Management
27 November 2017

School Policy and Information Management
NSW Department of Education
Level 1, 1 Oxford Street, Darlinghurst NSW 2010 – Locked Bag 53, Darlinghurst NSW 1300
Telephone: 02 9244 5080 – Email: serap@det.nsw.edu.au



11.2. School A Interview Excerpts

A glossary of Department of Education (DOE) specific terminology used by the research participants in the excerpts below is given in Appendix 11.4.

Table 12.

Extended excerpts from School A's DP with themes and initial codes.

Themes	Codes	Time	Interview Excerpts
Classroom Applicability Decision- Making	DOE Decision- Making	1:14 – 3:00	<p>Q: Excellent, excellent. So, umm ... in your position, as you're one of the people who is mainly responsible for ICT happenings around the school, how are ICT decisions made in the school?</p> <p>A: Hmmm ... aahh, I take advice from ... I've often taken advice from James at a regional level. And James's been quite helpful. Doesn't always tell me what I want to hear but James gives me a very good practical input into what can be done from the Department's perspective. Umm ... and, I guess in the beginning, the decisions were made by my own research and what information ... There was ... I found the resources from the Department were lacking in terms of how to make those decisions... It was a combination of what was going to be the most feasible and practical for the community. We can't rely on our community being able to fund a big laptop program like they have [in neighbouring schools]. Umm ... so we, so in terms of the BYOD, that was the most practical decision for us</p>
Classroom Applicability	Maintenance School Resources	13:48 – 15:40	<p>I guess ... I mean in a perfect world we would have every kid having the same type of device I guess. And there would be more support. Like we could have TSOs that could support student devices. Especially by the end of the year, their devices are broken. They're not bringing them to school. And that makes it very difficult for teachers. Because if they've planned a lesson that uses Google Slides, they can't do it because half the kids don't have their devices. Umm ... so some kind of provision to put on a level playing field with private schools.</p>

Resources	Parental Affluence	16:47 – 17:35	<p>Q: What helps ICT integration here?</p> <p>A: I guess the relative affluence of the community. So even though we have to – we can't tell everyone that they have to bring a certain type of computer, because we are still in a public school, but in this area there are very few kids who can't afford to bring a device. We've got the odd kid who kind of says "Oh, I can't get a device for another few months", or "My parents can't afford to buy me one" so we have loaner iPads and laptops that we can lend out for periods.</p>
Resources	New School Setup Lack of DOE Support	23:56 – 25:00	<p>There was nowhere in the department that seemed to be able to provide support for what you need to do as a new school, so every time we would phone a section of the department to find out our T4L roll-out or to ... umm ... you know to get our staffing – whatever – they wouldn't know who we were, aah ... they wouldn't have any idea how to calculate our entitlement, they wouldn't be able to point us in the direction of support for developing policies or anything like that.</p>
Resources Decision- Making	School Task Allocation Future Provision	22:55 – 24:00	<p>Q: And the one final thing leading on from all of this is how do you think ICT integration efforts might be improved in the future?</p> <p>A: I would love to see ... umm ... I would love to see either a Headteacher Teaching and Learning or a member of staff ... to push the professional learning for staff and to really make the strategic decisions that I always have to make on the fly without all the information and without being able to devote the time that I would like. Because I'm the only DP in the school, I'm doing EVERYTHING and my decisions are often budget-driven. And still, they're always going to be budget-driven, but I'd really like ... ahh ... to see one member of the executive who it is essentially their job to kind of take ownership of that area and make sure all of the staff are confident, and I mean I think to an extent our Teaching and Learning Headteacher has done that ...</p>

Resources	DOE Lack of Support	25:13 – 25:30	Q: Is there anything [the Department] could do to actually help you with this role? .
	Future Provision	26:47 – 28:25	. A: The Department could be more helpful in that regard. Umm ... but, the ... umm ... the Futures Learning Unit: I did ask them what support can you give us? Can we have a conversation about what direction we should be going for our new campus, for the senior campus, because it's all future-focussed and flexible learning spaces and all of this kind of stuff, and we weren't sure what we should do for ICT.... [Giggles] So ...
			Q: Did you ever get an answer to that question?
			A: No, not at all. So again, we kind of have to blindly try and figure out what we think we should do. I've had a few chats with James, again James's been quite useful. Again, that's not their job. You know, James's in charge of everything. So, James's very busy. Umm ... so, yeah, that's been frustrating. Because they're sort-of building this future-focussed school but not providing us with the support to try and make sure that ... umm ... in terms of technology, it is a bit future-proofed. So, yeah.

Notes. Q indicates the interviewer's question and A indicates the interviewee's answer or response to a question. The 'time' column gives the start and end times of each excerpt in minutes and seconds (mm:ss) format. All excerpts given here were originally from the interview with School A at 10:00am on 12 December, 2017.

11.3. School B Interview Excerpts

A glossary of Department of Education (DOE) specific terminology used by the research participants in the excerpts below is given in Appendix 11.4.

Table 13.

Extended excerpts from School B's DP with themes and initial codes.

Themes	Codes	Time	Interview Excerpts
Resources	School	1:40 – 2:15	So those lists that come in as wish lists. We then have a look at – I've got an existing list [of IT assets]. So my list actually tells me how old things are, and where to, and how often to replace, and how many people have. Like, how many staff in English, how many in Science. And then we look at how many, based on equity, right? ...
	Resources		
	Future		
	Provision		
			We don't just go and buy everything. We just look at where the existing ones are, how old they are, then from there and we worked out basically what are the problematic ones that we really need to replace. From the budget submissions from HTs and prioritising what to be replaced and purchased, the team then decides... So then we just have a running sheet and then I just ask him to go and purchase.
Decision-Making	School	4:56 – 5:20	A: I also have a Computing Teacher on this team. So that if I feel, cause, I don't really quite know, like, I'm not a computer teacher, but I'll say to her "Can you have a play?" So there's a tech support who'll have a play. And she can trial the product from a teacher's point of view. And then she can give me feedback and then I can trial it too, whatever it is we're looking at.
	Leadership	8:50 – 9:05	Q: How would you describe the role of the key players in ICT integration decision-making in the school? You mentioned that you're one of them, umm ... would the ICT Committee have some sort of decision-making role in this?
			A: Yes, definitely.

