Implementing and Sustaining ICT Integration in Schools:

A Case Study of Two Primary Schools in Taiwan

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Abstract

The main purpose of the present research was to explore the reasons why some schools are relatively successful in implementing and sustaining pedagogical innovations in Information and Communications Technology (ICT) integration, while others are less so. The second purpose was to examine the way in which the change process within school settings affected teachers' reaction to continuation of the new practices of ICT integration. With specific reference to the educational context in Taiwan, this research centres on two rural schools with remarkably different levels of sustainability of ICT implementation. In this research, one of the target schools labelled 'School A', which was identified as successfully sustaining pedagogical innovations in ICT integration; the other target school labelled 'School B', which was identified as not yet successfully sustaining pedagogical innovations in this regard. Questionnaires, interviews and documentary reviews were the research sources. Quantitative and qualitative approaches were applied in the data analysis. The results of the research confirmed that, first, there was a clear difference between School A and School B with respect to their leadership approaches to managing pedagogical innovations in ICT integration. Leadership for implementing ICT in School A was collaborative and proactive. Leadership for implementing ICT in School B was limited to ICT experts and formal leaders in the overall process of ICT implementation. Second, the results showed that the organisational processes in School A and School B were somewhat similar, but with several differences. These differences could account for the divide between the two target schools with respect to the level of their capacities for sustaining pedagogical innovations in ICT integration. Third, the results pointed out that teachers in both target schools were generally satisfied with the accessibility to their in-house ICT resources and professional development. However, further findings reflected that compared with the access to ICT resources and ICT training sessions, teachers' perceived compatibility of the ICT-integrated pedagogies and informal learning had a much stronger link with teachers' determination to continue using ICT across the curriculum. Finally, the results revealed that the external support from the government, parents and cross-school learning were influential to the change effort of implementing ICT in both School A and School B. Notably, in terms of the effect on the long-term ICT implementation in both target schools, the impact of the governmental support was found to override parental support and cross-school learning. Currently, there is still limited research in Taiwan into rural schools' sustainability of ICT implementation. The present research could serve as a reference for further research in this regard.

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Chapter 1
Introduction

1.1 Background

The introduction and extension of the use of Information and Communications Technology (ICT) has been of concern in the educational field over recent years as can be evidenced by studies of change management and ICT integration in schools both in the United Kingdom (UK) and internationally (e.g. Fox 2003; Sheppard 2003; Yuen et al. 2003). The potential of the adoption of new technologies for diversifying teaching approaches and enhancing students' learning motivation and academic achievements is widely acclaimed (Pilkington 2007). On this basis, appropriate and effective implementation of ICT across the curriculum, so-called 'ICT integration', is highly likely to bear a positive and profound impact on students' learning processes and outcomes. Conole (2007, p. 81) goes further, asserting that 'technologies are now beginning to be used in a rich range of ways to support learning'. There seems to be no doubt that schools today are in a new stage of the application of ICT.

It is evident that the aim of implementing educational change of introducing and extending the use of ICT in classes is to improve the existing teaching practices. However, the processes of managing pedagogical innovations involving ICT in a school context are usually fraught with difficulties in practice in England (Jones 2004) and in many other countries (Owston 2007). That is, whilst the significance of ICT in education is acknowledged, practical challenges of successfully integrating ICT into the curriculum in school settings also arise. More specifically, the studies concerning successful ICT implementation in schools in England identify that the key and shared attribute of these schools lies in the joint lead and active involvement of the

headteacher and other staff members in leadership positions in the change process of ICT development (Kennewell et al. 2000; Tearle 2003). The above attribute is also verified to be crucial for school changes involving ICT integration in other educational contexts, such as Canada (Sheppard 2003) and Hong Kong (Wong & Li 2006).

In a sense, the importance of leadership approaches to managing school-wide pedagogical changes and improvements in ICT adoption is acknowledged. However, little research examines the ways in which the headteacher employs the existing leadership knowledge to successfully transform a traditional school into an ICT-capable school. Apart from this problem, the literature on the use of ICT for supporting teaching and learning in different educational settings spotlights the increasing 'digital divide' between urban and rural areas (Flanagan & Jacobsen 2003; National Telecommunications and Information Administration 2000).

1.2 Rationale for conducting this research

The Taiwanese government, like many countries, recognises the importance of ICT in educational development and improvement. In 1980 the Taiwanese Ministry of Education (MOE) has set up the Taiwan Academic Network (TANet), which provides network services for all schools and research institutions in the educational field (MOE 2006d). The establishment of the TANet enables schools at all levels to have convenient and digital access to cooperating with educational research institutions nationwide in sharing knowledge and resources. In the 1990s the MOE became more ambitious about using technological applications for enhancing educational innovations. Thus, the ICT-related policies, including the Programmes for ICT Education at Schools of All Levels, Computer-Aided Teaching and Infrastructure of

ICT Education, were formulated between the mid and end of the 1990s (MOE 2005). Due to the government's investment in ICT infrastructure, since 1999 all primary and secondary schools have had internet access, school websites and at least one computer lab, and teachers and students have possessed their own email addresses (MOE 2005).

In 2001 the Taiwanese government went one step further, announcing the Blueprint for ICT Education at Primary and Secondary Schools, which turned the focus from teaching ICT as a separate subject towards using ICT across the curriculum (MOE 2005). Tying in with the Blueprint, the MOE introduced the ICT Seed School Project (ICT SSP) in primary schools in 2002. The ICT SSP aimed at extending the use of new technologies in schools by integrating ICT into the curriculum (MOE 2005). Through the ICT SSP, a total of 600 ICT-capable schools which were named 'ICT Seed Schools' were given training and funding by the central government to expand their use of ICT across the curriculum. They were then expected to support other schools with their ICT development.

Notably, however, the report released by the MOE (2006c) reflects that while some ICT Seed Schools were very successful in implementing and sustaining the ICT SSP, others less so. Furthermore, although the worldwide studies by the International Telecommunication Union (2003) showed that ICT education and affordability in Taiwan ranked the 9th internationally and the 3rd in the developed Asia-Pacific Region, a recent survey reveals that Taiwan has a wide digital gap between rural and urban schools (MOE 2006a). More recently, the international ministerial conference on 'ICT for a Better Education' held by the MOE in Taiwan highlights the fact that it is a common but challenging target for many developed countries to narrow the digital divide between rural and urban schools (MOE 2007). Despite this warning sign, little

research has been conducted on exploring how rural schools, specifically those unable to continue improving, manage educational change and innovations in ICT implementation. It is clear that simply installing computers, networks and ICT software in educational settings is insufficient if schools, those in rural areas in particular, are expected to be successful in implementing and sustaining pedagogical innovations in ICT integration.

Given the above context, the present research is to explore the reasons why some schools are relatively successful in implementing and sustaining pedagogical innovations in ICT integration, while others are less so. By focusing particularly on two Taiwanese rural ICT Seed Schools with remarkably different capacities for continuing ICT implementation, this study examines the way in which the change process within school settings affected their sustainability of new practices involving ICT integration. This research also examines the studies of educational innovations regarding ICT implementation and school leadership in Taiwan and those in other countries. Thus, the findings may provide the related researchers with the patterns of change management of ICT implementation in Taiwanese schools. Moreover, they could contribute to offering suggestions to fill the gap in the existing knowledge of the leadership approaches to pedagogical innovations in ICT integration in rural schools.

For the sake of clarity, the remaining sections of this chapter are presented under the following headings: research context, research purposes and questions, limitations of this research, definition of the terms used within this research, and structure of this thesis.

1.3 Research context

1.3.1 Overview of Taiwan

Taiwan is located in the Asia-Pacific region and lies between Japan and the Philippines. According to the Government Information Office of Taiwan (2008), the total area of Taiwan is 36,188 square kilometres (13,972 square miles). In 2008, the population was around 23 million. While the average density of population per square kilometre was 636 people, approximately 70% of people lived in the cities. In the most crowded city, the density of population rose to 9,835 people per square kilometre.

In Taiwan, three major languages which are used widely in people's daily lives are Standard Chinese (official language), Taiwanese/Holo (dialect) and Hakka (dialect). In addition, the minority (around 2%) of population in Taiwan are indigenous people (native people) and some of them can still speak in their own indigenous languages which are classified as Formosan languages.

With respect to the nation's economy, Taiwan was classified by the International Monetary Fund (IMF) as a 'newly industrialised Asian economy', like Singapore, Hong Kong and South Korea (IMF 2006). Moreover, Taiwan is a 'high-income economy', based on the country's classification proposed by the World Bank (2009), even though Taiwan is not a member of the World Bank and thus not on its official list. In 2007, Taiwan was the world's 24th-largest economy among the 181 economies ranked by the IMF. Taiwan's gross domestic product (GDP) exceeded US$383.3 billion in 2007 (Government Information Office of Taiwan 2008).

1.3.2 Educational system in Taiwan

The educational administration in Taiwan includes two levels as follows (MOE 2006c):

1) **The Ministry of Education (MOE) at the central government level**

   The MOE is in charge of nation-level educational, social and cultural affairs. Its main duties are determining general educational policies, setting up educational guidelines and directions, and supervising the Bureaus of Education (BOEs) nationwide.

2) **The Bureaus of Education (BOEs) at the local government level**

   There are 25 BOEs in Taiwan, including 2 municipal BOEs (in Taipei Municipality and Kaohsiung Municipality), 5 city BOEs and 18 county BOEs. Each BOE has a team of educational inspectors for supervising and evaluating local schools.

The current educational system in Taiwan is as follows (MOE 2008a, 2008b):

1) **Two- to three-year pre-school education (kindergartens)**

   Government-funded kindergartens are affiliated to local primary or junior high schools and serve children aged 5-6. Public-funded (private) kindergartens serve children aged 4-6.

2) **Nine-year compulsory education**

   Compulsory education contains two levels. The first level is six-year primary education (ages 7-12) and the second level is three-year junior high education

(ages 13-15). All curricula of compulsory education are based on the Grade 1-9 Curriculum Guidelines. In order to diversify teaching approaches and free up the curriculum, the government allows schools to decide their teaching materials, including textbooks, and promotes teachers to develop school-based curricula.

3) Three-year senior high and senior vocational education

Both senior high and senior vocational schools serve students aged 16-18 and graduating from junior high schools. Like compulsory education, senior high and senior vocational schools have the flexibility in choosing and designing their teaching materials.

4) Higher education

This level of education contains two-year colleges, four to seven years of undergraduate education, and postgraduate education which covers one- to four-year master and two- to seven-year doctoral programmes.

1.3.3 Overview of the Master Plan and the ICT Seed School Project

The ICT Seed School Project (ICT SSP) in Taiwan was launched in 2002. Since the idea of the ICT SSP can be traced back to the ICT Education Master Plan (the Master Plan), which was announced by the Ministry of Education (MOE) in 2001, the following gives a brief review on the Master Plan and the ICT SSP in turn.

1.3.3.1 The Master Plan

Due to the impact of the computer technology on education in the information age, learning with others through sharing systems of the Internet is not the only one way to absorb knowledge. The MOE in Taiwan planned to develop students' abilities to apply

ICT to gaining capacities for analysis, constructing knowledge and making a decision (MOE 2005). Because of this, students were expected to use computers more independently and effectively to assimilate new information. In addition, teachers were asked to have expertise of integrating ICT into teaching, and the application of ICT across the curriculum was requested to reach 20% of their teaching hours. It is for these reasons that the Master Plan clarifies four key targets:

1) All students can have the ready access to ICT.

2) Students can have the initiative to learn ICT.

3) School staff can cooperate with one another to create new ideas.

4) Knowledge can be available for people any time.

The Master Plan also demonstrates ten strategies for achieving the above targets:

1) Constructing a superior ICT environment and ensuring that each school can have peer-to-peer networks.

2) Encouraging schools to purchase ICT equipment and utilise computers effectively.

3) Incorporating ICT with different subject areas to develop new learning models which are able to correspond with the context of each school.

4) Formulating a interchanging system through the Internet to provide teachers with convenient access to sharing pedagogical knowledge and experiences with one another immediately.

5) Training and supporting teachers to extend the use of ICT in classes, and asking schools to consider teachers' computer literacy and their capacity for ICT application when employing teachers.

6) Encouraging schools to share experiences of using ICT in classes and school administration to improve educational quality equally in urban as well as rural areas.

7) Establishing and strengthening the relationships between schools and their local communities, and encouraging the public to invest in ICT developments in schools.
8) Applying ICT to simplifying school administrative processes, and improving teachers' computer literacy to enable them to give support to one another.
9) Evaluating the impact of the use of the Internet on teaching and learning, schools, families and society.
10) Setting up ICT Seed Schools to support other schools with their ICT implementation and developments.

1.3.3.2 The ICT Seed School Project

The ICT Seed School Project (the ICT SSP) was a national ICT-related project announced by the Ministry of Education (MOE) in 2002 in Taiwan and aimed at extending the use of ICT in school settings by integrating ICT into the curriculum (MOE 2005). The main approaches to selecting the ICT Seed Schools and to implementing the ICT SSP are presented as follows:

1) **Selection of the ICT Seed Schools**

   In order to implement the ICT SSP, the MOE empowered all Bureaus of Education (BOEs) to evaluate which local schools would have the potential to become ICT Seed Schools. The main areas for evaluation contained the school's features, current achievements in ICT integration, both short- and long-term plans for school-wide ICT developments, and strategies for guiding their neighbouring schools to implement ICT across the curriculum.

2) Missions of the ICT Seed Schools

Each eligible ICT Seed School was asked to set up the school-based ICT Instructional Team, which was an ICT-focused learning community and constituted of classroom (or subject) teachers with ICT expertise. There was no rigorous limitation in the maximum of the members within the ICT Instructional Team. Of special note was that the MOE designated 3 specific school staff – the headteacher, the director of academic affairs (senior leader) and the ICT coordinator (middle leader) – as the formal leaders for guiding and supporting the ICT Instructional Team throughout the process of undertaking school-wide pedagogical innovations in ICT integration. Before putting the ICT SSP in to practice, the formal leaders and the ICT Instructional Teams from the ICT Seed School were sent to the ICT-related training run by the MOE. After its formal leaders and the ICT Instructional Team successfully completed the training, the ICT Seed School was provided with governmental funding of NT$ 1,000,000 (nearly £ 20,500) once a year to undertake the following tasks:

- Dealing with the in-house ICT training sessions for staff members.
- Enlarging the ICT infrastructure (e.g. ICT hardware, software and networks).
- Collaborating with other ICT Seed Schools in developing the ICT-integrated instructional modes.
- Leading and tutoring other schools in using ICT for teaching and learning purposes.

3) Evaluation of the progress of the ICT Seed Schools

During the academic year, the counselling committee, which was organised by the chief executives from the Computer Centre of the MOE and ICT professionals from local universities or colleges, was sent to the ICT Seed Schools in order to

supervise and evaluate the schools' progress in ICT implementation and developments. Apart from undergoing counselling with the committee about the problems with ICT implementation, the ICT Seed Schools were asked to substantiate their achievements by means of demonstrating the documents and teaching practices of ICT integration. Through the consultative and evaluative processes, the counselling committee diagnosed and decided which schools would be qualified to secure the funding from the government for continuing the ICT SSP in the next year.

1.3.4 Overview of ICT implementation in rural areas in Taiwan

As mentioned above (see section 1.1), there exists a digital gap between rural and urban schools in Taiwan, even though ICT implementation in school settings generally improves. Because of this, the Taiwanese government confirmed 'narrowing the urban-rural digital gap' as one of the national key policies in 2004. Since then, caring for the digital well-being of rural schools and pursuing schoolchildren's equal digital opportunities have been a high priority in the central educational guidelines. The Ministry of Education (MOE), therefore, continued endeavouring to minimise the existing digital gap between urban and rural schools by coordinating the efforts offered by the Bureau of Education (BOE) of each county (MOE 2006b). Apart from keeping promoting the ICT SSP, the MOE worked closely with the BOEs in applying two main approaches to increasing rural students' digital opportunities and narrowing the urban-rural digital gap (MOE 2006a; MOE 2006b). The two approaches are outlined as follows:

1) **Assistance of the ICT volunteers from local colleges**

In order to provide students in rural areas with more convenient access to enhancing ICT knowledge and skills, the BOEs supported their local colleges to organise the ICT voluntary groups, which were constituted by college students with sufficient ICT capacities. The ICT voluntary groups from colleges were sent to rural primary schools to assist teachers in promoting students' ICT capacities.

2) **Assistance of the ICT industry**

In order to offer rural schools more opportunities of gaining the required technological facilities and technical support, the MOE enacted an active role in soliciting technological resources from the ICT industry to establish Digital Opportunity Centres in rural areas nationwide. All ICT resources provided by each Digital Opportunity Centre are open to the local students and teachers.

However, whilst massive investments and improvements in promoting ICT adoption in rural areas had been made over the years, a more recent national report (MOE 2007) revealed that in general, rural schools still fell behind urban schools with respect to ICT developments in the particular aspect of ICT integration into the curriculum. This report further stressed that it should be a national priority to put more emphasis on extending the use of ICT across the curriculum in rural schools.

Given the above, simply providing ICT facilities and ICT training sessions for teachers, associated with the government-mandated change initiative, may not ensure rural students' digital 'well-being', in the terminology of the official Taiwanese documents (MOE 2006b). Considering this, I felt that it was important to probe into the change process and inevitable challenges of implementing ICT in rural schools, if

schools in different areas are expected to provide students with equal digital opportunities.

1.3.5 Background of the two rural schools selected for this research

The ICT Seed Schools selected for this research are two rural primary schools in Yilan County, which is located in north-eastern Taiwan. Much earlier than other local governments, the Yilan County government proposed the White Paper of ICT Education at Junior High Schools and Elementary Schools of Yilan County in 1997 (Yilan County Government 2005). When the ICT SSP was launched, Yilan County took the lead in response to this change initiative and advocated ‘using ICT to lead Yilan’ (Yilan County Government 2005). Unfortunately, the Yilan County government’s active involvement in educational agendas was unable to result in successful ICT developments in all local schools. For instance, the two target schools within this research reflected very different outcomes of pedagogical innovations in ICT integration. Aiming at extending the use of ICT for teaching and learning purposes, both schools were qualified to participate in the ICT SSP in 2003. However, one of them was unable to continue the ICT SSP in 2004. The other school, in contrast, was still a publicly acknowledged ICT Seed School at the time of the research, and its successful experiences in pedagogical innovations in ICT integration were introduced in many schools in Taiwan.

At first sight, the investigation into change management in a so-called successful school might be more constructive to the educational field. However, it is difficult to disagree that findings about the growing pains which schools undergo in the change process can make a contribution to educational practice. As Fink (2000) stresses, lessons learnt from schools with difficulties in implementing and sustaining

pedagogical innovations are highly likely to offer the implications for educational improvement in the existing school practices.

1.4 Research purposes and questions

The main purpose of the present research is to explore the reasons why some schools are relatively successful in implementing and sustaining pedagogical innovations in ICT integration, while others are less so. The second purpose is to examine the way in which the processes of change management within school settings affect their capacities for continuing new teaching practices of ICT integration. With specific reference to the educational context in Taiwan, this research centres on two rural schools with remarkably different levels of sustainability of ICT implementation. This research focuses particularly on four main issues:

1) Leadership approaches to pedagogical innovations in ICT integration

2) Organisational processes of pedagogical innovations in ICT integration

3) ICT resources and teachers' professional development

4) External support for pedagogical innovations in ICT integration

Based on these main issues, the research questions are:

1) Is there any difference between the two target schools with respect to their leadership approaches to pedagogical innovations in ICT integration?

2) Is there any difference between the two target schools with respect to their organisational processes of making pedagogical innovations in ICT integration?

3) Do the in-house ICT resources and teachers' professional development affect the two target schools' pedagogical innovations in ICT integration?

4) Does the external support influence pedagogical innovations in ICT integration in the two target schools?

According to Robson (2002), research questions are required to be clear, feasible and directly related to the research purposes. He goes further, suggesting that good research questions can be built upon researchers' theoretical understanding of the crucial issues raised in the related studies. Considering this, the research questions of the present study were developed from my reflections upon the literature on leadership and school change and the related intention-based studies, particularly Ajzen's Theory of Planned Behaviour (1985). Recently, the Theory of Planned Behaviour has been widely used to explain and predict individual's acceptance of or resistance to the changes or innovations involving ICT adoption in school settings (e.g. Mathieson 1991; Sun 2003) and business sectors (e.g. Venkatesh & Davis 2000). Further discussion of Ajzen's Theory of Planned Behaviour and the associated intention-based research are presented in chapter 2 of this thesis.

It is inevitable that the findings from the two case-study schools within this research limit the possibilities for generalisation. However, little research is undertaken to examine school-wide ICT adoption focusing exclusively on rural areas. It is anticipated that the answers to the research questions of this study can shed light on the approaches to managing pedagogical innovations in ICT integration in rural schools. Thus, it is expected that the result of the present research, on the one hand, will contribute to illuminating the potential factors which facilitate and undermine sustainability of educational change involving ICT integration in rural schools, particularly those in Taiwan. On the other hand, it will extend knowledge in the field of school leadership for change management regarding ICT implementation.

1.5 Limitations of this research

1. The present research is limited in its focus on change management within primary schools in Taiwan. Hence, this research did not include other levels of educational institutions in Taiwan.
2. The research subjects were rural schools. Therefore, schools in other areas (e.g. urban schools) were not included in the present study.
3. This research only explored change management of pedagogical innovations in ICT integration. Consequently, the issues of managing changes in the use of ICT for coping with school management and administration were not included.
4. The findings are specifically associated with the educational context in the Taiwanese rural areas. Therefore, generalisations might be impossible from the results of this study to other educational settings unless similar characteristics are found.

1.6 Definition of the terms used within this research

This section presents the operational definitions of the key terms which are used within this research.

1) Adoption:

Rogers (1995) defines ‘adoption’ as a decision to make full-scale use of a new idea as the best course of action available. In the present research, a new idea is represented by the introduction/extension of the use of ICT in the existing teaching practices.

2) ICT-capable:

According to Kennewell et al. (2000), to be 'ICT capable' is to be competent in managing the situations in which ICT instruments are applied'. Since the present research is involved with ICT integration into the curriculum, the term 'ICT capable' used within this research is represented by teachers' capacities for effectively incorporating ICT with their existing teaching practices.

3) ICT integration, ICT implementation, ICT-integrated pedagogy and ICT-based pedagogy:

In the present research, these four terms are used interchangeably; however, they are all defined as the same meaning – teaching and learning with ICT. That is, the four terms used in this research are referred to as embedding/incorporating ICT in the curriculum for supporting teaching and learning, rather than teaching ICT as a separated subject. In addition, the four terms are not concerned with the application of ICT to dealing with school management and administration.

4) ICT Resources:

'ICT resources' used for supporting teaching and learning can be viewed as 'all aspects of digital information handling' (Kennewell et al. 2000, p.1). In addition, some authors broadly identify ICT resources within school settings as the provision of ICT facilities as well as appropriate technical support (Owston 2007; Selwood 2007). The term 'ICT resources' in the present research is used in the broad sense to cover the ICT infrastructure and technical support within schools. The ICT infrastructure is represented by the hardware, software and networks. Technical support is referred to as the assistance both in maintaining computer hardware and in solving teachers' problems with using ICT in classes.

5) Pedagogical innovations:

An ‘innovation’ can be regarded as an idea, an object or a practice which is perceived by individuals to be new or creative in the context in which they get involved (Rogers 1995). Introducing/extending the use of ICT in classroom practices is concerned with an innovation in the existing teaching approaches or pedagogies (Jones 2004). Considering these authors’ statements and the purpose of this research as well, the term ‘pedagogical innovations’ used in the present study is defined as the ideas or practices of teaching with ICT in a school context.

6) External support:

‘External support’ for school changes and improvements can be widely defined as the outside support which a school secures from its surrounding environment (Leithwood & Riehl 2003; Owston 2007; Tearle 2003). For the purpose of this research, the term ‘external support’ is represented by a school’s outside support gained from the government, parents and teachers’ cross-school learning.

7) Sustainability:

‘Sustainability’ used in the educational context refers both to durability of new practices in school settings and to the fact that whether good practices can be spread from a few schools to the entire educational system (Fullan 2006; Hargreaves & Fink 2006; Lambert 2007). In the present research, new practices are represented by ICT integration into the curriculum.

1.7 Structure of this thesis

The remaining chapters of this thesis are arranged as follows:

Chapter 2 reviews the related studies of educational change and ICT adoption in school settings, and presents the theoretical framework of this research. The theoretical framework was built on two areas of the literature. The first area is concerned with school changes and improvements, with a focus on the issues of school leadership and management. This research draws on Leithwood and Riehl's work (2003), in particular. Leithwood and Riehl (2003) examined the features of effective school management in various countries and identified three common principles of successful leadership practices: 'setting directions' – the development of a shared vision, consensus about school targets and high performance expectations for teachers' work; 'developing people' – enhancing teachers' individualised and professional support, staff commitment, and important values for school developments; 'redesigning the organisation' includes shaping a collaborative learning culture, motivating teachers to participate in decision-making, and building the relationships with parents and the community.

The other area of work relating to this research involves school staff reaction to the introduction of new technologies in the existing teaching practices. The intention-based theories can be useful for bringing about an understanding of and an ability to predict individuals' attitudes and reactions when new technologies intervene in school contexts (see Mathieson 1991; Taylor & Todd 1995). Therefore, the literature on intention-behaviour models (i.e. the Theory of Planned Behaviour and the related studies of individuals' acceptance of ICT adoption) were reviewed and

discussed in this thesis in order to explore teachers' responses to managing pedagogical innovations in ICT integration.

Chapter 3 outlines the methodology and research methods. A case study approach is used in this research and as such the evidence used in covers many sources, since multiple information is highly complementary (Denscombe 2003; Yin 2003). Thus, questionnaires, semi-structured interviews and documentary reviews were used for gathering both quantitative and qualitative data from the two case-study schools – 'School A' and 'School B' – in the Taiwanese rural area. Furthermore, purposeful sampling was applied to ensure that the two schools selected for the present research had clear differences, in terms of their capacities for implementing and sustaining pedagogical innovations in ICT integration. Through analysing both quantitative and qualitative data, the results were used not only for triangulating each other, but also for generating answers to the research questions. Issues of validity, reliability and ethical considerations are also discussed in this chapter.

Chapter 4 presents the educational context and the results of 'School A' – the target school which was identified as being successfully implementing and sustaining pedagogical innovations in ICT integration into the curriculum. Some of the findings from the school were published (see Appendix 8). The results highlighted the fact that the school's achievements in implementing and sustaining its use of ICT were not simply the results of the headteacher's strong leadership, but the joint and intense engagement of staff members in leadership and management.

Chapter 5 outlines the educational context and shows the findings of 'School B' – the target school which was identified as not yet successfully continuing pedagogical innovations in ICT implementation across the curriculum. The results revealed that the key reasons for the school's failure to maintain good practices of ICT integration lay in the fact that leadership functions were not adequately distributed to the staff at all levels, but were limited to the formal leaders and ICT experts (i.e. teachers from within the ICT Instructional Team) in the overall process of ICT implementation. This restrictive pattern of the leadership approach may be related to the fact that the staff, particularly those from outside the ICT Instructional Team, were inclined to accept a traditional hierarchy and bureaucratic approaches to the organisational processes.

Chapter 6 compares and discusses the similarities and differences between the two target schools with respect to four aspects: leadership for ICT integration, organisational processes, ICT resources and teachers' professional development, and external support for pedagogical innovations in ICT integration. Through examining the findings from the two target schools, it was evident that the factors which affected continuation of ICT implementation in school settings were not discrete but inter-related, while distributed or shared leadership played the key role in underpinning school changes and improvements in ICT implementation.

Chapter 7 recaps the key findings from the two target schools. It also provides the implications for school leadership for change management and the application of the Theory of Planned Behaviour to pedagogical innovations in ICT integration. Based on the research findings and implications of the present study, this chapter further offers the recommendations for the Taiwanese government, school leaders and further research.

Chapter 2

Literature Review

2.1 Introduction

The aim of this chapter is to present and discuss the literature of educational change and school leadership for managing ICT integration into the curriculum, and to provide the means for identifying and justifying my research topic. For the research purposes, the literature reviewed and discussed in this study centres on three key issues: educational change and improvement in school settings, successful leadership for school change, and educational intervention of introducing/extending the use of ICT in the existing teaching practices.

On this basis, the conceptual framework for this research was built on two areas of literature. The first area of the literature concerns educational change in general and in ICT adoption within school settings, in particular. The other area of the literature focuses on school staff's responses to the introduction of new technologies in existing teaching practices. The intention-based studies are essential in bringing about an understanding of and an ability to predict individuals' attitudes and reactions when new technologies intervene in school contexts (Mathieson 1991; Taylor & Todd 1995). Hence, a particular type of the intention-behaviour model, the Theory of Planned Behaviour (TPB) constructed by Ajzen (1985), and the related research of organisational members' acceptance of ICT adoption both within and outside the educational arena are discussed.

For the sake of clarity, this chapter is arranged as follows. First, it outlines the methods used for searching and selecting the literature relating to the present research.

Second, it presents the nature of educational change. Third, it explores the sustainability of educational change, with a specific focus on two issues: schools as learning organisations and school leadership for educational change. Fourth, it examines the imperative factors of affecting ICT integration in schools and demonstrates the studies of ICT implementation in Taiwanese schools. Fifth, it presents the Theory of Planned Behaviour (TPB). Finally, it gives a summary for spotlighting the key themes of the literature review.

2.2 Methods used for the literature review

When commencing the literature review for research purposes, it is necessary to consider the width of the available resources (Robson 2002). However, I felt that it was equally essential to further filter through a range of the accessible literature by recognising the boundaries of the present research. This is because being clear about the research topic is crucial for allowing the overall course of the literature review to bring together and explore the studies pertaining to the issues which researchers concern (Gunter et al. 2007). The methods and processes of conducting this review are presented as follows.

2.2.1 Boundary of the research

The available literature on educational change in implementing ICT in schools is mainly divided into two aspects. One of these aspects centres on teaching with ICT; this is usually known as integrating ICT into classes or using ICT across the curriculum (Drenoyianni & Selwood 1998; Kennewell et al. 2000; Loveless 2003; Pilkington 2007; Sheppard 2003). The other aspect refers to applying new ICT software to dealing with managerial and administrative tasks in school settings (Passey 2002; Selwood 2007). Yet, it should be noted that the latter aspect in the

above is beyond the scope of the present research. The key concerns of this research are the questions of whether and how school staff are able to undertake and continue educational change in using ICT for teaching and learning. Even so, attention is still paid to the studies of ICT application to the area of school management, since they also relate to the issues of educational change in the use of ICT in school settings.

2.2.2 Sources and selection of the literature

A systemic search was undertaken by using the following sources of databases and journal indexes:

- Becta's Evidence Database (British Educational Communications and Technology Agency) at http://www.becta.org.uk/: a collection of the research of using ICT in the areas of teaching and learning and school management.
- NCSL (National College for School Leadership) at http://www.ncsl.org.uk/: a collection of the online publications for educational researchers and practitioners.
- Swetswise at http://www.swetswise.com/: a collection of electronic journals.
- Index to Theses at http://www.theses.com/: a comprehensive list of theses with abstracts accepted for higher degrees by universities in Great Britain and Ireland.
- ZETOC at http://zetoc.mimas.ac.uk/index.html: ZETOC offers the access to the British Library's Electronic Table of Contents of current journals and conference proceedings published per year. Since the database of ZETOC is updated on a daily basis, setting up ZETOC Alert enables me to keep up-to-date with new articles and papers relating to the present study.

Due to the research context, it was essential to have an insight into the literature on educational change in ICT integration in Taiwanese schools. Hence, the following

databases were used in this review for obtaining the Taiwanese research and journals in the educational sector:

- Electronic Theses and Dissertations System at http://etds.ncl.edu.tw/theabs/english_site/search_simple_eng.jsp): an online database which is set by the Taiwanese National Central Library and offers full-text theses and dissertations accepted for higher degrees by universities in Taiwan since 1986.
- CEPS (Chinese Electronic Periodical Services) at http://www.ceps.com.tw/ec/ecjnlsearch.aspx: an online database which offers full-text periodicals published in Taiwan since 1991.

In order to select and examine the literature which closely relates to the topic of the present research, further filtering was conducted by scanning the titles and abstracts of the publications which were gained through the above sources.

2.3 The nature of educational change

There seems to be no doubt that educational change can be viewed as a reflection of the accelerating rate of global shifts and diversity in society. Owing to the relentless changes in the information-rich, technology-oriented and increasingly complex world, the importance and necessity of ongoing reform and improvements in education were highlighted early on (Chapman 1996; Cuban 1988a; Hall 1995; Stoll 1999; Velzen & Robin 1985) and have been frequently stressed in the recent literature (Cohen et al. 2007; Fullan 2001; Hargreaves & Fink 2006; Kozma 2003; Venezky & Davis 2002).

Appreciating the urgency of continuous educational transformation and innovations, educational reformers and policy-makers in many countries have proposed the

powerful plans with the ideal guidelines for pursuing better quality education (Cuban 1988a; Fullan 1992; House 2000; Taylor et al. 1997). Furthermore, most authors in the educational arena have achieved a consensus, identifying that the processes of change within education contain three phases below: the initiation/adoption/mobilisation phase, the implementation phase and the institutionalisation/continuation phase (Day et al. 2000; Fullan 2001; Hall 1995; Morrison 1998). Despite the commonly perceived needs for educational innovations and the accepted principle that the implementation phase is the core of succeeding in managing changes (Bush & Glover 2003; Carnall 2003; Fullan 2001; Morrison 1998), very few mandated reform movements in educational settings yield expected outcomes. In his studies, Hargreaves (2002) even criticises that most reform agendas for improving schooling act as 'serial killers' of teachers' passion for instructional innovations, in that quite often the repeated actions caused by educational change fail to promote but defeat existing classroom practices.

The regular failures in achieving the intended targets for educational change and improvement may reflect upon the fact that change management in practice is a complex course in which a nexus of barely controllable but influential factors are entangled (Fullan 2001; Taylor et al. 1997). Therefore, rather than being static and linear, changes in education are usually seen as two-way, dynamic and intricate processes in which subtle and interconnected elements are embedded (Day et al. 2000; Fullan 2001; Hall 1995; Morrison 1998). Furthermore, educational change intrinsically involves not simply the ongoing transformation, development and reorganisations, but also a set of moving targets for responding to the endless needs from within and beyond the school gates (Hall 1995; Hargreaves 2002; Morrison 1998). To a certain degree, the intricate and fluid processes of educational

transformation echo Fullan's (1993) previous assertion that the non-linear causality and complexity between the decision-making, operation and effect of educational shifts and innovations should not be overlooked if changes in the school context are to be effective. Given the features of educational change, it is unsurprising that the effects of the planned educational shifts and innovations are usually far from predictable (Taylor et al. 1997).

Nonetheless, it should be pointed out that the situation of managing changes and innovations in schools is not always bleak. As the recent literature mentions, in some cases school staff accept and adopt new reform agendas for pursuing innovations and improvements at the very start when educational change occurs (Blumenfeld et al. 2000; Combs 2007; Datnow et al. 2002; Hargreaves & Fink 2003; Owston 2007). Despite this, these researchers give the consistent warning that rarely are the initial and fleeting success in educational change able to be either expanded beyond a few schools, or converted into long-lasting innovations and whole-school growth. This caveat appears to reflect upon the fact that:

> In terms of the change process, there has been strong adoption and implementation, but not strong institutionalisation.
>
> (Fullan 2000b, p. 1)

All these above could be summarised as saying that ongoing shifts and innovations in education are crucial and unavoidable, since rapid and relentless changes in people's daily lives require a profound and prompt response from the educational arena. Unfortunately, when intervening into the school context, most reform movements, even including the well-intentioned improvement agendas, have floundered or failed (Datnow et al. 2002; Fullan 2006; Sarason 1990). It is for these reasons that the researchers maintain that in the complex process of educational change, the initial

challenge is to ensure that the intended transformation is desirable and worthwhile for those who are involved (Fink 2000; Fullan 2000a; Hargreaves 2002; Lambert 2007). The next challenge is to make it doable and attainable, and then the most difficult of all is to make it last over time (Fink 2000; Fullan 2000a, Hargreaves 2002; Lambert 2007). Due to the intractability and urgency of sustaining educational change, recently the issues of moving beyond the stages of initiation and implementation to continuation/institutionalisation of educational change in school settings have received increasing attention (Fullan 2000a; Hargreaves & Fink 2006; Lambert 2007).

Bearing the above in mind – as well as considering that the present research focuses on the questions of how schools manage and sustain educational shifts – the next section discusses the imperative elements which determine whether educational change intervening into existing school practices will continue or fade away.

2.4 Sustainability of educational change

Sustainability of educational change typically refers not merely to the durability of reform movements in school settings, but also to the fact that whether these movements can be scaled up or spread from a few schools to the entire educational system (Elmore 1995; Combs 2007; Fullan 2006; Hargreaves 2002; Hargreaves & Fink 2006; Stoll 1999). Therefore, these authors perceive sustaining changes and innovations in education as a much tougher and more complicated undertaking than simply maintaining educational shifts over time. In order to explore in what circumstances educational reform can become widespread and long-lasting, this section discusses the requirements for sustaining changes within education.

Arguing from an ecological perspective, Hargreaves and Fink (2003) think that sustainability of educational change means more than whether or not things can last for long. In their words, the issues of sustaining changes and improvements within education are concerned with:

> How particular initiatives can be developed without compromising the development of others in the surrounding environment, now and in the future.
> (Hargreaves & Fink 2003, p. 2-3)

For Hargreaves and Fink (2003), sustainable educational change in schools has five critical and interrelated features below:

1) Its processes and effects are deep, broad and durable.

2) It supports continuous learning and knowledge sharing for benefiting everyone in the educational context, and thus, it does not profit simply a few individuals by means of partial changes and improvements.

3) It is upheld by accessible human and material resources. Moreover, it develops and renews its resource base.

4) It does not result in any negative impact on its surrounding environments; that is, it never flourishes at neighbouring schools' expenses and resources.

5) It promotes diversity and emphasises the importance of learning from differences through collective efforts for constructive debate and reflective evaluation. Hence, it strengthens not only its institutional capacity for ongoing growth, but also the abilities of its surrounding environments to manage continuous changes and innovations.

Supporting the ideas of Hargreaves and Fink, Fullan (2005a, 2005b) agrees that educational change is usually affected by the context in which it takes place. Fullan, therefore, perceives the needs for considering and examining the whole system of

education when exploring the requirements for sustainable educational improvement. From the perspective of systemic transformation, Fullan conceptualises sustainability of educational change as:

> The capacity of a system to engage in the complexities of continuous improvement consistent with deep values of human purpose.
>
> (Fullan 2005a, p. ix)

Based on the above conceptualisation, Fullan (2005b) maintains that sustaining educational change entails the tri-level solution, which is system-wide and radical transformation within education. This expresses the idea that capacity-building for educational change should focus not merely on the school/community level, but on the district level and the state/central government level as well (Fullan 2005a, 2005b). Hence, he advocates transforming each level of the holistic system for pursing sustainable change and improvement in education. That is, in addition to developing a positive school culture for supporting ongoing changes, Fullan thinks that governments need to foster new mindsets for thinking differently and to strengthen both their knowledge base and capacities for leading schools in managing long-term developments.

Apart from the above advocacy of large-scale and deep reforms at all levels, the remaining interconnected elements which Fullan considers fundamental for sustainable educational change are as follows:

1) Starting educational change with moral purpose. More importantly, moral purpose should move beyond individual levels to systemic levels (i.e. the entire school, the district and the state) if educational shifts and innovations are to be endurable and widespread.

2) Enhancing whole-school capacity for educational change by developing learning networks and communities across different schools.

3) Developing systemic accountability both by building vertical relationships between the central government and school districts, and by enhancing cross-level communicative avenues.

4) Forming a prevailing culture of deep learning for coping with endless challenges in the processes of educational change.

5) Pursuing both short-term and long-term results for achieving system-wide and lasting changes. For Fullan, accomplishing short-term targets for educational improvements functions can function as the cornerstone for developing public trust in mid-term and long-term investments in educational reform.

6) A cyclical mode of two counterbalancing forces – activity and rest – is the component for stepping into successful systemic change in education. Therefore, when reform agendas are announced in educational settings, time commitment and energy management for the whole system need considering.

7) Sustaining educational change requires continuation of adequate leadership capacity which is built throughout the organisation at all levels of the system.

Notably however, while stressing the importance of deep and large-scale reform of the holistic educational system, Fullan (2005a) views successful leadership at the school level as the primary and essential bedrock of integrating the above requirements for sustaining educational change into school contexts. Indeed, although noting the potential impact of a school's surrounding environments on the sustainability of educational change, Hargreaves and Fink (2006) still highlight the fact that leadership capacity within a school is the radical determinant of continuity or discontinuity of educational change.

It is evident that Fullan, Hargreaves and Fink argue sustainability of educational change from different perspectives; however, they reach a consensus that the ways in which schools react to reform agendas generally decide whether or not educational innovations are able to continue and become system-wide. Their common opinion raises the question of the way in which schools develop their capacities for acting positively and effectively on continuous reform movements. Like Fullan, Hargreaves and Fink, other researchers' shared response to the above question is that schools must become learning organisations which cultivate staff collaboration and continuous professional development (Blumenfeld et al. 2000; Combs 2007; Lambert 2006; Leithwood 2005; Sarason 1990). These researchers' arguments also echo the advocacies by Fullan, Hargreaves and Fink that effective school leadership is the core of building school capacity for coping with changes, and that developing sustainable school leadership is the fundamental and key strategy for sustaining educational change and improvement.

Before going any further, it was important to point out that the present research aims at understanding the way in which school staff act on educational change and implement ongoing developments. The studies presented and examined above reveal that successful leadership practice and learning-enriched environments within schools are the core of allowing schools to be well-prepared for continuing educational change. Considering this, the rest of this section discusses two issues: schools as learning organisations and successful school leadership for change management.

2.4.1 Schools functioning as learning organisations

Most educational researchers, on the one hand, agree that organisational processes in school settings can never be completely the same as those in companies (e.g. Fauske & Raybould 2005; Fullan 1999; Hargreaves 1995; Morrison 1998). On the other hand, these researchers stress that understanding the ideas of organisational learning applied to other human organisations, such as the business arena, is an imperative for educational researchers and practitioners who are concerned about managing school change and improvement. On this basis, this section reviews the literature in the educational and business fields for discussing the concepts and features of learning organisations. Furthermore, it explores the effect of schools as learning organisations on managing educational change.

2.4.1.1 Concepts and features of learning organisations

The studies of change management within and outside the educational sector usually use the terms of team learning, group learning and collaborative learning interchangeably for describing the key feature of learning organisations (DiBella et al. 1996; Fullan 2001; Hargreaves 1995; Senge 1990; Sheppard 2003). In fact, these terms express a common notion that purposeful interaction among organisational members and joint efforts of sharing and creating knowledge are the core of increasing individuals' profession and the overall ability of the organisation to pursue ongoing changes and developments (Fauske & Raybould 2005).

Speaking of the concept of organisational learning, the researchers tend to refer to the ideas and definition provided by Senge (Fullan 2001; Garvin 1994; Sheppard 2003). Based on Senge, a learning organisation can be seen as an organisation:

> Where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.
>
> (Senge 1990, p. 14)

For Senge (1990), organisational learning promotes dialogue and discussion between individuals, and this makes organisational members develop open debates by means of learning to think and to act together. The collective efforts of learning are regarded by Senge as the key to forming a shared vision for pursing system-wide and ongoing transformation within an organisation. Therefore, he particularly stresses that only the organisations with capacity for adjusting to rapid shifts in the society all the time are able to keep making reform and progress; yet to achieve this organisational learning is required to be the primary drive for changing and improving workplace culture.

Indeed, apart from being embedded in working routines and organisational culture, organisational learning involves:

> The acquiring, sustaining, or changing of inter-subjective meanings through the artifactual vehicles of their expression and transmission and the collective actions of the group.
>
> (Yanow 1993, p. 40)

Echoing the statements by Yanow (1993), DiBella et al. (1996) elaborate that organisational learning can be conceptualised as:

> The capacity or processes in an organisation to maintain or improve performance based on experience. This activity involves knowledge acquisition (the development or creation of skills, insights, relationships), knowledge sharing (the dissemination to others of what has been acquired by some), and knowledge utilisation (integration of the learning so that it is assimilated, broadly available, and can also be generalised to new situations).
>
> (DiBella et al. 1996, p. 363)

Other researchers also support that high-quality organisational learning usually succeeds in transforming organisational performance and culture as a whole; this enhances the overall capacity of an organisation for making changes and developments continuously (Garvin 1994).

In a sense, all these above could be summarised as saying that the processes of organisational learning involve joint actions of individual members; yet the functions of organisational learning are even more than the sum of individual learning. This is because organisational learning serves as the viable strategy not simply for strengthening and reflecting upon personal mastery, but also for broadening and deepening an organisation's knowledge base for change management. Moreover, interaction and dialogue in the processes of organisational learning take an important role in constructing a shared vision for allowing individuals to work together in undertaking and continuing organisational transformation and improvements.

2.4.1.2 Effect of schools as learning organisations

Like the literature on change management in the business sector, a consistent finding from the studies of educational reform is that organisational learning, collaborative culture and systemic change within school contexts are interrelated (Awbrey 2005; Boyce 2003; Burkhardt et al. 1995; Combs 2007; Fullan 2002; Stoll 1999). These researchers also draw a similar conclusion that organisational learning is necessary for successful and sustainable changes in schools.

When examining change management in education, Morrison (1998) identifies the properties of the school functioning as a learning organisation and they can be categorised as follows:

1) enhancing collective knowledge and personal mastery through continuous professional learning;

2) encouraging staff's positive attitudes and reaction to making differences and innovations;

3) developing common values and a shared meaning among individual staff when educational change is under way;

4) establishing feedback loops in the organisational processes;

5) constructing both formal and informal networks among staff; and

6) promoting shared responsibilities and active involvement of individual staff in school management.

Morrison (1998) also addresses that these properties are deeply rooted in the school culture which is featured as openness, synergy and widespread communication.

The statements by Morrison (1998) seem to echo other researchers' ideas of organisational learning and its impact on teachers' collaboration in undertaking educational reform. As Fullan (2001) pointed out, organisational learning contributes to the following components for effective school change: high staff commitment, mutual trust and coordination across staff members, shared school goals, high participation in continuous professional development and active engagement in decision-making processes. Hargreaves (1995) went further, stressing the difficulties in the processes of school change and improvement can be diminished when a learning culture permeates through the school. That is, staff collaboration in learning-enriched schools is spontaneous, rather than being contrived, because it derives from the staff as a team (Hargreaves 1994). In the same vein, other studies also confirm that schools as learning organisations typically possess a prevailing culture of staff collaboration and continuous learning (Harris & Lambert 2003;

Southworth 2004; Stoll 1999). In a sense, it could be said that in a school with a learning-enriched culture, coordinated action in the organisational processes is accepted by staff members as a natural and an integral part of their daily routines.

More importantly, it is highly likely that institutional collaboration based on staff coordination in learning and working can be treated as the base for energising the whole school to keep improving and creating its future. This is because staff collaboration which arises in learning organisations underpins mutual communication and constructive debates which motivate individuals to think together and to challenge assumptions (Harris & Lambert 2003; Stoll 1999). The interactive processes of collaborative learning, on the one hand, increase individuals' professional skills and knowledge which build the whole-school capacity for making transformation and progress (Harris & Chapman 2002; Southworth 2004). On the other hand, they assist in shaping a common vision and raising individual staff's confidence in experimenting with new teaching practices (Day 2003; Fullan 1999; Leithwood 2005). Consequently, school staff are required to have new mindsets and engage in shared enterprises for school improvements if educational change is to be successful and sustainable; yet to achieve this, schools need to function as learning-enriched organisations (Copland 2003; Fullan 2001).