		9:06 – 9:24	Q: In what way?
			A: Umm ... so basically everybody would trial ... whatever that, you know, which is time or past experience, we would trial the software. Everybody would go away and trial it. Then everybody would come back and we would sit as a team and then discuss it. And that's been happening.
ICT Implementation	Staff Testing	9:27 – 9:49	Q: So, is the turnaround between – say – headteacher and some staff members suggesting software, to trialling it, to implementing it, is that a relatively quick process? Or is it ...?
			A: Umm ... it depends on what it is. It's hard to put a timeline. Sometime it could happen within, you know – say I show someone, they feel comfortable. We can trial it for two weeks and there's no issue, then that's it. It depends. And other times, we could then go back to paper as has happened before as well.
Decision Making		14:00 – 14:30	Q: ... How could your role in all of this, how do you think your role could be made more effective in some way at the school?
			A: As in ICT Co-ordinator?
			Q: Yes. [Nods affirmatively]. That component of your Deputy role.
			A: [Pauses] Umm ... [pauses] ... we have more money. If we have more experts.

Notes. Q indicates the interviewer's question and A indicates the interviewee's answer or response to a question. The 'time' column gives the start and end times of each excerpt in minutes and seconds (mm:ss) format. All excerpts given here were from the interview with School B at 4:00pm on 6 March 2018.

11.4. Glossary

The Department of Education (DOE) in the Australian state of New South Wales utilises context-specific terms to describe the roles of various personnel within its network of public schools. The definition of the DOE terms used in this thesis are given here.

Table 14.

Department of Education (DOE) terms used in this thesis.

Term	Definition
Bring Your Own Device (BYOD)	This refers to the act of students bringing in any sort of electronic device, owned by the student, capable of connecting to the DOE's Wi-Fi network (NSW Department of Education, 2013b).
Computer Co-ordinator	Staff member who has the technical and pedagogical responsibility to facilitate ICT integration (Lai et al., 2002).
Deputy Principal (DP)	DPs lead and manage issues such as but not limited to teaching and learning, student leadership and wellbeing, assessment and malpractice (Sydney Distance Education High School, 2017). They implement strategic school directives from the principal and liaise with parents and the wider community. They are often the front line of school activities and events (D'cruz, 2016). See <i>principal</i> .
Entitlement	See <i>staffing entitlement</i> .
Enhanced Technology for Learning (ET4L)	Extended set of ICTs made available to schools. See <i>technology for learning</i> .
Future Focussed Schools	See <i>future focussed pedagogies</i> .
Future Focussed Pedagogies	Future focussed pedagogies are teaching and learning practices that place the school as future-makers. These practices emphasise the need to be adaptable for future challenges to be met by students. An optimal combination of technological, assessment, spatial, temporal and policy arrangements is required to support these newer pedagogies (Stevens et al., 2018).

Futures Learning Unit	Specialised unit of the DOE that collaborates with researchers both inside and outside of the department on the intersection of pedagogy, learning spaces and technology (NSW Department of Education, 2018d).
Headteacher (HT)	High school teacher with an executive position in a subject area (NSW Department of Education, 2013a).
Headteacher Teaching and Learning (HT T&L)	Headteacher with a specific focus on curriculum development and implementation, assessment, reporting and teacher development (NSW Department of Education, 2018e).
ICT Committee	Also known as a <i>technology committee</i> , the ICT Committee refers to a group of teachers with a key ‘motivator’ charged with the responsibility of facilitating ICT integration (Hayes, 2007).
Interactive White Board (IWB)	Also referred to as an <i>electronic whiteboard</i> , an IWB is a technological tool used for learning in the classroom (NSW Department of Education, 2013a). An IWB usually consists of a computer screen projected onto a flat surface which can be drawn on with styluses and erased with board ‘erasers’. This is analogous to a more traditional whiteboard with whiteboard marker.
Principal	Primary leadership role inside the school. They have the overall responsibility of but not limited to: educational programs, teaching and learning, student and staff management, school development, school resource management and relationship building with the community. They are accountable to the DOE with respects to staff and student outcomes (NSW Department of Education, 2018c).
Staffing Entitlement	Government guarantee on the number of qualified classroom teachers, executive, specialist teachers and support staff assigned to a school (NSW Teachers Federation, 2018).
Sentral	Sentral is a student information management system. It manages issues such as but is not limited to student attendance, parent communications, academic and well-being reports (Sentral Education, 2018).
Technology for Learning (T4L)	DOE policy on the provision of ICT infrastructure in schools such as but not limited to servers and wireless access points for BYOD programmes (Savert, 2013).

Technological and Applied Studies (TAS)	<i>Key learning area</i> or subject grouping that covers technology related subjects (NSW Department of Education, 2013a). Subjects in this area include but are not limited to Design & Technology, Textiles, Food Technology and Information Technology.
Technical Support	Repair and advice service for computing equipment. TSOs in schools provide this service to staff. See <i>technical support officer</i> .
Technical Support Officer (TSO)	Non-teaching staff member who provides IT support and maintenance services to schools (NSW Department of Education, 2017).