Other research evidence also reports that organisational learning gives fresh impetus to staff's coordinated action which facilitates change management, such as building shared visions, solving problems together and clarifying each individual's different interpretations of new educational policies through collective discussions (Awbrey 2005; Boyce 2003). A common finding from the large-scale international studies of educational innovations across Europe, Northern America and Asia reinforces that

organisational learning within schools strongly ties with the sustainability of educational change (Organisation for Economic Cooperation and Development [OECD] 2001). The OECD's research particularly stresses that the leadership and management team and teaching staff in the learning-enriched schools coordinated their efforts to develop the improvement plans and settle their confusion about the statements of new educational policies for achieving a shared meaning of whole-school change.

All the above studies prove that collaborative and learning-enriched environments allow schools to be ready for embarking on change and improvement. However, hardly can schools act as learning organisations if the headteacher has little passion for leading the entire staff to work on shifting an institutional culture (Rhodes & Brundrett 2009; Southworth 2004). On this basis, it can be assumed that the headteacher's support functions as the crucial base for establishing collaborative learning organisations.

Indeed, Leithwood (2005) conducted multi-case studies of successful school change in different countries. Leithwood found that these successful schools all fostered strong learning cultures, despite their different educational contexts. He went further, pointing out that headteachers in these schools were the main developers who endeavoured to form their schools as learning organisations. Thus, teachers within these schools were motivated to work closely and collaboratively in sharing pedagogical knowledge and skills. More importantly, each of theses schools nurtured a positive culture within which staff members were open to colleagues' comments on their ideas.

Conducting the longitudinal case studies of the life-cycle patterns of a specific school, Fink (2000) explored the reasons why schools usually moved away from the stage of innovation to convention by examining a school in Canada. In the first innovative period in his case study school, Fink found that the staff had a shared meaning and responsibility for success and were willing to embark on the risk-taking change and experimentation, because of their high commitment to continuous improvements. In addition, a culture of collaborative learning throughout the school allowed the staff to receive constant support from colleagues and to attend professional training regularly. The staff felt free to share their information and challenge colleagues' arguments when evaluating different ideas, since they were open-minded and respected differences among individuals. However, after the headship changed, staff collaboration faded away. The cultural norms which used to exist in the previous innovative period, such as a shared meaning, professional development for supporting continuous progress and risk-taking, were replaced by isolation, divisiveness, cynicism and disappointment. All these changes made this earlier innovative school turn out to be conventional.

Based on Fink (2000), a culture of collaborative learning usually encourages teachers to offer and receive both informal and formal assistance in their professional development, and this is interrelated with teachers' confidence in individual skills and certainty of taking action for educational change. More importantly, his findings also show that changes in the approach to school leadership could result in the radical shift in whole-school working patterns and organisational culture.

It would be evident that organisational learning has strong interrelationships with institutional collaboration and systematic change, and that constructing schools as

learning organisations can be treated as the fundamental strategy for school renewal and improvements. Nevertheless, without adequate school leadership capacity for supporting and developing a system-wide learning culture, it is nearly impossible to transform a traditional school into a learning organisation. In a sense, aside from working and learning patterns of the entire staff, leadership approaches are highly influential to whole-school change. The next section will examine the impact of school leadership on educational change.

2.4.2 School leadership for educational change

There is a common agreement that it calls for successful school leadership to raise the abilities of the entire school to continue educational transformation and growth (Crawford 2005; Day 2003; Fullan 2006; Hargreaves & Fink 2006; Leithwood 2005). Despite the growing enthusiasm for developing leadership capacity for school change within the research community, rarely is attention paid to the radical questions of how and why particular patterns of leadership are highly instrumental for implementing educational change (Day 2003; Harris & Spillane 2008; Spillane 2006). On the grounds of the above – as well as considering one of the purposes of the present research is to explore the way in which school leaders steer the entire school towards or away from successful reform – this section discusses the concept of leadership practice in a school context and examines the key principles of successful school leadership for managing educational change.

2.4.2.1 Leadership practice in a school context

The definitions of leadership are different from one study to another. Even so, leadership is generally regarded as a fluid relationship within a process of pursuing collective purposes of the organisation (Cuban 1998b). Indeed, while noting that the literature lacks a consensus on the precise definition of leadership, Yukl finds that:

> Most definitions of leadership reflect the assumption that it involves a [social influence] process whereby intentional influence is exerted by one person [or group] over other people [or groups] to guide, structure and facilitate the activities and relationships in a group or organisation.
>
> (Yukl 1998, p. 3)

The studies focusing on the capacity of school leadership for educational change see leadership as a dynamic and an ongoing process of influence in which all school staff get involved (Day 2003; Leithwood et al. 1999). Gronn's (2002) research of the new approach to school leadership in today's changing times describes leadership as a status which is attributed to an aggregate of individual staff in school organisations acting in concert.

Proposing enhancing leadership capacity for school change and improvement, Harris and Lambert (2003) assert that leadership is more than the sum of individual leaders. Since leadership concerns 'an energy flow or synergy generated by those who choose to lead' (p. 17), Harris and Lambert maintain that the concept of school leadership needs to be:

> Separated from person, role and a discrete set of individual behaviours. It [school leadership] needs to be embedded in the school community as a whole.
>
> (Harris & Lambert 2003, p.17)

Echoing the statement by Harris and Lambert, Leithwood and Riehl (2003) claim that leadership in school settings should be treated as a function, rather than a role. It is Leithwood and Riehl's belief that school leadership involves a set of functions which are performed by staff members in different roles and at all levels in a school. They, therefore, define school leadership as the functions of 'providing direction and exercising influence' (p.3). In addition, they point out that a successful school leader does not simply impose goals on teachers, but work with teachers in developing the conditions which support continuous changes and innovations in education.

All these above studies appear to reach a consistent conclusion that school leadership is not determined by a high-powered headteacher's charisma, but by the reciprocal interaction among and coordination across positional and informal leaders and followers within schools. This is because leadership practices in school contexts involve the collective efforts and shared responsibilities for achieving a common purpose of all staff members.

2.4.2.2 Principles of successful school leadership

Reviewing extensive studies of leadership practice in a school context, Leithwood and Riehl (2003) identify setting directions, developing people and redesigning the organisation as the crucial and basic principles of successful leadership. In his later international studies of school leadership and educational change, Leithwood (2005) verifies the applicability of these principles in different school settings across different countries. Considering this, the present research demonstrates and discusses three principles of successful school leadership proposed by Leithwood and Riehl (2003), and examines the related research of leadership for managing changes in schools.

1) Setting directions

For Leithwood and Riehl (2003), successful headteachers set school goals not merely for coping with the present educational change, but for prompting the entire staff to foster a vision of the long-term school development. Based on this belief, Leithwood and Riehl argue that the principle of setting directions involves:

- constructing and communicating a clear vision for whole-school transformation and development;
- forming shared meanings to assist school staff in acting appropriately and effectively on the reform agendas;
- demonstrating performance expectations for high-quality work;
- developing consensus about coherent short-term targets; and
- monitoring and assessing the organisational performance by means of reflective evaluation and systematic evidence.

Clearly, staff collaboration is one of the main strategies for achieving a shared vision and teachers' agreement on the goals of school improvement (see section 2.4.1). However, as a school leader, the headteacher needs to be visionary and responsible for creating a culture which is supportive for open communication and productive discourse; this is the useful access to constructing a common meaning of change and innovation in education (Leithwood 2005). Encouraging staff members to engage in the processes of target setting also facilitates teachers' involvement in decision-making (Leithwood & Riehl 2003).

In addition, clarifying and conveying the school's direction is not only an essential capacity of the headteacher for tackling systemic change, but also the base of setting a common and distinct vision for the future development (Combs 2007; Harris &

Lambert 2003). In addition, the processes of goal setting can generally form common beliefs and values among individual staff; this could allow the entire school to foster a change culture for supporting innovations and improvements (Combs 2007; Day 2003; West et al. 2005). Fullan (2001) makes a similar point by saying that effective school leaders usually work together with teachers in attacking the fragmented reform agendas through staff discussions on the issues of school future and the tactics for improvement. He also warns that school change cannot be successful unless its meaning is shared among staff. In a sense, it can be assumed that successful headteachers collaborate with school staff in shaping the school's vision and in discussing the strategies for achieving the collective goals.

Other research findings reinforce the crucial role of the headteacher in organising school directions for educational change. Day et al. (2001), for instance, explored the role of leadership in 12 improving English schools in which the headteachers were publicly acknowledged as being instrumental in overall success of the schools. A common and key finding from these schools is that the headteachers took the initiative to discuss clear visions and values with staff, in order to build a shared sense of meaning and to promote teachers' commitment. Importantly, despite the high standards used for evaluating the progress of whole-school performance, they were considered by the staff challenging but achievable. This is mainly because the headteachers in these schools not merely worked together with the staff in setting and revising targets, but also inspired the staff to reach for ambitious goals by offering adequate support.

Instead of centring on successful school change, Brown (2002) investigated the headteacher's leadership in a failing English primary school. Based on his findings,

teachers in this school were uncertain of which action for school change had the high priority and did not comprehend what the headteacher expected of them. One of the main reasons was that the headteacher did not notice the importance in bridging the gap between every short-term improvement scheme at each stage. Although there seemed to be a shared culture in which teachers communicated the issues of educational improvement with their colleagues, the headteacher spent little time participating in staff discussions of the strategies for reform agendas. Brown, therefore, suggests that it seems essential for the headteacher to act not only as an initiator, but also as a mediator and a manager of the clear school vision and plans, particularly when educational change is under way.

All the above studies reflect the paramount role of the headteacher in leading the staff to achieve a consensus on the reform movements for school improvement. In addition, staff contribution to school change tends to depend on whether the headteacher offers sufficient support and has high expectations for the progresses in their work. As a result, the way in which the headteacher establish and communicate the school's vision and directions can be considered potentially influential to educational change in practice.

2) Developing people

Believing that effective school management depends on the joint efforts of the entire staff, Leithwood and Riehl (2003) contend that successful headteachers emphasise the development of human resources in their schools. For Leithwood and Riehl, the principle of developing people concerns the following areas:

- providing intellectual stimulation;
- emphasising individualised needs and professional learning; and

- setting appropriate models which are consistent with the school's values and goals.

The successful headteacher supplies professional training to enhance teachers' skills, and created a school culture which nourishes the constructive debate and open evaluation among staff. Hence, it is spontaneous for teachers to reflect upon existing practices critically, question taken-for-granted assumptions and experiment with new practices (Leithwood 2005). Indeed, in order to succeed in managing and sustaining educational change, school staff need to 'steer clear of false certainty' (Hargreaves & Fullan 1998, p. 114).

The initiation of school change usually requires teachers' sufficient competency for adapting themselves to reform and their aspiration for educational improvement (Fullan 2001; Louis 2007; Morrison 1998). Importantly, the encouragement and support from the headteacher could be the main force for driving teachers to participate in continuous professional learning. For example, In Day et al.'s (2001) research, the successful headteachers encouraged staff to make attempts on risk-taking for changing and improving the present status, and acknowledged staff's good work. These headteachers also fostered hope to face educational reform and to inspirit teachers who had difficulties in carrying out new teaching practices.

In their case studies across different schools in England, Leithwood and his colleagues found that all headteachers had a strong and positive impact on the staff's motivation, commitment and beliefs about the supportiveness of their working conditions (Leithwood et al. 2006). They concluded that the headteacher is the crucial supporter for staff to develop their personal mastery in embarking on school change.

In the same vein, Harris and Lambert's studies of developing leadership capacity for school change and improvement also address that:

> Leadership is about learning together and constructing meaning and knowledge collectively and collaboratively … It means generating ideas together; to seek to reflect on and make sense of work in the light of shared beliefs and new information; and to create actions that grow out of these new understandings.
>
> (Harris & Lambert 2003, p.17)

More specifically, successful headteachers are able to lead staff in considering the values and reflecting upon the action for new educational agendas in a critical and constructive way (Leithwood et al. 2006). In fact, even in the school with a collaborative and learning culture, it seems inevitable for staff members to confront conflicting tensions when working together. This is because like-minded consensus is not the base of staff collaboration within schools (Fullan 1999; Hargreaves & Fullan 1998). Despite this, the studies of sustaining educational change in schools address that the value of teachers' collaborative learning lies in showing their respect for and learning from individuals' diversity (Fullan 2006; Hargreaves & Fink 2006). It is for these reasons that the headteacher's and other senior leaders' prompt mediation of turning conflicts among staff members into productive discourse and discussions is particularly imperative in the organisational processes. That is, without the competent headteacher and other senior leaders to manage the conflicting tensions among staff members, individuals' diverse opinions and critical dialogue cannot be beneficial, but fragmented or even harmful for people who work together in pursuit of school change and improvement (Fullan 1999).

Reviewing extensive studies of a series of educational reform in America, Cuban (1988a) revealed that although making change to a certain extent, schools 'remained fundamentally the same' (p. 343). Whilst noting that the superficial school change was partially caused by the problematic educational policy, Cuban also argued that the radical problems were embedded in schools. As he observed, teachers at the frontline of educational practice usually accustomed themselves to their daily routines of schooling. He, therefore, said that 'change may be a continuous process, but notions of improvement reside in the heads of participants' (p.343). In order to manage deep and continuous change in school settings, school leaders need to form and demonstrate the important values (Cuban 1988a).

Indeed, educational policies are usually overload and fragmented, and this can result in disturbance as schools are asked to carry out educational change (Fullan 2001; Hargreaves 2002). Even so, Fullan (2001) argues that the teachers' resistance to implementing and sustaining educational change can be diminished, when the headteacher enlarges the school's capacity by supporting teachers in both rational and emotional ways (Fullan 2001). It would appear that the problems with educational policies can cause teachers to struggle with managing school change. However, compared with external factors, the internal factor – the way in which the headteacher shapes the common values among teachers – tends to be more influential to educational reform within the school context. That is, there should be a wholesale shift in teachers' attitudes towards the reform movement which they encounter.

3) Redesigning the organisation

Last but not the least, the principle of redesigning the organisation is the core of successful school leadership. It is well-documented that schools acting as learning organisations interconnect strong school capacity for change management, institutional coordination and a prevailing culture of supporting innovations (see section 2.4.1). Leithwood and Riehl (2003) further point out that successful headteachers are enthusiastic about constructing schools as professional learning organisations/communities and underpinning staff collaboration in the process of leadership and management. On this basis, the principle of redesigning the organisation in Leithwood and Riehl's views relates to the areas as follows:

- promoting staff's participation in decision-making;
- shaping a positive culture which possesses shared norms, values, beliefs and attitudes and which develops staff's coordinated action, mutual caring and trust;
- allocating equipment and tailoring the organisational structure based on the needs of the school as a whole and individual staff; and
- establishing external relationships with parents, neighbouring schools and governing bodies.

Notably, Leithwood and Riehl (2003) add that successful leadership for change management is usually associated with participative or shared patterns of leadership practice. That is, successful headteachers encourage teachers to take the role in leading and managing school not only by empowering the staff to exercise leadership practice, but also by cultivating teachers' leadership abilities.

The critical role of the headteacher in facilitating staff collaboration is reinforced in Leithwood's (2005) other studies of school leadership in 7 countries. As Leithwood

concludes, rarely can institutional coordination among teachers in implementing educational change arise if the headteacher is unable to create a culture in which teachers feel ownership of school leadership and management. The later studies by Leithwood et al. (2006) report that collaborative approaches to leadership practices inspire teachers to perceive the needs for engaging in decision-making in the processes of school change, and that this is instrumental in making educational change institutionalised and sustained. It would appear that a school culture which fosters mutual trust and collaborative working relationships and centres on professional learning is more likely to succeed in self-renewing and responding to improvement efforts (Day et al. 2000; Harris & Lambert 2003).

It seems that, rather than depending on the strong lead from an individual, sharing or dispersing leadership among school staff at all levels is the base for achieving long-term and system-wide educational change. Indeed, Crawford (2005) observes that staff participation in leadership could be fundamental for producing the collective outcomes which are relatively meaningful for school change and development. Many authors also agree that the concept of distributing leadership to teachers has become increasingly embedded in the language and practice of school leadership for educational change (Bush & Glover 2003; Fullan 2006; Hargreaves & Fink 2006; MacBeath 2005).

Other research evidence also suggests that effective headteachers in changing times should bring their colleagues into school leadership, in order to enlarge the benefits of staff collaboration for educational change. For instance, examining the new approach to leading schools to undertake and continue educational innovations, Gronn (2000) concludes that headteachers are key, but not exclusive, leaders. Gronn's conclusion

seems to suggest that school leadership needs to be distributed appropriately to staff if educational change in school settings is to be sustainable. To a certain degree, this reflects upon the fact that the single heroic and charismatic leaders are no longer able to manage continual educational change, even though a temporary success in school change may arise at the early stage (Hargreaves & Fink 2006; Morrison 2002). Indeed, it is widely accepted that appropriate distribution of school leadership to school staff can be instrumental for promoting teachers' engagement in leadership practices. Teachers' active involvement in school leadership is at the heart of the school's success in educational change (Chapman 2003; Harris 2004; MacBeath 2005; Rhodes et al. 2008). Importantly, some researchers go further, underlining the correlations between teachers' awareness of their important role in leadership processes and their intention to take up the responsibilities for making school change for better (Harris 2004; MacBeath 2005; Muijs & Harris 2003). Therefore, it seems that distributed leadership can be accepted as being a key constituent in achieving successful school change. More than this, though, in order to make distributed forms of leadership exert their potential power to facilitate the change process, it is essential for the school to enhance teachers' perceptions of their crucial role in leadership activity.

In Fink's (2000) case study school (discussed previously in section 2.4.1.2), the headteacher in the innovative period, on the one hand, let himself lead less and allowed teachers and parents to lead more by dispersing power, control and resources. On the other hand, this headteacher handled the tension between the leadership team and the other teachers, although he was regarded by the staff as a quiet and encouraging leader rather than an aggressive one. In Fink's mind, this successful headteacher was not a leader of followers, but a leader of leaders. Although Fink agreed that encouraging teachers to participate in leadership practice and making

decisions is helpful for staff collaboration and school development, he also noticed that it is essential but challenging for the headteacher to satisfy each teacher's needs. Despite the difficulties in dealing with differences among staff, mediation and communication are still the core tasks the headteacher needs to take. Based on Fink (2000), the main factor which directly influences continuity and discontinuity of school change lies in whether team building, coherence and staff collegiality in leadership are firmly embedded in the school's organisational processes.

In addition to promoting staff collaboration, the role of the headteacher may determine school relationships with parents and neighbouring schools. Several authors have contended that the continuation of educational change calls for the joint efforts of schools and families and collaboration among each school in the local community (e.g. Cheng 1996; Fullan 2001; Hargreaves & Fullan 1998). These authors also point out that staff in the school where the headteacher actively maintains strong extra-relationships with the wider community are generally keen on encouraging their teaching staff to collaborate with teachers from other schools. The research focusing on the successful schools in England also shows that the headteachers' involvement in building relationships with parents and other schools was one of the main reasons for letting these schools continue changing and improving (Day et al. 2001).

In Lam et al.'s (2002) studies of Taiwanese primary schools, most teachers in these schools felt that the desirable staff collaboration within school and across different schools functioned as the encouragement which supported them to overcome ongoing educational challenges. Moreover, this research reveals that teachers in the schools in which the headteachers were inward-looking tended to pay little attention to the opportunities for interacting with others in the neighbouring schools (Lam et al. 2002).

Owing to the core role of the collaboration within the school community in educational change, Lam et al. suggest that the headteacher is required to construct stable relationships with other schools for continual development. The findings from the above studies by Day et al.'s (2001) and Lam et al.'s (2002) could be summarised as saying that headteachers have a profound impact on both internal- and external-organisational collaboration and relationships that affect teachers' collective potentials for tackling change.

Like staff collaborative learning within school, building cross-school collaboration is likely to be tough for headteachers. Hargreaves and Fullan (1998), on the one hand, viewed 'forming new alliances' with parents and the school community as one of the guidelines for successful school change. On the other hand, they warned that it may pose problems for schools, if headteachers are unable to deal with the new pattern of working relationships. Morrison (2002) also confirmed that it is necessary for headteachers to establish close and steady relationships with parents and other schools, particularly when schools are undertaking educational change.

On this basis, there seems to be no doubt that collaborative learning within the school context can be beneficial for successful educational change and improvement. However, in order to enlarge the advantages of collaborative learning among school staff, the headteacher may need to take responsibilities for constructing a shared vision of school directions and supporting teachers by supplying the sufficient and specialised training.

2.5 Factors influencing ICT integration in schools

As many authors recognise the advantages of expanding ICT implementation in schools, they must also note that some staff members are reluctant to make the change involving the use of ICT (Cohen et al. 2004; Loveless 1995; Tagg 1995). However, teachers' support and professional skills could be the core of ICT development in schools. Cohen et al. (2004), for instance, stated that:

> If the teacher is not sufficiently expert or well prepared, if the teacher has a negative attitude to the use of ICT, if the teacher does not change his or her teaching behaviour, or if the teacher does not enable learning styles and learner behaviour to change, then the best promises of ICT will not be realised.
>
> (Cohen et al. 2004, p. 60)

In addition to teachers' professional capacities and beliefs, the roles of headteachers and ICT coordinators influence whether the ICT plan can work well in schools (Kennewell et al. 2000; Selwood 2007; Tagg 1995). Furthermore, technological equipment is the basic component for commencing ICT implementation (Venezky & Davis 2002). In order to understand the main factors affecting ICT development in schools, the remainder of this section discusses the following issues: the role of school leadership, school plans for ICT improvement, the role of the ICT coordinator and support from other staff members, and ICT resources and ICT-related training for school staff.

2.5.1 The role of school leadership

The role of school leadership usually has a profound impact on whole-school change for ICT integration in teaching and learning (Becta 2005; Heinrich 1995; Selwood 2007). Importantly, it seems to be the collaborative approach to school leadership that raises staff's willingness to experiment with new practices regarding the use of ICT for teaching and learning purposes. As Kennewell et al. (2000) contend, leadership

shared among the headteacher and other senior leaders is essential to shape an ICT culture which acts as a stimulant to the effective use of ICT in the school context. This is mainly because an ICT culture which penetrates the whole school makes teachers enthusiastic about continuous learning and open to new teaching practices (Fox 2003; Tagg 1995).

Other studies also reveal that school leadership could determine the maturity of ICT in schools. For instance, Sheppard (2003) investigated leadership approaches, organisational learning and educational change of ICT integration in Canadian schools. These schools were classified by Sheppard as innovative, moderately innovative and the least innovative (or static) based on their levels of ICT integration in classes. The findings show that the main cause making the difference between the innovative and the least innovative schools lay in leadership approaches. As Sheppard pointed out, leadership in the innovative schools was collaborative and shared among the headteacher, teachers, parents and other community partners. The headteacher also developed a supportive atmosphere for staff's continuous professional learning, innovation and risk-taking. This gave fresh impetus to teachers to be willing to experiment with new practices for making innovations and improvements in their teaching methods. Moreover, the headteacher was neither the sole plan-designer nor the final decision-maker; rather, senior teachers or managers acted as leaders who worked together with other staff members in building the school's vision and developing the improvement plan. Since the school culture fostered mutual trust, teachers with expertise in technologies were empowered to exercise leadership of managing the ICT-related schemes.

In the least innovative schools in Sheppard's (2003) research, the leadership approach was not participative and collaborative, but traditional and hierarchical. Most teachers were unconcerned about their ownership of the school committee and accustomed themselves to depending on the headteacher's directions and decisions. In many cases, the headteacher maintained the predominant position by filtering or altering the committee's decisions without their consensus. Even so, the teachers tended to accept the bureaucratic decision-making process within their schools. Although these schools did not have laudable results in ICT development, the staff generally felt satisfied with their present state of ICT adoption and did not think that change was a must. Despite the fact that some teachers were not fully content with the level of ICT integration in their schools, they did not convey their feelings to their formal leaders (e.g. the headteacher and other senior leaders), but blamed the circumstances on the external elements, such as the chaos caused by the new educational policy and the limited resources from the community. This was viewed by Sheppard as the main reason why these schools failed to keep educational change and improvement in implementing ICT. Sheppard concludes that ICT development in schools is subject to the degree of staff collaboration and organisational learning. He also stresses that only if school leadership is shared and participative, can the organisational learning continue and support school change in ICT implementation.

Tearle's in-depth case studies (2003), which focused on a school in England in which new teaching practices of ICT integration were successfully implemented and sustained. Tearle found that intense involvement and collaboration among school staff in the leadership processes was the key to allowing this successful school to enlarge its capacity for continuing good practices of ICT implementation.

Another study also shows that the role of the headteacher's leadership figures highly in school change involving ICT implementation. Wong and Li (2006) explore the relationships among leadership, school cultures and ICT implementation in one-tenth of the school population in Hong Kong. They identify a correlation between the headteacher's leadership and a school culture which affected teachers' reception of new teaching practice – using ICT in classes. Specifically, headteachers in the schools which integrated ICT into classes successfully had four common features: building a shared vision, fostering trust and empowering teachers, supporting innovations in education, and emphasising staff professional development. These key features of leadership formed their school cultures of collaboration and experimentation by promoting open and efficient communications between school managers and teachers, encouraging staff collegiality and stimulating staff to strive for school improvement involving using new technologies. Wong and Li summarise their findings by stating that the effective ICT integration in schools requires a collaborative culture among individual staff. In addition, the headteacher's leading approach is the key determinant which directly affects how a school culture is constructed.

Sheppard's multi-case studies (2003) and Tearle's in-depth case studies (2003) were conducted in a Western country, while Wong and Li's (2006) large-scale quantitative research was based on the Asian context. Despite their different research approaches and settings, all these researchers' common findings reinforce Kennewell et al.'s (2000) statements that the construction of ICT-capable schools is grounded on shared responsibilities of leadership.

Moreover, the headteacher's active involvement in the overall course of pedagogical shifts regarding ICT adoption seemed to be crucial to the success in widespread use of

ICT in a school context. For instance, Yuen et al.'s research (2003) focused on schools in Hong Kong. They found that the headteacher's encouragement and aspiration highly influenced teachers' acceptance of ICT integration. In order to detect the main factors enabling schools to continue ICT improvement, Owston (2007) conducted studies in ICT-capable schools in 28 countries. In these ICT-capable schools, 7% of the headteachers were classified by Owston as 'neutral' towards educational innovation, 66% were 'supportive' but not directly involved, and 27% were 'actively involved' in the innovation. Owston concluded that headteachers within his research tended to act as gatekeepers of educational innovation regarding the use of ICT in schools. Similar findings were also reported in Thomson et al's research (2006), which examined 6 Australian schools which successfully sustained pedagogical innovations in ICT integration.

In fact, not only is the role of the headteacher important for ICT implementation, but so are the ways in which senior leaders handle the ICT coordination. As the research indicates, the headteacher in the ICT-capable school works closely with the ICT coordinator, in order to comprehend the overall ICT policy and the state of ICT in the school (Kennewell et al. 2000). This allows the headteacher to identify the school-based needs and to communicate with staff about the extended whole-school development plan for using ICT in the coming years. Furthermore, Kennewell et al. stressed that most senior leaders in ICT-capable schools are deemed to be lead teachers who take the initiative to integrate ICT, instead of yielding responsibility to the ICT coordinator. On this basis, it could be summarised from Kennewell et al.'s statements as saying that without strong and continuous support from the headteacher, the ICT coordinator usually has difficulty in making contribution to a school. Apart

from this, sufficient involvement and aspirations of senior leaders is also important for extending ICT use in schools.

Becta (2005) also emphasised the benefits of senior leaders' active engagement in ICT implementation. As Becta suggested, if the process of integrating ICT is to be successful, the role of the leadership team is fundamental in designing the ICT policy for school improvement. Moreover, the studies by Somekh et al. (2007) revealed that senior leaders' commitment to improving school-wide ICT adoption from the outset of the change and development process was particularly influential on the levels of ICT integration in school settings. Their evaluation of the ICT Test Bed Project[1] reported that the establishment of an ICT-capable school required senior leaders' vision statement and their long-term plans for technological development. More specifically, they also stressed that the proactive involvement of senior leaders in the organisational processes, such as staff discussions, decision-making and goal-setting process, had a potential and positive effect on the overall course of managing school-wide ICT implementation.

Similarly, in the Taiwanese studies focusing on ICT implementation in school settings, good quality of school leaders' joint lead is widely accepted as the core of long-term pedagogical innovations in ICT integration. For example, Hsia's research (2002) concerned the key elements which affected pedagogical innovations in ICT integration in a city school. Hsia found that in addition to teachers' ICT skills, the headteacher's and the ICT coordinator's involvement in the leadership processes of

[1] The ICT Test Bed Project is a 4-year project launched by the Department for Education and Skills (DfES) in 2002, and aimed at understanding the effect of the government's wider agenda for education reform concerning ICT integration into schools (Becta 2006).

school-wide change potentially influenced the levels of ICT integration into teaching practices. Hsia went further, stressing that the headteacher and the ICT coordinator felt the strong needs for improving their skills in guiding the entire staff through the difficulties in the change process of ICT implementation. Ironically, Hsia's findings revealed that the government-run training programme for school staff did not focus particularly on leadership skills and knowledge of managing pedagogical innovations in ICT integration (Hsia 2002). In addition, Hsu's research (2004) investigated the outcomes of the government-mandated initiative for ICT integration in 155 city schools in Taiwan. Evidence from Hsu's research reinforced the significant effect of the leadership abilities of the headteacher and other school leaders (e.g. the ICT coordinator and director of academic affairs) on the change efforts of ICT integration in school settings. Echoing the studies by Hsia (2002), Hsu's findings also showed that even in the schools which were successful in making changes of ICT implementation, the headteacher and other school leaders were not confident of continuing their good practices of ICT integration over time.

2.5.2 School plans for ICT improvement

The ample literature has recognised the importance of a whole-school plan in supporting the ongoing ICT development; nevertheless, it seems to be challenging for school staff to set up the plans for improving ICT effectively and continuously (Fox 2003; Heinrich 1995; Kennewell et al. 2000). One of the reasons is that the relentless technological advance makes it necessary to update frequently the action for ICT progress in schools (Heinrich 1995; Selwood 2007; Yaxley 2003). The other reason is that the government spotlights the results of school change in using new technologies; yet they tend to be less concerned about guiding schools through the difficulties in managing school-based ICT plans (Becta 2005; Heinrich 1995). In order to solve

these problems, many authors have suggested that both the ICT policy statement and the ICT development plan should be considered when designing whole-school plans for ICT development (e.g. Fox 2003; Heinrich 1995; Selwood 2007; Yaxley 2003).

For Yaxley (2003, p. 19), the ICT policy statement can be viewed as a document which clarifies 'what the school is setting out to achieve in ICT and how it proposes to go about it'. The purpose of the ICT development plan is to demonstrate the detailed steps of accomplishing the goals listed in the ICT policy statement; therefore, the ICT development plan needs to contain the tasks, resources available, success criteria and timescales (Yaxley 2003). That is, the ICT policy statement offers the clear but brief guidelines for the ICT development in the future, while the ICT development plan focuses on 'what is currently happening to move things forward in the school' (Yaxley 2003, p. 19).

Selwood (2007) also thought that schools should set up both the ICT policy statement and the ICT development plan for improving ICT continuously, and that the ICT vision statement within the ICT policy can be fulfilled by means of the ICT development plan. Importantly, he further pointed out that the ICT policy statement should also outline the current situations of the school, in order to examine the needs based on the school context.

Somekh et al. (2007) also support the idea that planning for ICT should meet demands from the school. Their findings from the ICT Test Bed Project revealed that the leadership team of the school which was able to sustain ICT integration built the whole-school ICT policies into the school improvement plan. Moreover, once the ICT policy was underway, the leadership team also considered and outlined the ways of

continuing technological development in the coming years (Somekh et al. 2007). As a result, it would appear that it is fundamental for school leaders to be visionary about sustainability of the improvement in ICT, when the school is at the commencement of the ICT plan.

Furthermore, the effective process of managing a whole-school ICT plan requires the involvement of the headteacher and senior leaders in three stages – vision, review and implementation (Becta 2005). Becta (2005) elaborates that the headteacher and senior leaders should be certain of what they attempt to accomplish, comprehend the state of ICT in the school, show the realistic strategies for meeting the targets and evaluate the outcomes. As Becta indicates, the operative process is not linear, but cyclic and interactive, and so that each stage can feed back to alter one another. Therefore, it could be said that school leaders are required to modify the ICT development plan frequently by reviewing the present conditions of their school. This is parallel to Selwood's (2007) and Somekh et al.'s (2007) arguments that the ICT plan should be updated and adaptive to what the school needs.

Moreover, whether the government takes the initiative to guide schools to the ways of managing changes in ICT implementation is considered essential. For instance, Becta (2005) suggests that, instead of merely encouraging schools to extend ICT use, the government needs to be proactive and ambitious about leading schools to develop long-term plans for ICT.

In a Taiwanese study, Hsia (2002) stated that it may be necessary for the Taiwanese government not only to supply the support for ICT equipment, but to enhance school leaders' competency in management and sustainability of educational change for ICT

development. Similar opinions are given in another Taiwanese study by Yang (2004) concerning the implementation of the government-funded ICT project in primary schools. As Yang indicated, most headteachers and senior leaders were struggling with carrying out school change caused by the introduction of the central ICT project, since the government overlooked the necessity of the long-term investment in building school leaders' abilities to make the systemic change and ongoing progress in using new technologies.

As a result, compared with the plans for other educational change, the ICT plan may need to give more details and to be fulfilled through shorter cycles of management processes (Selwood 2007). Due to educational situations in practice and the advantages of using the cyclic development plan for ICT, it may be helpful for school leaders to decide the priority of school-based needs.

2.5.3 The role of the ICT coordinator and the ICT subject leader

In the literature on educational leadership and management, it has been generally accepted that middle leaders in schools, such as subject leaders, have the potential to alter staff members' working culture which could affect teachers' engagement in the processes of school change (Busher et al. 2007; Busher & Harris 1999). Importantly, as a middle leader, either the ICT subject leader or the ICT coordinator is usually put in the spotlight when a school undertakes pedagogical innovations involving ICT adoption. As Kennewell et al. (2000) highlighted, it is middle leaders, the ICT coordinator and the ICT subject leader in particular, who enact a pivotal role in converting the headteacher's or other senior leaders' vision and plan for ICT into effective teaching practices. Kennewell et al. went further, stressing that the ICT coordinator and the ICT subject leader could potentially assist in shaping an ICT

culture in which other staff members are inspired to participate in the coordination of ICT throughout the change process.

It may not be surprising that the ICT coordinator and the ICT subject leaders have a certain influence on the overall course of implementing ICT in schools. This is because the ICT coordinator's responsibilities are to exercise strategic leadership across subject areas to extend the use of ICT in classroom practices and to advise the headteacher on the ICT component of the school's development plan (Fox 2003; Kennewell et al. 2000). The ICT subject leader's responsibilities are to organise ICT training sessions in order to offer the required support for teachers who teach ICT as a separate subject (Fox 2003; Kennewell et al. 2000). Notably, however, the studies of ICT implementation in the educational context in England revealed that in secondary schools there are typically two teachers who share the responsibilities for taking up the role of the ICT coordinator and the ICT subject leader (Fox 2003). The above studies further pointed out that most primary schools in England simply have the ICT coordinator alone to deal with ICT integration into the curriculum and teachers' ICT training as well (Fox 2003). Fox, therefore, claimed that in comparison with ICT coordinators in secondary schools, ICT coordinators in primary schools may face heavier workload in the change process of implementing ICT. Similar opinions were given in the studies of ICT implementation in educational settings in Taiwan (Chan & Wu 2003; Yang 2004). These researchers found a common trend in the Taiwanese primary schools that there is only one staff member (i.e. the ICT coordinator) who assumes the responsibilities for coordinating the use of ICT across the curriculum and for leading colleagues in teaching ICT. These researchers also subscribed to the same views, arguing that the ICT coordinator in a primary school is usually burdened with more workload than other middle leaders (Chan & Wu 2003; Yang 2004).

It would appear the studies regarding ICT implementation in a primary school have similar findings that the ICT coordinator generally takes a wider variety of roles than those coordinating any other subject. As Tondeur et al. (2007) reported, within primary schools, not only do ICT coordinators need to handle the coordination of ICT, but they are also expected to be the immediate trouble-shooters of technological problems, the key leaders or managers of school-based ICT plans, and the organisers of the staff members' ICT training. For Heinrich (1995), the nature of ICT coordinator's day-to-day work in a primary school usually involves teaching ICT as a separate subject, cross-curricular support for staff, supplying in-service training, developing the ICT plan, managing school networks and maintaining technological systems. Due to the ICT coordinator's demanding jobs, Heinrich (1995) stressed that successfully implementing ICT in schools requires strong support and collaboration of staff members at all levels. Heinrich further stated that it could be useful to hold the staff meetings aiming at discussing the issues of school-based requirements for ICT, in that the mutual communication could be the spur for teachers' participation in the action for promoting ICT integration. Examining the essential component for effective implementation of ICT in schools, Yaxley also asserted that:

> Staff should be involved as much as possible in the drafting of the [ICT] policy. This will help them to feel a sense of ownership of the policy.
>
> (Yaxley 2003, p. 20)

Moreover, based on Sheppard's findings (2003) from the 'innovative schools' (i.e. the schools successfully implementing ICT in Sheppard's research), there was a tendency that classroom and subject teachers were actively involved in the processes of pedagogical innovations in ICT integration (discussed previously in section 2.5.1). On this basis, it could be said that the ICT coordinator is required to assume the duty to manage the school's plan for ICT. Even so, other staff members specialising in

different subjects also need to shoulder the responsibilities for implementing ICT if whole-school change regarding ICT adoption is to be successful.

Echoing the above literature, Hsu (2003) concluded that a primary school ICT coordinator in Taiwan is a classroom/subject teacher who concurrently holds a leadership position as a middle leader with the responsibilities for three key areas: (1) promoting the status of ICT implementation and development in the whole school; (2) introducing ICT into teachers' lesson planning (across the whole of the curriculum); and (3) managing the school's ICT resources. Owing to the above responsibilities, the ICT coordinator needs to cope with the following tasks: (1) managing the in-house ICT training sessions for school staff; (2) attending the government-funded ICT training and ICT-related conferences to identify and disseminate the latest ideas and strategies for teaching and learning with ICT; (3) working closely and collaboratively with teachers to coordinate/implement ICT across the curriculum; (4) assembling and developing online teaching and learning materials (e.g. producing the ICT-integrated instructional modes used for a wide range of subject areas); (5) assisting teachers in handling problems with the computer hardware and software (e.g. offering immediate technical support for teachers and negotiating maintenance arrangements with the school's contracted ICT suppliers); (6) upgrading the hardware and software; and (7) managing the school network and maintaining the school's websites and teachers' and students' email accounts.

In the same vein, Chan and Wu (2003) conducted their research to explore the ICT coordinator's daily workload in the Taiwanese schools. Chan and Wu found that in addition to having class-teaching responsibilities, the ICT coordinator were required to act as the core leader for guiding colleagues to develop the school's ICT policy, to

manage the ICT-related tasks (e.g. implementing ICT across the curriculum and arranging ICT training sessions for the staff). Moreover, in Chan's studies (2002) which surveyed ICT coordinators' willingness to continue their job posts in Taiwanese schools nationwide, nearly 70% of the respondents were reluctant to keep holding their posts in the next academic year, due to the overwhelming burden of their day-to-day working practices, such as technical maintenance, network management and designing the school-based online platform for teaching and learning. Owing to the daunting tasks in the ICT coordinator's working routine, Chan claimed that the processes of implementing ICT in a school context entail the ICT coordinator's endeavour as well as the joint efforts from other teaching staff. Similar findings about the ICT coordinator's heavy workload were also reported in another Taiwanese study (Yang 2004). As Yang pointed out, when pedagogical innovations in ICT integration is introduced in school settings, the ICT coordinator's daily workload is usually much heavier than most other formal leaders. This is not only because of the nature of ICT (e.g. continuous advances in computer technology), but also because ICT integration is a form of cross-curriculum pedagogical innovation (Yang 2004). Yang, therefore, suggested that the leadership responsibilities for managing new practices of ICT integration in a school should be shared between the ICT coordinator and other staff members across different subject areas.

Based on all the above studies, it can be summarised as saying that the tasks of pedagogical innovations in ICT integration should not be put on the shoulders of one particular school leader, such as the ICT coordinator, but be appropriately distributed to the staff at different levels if educational change of ICT integration is to be successful and sustainable. In other words, not only the ICT coordinator's high commitment to ICT development, but staff members' joint contribution to the

leadership processes of implementing ICT is also fundamental for managing wholes-school change in ICT integration.

2.5.4 ICT resources and ICT-related training for school staff

There seems no doubt that successful implementation of ICT in the school context calls for both sufficient ICT resources and teachers' adequate ICT skills and knowledge. Many studies have observed that the government's funding for enlarging the ICT infrastructure in school settings is the basis for commencing educational change involving new technologies. For example, Harris (1999) argued that if the access to technological equipment is inconvenient for school staff, teachers will go back to the traditional instruction. Hence, when the government proposes extending the use of ICT in schools, they should also supply sufficient and appropriate equipment (Harris 1999). In his large-scale international studies, Owston (2007) found that the ICT infrastructure is the primary requirement for schools to manage changes and improvements in new technologies.

Apart from this, the government support for the ICT equipment should consider school contexts, in order to meet the needs of schools (Venezky & Davis 2002). Similarly, recent research undertaken in the Taiwanese educational context also sheds light on the importance issues of school-based needs, particularly when the government intends to offer support for schools to manage changes and improvements in ICT adoption. For example, conducting their studies in 51 Taiwanese primary schools with different contexts in terms of size and area, Lam et al. (2002) found that compared with city schools, rural schools were dependent more on the provision of technological equipment from the government. This is possibly because city schools usually have more internal and other resources from parents and the local community

(Lam et al. 2002). Consequently, Lam et al. suggested that the government needs to allocate ICT resources by examining the circumstances of schools. More recently, Tang's comparative studies (2007) explored school staff using computer software for dealing with school administration in 2 city schools and 2 rural schools in the Taiwanese educational context. In Tang's findings, in comparison with rural schools, city schools had much more sources of financial support from outside the school. Tang further pointed out that schools in rural areas highly relied upon the fixed budget set by the government.

Based on the common result of the comparative studies by Lam et al. (2002) and Tang (2007), it seems that compared with city schools, rural schools in Taiwan may encounter much more challenges when schools are expected to make changes and improvements in ICT implementation, in particular. To a certain degree, this result raises concerns over the divide between rural schools and city schools with respect to their financial resources. In this sense, it can be said that the sufficiency of the Taiwanese rural schools' external support securing from the government is worthy of further attention and exploration.

In addition, in order to examine the outcomes of the government-mandated reform movement concerning ICT integration in school settings, Chen (2004) undertook the large-scale studies in 200 primary schools in Taiwan. Chen found that the frequency of using ICT across the curriculum in the schools did not meet the government's expected target. Chen went further, pointing out three radical problems with the low frequency of ICT adoption in classes. The first problem was that the existing ICT facilities within schools were not always available for teachers. Second, the ICT-based learning materials did not fit well with the curricular content and purposes.

Finally, teachers were unable to gain the immediate technical support when technological instruments went wrong during classes. Echoing Chen's findings, Chiang's research (2005), which investigated the barriers to integrating ICT into the curriculum in 55 schools in Taiwan, also confirmed that both inadequate ICT facilities and incompatibility of the ICT-integrated pedagogies with the existing practices were the key barriers. Apart from this, Chiang highlighted another barrier which was concerned with teachers' limited access to appropriate training sessions.

Indeed, apart from the ICT resources, teachers' professional development can be deemed the fundamental factor determining the sustainability of ICT development in schools. As Venezky and Davis (2002) put it, the reliable and accessible ICT equipment is critical at the initial stage of using ICT in a school; however, sustaining ICT implementation entails good-quality and continuous professional training for enhancing teachers' ICT capabilities. Venezky and Davis' (2002) common findings from different schools in Europe which succeeded in incorporating ICT into the curriculum indicated that the useful teachers' training programmes increased teachers both ICT skills and pedagogical knowledge of integrating ICT in teaching practices effectively and appropriately. Importantly, most schools which continued advancing in ICT actively engaged in larger national demonstration programmes or other consortia that shared expertise in using ICT (Venezky & Davis 2002). Venezky and Davis concluded that schools which sustained ICT improvement usually supplied teachers with the in-house training and managed professional development across schools, regions or at a national level. Venezky and Davis (2002) also noted that successful professional development for staff beyond a single school entails both the coordination among different schools and the strong support from the government.

2.6 The Theory of Planned Behaviour (TPB) and the related intention-based studies

Considering the present research was concerned with implementation and sustainability of pedagogical innovations in ICT integration in school settings, I would argue that the factors which potentially affected teachers' reaction to the new teaching practices involving ICT adoption were in need of exploration. On this basis, this section presents and examines the main concepts of the Theory of Planned Behaviour formulated by Ajzen (1985), who introduced the theoretical constructs of the intention–behaviour link.

Recently, many researchers have identified intention-based theories and models as an instrumental approach to examining behavioural intention, for understanding and predicting individuals' reaction to the intervention of new technologies in an organisation. While different models have been proposed in several studies regarding technology acceptance and usage (e.g. Taylor & Todd 1995; Venkatesh et al. 2003), the Theory of Planned Behaviour constructed by Ajzen (1985) is the theoretical basis for these revised models. Furthermore, in his study centring on the comparison of different models in a school context, Mathieson (1991) verified that the Theory of Planned Behaviour provides more specific and detailed information which assists in guiding ICT development in an organisation, and this is also well supported by Taylor and Todd's (1995) findings. Due to the applicability of the Theory of Planned Behaviour to the educational settings in which new technologies are introduced, the present research uses the Theory of Planned Behaviour as a theoretical framework for exploring the factors which may make school staff support or resist the continuous ICT development.

The Theory of Planned Behaviour constructed by Ajzen is an extension of his previous theory – the Theory of Reasoned Action (Ajzen 1985). The Theory of Reasoned Action believes that when individuals have full volitional control over their behaviour, intention which is jointly affected by attitude towards the behaviour and subjective norm can be used to explain and predict the desired behaviour (Ajzen 1985; Ajzen & Madden 1986). However, human behaviour is usually under limited volitional control, and this confines the prediction and application of the Theory of Reasoned Action in practice (Ajzen 1985). Identifying the limitations in the Theory of Reasoned Action, Ajzen (1985) developed the Theory of Planned Behaviour by adding 'perceived behavioural control (PBC)' to the original intention–behaviour link in the Theory of Reasoned Action. As can be seen in Figures 2.1 and 2.2, PBC is not considered in the Theory of Reasoned Action, but regarded as one of the crucial factors influencing intention, or even behaviour, in the Theory of Planned Behaviour. That is, the Theory of Planned Behaviour assumes that:

> The more favourable the attitude and subjective norm with respect to a behaviour, and the greater the perceived behavioural control, the stronger should be an individual's intention to perform the behaviour under consideration.
>
> (Ajzen 1991, p. 188)

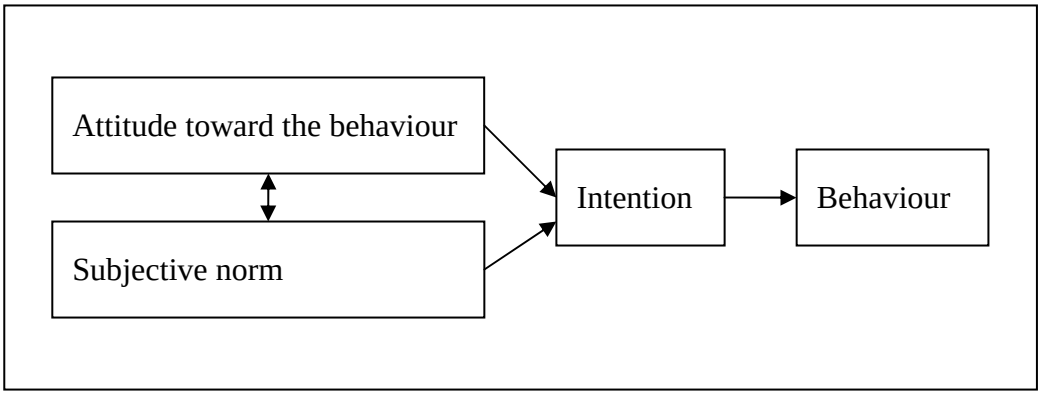

Figure 2.1 The Theory of Reasoned Action (Ajzen & Madden 1986, p. 454)

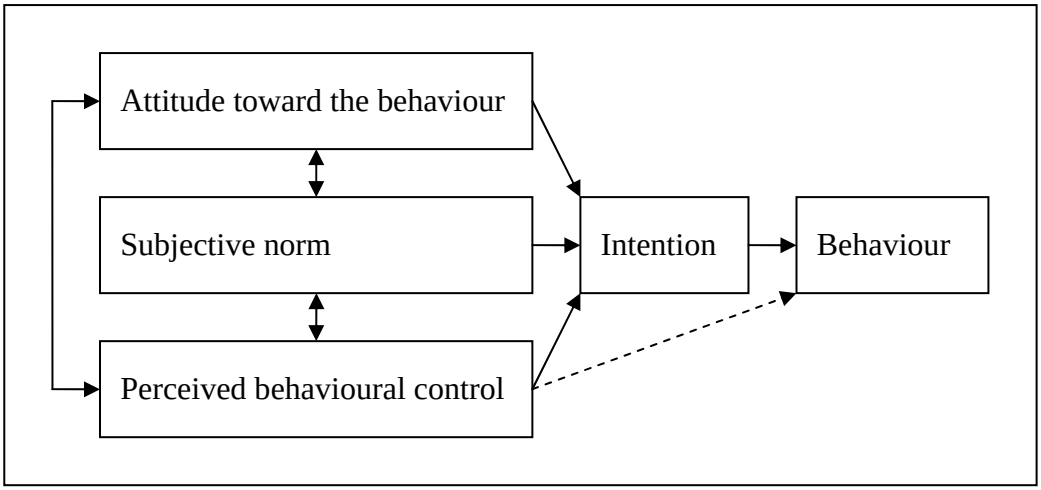

Figure 2.2 The Theory of Planned Behaviour (Ajzen & Madden 1986, p. 458)

Further discussions of the key components in the Theory of Planned Behaviour are presented as follows.

2.6.1 Behaviour and intention

Behaviour is defined by Ajzen (1985) as the observable and goal-directed performance in a specific context, and mainly driven by intention. The term 'intention' at the earliest stage of formulating the Theory of Planned Behaviour was simply seen as individuals' attempts to perform the given behaviour, rather than necessarily relating to actual action (Ajzen 1985). Yet, substantial studies have verified the strong correlation between intention and actual behaviour (Ajzen 1991; Mathieson 1991). Thus, in his later work, Ajzen (1991) asserted that intention can be seen as the immediate antecedent of the behaviour and serves as the indicator of individuals' will and readiness to execute the action desired. Furthermore, Ajzen (1985) assumed that intention is not only determined by attitudes and subjective norms, but can be moderated by perceived behavioural control in a particular situation (detailed information on 'perceived behavioural control' is presented in section 2.6.4).

1) Related studies of individuals' behaviour and intention

With respect to individuals' responses to ICT adoption in organisations, Mathieson (1991) claimed that in many cases user acceptance of new technologies can be predicted from their intention. Davis et al.'s research (1989) which focused on individuals' reaction to technological innovations also showed that intention and behaviour regarding ICT usage are closely related. In Taylor and Todd's studies (1995) concerned with students' use of technologies, intention not only functioned as an essential mediator in the links between attitudes and behaviour and between subjective norms and behaviour, but also played a vital role in explaining and predicting the expected performance.

2) Reflections upon behaviour and intention

Based on the above research evidence, Ajzen's proposal (1985) of the strong link between intention and the given behaviour can be helpful to understand the relationships between individuals' intention of ICT adoption and their actual responses to technological innovations. Since the present research is concerned with educational innovation of ICT implementation in schools, the potential factors making the target schools continue or discontinue ICT development may be detected by comprehending staff members' intention involving the use of new technologies.

2.6.2 Attitudes towards the behaviour and behavioural beliefs

'Attitudes towards the behaviour' are individuals' positive or negative evaluations of performing the expected behaviour, and they are assigned to personal determinants of intention (Ajzen 1985). For Ajzen (1985), individuals' attitudes towards the behaviour are shaped by 'behavioural beliefs' (i.e. original perceptions of the expected behaviour) which are the subjective values of the consequences of the target behaviour. Moreover,

among different behavioural beliefs, only a few of them which are readily accessible at a given moment are assumed to affect attitude towards the behaviour (Ajzen 1985).

1) Related studies of individuals' attitudes towards the behaviour

Echoing Ajzen's arguments, many studies using the Theory of Planned Behaviour for examining institutional changes/innovations involving ICT implementation in a school setting have verified individuals' attitudes towards ICT adoption as the crucial determinants of the level of individuals' acceptance of the ICT-based new practice within their workplace (e.g. Mathieson 1991; Taylor & Todd 1995). The common findings from these studies showed that individuals' attitudes undertaking the ICT-related changes/innovations are the key to affecting their intentions and the expected behaviour of applying ICT to the existing working practices. These studies further confirmed Ajzen's assumptions that individual's behavioural beliefs had the potential to decide their attitudes towards the behaviour. In this sense, it can be assumed that when it comes to individuals' acceptance of or resistance to the ICT-related innovations, the underlying behavioural beliefs determining individuals' attitudes towards ICT adoption are worth examining.

Among a wide range of behavioural beliefs (or original perceptions of the expected behaviour), many studies have identified 'perceived compatibility' and 'perceived easiness' as the crucial perceptions which profoundly affect attitudes towards accepting the ICT-related innovations which are introduced in individuals' workplace (Davis et al. 1989; Moore & Benbasat 1991; Rogers 1995). The notion of 'perceived compatibility' is concerned with whether individuals perceive that the expected innovation corresponds to their existing values, previous experiences and current needs (Rogers 1995). The term of 'perceived easiness' relates to whether individuals believe that they can use or apply the expected innovation without confronting

difficulties (Davis et al. 1989). Resonating with the above studies, Taylor and Todd's research (1995) – which used Ajzen's Theory of Planned Behaviour to investigate individuals' attitudes towards ICT adoption in schools – pointed out that individuals' perceived compatibility and perceived easiness were at the core of deciding individuals' attitudes towards applying ICT to their existing practices.

Sun's studies (2003) applied the Theory of Planned Behaviour to examining teachers' acceptance of new teaching approaches of ICT adoption in the Taiwanese schools. Based on Sun's research, teachers' attitudes towards ICT adoption were found to be at the heart of affecting their intention to undertake the ICT-related pedagogy. More than this though, when comparing the impact of individual's behavioural beliefs on their attitudes towards conducting the new practices of ICT integration, perceived compatibility was found to be more influential than perceived easiness. Sun went further, adding that teachers' perceived easiness had a positive, but no significant, impact on their attitudes. This result was explained by Sun as the fact that most teachers perceived students' benefits from learning with ICT, and this perception potentially inspired teachers to overcome their difficulties in undertaking new practices of ICT integration. Sun, therefore, suggests that if the new teaching approaches involving ICT application are expected to be effectively and widely used in school settings, school leaders may have to enhance teachers' positive attitudes towards ICT adoption by notifying them of the utility and benefits of teaching with ICT.

Wu's research (2004) also used the Theory of Planned Behaviour to investigate teachers' intention to teach with ICT in 14 primary schools in Taiwan. Based on Wu's findings, once teachers felt satisfied with the required ICT resources and training

sessions, the extent to which teachers perceive the compatibility of ICT adoption with their teaching experiences and existing practices was particularly influential to teachers' intentions to continue implementing ICT across the curriculum. Apart from this, the international studies by Owston (2007), who explored the determinants of sustaining ICT implementation in contextually different schools across 28 countries. Echoing Wu's research within the Taiwanese educational context, Owston's international studies also revealed that teachers' convenient access to the ICT facilities and technical support was necessary, but not sufficient for sustaining pedagogical innovations in ICT integration within school settings. Owston went further, identified that teachers' perceived compatibility of ICT integration as the essential and predominant factor which had the potential to lead teachers to persist with good practices of ICT application.

2) Reflections upon attitudes towards the behaviour and behavioural beliefs

As discussed above, the Theory of Planned Behaviour assumes that behavioural beliefs (or original perceptions of the expected behaviour) are the basic and important factors influencing individuals' attitudes towards the behaviour, and this assumption is well supported by the studies of ICT implementation in schools and other organisations. Importantly, the common findings from the studies confirm that individuals' perceived compatibility and perceived easiness are widely accepted as the primary behavioural beliefs which decide individuals' attitudes towards ICT adoption. More importantly, however, when individuals understand that new technologies are of great value to them, perceived compatibility seems to exert a more powerful impact on their attitudes than does perceived easiness. That is, it is likely that individuals will cope with difficulties in using new technologies if these technologies are compatible with their experiences and meet their current needs. Given the above, when

implementing pedagogical innovations in ICT integration, school staff in leadership positions may need to effectively convince teachers of the benefits from teaching with ICT and the applicability of the ICT-integrated pedagogy to the existing classroom practices. By doing this, teachers may be inspired to foster positive attitudes towards embarking on pedagogical innovations involving ICT adoption, even when encountering the unavoidable challenge in the change process.

2.6.3 Subjective norms and normative beliefs

The term 'subjective norm' – which is the social determinant of intention – refers to individuals' perceptions of social expectations and pressures put on them to perform or not perform the behaviour, and is formed by normative beliefs (Ajzen 1985). Normative beliefs are concerned with individuals' motivation to comply with 'important others' (Ajzen 1991, p. 195). That is, normative beliefs deal with the probability that salient referents would approve or disapprove of individuals' performance of the target behaviour (Ajzen 1991). For Ajzen (1985), an important referent can be a person or group whose beliefs and opinions are usually influential to the individuals under study.

1) Related studies of subjective norms

Ajzen's ideas of the relationship between social influence and human intention have been widely used for explaining people's reaction to technological innovations. For example, in the literature on introducing/extending the use of ICT in an organisation, Ajzen's concepts of subjective norms usually serve as the essential basis for understanding the impact of social influence on people's reaction to ICT adoption (e.g. Hartwick & Barki 1994; Venkatesh & Davis 2000). Apart from this, in the educational field, Chou (2006) undertook the studies which used the Theory of Planned Behaviour to explore and explain the Taiwanese teachers' acceptance of new practices of ICT

integration. In Chou's studies, the teachers' desire for colleagues' approval in the social system within their workplace was proved to be one of teachers' underlying reasons for accepting and getting involved in whole-school pedagogical innovations in ICT integration. Therefore, supporting Ajzen's assumptions, Chou concluded that subjective norms embedded in teachers' workplace were highly likely to affect teachers' intentions to engage in the change process of implementing ICT.

Importantly, the extent to which subjective norms affect individuals' intentions of ICT adoption may rely on individuals' ICT background (e.g. ICT-related experiences, knowledge and skills). For example, Taylor & Todd (1995) explored individuals' acceptance of new technologies in school settings. Their findings showed that subjective norms had a significant impact on individuals' intentions of ICT adoption. More than this though, the effect of subjective norm on intention was more influential to individuals without prior experiences in ICT and less influential to those with ICT-related experiences (Taylor & Todd 1995). The different impact of subjective norms on individuals with different ICT-related experiences in Taylor and Todd's research (1995) seems to echo Hartwick and Barki's arguments (1994) that individuals with very limited ICT-related experience tended to form their intentions of ICT adoption by counting on others' opinions and reactions.

Rather than focusing on an individual level, Venkatesh and Davis' (2000) longitudinal field studies chose different types of firms to be research subjects and examined people's ICT usage from an organisational perspective. Similar to the results of Taylor and Todd's research (1995), the common findings from different firms in Venkatesh and Davis' studies indicated that subjective norm was influential to individuals' intention, and this was particularly evident when organisational members lacked

ICT-related experiences and skills. Furthermore, the firms were classified by Venkatesh and Davis as two categories. One is a voluntary system in which individuals' voluntariness is the basic impetus for using new technologies; the other is a mandatory system in which decisions made by leaders and managers are the main force driving individuals to use new technologies. In the firms characterised as mandatory systems, subjective norm was more influential to intention than was individuals' attitude. Nevertheless, most organisational members in both systems gained experience in ICT usage in the process of ICT implementation, and thus personal judgment on ICT adoption, instead of others' opinions, became the key determinant of intention. Therefore, even in mandatory systems, subjective norm was specifically important for affecting individuals' intention to use new technologies at the initial stage of ICT development, but became less important over time.

It would appear that the effect of subjective norm on individuals' intention of ICT usage fails to last in organisations; yet social influence exerted through mandatory systems may contribute to organisation members' technological adoption in the beginning of ICT implementation. As Agarwal and Prasad (1997) suggested, mandating for using technological innovations could be valuable in enhancing the positive impact of subjective norm on prompting organisational members to overcome the hurdle of first-time use. Venkatesh and Davis' research and Agarwal and Prasad's statements may echo Rogers' arguments (1995) that mandates for adopting innovations usually put systemic pressure on individuals, and this could be a useful and direct mechanism letting organisational members realise the advantage of making changes. He, however, also contends that in many cases the social pressure caused by subjective norm on individuals' motives for using innovations will weaken as time goes by.

2) Reflections upon subjective norms and normative beliefs

All the above studies confirm that subjective norms are usually important for shaping individuals' intentions of accepting or rejecting ICT-related innovations. These studies could support Ajzen's arguments (1985; 1991) that individuals' intentions are likely to be affected by subjective norms. Moreover, social influence and pressure formed by subjective norms may be useful for making organisational improvements in ICT adoption at the initial stage of the change process. Even so, individuals' sufficient ICT-related experiences may attenuate the effect of subjective norms on their intentions to use ICT. In this sense, when school changes regarding ICT development are under way, the necessary pressure put on the staff seems to be essential and important in the change process. Despite this, however, it is equally or even more important to offer the staff the adequate support for enhancing teachers' ICT-integrated pedagogical skills. By giving the required pressure and suitable support, it is highly likely to promote teachers' intentions of taking action for supporting ICT implementation.

2.6.4 Perceived behavioural control and control beliefs

Ajzen's construct of perceived behavioural control mainly originated from Bandura's (1982) concept of perceived self-efficacy which involves individuals' confidence in executing the intended action (Ajzen 1985).[2] Therefore, perceived behavioural control is defined by Ajzen (1985) as individuals' perceptions of the ease or difficulty of performing the given behaviour, and refers to whether individuals feel confident of their abilities to overcome the impediments to the behavioural goal. The basis for constituting perceived behavioural control is a set of control beliefs (Ajzen 1991).

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[2] According to Bandura (1982, p.122), perceived self-efficacy is concerned with 'judgements of how well one can execute courses of action required to deal with prospective situations'.

According to Ajzen:

> Control beliefs may be based in part on past experience with the behaviour, but they will usually also be influenced by second-hand information about the behaviour, by the experiences of acquaintances and friends, and by other factors that increase or reduce the perceived difficulty of performing the behaviour in question.
>
> (Ajzen 1991, p. 196)

That is, control beliefs are concerned with the accessibility of requisite resources and opportunities in the process of executing the expected behavioural performance (Ajzen 1985). Laying great stress on the relationships among control beliefs, perceived behavioural control and actual behaviour, Ajzen stated that:

> The more resources and opportunities individuals believe they possess, and the fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behaviour.
>
> (Ajzen 1991, p. 196)

Even though his research evidence showed that perceived behavioural control correlated well with behavioural performance, Ajzen (1991) acknowledged that a direct link between perceived behavioural control and behaviour may emerge only under two conditions. First, the behaviour is not totally under individuals' volitional control. Second, perceived behavioural control needs to reflect the actual behaviour completely. Consequently, as Ajzen (1985) mentioned, when required resources change or unfamiliar elements intervene in the process of performing the behaviour, individuals' perceived behavioural control is likely to fail to function as the predictor of their behaviour. That is, perceived behavioural control is the context-specific expectancy of the particular behavioural achievement, and varies, rather than remaining stable, in different situations (Ajzen 1985; Mathieson 1991).

1) Related studies of perceived behavioural control

As regards the research exploring individuals' technology acceptance and usage from an intention–based perspective, the significant impact of perceived behavioural control on intention has been found in several studies (Mathieson 1991). Yet, individuals' lack of ICT-related experience is likely to moderate the effect of perceived behavioural control, but enhance the influence of attitude, on intention of using new technologies.

Applying the Theory of Planned Behaviour to understanding ICT acceptance of individuals with and without ICT-related experiences, Taylor and Todd (1995) used individuals' self-efficacy and facilitating conditions within a school setting, such as technological compatibility and time and financial management of using ICT resources, as the key control beliefs of ICT adoption. As their research showed, the effect of perceived behavioural control on the intention of using ICT was significant for individuals whether with or without ICT-related experiences. Even so, ICT-inexperienced individuals' intentions of ICT adoption counted more on their attitudes towards using ICT than on perceived behavioural control. However, ICT-experienced individuals' intentions relied more on their perceived behavioural control than on their attitudes. Taylor and Todd (1995), therefore, concluded that inexperienced individuals seemed to readily depend on their attitudes and discount control information when forming their behavioural intentions.

The research by Tsai (2000) applied the Theory of Planned Behaviour to investigate teachers' willingness to use ICT for supporting teaching and learning in 16 different-sized primary schools in Taiwan. Tsai found that in the change process of pedagogical innovations in ICT integration, the link between teachers' self-confidence

in using ICT in classes (perceived behavioural control) and intentions was relatively strong, but weaker than that between attitudes and intentions. However, Tsai stressed that the schools within his research were at the very early stage of adopting the specifically high-tech ICT instruments, and thus the teachers had limited information of using these new technologies and the associated online materials for teaching purposes. In addition, most teachers still lacked the in-house training on using the sophisticated technological innovations. It is for these reasons that the teachers' determination to accept or reject ICT integration depended much more on their original attitudes towards ICT adoption, rather than on the level of their confidence in handling the difficulties in implementing ICT across the curriculum (Tsai 2000). Detailed discussion of the relationships between individuals' attitudes towards ICT adoption and their reaction to the ICT-integrated teaching approaches are presented in section 2.6.2.

2) Reflections upon perceived behavioural control and control beliefs

The studies discussed in the above confirm that perceived behavioural control figures pre-eminently in intention of ICT adoption. These studies also indicate that lack of the ICT-related experience and access to the required facilities for supporting ICT use may decrease the effect of perceived behavioural control on intention of technological adoption, but attitude may become particularly influential to intention instead. To a certain degree, these findings reflect upon Ajzen's assertion (1985; 1991) that the consideration of the impact of perceived behavioural control is likely to enhance the accuracy in explaining behavioural intentions, specifically when individuals are familiar with the expected behaviour and gain the requisites for performing the behaviour. On this basis, it is worth noting that perceived behavioural control may affect teachers' intentions of accepting or rejecting school change regarding ICT

implementation, only under the condition that teachers are provided with sufficient technological resources and appropriate training on ICT application. When it is not, then teachers' attitudes towards ICT adoption can act as the fundamental factors which are likely to decide whether or not they intend to carry out school changes for ICT development.

To conclude, the Theory of Planned Behaviour may function as an essential base for explaining and predicting human behaviour. From the literature, it appears that this theory can serve as a conceptual framework for understanding the key factors making individuals accept or reject ICT-related innovations by detecting social and personal determinants of intention and perceived control over behaviour. School changes caused by the introduction of ICT implementation are involved with educational intervention and innovations. Thus, the Theory of Planned Behaviour can be helpful for exploring the reasons why school staff support or resist changes for ICT development.

2.7 Summary

Ongoing educational change, coupled with integrating new technologies into school settings, may make school staff encounter more challenges. Nevertheless, inherently complex factors in the process of educational change concerning ICT implementation do not mean that effective improvement is always unattainable. Specifically, successful ICT integration into schools depends on the headteacher's leadership approaches, the level of staff collective efforts and organisational learning cultures.

In order to sustain ICT development in schools, headteachers and senior leaders may be required to take the initiative to set up long-term ICT policy according to the

school-based demands. The strategies for the continuous progress in ICT should be considered in the beginning, rather than at the end, of the operative process of the school ICT plan. Importantly, the key to constructing an ICT-capable school may lie not only in the internal positive impetus from the school itself, but also in the external support from the government and the stable relationship between the school and its community.

The present studies are concerned with educational change for ICT development in school organisations, and thus the intention-based theories, Ajzen's Theory of Planned Behaviour (1985), in particular, are discussed in this research. Furthermore, based on the literature regarding ICT implementation and educational change, the reaction of school leaders and teachers to the intervention of new technologies in schools seems to act as the radical determinant of ICT development. Bearing this in mind – as well as considering the main ideas of the intention-based theories had been verified by many educational studies to be applicable to exploring and even predicting individuals' readiness and reaction of the whole organisation in which new technologies intervene (e.g. Mathieson 1991; Sun 2003), the main assumptions of the intention–based studies discussed in this chapter were used to examine and explain the driving force making school staff continue or discontinue educational change involving ICT development.

Chapter 3

Methodology and Research Methods

3.1 Introduction

This chapter is to present the methodology and research methods of the present research, and comprises the following six sections. First, it demonstrates the research purposes and questions. Second, it discusses the use of quantitative and qualitative research approaches in the field of social studies, and then gives the reasons for applying mixed methods research (the combination of both quantitative and qualitative research) and case study approaches to conducting the present study. Third, it outlines the methods of data collection and analysis focusing on questionnaires, interviews and documentary reviews used in the field. Fourth, it evaluates the research design against the criteria of reliability and validity. Fifth, it discusses the ethical issues considered within the present study. Finally, it makes a summary of this chapter and presents the methodological framework for this research.

3.2 Research purposes and questions

The main purpose of the present research was to understand the reasons why pedagogical innovations in ICT integration within some schools were successfully implemented and sustained over time, while within other schools gradually faded away, particularly after the initial imposed pressure disappeared. The second purpose was to explore the way in which the processes of change management within school settings affected school staff reaction to the continuation of the ICT-integrated pedagogies. With specific reference to the educational context in Taiwan, this research centres on two rural schools with relatively different levels of capacities for sustaining educational change involving ICT adoption. In addition, the present study focuses particularly on four key issues:

1. Leadership approaches to pedagogical innovations in ICT integration
2. Organisational processes of pedagogical innovations in ICT integration
3. ICT resources and teachers' professional development
4. External support for pedagogical innovations in ICT integration

Based on these key issues, the research questions are:

1. Is there any difference between the two target schools with respect to their leadership approaches to pedagogical innovations in ICT integration?
2. Is there any difference between the two target schools with respect to their organisational processes of making pedagogical innovations in ICT integration?
3. Do the in-house ICT resources and teachers' professional development affect the two target schools' pedagogical innovations in ICT integration?
4. Does the external support influence pedagogical innovations in ICT integration in the two target schools?

3.3 Methodology

Due to researchers' different beliefs about the nature of knowledge and the process by which knowledge is gained and validated, educational studies are involved in diverse research approaches (Robson 2002). In this sense, researchers' epistemological assumptions about truth or social reality usually play a key role in research, since they typically direct the type of research methodology. Apart from this, when outlining the nature of the debate between qualitative and quantitative paradigms, Patton (1997) stresses that each paradigm has its own strengths and weaknesses. Patton also argues that researchers need to be certain of whether their research data can be accessible to the methodologies which they choose. In order to enhance the quality of a study, it is important to confirm the research purposes and assess the possible approaches before

applying a methodology to a field. On this basis, the remainder of this section begins with the discussion of epistemological assumptions and research purposes of both quantitative and qualitative paradigms, which is followed by the reasons for using case-study approaches for the present research.

3.3.1 Quantitative and qualitative research paradigms

Quantitative and qualitative paradigms are based on different, or even opposing, epistemological assumptions of social reality. For example, Gall et al. (2003, p. 23) label quantitative and qualitative forms of research positivist and post-positivist respectively. Like Gall et al., Cohen et al. (2005) think that the quantitative paradigm is virtually synonymous with positivism, and that the qualitative paradigm is linked to anti-positivism. However, Patton (1997) uses the terms ‘naturalistic or qualitative’ and ‘experimental or quantitative’ paradigms, rather than ‘post- or anti-positivist’ and ‘positivist’ paradigms, when presenting the features of the two epistemological positions. The subsections below do not go further to debate the terminological issues of paradigms, but choose the neutral terms ‘qualitative’ and ‘quantitative’ to discuss their different methodological assumptions and tenets about paradigms, which guide investigators as they decide their research approaches in the field.

3.3.1.1 Epistemological assumptions and research purposes

1) Quantitative paradigm and research

The quantitative paradigm assumes that the features of the social environment have an objective reality and views the world as being ‘out there’; hence, many proponents of the quantitative paradigm argue that social reality and phenomena are available for study in a more or less static form (Cohen et al. 2005; Gall et al. 2003; Robson 2002). That is, quantitative researchers tend to believe that the social world is the same as the physical

world, and that the ways in which an individual explains phenomena are not as significant as establishing a law which can be applied to other situations. For quantitative researchers, reality exists objectively, and the generalisability of their research findings is an important goal. Therefore, quantitative researchers think that there should be as little as possible concerned with subjectivity involved in the research, and laws about the world can be generalised from the findings of a rigorous research design. Gall et al. (2003) also state that the epistemological doctrine of the quantitative paradigm is that reality is independent of those observing it, and that unbiased observations of reality constitute knowledge.

2) Qualitative paradigm and research

The qualitative paradigm, in contrast, assumes that social reality is constructed by the individuals participating in it; hence, researchers subscribing to a qualitative paradigm highlight the local meaning and social actions for the actors involved in the context (Cohen et al. 2005; Gall et al. 2003; Robson 2002). Moreover, qualitative researchers think that social symbols become meaningful because human beings interact with their settings (Patton 1997). Gall et al. (2003) also propose that qualitative researchers do not think that the features of the environment can be significant or analysed without considering the ways in which individuals explain the phenomena. Furthermore, for qualitative researchers it is unnecessary to take steps to avoid subjectivity in conducting their investigation; rather, it is also important to acknowledge the subjectivity in research processes and hence to discount (Cohen et al. 2005).

Hence, the qualitative paradigm tends to assume that human beings play an active role in the environment rather than accepting phenomena passively. Yet, due to individuals' complex interactions and different interpretations, it seems impossible for social

researchers to preclude the possibility of personal values contaminating their studies. On the one hand, qualitative researchers respect individuals' different explanations of the same events; on the other hand, they need to face and perceive the issues of subjectivity within their research.

3.3.1.2 Research approaches

1) Quantitative research

With the ideal of objectivity, quantitative researchers try to prevent themselves from including their personal thoughts and interpretations of what they have observed. As Gall et al. put it:

> Their [quantitative researchers'] goal is to keep themselves out of the processes of collecting data and reporting their findings as much as possible.
>
> (Gall et al. 2003, p. 17)

It could be said that quantitative researchers tend to be outsiders vis-à-vis their studies. Since the quantitative paradigm argues that the phenomena of social life are similar to the nature of the physical world, confirming the relationship between variables is one of the main purposes within quantitative research (Cohen et al. 2005). In order to examine cause-and-effect relationships, quantitative researchers usually conduct a statistical analysis after gathering the data through large-scale surveys or controlled experiments. As Patton (1997) mentions, quantitative research emphasises a broad picture of social phenomena, rather than a single specific issue. Therefore, numerical data gathered from many samples are preferable. Cohen et al. (2005) indicate that, in addition to surveys, rigid experimental designs may allow quantitative researchers to manipulate factors and to be more objective. It could be said that researchers using quantitative methodologies tend to make findings general after analysing the key factors within fixed or artificial

research settings. That is, quantitative researchers may believe that findings from the sum of the part of something can reflect some aspect of reality.

2) Qualitative research

According to the qualitative paradigm, people do not simply accept the environment. Instead, human beings themselves construct the world. On this assumption, individuals, including investigators, and their interactions within the research context are considered subjects rather than objects. Qualitative researchers, therefore, usually play the role of insiders in research settings. As Gall et al. (2003) note, qualitative researchers view themselves as integral constructors of the social reality which is being investigated.

For the qualitative paradigm, the world consists of constructed reality and 'these constructions take the form of [individuals'] interpretations' (Gall et al. 2003). Consequently, ethnographic studies, case studies and grounded theory studies, rather than large-scale surveys and experiments, serve as major research approaches in qualitative studies (Merriam 1998). This is because these strategies, based on a qualitative methodology, enable investigators to immerse themselves in real-life contexts to perceive phenomena or establish their own theory (Merriam 1998; Robson 2002). Furthermore, microscopic but detailed information, instead of a general picture, may be gathered through researchers' participation in the field.

3.3.2 Mixed methods research

Based on the above discussion, it is clear that qualitative and quantitative paradigms have different arguments about research strategies and methods of collecting and analysing data. Despite this, in the methodological literature, many authors have made similar comments that mixing or combining quantitative and qualitative approaches in the same

research design is feasible (Reichardt & Cook 1979; Johnson et al. 2007; Robson 2002). Denscombe (2003) goes further, maintaining that social researchers rarely depend on one approach alone, in that incorporating different research approaches and methods into one study is particularly instrumental for further exploration of social phenomena.

For Johnson et al. (2007), mixing quantitative and qualitative research methods within the same research is a practical and crucial approach to knowledge (including theory and practice). In addition, mixed methods research endeavours to consider diverse viewpoints, perspectives, positions, and standpoints (including the standpoints of qualitative and quantitative research) in the research process. Highlighting the importance and utility of mixing both quantitative and qualitative approaches to conducting social research, Johnson et al. (2007) strongly support the idea that mixed methods research can be positioned as one of the three research approaches (i.e. quantitative research, qualitative research and mixed methods research). According to the classification proposed by Johnson et al., (2007) there are three types of mixed methods research:

(a) Qualitative dominant mixed methods research

‘Qualitative dominant mixed methods research’ is described by Johnson et al. (2007) as a mixed research approach within which qualitative strategies are pre-eminent. Therefore, researchers who use qualitative dominant mixed methods research generally support a qualitative view of the research process; meanwhile, they recognise that most research projects can gain potential benefits from the supplementary quantitative data and approaches (Johnson et al. 2007).

(b) Quantitative dominant mixed methods research

For Johnson et al. (2007), 'quantitative dominant mixed methods research' is a mixed research approach within which quantitative strategies are pre-eminent. Hence, researchers who use quantitative dominant mixed methods research are inclined to support a quantitative view of the research process; they, however, concurrently perceive the advantages of using the supplementary qualitative data and strategies for conducting research projects (Johnson et al. 2007).

(c) Pure mixed methods research

In the definitions given by Johnson et al. (2007), 'pure mixed methods research' is in the centre of the qualitative-quantitative continuum. That is, for researchers who use pure mixed methods research, both quantitative and qualitative approaches are at the equivalent status and thus, neither of them is dominant in the research process (Johnson et al. 2007).

Agreeing with Robson's statement (2002) that there is no perfect research approach which can serve all social studies, I believe that researchers are required to decide the type of their research approaches on the basis of their research purposes and the means of obtaining and analysing data to answer their research questions. Within the present study, I used qualitative dominant mixed methods research – the first type of mixed methods research in Johnson et al.'s (2007) classification – as the research approach. The reasons for applying qualitative dominant mixed methods research to undertaking this study are presented as follows:

(1) This research was concerned with the issues of school change of ICT integration in Taiwan, whilst many factors of this process were carefully planned, other unplanned

factors could occur as the change process was happening and the research was taking place. As the literature on educational change points out, inevitably there are some uncontrollable and influential factors getting entangled in the processes of school changes and improvements (Fullan 2001; Morrison 1998). Despite this, it is my belief that the qualitative approach was able to make the present research strongly increase the likelihood of obtaining data and providing findings which were much closer to what was exactly happening in the intricate processes of school change. This is because rather than imposing formal tests of hypotheses, the qualitative approach can be used to provide descriptions of the process of social phenomena in their natural settings (Denscombe 2003). The openness of the qualitative approach enabled this research to detect the information which might not have been included in the original inquiry. Moreover, the high degree of flexibility of the qualitative approach allowed my research procedures to be open to any change in the processes of data collection according to the research participants' responses.

(2) As discussed in chapter 2, many studies of educational change have shared the common views that the change process in school settings is perceived to be two-way and dynamic. This is because the overall course of school change is not only affected by the new educational initiative itself, but also greatly influenced by the teachers' perceptions of and reaction to the expected change. Therefore, in this research, care was taken to scrutinise the way in which school staff interpreted and responded to the change initiative of ICT implementation within this research. Apart from this, the primary purpose of the present research was to have an insight into the leadership approaches to managing changes of ICT integration in two case-study schools. Given the above, the qualitative approach was more likely to allow the present study to obtain in-depth and trustworthy data for the research purpose. This is because the

qualitative paradigm tends to argue that human beings are active and integral constructors of the context in which they are involved (Gall et al. 2003). Hence, the research approach based on the main arguments by the qualitative paradigm stresses investigators' and participants' perceptions of and reflection upon the context which is under research. Furthermore, the research design of case study[1] is generally involved with the research assumptions proposed by the qualitative paradigm (Merriam 1998; Robson 2002).

(3) Although the qualitative approach (case-study approach) was the key base for this research design, both quantitative and qualitative methods were used in the processes of data collection and analysis. There were two key advantages of mixing two research methods within this study. First, it enabled this study to triangulate the findings gained through quantitative methods with those collected through qualitative methods (Robson 2002). Second, it allowed this study to fill in the gaps by obtaining more research data which may be unable to depend on either quantitative or qualitative methods alone (Gall et al. 2003). The following outlines the strategies for combining quantitative methods (the questionnaires) with qualitative methods (the interviews and documentary reviews) within the present research:

(a) Numerical data obtained from the returned questionnaires (quantitative methods) was used for providing a general picture of staff members' opinions on pedagogical innovations in ICT integration. The purpose of conducting questionnaires in the first phase of the research procedures was to establish an initial overview with the potential for informing the subsequent interviews.

[1] Detailed discussions of the features of case studies and the use of the case-study approach within the present research are presented in section 3.3.3 and 3.3.4, respectively.

(b) Following the questionnaire phase, semi-structured interviews were undertaken in each case-study school. This is because part of the interests of the present research was to explore the factors making teachers continue or discontinue pedagogical innovations regarding ICT integration. Therefore, it was anticipated that this research was involved with the examination of individual responses to new teaching practice, which would not be adequately explored unless the one-to-one interviews (qualitative methods) were conducted. For example, the interviewees within this research were asked their own feelings about the leadership processes of managing pedagogical innovations in ICT implementation within their own school (see question 3 in Appendix 3). This research also concerned the social impact within the staff workplace on individual intention to participate in the processes of implementing ICT. For example, the interviewees were asked to describe the effect of their school culture on their working patterns and learning approach (see question 9 in Appendix 3).

(c) The other qualitative data gained through the documentary reviews was used as the supplements to the findings from the questionnaires and interviews. That is, even though documentary reviews did not take the key role in terms of the research methods within this study, information gathered from the documents had the potential for triangulating the research data collected from the questionnaires and interviews.

Through examining the usefulness and feasibility of incorporating both quantitative and qualitative approaches into one study, I believe that the use of qualitative dominant mixed methods research within the present study was able to minimise weaknesses and draw

from strengths of both research approaches. That is, in the present study, the research assumption of the qualitative paradigm served as the base for the research process in which both quantitative and qualitative methods were mixed.

3.3.3 Features of case study

3.3.2.1 Explanation and exploration of the wholeness of the specific instance

Instead of stressing the breadth of study and the general phenomena, case study centres on the detailed information of the particular subject and the context. For example, Denscombe (2003), argues that case studies typically choose small numbers as research subjects which are explored in depth, and this is the main property making case studies different from survey approaches. The emphasis on the detailed data usually allows case study researchers to perceive the certain activities which are not always accessible to quantitative approaches (Cohen et al. 2005). In addition, Gummesson (2000, p. 86) states that ‘a case study seeks to obtain a holistic view of a specific phenomenon or series of events’. Robson (2002) also agrees that case studies usually focus on particular situations in which the research settings are considered. In the same vein, Denscombe (2003) thinks that findings of case study research are gained from a thorough understanding of the processes of activities and interrelationships among the events. Due to the stress on the characteristic wholeness of phenomena, case studies are appropriate for exploratory and explanatory or descriptive research (Burns 2000). Therefore, Sturman (1997, p.61) argues that case studies could let social researchers explain ‘why things happen as they do’. Yin (2003) goes further, stating that case studies could serve as the useful approaches to dealing with the research involving ‘how’ or ‘why’ questions.

3.3.2.2 Investigation of the instances within their natural contexts

Different from experimental approaches which control the research settings, case studies emphasise the natural contexts in which social phenomena happen. This enables investigators to 'retain the holistic and meaningful characteristics of real-life events' (Yin 2003, p. 2). As Denscombe (2003) claims, case study is a generic term for investigating an individual, a group or phenomena as they naturally occur, without researchers' artificial changes or controls. Hence, it has become generally accepted that compared with other research strategies, case study approach can be more appropriate for examining contextual and contemporary events in human systems, specifically when the instances under studied are unable to be manipulated (Hitchcock & Hughes 1995; Yin 2003).

3.3.2.3 Multiple research sources and methods

In order to comprehend the context as a whole, case study investigators gather various sources through different research tools which can comprise both quantitative and qualitative methods (Denscombe 2003). As Yin (2003) asserts, one of the important principles of doing high-quality case studies is to use multiple research methods to gather different sources of evidence. Yin's opinions seem to explain why case studies usually involve diverse methods for collecting quantitative and qualitative data. For example, research methods used in case studies are mainly classified as the following types: asking questions through questionnaires or interviews, making observations, and reading documents (Bassey 1999; Robson 2002; Stake 1995). Moreover, in order to enhance richness of the information through multiple research methods, most case study researchers apply the skills of triangulation to facilitating the validation of the data (Denscombe 2003; Stake 1995).

3.3.4 Rationales for using case-study approaches in this research

3.3.3.1 Exploring educational phenomena within the school context

Case studies can be used to explore context-situated instances, and this could facilitate the present research to detect what exactly happens to the change process of implementing ICT across the curriculum in school settings. As Denscombe (2003) puts it, case studies investigate both cause-and-effect relationships and processes within social settings; therefore, the findings from case studies could reflect the events in their natural settings through the detailed description. Cohen et al. also contend that:

> One of their [case studies] strengths is that they observe effects in real context, recognises that context is a powerful determinant of both causes and effects.
> (Cohen et al. 2005, p. 181)

Moreover, many large-scale studies of educational change regarding ICT development in Taiwan are short of the findings from rural areas (e.g. Chen 2004; Chiang 2005; Juang 2004; Yang 2004). Chiang (2005) also suggests that it may be necessary for further research to apply case studies to understanding in depth the ICT implementation in rural schools, in order to explore realistic problem-solving tactics of school staff. This can justify using case studies in this research to understand innovations regarding ICT integration in Taiwanese rural schools.

3.3.3.2 Using case-study approaches for revelatory purposes

In addition to exploring the reasons for effective school change for ICT improvement, this research is concerned about schools which have difficulties in continuing ICT development. However, most Taiwanese researchers ignored the importance in detecting the factors making schools fail to sustain the progress in ICT (Qin & Huang 2004). Based on Yin (2003), a case-study approach is highly justifiable as a way of dealing with the

case which serves a revelatory purpose. Therefore, in this research, case studies were considered as the useful approaches to producing the findings which were possibly neglected in previous studies. In addition, Cohen et al. maintain that one of the main advantages of case studies is that:

> Findings catch unique features that may otherwise be lost in larger scale data (e.g. surveys); these unique features might hold the key to understanding the situation.
> (Cohen et al. 2005, p. 184)

That is, case studies could penetrate the phenomena which may be hardly susceptible to quantitative approaches. Case studies used for the present research may allow the findings to be supplementary to the previous statistical results lacking the consideration of the school context in rural areas.

3.3.3.3 Examining the processes of change management within school settings

It should be noted that the two rural schools selected for the present research were involved in the change initiative for pedagogical transformation and developments in ICT adoption. Bearing the context of the target schools in mind – as well as considering the primary purpose of the present research is to explore the reasons why some schools are able to succeed in continuing pedagogical innovations in ICT integration, while others are less so – this research was involved with the examination of the change process within schools. When it comes to the application of case studies to exploring the overall course of educational change in school settings, Clarke and Dawson (1999) agree that case studies can serve as one of the main approaches to examining and understanding the processes and outcomes of implementing new educational projects or policies. Stenhouse (1980) also argues that many case studies are presented with information which indicates the merits or demerits of educational policies, programmes or institutions. In a sense, case

studies are highly likely to be conducive to examining the overall course of dealing with educational projects, innovations, interventions or policies within school settings.

3.4 Research design and methods

In this research, two ICT Seed Schools in Yilan County in Taiwan were selected as the target schools. The following begins with the reasons for choosing the two specific schools. Furthermore, it presents the research methods – questionnaires, interviews and documentary reviews – used within the present study.

3.4.1 Selection of the research site

3.4.1.1 Reasons for choosing the rural area

The ICT Seed School Project (the ICT SSP) was announced by the Ministry of Education (MOE) in 2002 in Taiwan, and aimed at constructing 600 schools to become ICT Seed Schools within 3 years, while this goal was fulfilled ahead of schedule in 2004 (MOE 2005). Although the goal was accomplished, the current Taiwanese official figures reflected upon the digital gap between city schools and rural schools , and so that the MOE made a slogan 'Bridging the Digital Gap in Remote Schools' (MOE 2006a). It seemed that the MOE attempted to make the investment in enhancing ICT capabilities of rural schools. However, without an in-depth investigation into the problems situated within school settings, the official advocacy could not improve the present conditions, but merely spotlights the frustrating results of ICT implementation in rural areas. It was my belief that one of the initial and pragmatic approaches to assisting rural schools in making transformation and improvements in ICT adoption was to have insight into the overall process of change management in the school context. On this basis, I felt that the comparable rural schools which succeeded and had difficulties in continuing the ICT SSP could allow this research to detect the authentic challenge in practice.

3.4.1.2 Reasons for choosing the ICT Seed Schools in Yilan County

Yilan County is in north-eastern Taiwan. The Yilan County government was ambitious about ICT education and the extension of the use of ICT in school settings. Hence, much earlier than other local governments in Taiwan, the Yilan County government published the White Paper for improving ICT development in schools in 1997 (Yilan County Bureau of Education 2005). Apart from this, when the central government announced the ICT SSP, the Yilan County government took the lead in response to this central project and proposed the idea of 'using ICT to lead Yilan' (Yilan County Bureau of Education 2005).

Ironically, however, the Yilan County government's ambitious goal of making pedagogical innovations in ICT integration did not exactly bring about widespread use of ICT in classes in all local schools. For example, the two target schools which were located in Yilan County and selected for the present research reflected upon the very different images of school-wide pedagogical change regarding ICT integration. According to the official report (MOE 2005), both target schools within this research were evaluated by the government as being qualified for running the ICT SSP in 2003. However, one (School B[2]) of the target schools failed to meet the government's standard for continuing the ICT SSP in 2004. The other (School A[3]), in contrast, was still a publicly acknowledged ICT Seed School in the following years, and its successful experiences in pedagogical innovations regarding ICT adoption were introduced in many schools in Taiwan.

[2] School B in this research is the target school which discontinued ICT Seed School Project in 2004 (for detailed information, see chapter 5).

[3] School A in this research is the target school which still continues ICT Seed School Project (for detailed information, see chapter 4).

At first sight, the investigation into change management in such a so-called successful school, School A, for example, seemed to be more constructive to the educational field. However, I would argue that not only was the effective school worth exploring, but so was the struggling one. As the work by Fink (2000) reflects upon:

> The warning signs of deteriorating conditions [of the failing schools]…will help school leaders to assist successful schools to 'stay the course'.
>
> (Fink 2000, p. xiv)

In addition, Denscombe (2003) asserts that purposeful sampling can be instrumental for making research subjects fit with the specific research purposes. It is for all these reasons that the two rural schools, namely 'School A' and 'School B', with different levels of capacity for sustaining pedagogical innovations in ICT integration were carefully and purposefully selected as the case-study schools for this research, in order to gain more in-depth information of change management involving ICT adoption in rural schools.

3.4.2 Research methods

Multiple information is highly complementary; hence, the evidence used in case study needs to cover as many sources as possible (Denscombe 2003; Yin 2003). Consequently, self-completion questionnaires, semi-structured interviews and documentary reviews were the main research tools used in this research for gathering quantitative and qualitative data from two target schools. It took approximately two months to gain the responses to the questionnaires and interviews, during which time the quantitative results from the questionnaires were analysed preliminarily. The following initially presents the pilot studies for this research, and then continues by illustrating the details of the research methods.

3.4.2.1 Pilot study

Pilot studies can be viewed as the way of detecting whether the research methods and instruments work as intended. As Gall et al. (2003) argue, a pilot study can be a small-scale testing of the procedures which researchers use in their main studies. In addition, a pilot study can assist researchers to revise and refine their data collection plans and methods (Robson 2002). That is, a pilot study can be treated as a laboratory to allow researchers to experiment with different approaches on a trial basis (Yin 2003). Therefore, through conducting a pilot study, researchers could become aware of the potential weaknesses and problems in advance. This, in turn, offers opportunities for researchers to improve their research tools, correct errors and avoid mistakes before the main research are undertaken (Cohen et al. 2005).

On this basis, in order to evaluate the quality and to reduce the weaknesses of the research design, the pilot study was conducted in the research. Prior to the pilot study, very careful preparation and design were undertaken. The main procedures included: asking advice from my supervisor, designing the questionnaires, preparing for the interviews, the preparation of tools, practising, evaluating and improving the interviews and questionnaires in cooperation with my colleagues in Birmingham and in Taiwan. The key objectives of the pilot study which were achieved are presented as follows:

1) To check the clarity of the wording used in the questionnaires.

2) To understand the time required to complete the questionnaires and the interviews.

3) To detect whether or not the inquiries designed in the questionnaires and interviews provided the desired type of responses which could lead to answers to the research questions.

In October 2006 the pilot study was undertaken in a Taiwanese ICT Seed School in Yilan County – the same county in which the two target schools of the present research were located. A total of 5 school staff were selected as the participants within the pilot study. The 5 participants were a teacher from outside the ICT Instructional Team, a teacher from within the ICT Instructional Team, the other 3 were the designated formal leaders – the headteacher, the director of academic affairs and the ICT coordinator. The participants of the pilot study gave the positive feedback. However, two changes were still made for the following reasons:

1) One of the changes was related to the design of the questionnaires, since the participants' common opinions, there existed a strong overlap in meaning between two statements. As the participants pointed out, it was not easy to distinguish between the statement of 'there is close collaboration among the staff at all levels in the goal-setting processes' and the statement of 'there is joint planning among the staff at all levels in the organisational processes'. In addition, the participants felt that the wording 'joint planning' was much clearer and understandable. Therefore, the latter statement – 'there is joint planning among the staff at all levels' – was still included in the question. However, the other statement – 'there is close collaboration among the staff at all levels in the goal-setting processes' – was omitted. Further discussion of the design of the questionnaires for this research is presented in section 3.4.2.2.

2) The other change was associated with the design of the interview questions. For example, two teachers in the interview phase reflected that they, on the one hand, agreed with the positive effect of their formal learning opportunities within their school (e.g. the in-house ICT training and workshops). On the other hand, they expressed the views that learning with or from colleagues in an informal manner (e.g.

informal staff discussions in the office or in the hallway between classes) was conducive to their acceptance of new practices of ICT integration, to a certain extent. Whilst the teachers in the piloting claimed that informal learning was not perceived to be commonplace in their workplace, the inquiries designed in the questionnaires and interviews can be based on researchers' reflections upon the issues which emerge in the field and can possibly lead to useful ideas through further examinations (Robson 2002). Therefore, considering the potential impact of teachers' informal learning on their reaction to pedagogical innovations in their school, the issues of teachers' opportunities of informal learning and the perceived effects of these learning opportunities were added to the questions in the interview phase. Detailed design of the interviews of this research is demonstrated in section 3.4.2.3.

3.4.2.2 Questionnaires

In social studies, questionnaires may be considered a common strategy for gaining data. As Verma and Mallick (1999, p. 117) maintain, 'the questionnaire is often a vital tool in the collection of data'. Although the purposes of each questionnaire are different, they can be divided into two types. One of them is the self-completion questionnaire, and the other is designed for assisted completion (Verma & Mallick 1999). The difference between them is that the former allows the respondents to present their opinions by filling in the questionnaire without the researcher being present. The latter supposes that the researcher assists the research participants in completing their answers by asking them the questions in the questionnaire. Most inquiries are suitable for both types, while the self-completion questionnaire tends to be the most commonly used in the educational field (Verma & Mallick 1999). This is because a self-completion questionnaire dictates much of what follows (Verma & Mallick 1999). In addition, when dealing with sensitive issues or investigating into research subjects' opinions, feelings and attitudes, self-administered

questionnaires are preferable to assisted-completion ones (Cohen et al. 2005; Oppenheim 1998).

Apart from this, depending on the types of questions, questionnaires can be categorised into two kinds: closed and open. Compared with closed questions, open questions make it possible for the research participant to answer with little prompting, to offer more detailed and specific information. On the contrary, closed questions may limit the types of answers, which constricts the range of the data to a certain extent. Despite this disadvantage, of the two, closed questions are the more widely used. This is because 'a closed question is one expressed in a way that allows a limited number of options for the respondent to select' (Verma & Mallick 1999, p. 118). Furthermore, it is easier to code for subsequent analysis (Verma & Mallick 1999).

1) Strengths and weaknesses of questionnaires

No matter what types of questionnaires are used, they both have strengths and weaknesses as follows (Denscombe 2003; Robson 2002):

Time-saving

Generally, it is not necessary for researchers to gather responses through a face-to-face process. In addition, closed questions make it easier to transform the answers into quantitative forms, which could allow the data analysis to be more simplified.

Avoiding researcher bias

The researcher may be one of the variables which affect the results of the study. However, excluding face-to-face questionnaires, the researcher's bias could be reduced, once an appointed person is made responsible for delivering and gathering questionnaires.

Confidential

Collecting data through questionnaires tends to be secretive and create anonymity for the respondents. This allows the research participants to answer questions more honestly, which can increase the reliability of the study.

Extensive

Most questionnaires, excluding the face-to-face type, can be delivered to more respondents. Thus, the number of research participants is potentially large. In addition, more questions can be presented in questionnaires than in other research methods because the formats of the questionnaire, particularly the closed questions, are succinct. This allows questions to comprise more diverse and expansive aspects.

Fixed and consistent

On the one hand, this feature of the closed questionnaire diminishes the difference of questions among different respondents, which can be helpful for the data analysis to some degree. On the other hand, due to the fixed nature of the questions, the questionnaire is unsuitable for each research context. In this circumstance, some subtle but significant information, such as respondents' true feelings and gestures, are ignored. This is probably one of the most controversial issues when using questionnaires to conduct a survey.

Researcher-orientated

Since the types of questions and the items for answering are fixed, it is possible that respondents cannot answer questions as much as they wish, or they may not find a satisfying selection of questions in the questionnaire. Even though respondents are given an open-ended questionnaire, the questions are designed in advance. Therefore, most data may come from the research participants' passive responses.

Questionnaires may serve as a convenient method for collecting a huge volume of information, while they do have some drawbacks. Therefore, it can be helpful to combine other research tools with the questionnaires to make the data more reliable and valid.

2) Design and administration of the questionnaires

Issues and inquiries

For the purpose of the present research, the questionnaires (see Appendix 1) were designed for focusing on four main issues. These were:

(1) Leadership approaches to pedagogical innovations in ICT integration;

(2) Organisational processes of pedagogical innovations in ICT integration;

(3) ICT resources and teachers' professional development; and

(4) External support for pedagogical innovations in ICT integration.

Based on the four issues, the questionnaire was organised into four sections, together with a total of 22 statements (closed questions). All the 22 statements asked the research participants to agree or disagree by marking a six-level answer scale. The following presents the 22 statements in turn.

Section 1

Leadership for managing pedagogical innovations in ICT integration in the school:

Statement 1.1: I am satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration

Statement 1.2: There is coordinated action across the staff at all levels in the leadership processes of pedagogical innovations in ICT integration

Statement 1.3: There is a good approach to developing teachers' leadership potential for managing school changes and improvements in ICT integration

The research subjects' responses to the above 3 statements were used to answer research question 1: is there any difference between the two target schools with respect to their leadership approaches to pedagogical innovations in ICT integration?

Section 2

Organisational processes of managing pedagogical innovations in ICT integration in the school:

Statement 2.1: There is a clear vision for integrating ICT into the curriculum;

Statement 2.2: There is joint planning among the staff at all levels

Statement 2.3: There is adequate consultation with teachers on key decisions of dealing with ICT integration

Statement 2.4: There is a suitable approach to holding teachers accountable for their work

Statement 2.5: I am clear about my role and responsibility

Statement 2.6: I believe that ICT integration enhances students' learning outcomes

Statement 2.7: I believe that ICT integration reduces teachers' workload

Statement 2.8: I support the idea of ICT integration

Statement 2.9: I am ready for ongoing pedagogical innovations in ICT integration

The research subjects' responses to the above 9 statements were used to answer research question 2: is there any difference between the two target schools with respect to their organisational processes of making pedagogical innovations in ICT integration?

Section 3

ICT resources and teachers' professional development in the school:

Statement 3.1: The hardware (i.e. computers, digital projectors and other technological instruments for teaching purposes) meets my needs

Statement 3.2: The software (i.e. online teaching and learning materials and the ICT-integrated instructional modes) meets my needs

Statement 3.3: The technical support meets my needs

Statement 3.4: I use ICT appropriately to support teaching and learning

Statement 3.5: I have been trained in all aspects of ICT necessary for my teaching

Statement 3.6: Good practices of teaching with ICT are shared widely across the school

Statement 3.7: There is a supportive culture which inspires teachers to reflect upon the value of implementing ICT across the curriculum

The research subjects' responses to the above 7 statements were used to answer research question 3: do the in-house ICT resources and teachers' professional development affect the two target schools' pedagogical innovations in ICT integration?

Section 4

External support for the school:

Statement 4.1: Cross-school ICT-related workshops and training enhance my abilities to deal with pedagogical innovations in ICT integration

Statement 4.2: Parents' support is crucial to pedagogical innovations in ICT integration in our school

Statement 4.3: The government offers suitable support for pedagogical innovations in ICT integration in our school

The research subjects' responses to the above 3 statements were used to answer research question 4: does the external support influence pedagogical innovations in ICT integration in the two target schools?

Research participants in the questionnaire phase

The key aim of using questionnaires for the present research was to gain a general picture of teachers' opinions on school change regarding ICT implementation before collecting the in-depth data through the subsequent interviews. Consequently, all teaching staff, including the director of academic affairs (senior leader) and the ICT coordinator (middle leader), in each target school were chosen as the participants in the questionnaire phase. It should be noted that in Taiwanese primary schools, headteachers (one of the formal leaders for the ICT Instructional Team) has no class-teaching responsibility, and thus their primary responsibility are leading and managing. As regards the ICT coordinator and the director of academic affairs (the other two formal leaders for the ICT Instructional Team), their primary responsibility was classroom teaching rather than leading and managing during a typical workday. The questionnaires designed for this research were involved with the staff individual experiences and acceptance of teaching with ICT in the change process. Hence, the headteachers in the two target schools were excluded from the questionnaire respondents; they, however, were selected purposely as the interviewees. In total, the questionnaires were given to 50 staff members in School B and 30 staff members in School A.

Process of administrating the questionnaires

All research participants were given the questionnaires both in English (see Appendix 1) and in Standard Chinese (see Appendix 2). This is because the original wording used in the questionnaires of the present research was English. However, this research was conducted in Taiwan in which Standard Chinese is the official and daily language. Moreover, agreeing with Robson's (2002) and Denscombe's (2003) common statements that it is essential to make questionnaires easy to understand and fill in, I believe that it

was necessary to provide the research participants with the questionnaires in both languages (English and Standard Chinese).

In May 2007, the headteacher in each target school provided me with sufficient time at the staff meeting to outline my research purposes, the methods of data collection and the key issues which would be discussed. Then, I gave the research participants the questionnaires both in English and in Standard Chinese, and explained how an English version of the questionnaire had been translated. For instance, the term ‘accountability/accountable’ used in the questionnaires was translated into ‘職責/負責任的’, which means ‘responsibility/responsible’ in Standard Chinese. Apart from this, recognising that the terms ‘accountability/accountable’ have deeper meanings than ‘responsibility/responsible’, I further expanded the definitions of ‘accountability/accountable’ within this research by offering the following examples for the research participants: (1) the terms ‘holding teachers accountable for their work’ in the questionnaires meant that ‘teachers who are responsible for and highly-committed to their work’; (2) ‘teachers with accountability for implementing school change’ are inclined to fulfil their obligation to report and explain their actions (e.g. planning for and implementing the new practice of ICT integration) as well as the consequences caused by their actions (e.g. the results of managing this new practice). After clarifying all the translations, I also provided time for the research participants to read through the questionnaires and ensured that the participants felt easy to respond to all inquiries without confusion about the translation and wording. Through the above procedures, I believe that the research participants in the questionnaire phase were able to give their responses without difficulty, and that data was trustworthy and valid.

Procedures for analysing the questionnaire data

It took approximately three weeks to gain the feedback of the questionnaires from both target schools. All the responses to the statements with a six-level answer scale were translated into scores. For example, the answer list had six choices: very strongly disagree, strongly disagree, disagree, agree, strongly agree and very strongly agree, with each represented by a corresponding score 1, 2, 3, 4, 5 and 6 to assist with the interpretation of results during the process of the data analysis. The computer program, Microsoft Excel, was the main instrument to interpret this quantitative data.

3.4.2.3 Interviews

A wider picture of the investigation can be given when adding qualitative methods, interviews for instance, to the process of data collection. As Robson states:

> Using more than one [research method] can have substantial advantages…Studies may combine methods producing quantitative data with others yielding qualitative data.
>
> (Robson 2002, p. 370)

Recently, more and more researchers in the social science field apply qualitative methodology to collecting and analysing their data, with interviews being commonly used. Sanger (1996) also observes that for qualitative research, the interview is one of the key strategies for data collection.

1) Types of interviews

According to Robson (2002) and Wellington (2000), interviews can fall into three major types as follows:

Structured interviews

This method can be thought of as an 'oral questionnaire' (Denscombe 2003; Robson 2002). From Parsons' (1984) perspective, the structured interview may be little more than a 'face-to-face questionnaire' (Wellington 2000). In practice, when many interviewers conduct the same research, structured interviews are possibly useful for collecting and comparing the data. As Wellington (2000) states, structured interviews can be of value when a group of researchers as interviewers are involved in the same studies. Nevertheless, in comparison with the other forms of interviews, responses gained from a structured interview reveal fewer of the respondents' thoughts and thus, some significant information may be ignored more easily. This is because questions are designed in advance, which constricts the depth and extent of the responses.

Unstructured interviews

This type of interview is also seen as a non-standardised interview (Wellington 2000). Since questions within this type of interview are neither pre-designed nor in strict order, an unstructured interview will 'vary from one interviewee and one interviewer to the next' (Wellington 2000, p. 74). This method is valuable in some aspects, in that it allows a researcher to have more opportunities to ask specific questions based on the responses of the interviewees (Denscombe 2003). However, the authors also warn that an unstructured interview may be unsuitable for inexperienced interviewers when conducting research (Bassey 1999; Denscombe 2003).

Semi-structured interviews

Compared with the unstructured interview, a semi-structured interview is less flexible (Denscombe 2003; Robson 2002). However, questions within this interview are not completely pre-determined because the conversation between an interviewee and the

interviewer are based on some guidelines or main issues. As Wellington (2000) notes, semi-structured interviews are featured as loosely defined frameworks, and this allows interviewers to have flexibility over the range and order of questions. Therefore, semi-structured interviews are more respondent-orientated than structured interviews. Despite this advantage, the interviewers' expertise and interaction with the respondents may influence the depth and breadth of the data collected in the semi-structured interviews.

2) Strengths and weaknesses of interviews

Instead of discussing the advantages and disadvantages of structured and unstructured interviews, this section focuses on semi-structured interviews used in this study. Based on Robson (2000) and Denscombe (2003), the strengths and weaknesses of semi-structured interviews can be summarised as follows:

Flexibility

On the one hand, flexibility is a benefit of the semi-structured interview. The process of the interview is based on a guideline or a checklist of questions. Consequently, interviewers are allowed to develop deeper or more specific questions, depending on the responses of the interviewees. On the other hand, this feature may be a disadvantage when considering data analysis. Since the structure and questions are loosely defined, responses from different interviews are not easily categorised and may take up significant research time.

High response rate

A face-to-face situation within the semi-structured interview can help avoid respondents skipping questions because the interviewers themselves ask the questions one after another.

Responses are closer to the truth

Compared with questionnaires, a conversation within the interview provides respondents with less time to think or organise their mental content. Hence, interviewees may hardly have time to hide information, which makes the answers closer to the truth, therefore more valid.

Bias from interviewers and interviewees

The interaction between an interviewer and an interviewee may affect the answers to the questions. In addition, other factors, such as interviewers' attitudes, appearance, and accent, may arouse interviewees' mental responses to some degree, which will influence the accuracy of the answers.

Costly and time-consuming

Interviews are often conducted in the form of a one-on-one situation, so this is a costly and time-consuming research approach.

Less confidential

Unlike questionnaires, respondents within the process of the interview cannot answer questions privately. This may cause respondents to avoid answering some sensitive or personal questions and make the research loose meaningful data.

3) Design and administration of the interviews

In the interview phase, the predetermined set of questions are presented in Appendix 3. The questions designed in the interviews focused on the following issues:

1. The leadership process of managing school-wide pedagogical innovation in ICT integration
2. The key approach to cultivating potential teachers as the future leaders for continuation of good practices of ICT implementation in the school
3. The reasons behind the staff satisfaction with their school leadership for managing pedagogical innovations in ICT integration
4. The decision-making and goal-setting processes of implementing ICT across the curriculum
5. The staff satisfaction with the in-house ICT resources and ICT-related professional development
6. The impact of the three sources of external support – the governmental support, parental support and cross-school learning – on the school's long-term pedagogical developments in ICT adoption

<u>Research participants in the interview phase</u>

(1) School staff from within the ICT Instructional Team

Originally, I planned to arrange one-to-one semi-structured interviews in both case study schools with all staff members who were in the ICT Instructional Team in 2003. That is, 6 staff members in each case study school I should have interviewed. However, after having a preliminary meeting with the headteacher in School A, I realised that there were another 4 teaching staff who participated in the ICT Instructional Team in 2004 when the school continued the ICT SSP. In order to gain the enriched information from the ICT Instructional Team, finally 10 teaching staff from within the ICT Instructional Team in

School A were chosen as the interviewees. Three key reasons for deciding to extend the scale of the interviews in School A were as follows. First, in the interviews, most teachers in School A mentioned the laudable contribution of the joint efforts of the ICT Instructional Team to manage school-wide ICT development plan in the change process. Second, it is widely accepted that the 'implementation' stage in the overall process of school change is particularly crucial for continuation of the change efforts (Fullan 2001; Hargreaves & Fink 2006; Morrison 1998). Third, as Denscombe (2003) puts it, there is no fixed rule for social researchers on choosing interviewees; hence:

> [When the research] aim is to delve in depth into a particular situation with a view to exploring the specifics, …the emphasis will be on choosing key players in the field.
> (Denscombe 2003, p.172)

As regards School B, 6 teaching staff from within the ICT Instructional Team were interviewed according to the original plan. The teaching staff from within the ICT Instructional Team in each case study school for the interviews were classroom teachers and subject teachers.

(2) School staff from outside the ICT Instructional Team

With respect to the interviewees from outside the ICT Instructional Team, a total of 9 school staff were picked out from School A. Among the 9 interviewees, 3 staff were selected deliberately and they were the designated formal leaders – the headteacher, the director of academic affairs (senior leader) and the ICT coordinator (middle leader). The remaining 6 interviewees in School A were chosen from the remaining 29 teaching staff. In School B, 16 interviewees were selected from both teaching and administrative staff. Among the 16 interviewees, 3 staff were selected purposely and they were the designated formal leaders for the ICT Instructional Team – the headteacher, the director of academic

affairs (senior leader) and the ICT coordinator (middle leader). The other 13 interviewees were chosen from the remaining 49 teaching staff.

In total, the interviewees from within the ICT Instructional Team included 10 staff members in School A and 6 in School B. As regards the interviewees from outside the ICT Instructional Team, in School A there were 6 teachers, the headteacher, the director of academic affairs and the ICT coordinator. In School B, the interviewees from outside the ICT Instructional Team were 13 teachers, the headteacher, the director of academic affairs and the ICT coordinator.

Process of conducting the interviews

Considering that the present research was undertaken in the Taiwanese educational settings, I asked the interviewees at both target schools questions in Standard Chinese. Even so, I also made the staff understand how all questions in the interview phase had been translated from English into Standard Chinese. For example, whilst the definition of the term ‘accountability/accountable’ used in the present study had been explained to the staff when administrating the questionnaires, I felt that it was important to reassure a good understanding of the staff about this term in the subsequent interviews. Consequently, like the questionnaire phase, the term ‘accountability/accountable’ used in the interviews was interpreted as ‘responsibility/responsible’ (which is ‘職責/負責任的’ in Standard Chinese) to make the questions clear and easy to understand. Examples of ‘having a high commitment to the jobs’ and ‘having high responsibilities for the actions and resulting consequences’ were also raised before asking the interviewees about accountability mechanisms within their school. All interviews were recorded through a digital recorder and transcribed in Standard Chinese. I believe that the interview data

within this research was rich and representative, and that all the transcripts were reliable and valid. This is because:

(1) In each target school, the interview data was secured from the headteacher and teaching staff with different job titles and different ICT-related and teaching experiences. Therefore, the transcripts of the interviews were able to provide a potentially diverse data sample. This, in turn, offered a wide range of perspectives on the issues relating to the present research.

(2) In order to make the research participants clear about the aim of the interviews, I informed them of the key issues which would be discussed in the interviews in advance at the staff meeting. The explanation of the key issues lasted for around 30 minutes. However, the research participants were not given the exact questions until the interviews were undertaken. There were two reasons for dealing with the interview questions in this way.

(a) Based on the feedback gained from the pilot study, all questions designed for the interviews were easy to answer. The interviewees within the pilot study did not think that it was necessary for them to know the questions before the interviews were conducted.

(b) As with Wellington's (2000) advocacy, I would argue that not providing interview questions in advance allowed the interviewees to be more likely to give their responses naturally without filtering out the information pertaining to the present research. This is highly likely to allow the interview data to be much closer to the truth.

(3) The time scale of conducting each interview was slightly different (varying from 30 to 40 minutes). Even so, I believe that the length of each interview and the sample of interviewees within this study were sufficient to gain the in-depth information, in that:

(a) I spent time in establishing relationships with the staff in each target school in the processes of conducting the present research. For example, I had lunch with the staff during their working days and stayed in the staff office or staff communal room when this research was under way. Therefore, I had frequent conversations with the staff members in natural circumstances within their workplace. In addition, I was invited to assist the staff in holding their holiday activities (e.g. students' music festival in School A and students' sports event in School B). The above involvement in the research context, on the one hand, enabled me to become familiar with the staff and build up our mutual trust before the interviews were undertaken. On the other hand, it provided me with sufficient chances to observe and understand the staff members' interactions and working patterns in their school routine. As with Robson's arguments (2002), I believe that my intense and active engagement in the context under study offered me the access to probing and perceiving the staff members' individual values and subjective norms within their workplace. This initial perception was helpful for me to conduct the interviews in each target school.

(b) In order to make interviewees feel free to express their opinions without any time pressure, no interviewees were asked to give their responses within a fixed time scale. Apart from this, before completing the interviews, I asked the interviewees for their additional opinions or comments on the issues which was under studied. This allowed me to make sure that no important but subtle

information had been ignored in the interviews, and that all interviewees felt comfortable and satisfied with their own responses.

(c) The key issues which the interviewees raised were recurring in the processes of interviews in each target school. Agreeing with Miles and Huberman's statement (1994), I would argue that the repeated issues which emerged in the interviewees' responses guaranteed the credibility and richness of the interview data.

(4) In order to guarantee the accuracy of the interview data, I gave each research participant a transcript in Standard Chinese of his/her own interview. After gaining the research participants' agreement with the transcripts, I started the translation phase (translating from Standard Chinese into English). Furthermore, in order to ensure that all English translations did not claim more than was available in the transcripts in Standard Chinese, the transcripts in both languages were then rechecked by my Taiwanese colleague with a postgraduate degree in TEFL (Teaching English as a Foreign Language). Considering the research participants' entitlement to privacy and the confidentiality of the research data, I did not offer my colleague any information on the background of the interviewees and the target schools.

Procedures for analysing the interview data

Through referring to the work by Miles and Huberman (1994), Qualitative Data Analysis, three stages which were used for analysing the interview data within the present research are demonstrated as follows:

Reducing the data: in this stage, the interview transcripts were read several times to identify the key themes which emerged in the interview phase. In order to clearly recognise these themes, I drew up a matrix (see below) and made a mark in the appropriate box when a specific theme emerged. For example:

	Teacher 1 (interviewee)	Teacher 2 (interviewee)
Theme 1		
Theme 2		

Displaying the data: in this stage I recognised the recurring themes which were underlined in the first stage. I further identified the interconnections between the underlying themes and my research questions.

Drawing the conclusion: I labelled the headings of the underlying themes based on stage two. Then, I presented and discussed the detailed data directly related to these themes.

3.4.2.4 Documentary reviews

Applying documents to part of the research evidence could be a useful access to exploring what happens to the field (Prior 2003). Since documents can be used to reflect events in society, they are usually treated as common and important data in social research, particularly in case studies. For example, Yin (2003, p. 87) identifies the values of documentary information by stating that ‘documents play an explicit role in any data collection in doing case studies’. He also highlights the fact that researchers’ field notes can serve as supportive documents for case studies (Yin 2003). For Best and Kahn,

> Documents are the records kept and written by actual participants in, or witnesses of, an event, These sources are produced for transmitting information to be used in the future.
>
> (Best & Kahn 1998, p.85)

1) Types of documents

The types of documents applied to social research are multi-modal and can embrace words, pictures, diagrams, emblems, electronic information, sculptures and paintings (Prior 2003). According to the authors, documents used for educational research can be broadly classified as the following two categories (Best & Kahn 1998; Cohen et al. 2005; Denscombe 2003).

Official and other public documentation

This category comprises official statistics, reports, archives, policy documents, educational annals and chronicles, school prospectuses and publications, professional and lay periodicals, newspapers, magazines, books, journals and survey data.

Restricted documentation

This includes diaries, autobiographies, internal memos, correspondence (e.g. emails and letters) and samples of students' work.

In addition to the written sources, oral testimony, particularly data gained from interviews, and relics, such as school buildings and equipment, are other useful documents which figure pre-eminently in educational research (Best & Kahn 1998).

2) Strengths and weaknesses of documentary reviews

Documentary studies used in research generally have the following strengths:

Cost-effective

Documentary studies could allow investigators to understand a general picture of the field without conducting large-scale inquires. For example, it is usually inexpensive and convenient for researchers to gain preliminary information and knowledge of the research settings by reviewing public documents, such as official surveys and authorised reports.

Corroborating evidence and exploring further

Documents are stable, exact and broad, which allow researchers to examine the information repeatedly and in depth, and this can enhance the validity of the data gathered in the field (Yin 2003). Best and Kahn (1998) also point out that documentary reviews could be useful to verify research data and to make findings much closer to reality. Moreover, inferences made in the process of documentary reviews may lead researchers to conduct further investigation into their cases (Yin 2003).

Diminishing the spatial and time restriction

Cohen et al. (2007) argue that data gathered from documents may let researchers reach inaccessible persons or events, and that documentary reviews are particularly useful for the case study involving historical and longitudinal research. This is because many documents are ‘written “live” and in situ’, they could ‘catch the dynamic situation at the time of writing’ (Cohen et al. 2007, p. 201). Prior (2003) gives the similar statements by saying that documentary studies make it possible for researchers to perceive and analyse educational events occurring at different time and in different places. This may benefit

investigators who intend to make comparisons of educational phenomena in dissimilar settings.

Reducing the reactive effect

Research processes of documentary reviews are usually unobtrusive (Yin 2003). As Cohen et al. (2007) state, like non-participant or indirect observation, documentary collection and analysis involves little or no reactivity of research subjects. It could be assumed that due to the indirect access to research data, documents allow investigators to keep the research context natural and close to reality as the studies are under way. As Yin (2003) contends, one of the attractions of applying documents to research is that data gained from the documentation is not generated as a result of the particular case study, but is a reflection of social events. In this sense, documentary reviews used in educational studies may decrease the possible biases caused by research participants' reactive effect and enhance the quality of the research.

Despite the above strengths of documentary studies, there are also some weaknesses below:

Problems with retrieving the documentary data

It could be difficult to retrieve the complete documents; therefore, researchers may gain the fragmented data which is insufficient for them to comprehend the whole picture of what they plan to explore (Yin 2003). Furthermore, the authenticity of documentary evidence is usually questioned, specifically when researchers gain their data by tracing back to historical documents (Cohen et al. 2007). Considering the important role of documents in social research, Scott (1990) states that when social researchers conduct documentary studies, the authenticity, credibility (including accuracy, legitimacy and

sincerity) and meaning (actual and interpreted) of the documents need to be considered. Consequently, when reviewing documents, researchers should also detect the provenance of documentary evidence.

Biased selectivity and presentation

It is crucial for researchers to consider whether their documentary data is representative (Scott 1990), because documents are possibly 'highly biased and selective' in practice (Cohen et al. 2007, p. 201). Yin (2003) also warns that documents are produced for achieving the specific targets and some of them can be blocked deliberately. That is, information presented in the documents which have survived the passage of time may be partial, rather than comprehensive, and this can challenge the reliability of document-based research. Therefore, Denscombe (2003), on the one hand, agrees that government publications could be the useful documents for educational investigators to have a broad view of the issues relating to their research. On the other, he said that 'official statistics can not always be taken as "objective facts"' (Denscombe 2003, p. 217). On this basis, when interpreting documentary content, investigators need to identify the purpose and the audience for it is written (Yin 2003).

3) Data collection and analysis of the documents within this research

The strategies used within this research for analysing the data gained through documentary reviews were based on content analysis suggested by Denscombe (2003). The following presents two procedures for collecting and analysing the documents used for this research:

Deciding the appropriate sources of the documents

Documentary reviews used for this research were to provide an overview of the related ICT policies in the Taiwanese educational settings and the background, particularly the in-house ICT infrastructure, of the two target schools. On this basis, the documents used within this research were obtained from the central government and Yilan County government, Ministry of Education, Yilan County Bureau of Education and the two target schools. Therefore, the ICT policies announced by the central government and Yilan County government, the ICT SSP, the school-based ICT plans and policies served as documentary sources in this study.

Identifying the related categories for analysing the documentary data

Documents collected within this research were to function as supplementary information for the findings from the questionnaire and interview concerning the ICT infrastructure and external support of each target school. Therefore, through reviewing the obtained documents in the first procedure, the information focusing on the two schools' ICT hardware, software, networks and external relationships was singled out for further analysis and discussion.

3.5 Weaknesses of the research design

Terminology of the criteria for assessing social studies, particularly qualitative research, has been the subject of debate (Robson 2002). However, 'all research is concerned with producing valid and reliable knowledge', validity and reliability may be central concepts which mainly decide whether the qualitative research is convincing (Merriam 1998, p. 198). Compared with other criteria, Yin (2003) contends that validity and reliability are more suitable for evaluating research approaches applied to social sciences. Cohen et al. (2005) also assert that validity and reliability can be used to examine both quantitative

and qualitative research. On this basis, reliability and validity could serve as the common standards for testing the credibility of social research. Therefore, the following focuses on case study approach used in my research with respect to reliability and validity.

3.5.1 Threats to reliability

3.5.1.1 Reliability in case studies

Reliability is the concern for whether the research can be replicated through the same instruments by another researcher to produce the same findings (Denscombe 2003; Merriam 1998). Reliability is usually problematic for research approaches based on the qualitative paradigm, in that qualitative investigators themselves are usually the main research tools, and this non-standardisation of instruments precludes formal reliability testing to some degree (Robson 2002). Case studies are usually assigned to qualitative approaches. Consequently, it may be dangerous to use case studies to gain the meaning of events, rules and intentions, because findings from subjective reports are inclined to be incomplete and misleading (Cohen et al. 2005). In addition, complexity of phenomena makes it difficult for case study researchers to replicate the research settings located in social reality. This tends to be specifically true in case studies dealing with the educational phenomenon.

It seems that findings from case studies used in social research usually meet problems with reliability. Nevertheless, Merriam (1998) observes that human behaviour itself is neither static nor repeatable; hence, social research can never meet the rigid standard of reliability completely. As a result, it seems important for social researchers, case study researchers in particular, to consider their methods and research practices carefully, in order to enhance the trustworthiness of their studies.

3.5.1.2 Dealing with the issues of reliability in this research

It is nearly impossible to duplicate the results of this study by conducting another case study, because of the dynamic interactions among human beings in the educational context. Yet, according to the authors' suggestions on the principles for maximising reliability (e.g. Bassey 1999; Merriam 1998; Yin 2003), the measures which were used within this research for reducing the potential errors and biases are presented as follows:

- Recording my assumptions and positions when undertaking the research, in order to examine the biases caused by my prejudice.
- Using the stranger's viewpoint to do the investigation, in order to be aware of the constant but key phenomena taken for granted by school staff.
- Re-checking my interpretations of the findings with research participants, in order to avoid the analytical processes being affected by my subjectivity.

3.5.2 Threats to validity

Validity deals with two main questions below: one is 'whether the research is correct', and the other is 'whether the results can be general'. According to Merriam (1998) and Yin (2003), the former is labelled as internal validity, and the latter is external validity.

3.5.2.1 Internal validity in case studies

Since internal validity is concerned with whether the findings reflect the fact, research methods can be the key determinants of internal validity. As regards case study approaches, proponents of the qualitative paradigm usually argue that human beings as research tools can describe reality more clearly. For example, Lincoln and Guba observe that:

> ‘Reality’ is a multiple set of mental constructions…made by humans; their constructions are on their minds, and they are, in the main, accessible to the humans who make them.
>
> (Lincoln & Guba 1985, p. 295)

Based on Lincoln and Guba’s statement, explanations and interpretations of research subjects and investigators can serve as valid access, rather than bias-laden obstacles, to understanding the events in the real-life contexts. Therefore, case studies could also assist increasing internal validity of the research to a certain degree. Furthermore, case studies highlight thick and detailed descriptions of what researchers observe, perceive and the way they come to the results. This shows a picture of the wholeness of phenomena and the consideration of the impact of subjectivity. Nisbet and Watt (1984) also mention that ‘the whole is more than the sum of its parts’ (Cohen et al. 2005, p. 181), and they treat case studies as useful approaches to presenting a complete story of the specific events in the real world.

3.5.2.2 External validity in case studies

Case studies are usually criticised for lacking external validity, since the concern of external validity is whether the findings can be applied or generalised to other cases and situations (Merriam 1998). This is because research designs following case study approaches are concerned with explaining and understanding what is going on within a particular context, and ‘very rarely involve the selection of a representative sample of settings from a known population’ (Robson 2002, p. 177). Indeed, although justifying the appropriateness of using case study to explore specific instances within their own natural contexts, Yin (2003) also acknowledges that quite often case study researchers face a typical and challenging question of how they can generalise their findings when their research sample is relatively small (e.g. n = 1). Despite this, Yin highlights

generalisability of the findings from case studies, and examines two main concepts of the term of ‘generalisation’ used in the field of social research. One is ‘statistical generalisation’ (which is unsuitable for case study); the other is ‘analytic generalisation’ (which can be appropriate for examining external validity of case study).

For Yin, the former mode of generalisation – ‘statistical generalisation’ – is an inference made about a population (or universe) based on empirical data gained through a representative sample. More importantly, he warns that:

> A fatal flaw in doing case studies is to conceive of statistical generalisation as the method of generalising the results of the case.
>
> (Yin 2003, p. 32)

However, in Yin’s views, it is the other mode of generalisation – ‘analytic generalisation’ – that can be the appropriate method of establishing theory from the results collected through case study, by which he means that:

> A previously developed theory is used as a template with which to compare the empirical results of the case study. If two or more cases are shown to support the same theory, replication may be claimed.
>
> (Yin 2003, p. 32-33)

To a certain degree, Yin’s comments on analytic generalisations of case study approach echo with Sim’s (1998) positive opinions on generalisability of findings gained from case study. As Sim maintains:

> The data gained from a particular study provide theoretical insights which possess a sufficient degree of generality or universality to allow their projection to other contexts or situations.
>
> (Sim 1998, p. 350)

In the same vein, Bassey (2001) agrees with the possibility of generalising from the results of the case study and proposes the notion of 'fuzzy generalisation'. In his realisation, 'scientific generalisations' (which mean '*if x happens in y circumstance then z will occur in all cases*') and 'probabilistic generalisations' (which mean '*if x happens in y circumstances then z will occur in about p% of cases*') are usually accepted as the central concepts of generalisation or external validity in many studies (Bassey 2001, p. 10, italics in original). He also observes that scientific generalisations are strongly related to the studies in the area of classical physics, and that probabilistic generalisations are typically based on the results of survey research. Apart from this, Bassey observes that either probabilistic generalisations or scientific generalisations are built upon the idea of statistical generalisations.

Notably, resonating with Yin's firm warning about the faultiness of applying statistical generalisations to case studies in the arena of social research (discussed previously in this section), Bassey criticises that very few types of statistical generalisations can be made in educational research and be useful for improving school practices. This is because Bassey acknowledges a nexus of uncertain and complex factors which continue emerging in educational settings. Consequently, instead of advocating the utility of statistical generalisations, Bassey highlights the usefulness of making fuzzy generalisations from case studies in the educational field. He views a fuzzy generalisation as 'something that *may* be true'; that is, '*if x happens in y circumstances, z may occur'* (2001, p. 10, italics in original). In his previous work – Case Study Research in Educational Settings, Bassey states that:

> A fuzzy generalisation carries an element of uncertainty. It reports that something has happened in one place and that it may also happen elsewhere. There is a possibility but no surety.
>
> (Bassey 1999, p. 52)

Bassey (1999) emphasises that a fuzzy generalisation is a distinct and qualified generalisation arising from a case study on the basis of a single example or singularities. More importantly, he suggests that case study researchers who enunciate a fuzzy generalisation are required to examine and claim the conditions under which the same results are likely or unlikely to emerge in other similar cases (or situations). Thus, even though case studies are usually small-scaled investigations, fuzzy generalisations from the results of case studies still have potential not only for reflecting reality closely but also for contributing to improving educational practices and policies (Bassey 1999). It would appear that Bassey's concepts of fuzzy generalisations can solve the problems with external validity and utility of educational research which were raised by Robson (2002). In Robson's views, very little educational research is able to be replicated and inclusive, and thus findings gained from educational research, particularly case studies, tend to be of little help for changing and improving the existing practices.

In addition, Bassey describes a fuzzy generalisation as 'an invitation to "try it and see if the same thing happens for you"' (1999, p. 52). To some degree, Bassey's descriptions of fuzzy generalisations imply that educational researchers and practitioners are able to take an active role in generating knowledge and theory and to get closer to the truth by means of scrutiny and professional discourse (e.g. sharing, discussing and evaluating their findings). In this sense, the concepts of fuzzy generalisations seem to be consistent with the main arguments made by the qualitative paradigm. This is because from the perspective of the qualitative paradigm, human beings are active constructors, not passive

recipients, of social phenomena (discussed previously in sections 3.3.1.1 and 3.3.1.2). Subscribing to this perspective, I accept Bassey's concepts of fuzzy generalisations as the practical and suitable form of generalisation from the findings of the present research based on the case study approach.

In the light of the above discussion, it can be said that findings from small-scaled research with thick descriptions are able to provide an insight into the issues under study. In this sense, it was justifiable to use case studies as the research approach within the present study. This is because this research was designed to examine school leadership for change management within a specific geographical context, and case study approaches permit access to the in-depth information and a focus on the research questions for a particular instance. By offering rich data and descriptions, the findings provided within the present research based on the case study approach could assist in achieving fuzzy generalisations which would be subject to readers' interpretations. In other words, educational practitioners may translate the findings and implications provided within this research into their own practices should they hope to do so. This, in turn, potentially increases the chance of making the results from the present study contributive and applicable to other similar contexts.

3.5.2.3 Dealing with the issues of validity in this research

The main way to maximise validity is to use multiple sources of evidence, and to present a strong chain of evidence (Gall et al. 2003; Yin 2003). Since evidence gathered from different methods assists to reduce biases, the triangulation of data and methods can be useful to corroborate the same phenomena. Therefore, questionnaires, interviews and documentary reviews were used to collect data for this research. In addition, some authors suggest that an audit trail is a helpful document giving the reader confidence in the

findings (e.g. Gall et al. 2003; Merriam 1998; Robson 2002; Yin 2003). The audit trail within the present research contained:

- Information on the development and modification of the interview questions;
- Process notes of the data collection.
- Methods of interpreting the data from school documents and interviews.
- Records of data reduction and analysis.

3.6 Ethical issues

Social studies often relate to collecting data from people. Therefore, it is important for social researchers to consider ethical issues which may result in practical difficulties in the processes of collecting data and reporting results (Merriam 1998). As the ethical guidelines provided by the British Educational Research Association (Bera 2004) highlight, the whole research process of educational research was required to be undertaken within an ethic of respect for people, knowledge, democratic values, the quality of educational research and academic freedom. Due to the ethical considerations, I conducted the following steps to assure good practice within the present study.

First, noting the necessity of gaining permission from the gatekeeper of the authority to enter the research field (Merriam 1998), I presented my research proposal to the headteacher in each target school. In School A (which was identified as successfully sustaining pedagogical innovations in ICT integration), I was introduced by the ICT coordinator to the headteacher and the director of academic affairs. I briefed the research aim, methods and the way in which the findings would be reported and then, the headteacher gave me the permission to conduct this research within his school. In School B (which was identified as not yet successfully sustaining pedagogical innovations in ICT integration), I was introduced by a teacher from the ICT Instructional Team to the

headteacher, the director of academic affairs and the ICT coordinator. At the meeting with the headteacher in School B, I outlined the research purposes, research methods, the plan for reporting the results and the values of the participation of the school. Apart from this, I particularly stressed that this study was not to assess the present state and outcomes of pedagogical innovations involving ICT integration in the school. Instead, this study focused on the factors within and beyond the school context which potentially influenced the staff members' intentions to conduct the new practices of ICT adoption. Through a clear understanding of the research purposes and procedures of this study, the headteacher in School B allowed me to enter his school to undertake the present research.

Second, it is generally accepted that certain inquiries within research can bring about the risk of mental or physical harm to participants (Merriam 1998; Robson 2000). The present study involved inquiries into the situations in which the staff may have difficulties in managing new teaching practices in their own school. Hence, care was taken to prevent potentially sensitive and threatening questions which may offend individual staff. In order to avoid invading the participants' privacy and to make them feel free to express their opinions without fearing the disclosure of information, I made all participants clearly understand their right to remain anonymous and the confidential treatment of any information from them. Before conducting the interviews, I asked for permission to take notes and to record interviewees' responses on the digital recorder.

Third, the present research revealed examples of good practices of ICT integration as well as practices still in development. In order to prevent the target schools and staff members from being recognised, particularly a school which appeared to be still experiencing problems, a brief report which would be provided for the participant headteachers only included a summary of unattributed overarching themes based on the key findings from

this research. In this sense, the schools may choose to use this generalised report to reflect upon their own current practices should they wish to do so.

The above steps enabled this study to guarantee confidentiality of the research data and to avoid resulting in unnecessary harm to the participant schools and staff members. On this basis, it was anticipated that the overall process of the present research was ethically acceptable.

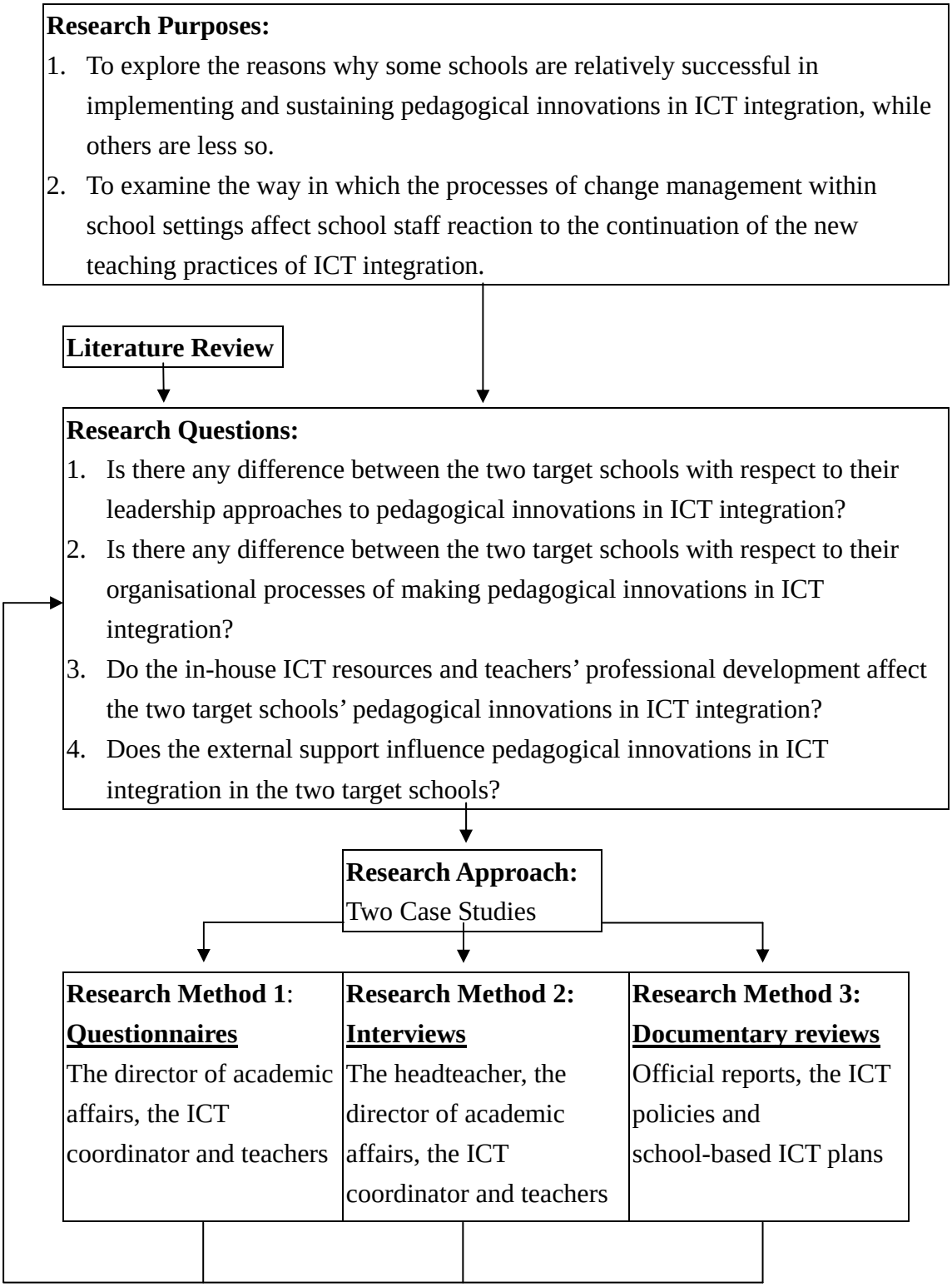
3.7 Summary

The main purpose of the present research was to explore the key factors which potentially affect a school's capacity for implementing and sustaining pedagogical innovations in ICT integration. The second purpose was to explore the way in which the change process within school settings influenced school staff reaction to continuation of the ICT-integrated pedagogies. In order to achieve the research purposes as well as to have an insight into change management in rural schools, the two specific Taiwanese primary schools located in the same rural area were purposefully selected as the target schools. One of the target schools – School A – was identified as being successfully sustaining pedagogical innovations in ICT integration. The other target school – School B – was identified as not yet successfully sustaining pedagogical innovations in this regard.

Due to the nature of the research purposes and questions, a case study approach served as the research strategy. The research participants from each target school within this study were the headteacher, the director of academic affairs (senior leader), the ICT coordinator (middle leader) and teachers from within and outside the ICT Instructional Team. In addition, questionnaires, semi-structured interviews and documentary reviews were used for collecting quantitative data and qualitative data. Through analysing both quantitative

and qualitative data, the results could be used not only for triangulating each other, but also for generating answers to the research questions. The methodological framework of the present research is demonstrated in Figure 3.1.

Figure 3.1: Methodological Framework



Chapter 4

Educational Context and Findings of School A

4.1 Introduction

This chapter is divided into three sections which present the background and findings of 'School A' – the target school which succeeded in implementing and continuing pedagogical innovations in ICT integration. The first section outlines the educational context of the school. The second section demonstrates the data obtained from the school by means of questionnaires, interviews and documentary reviews. The third section discusses the results and the final section summarises the key findings from the school.

4.2 Educational context of School A

School A in the present research was a rural primary school located in Yilan County in Taiwan. The school had 21 classes, with 578 students on roll (308 boys and 270 girls). The staffing of the school were a total of 30 teaching staff and the headteacher. Of the 30 teaching staff, 9 were subject teachers and the remaining 21 were classroom teachers. It should be pointed out that in Taiwanese primary schools, the headteacher has no class-teaching responsibility, and that every class has a classroom teacher who is in charge of both instructional and managerial tasks of the whole class. In addition, most subjects for each class, particularly in year one and year two, are taught by classroom teachers; some subjects are taught by subject teachers.

The management team of the school was constituted of 9 teaching staff, who concurrently undertook designated managerial roles either as senior leaders or as middle leaders. In the management team there were 3 senior leaders (the director of

academic affairs, the director of student affairs, and the director of general affairs) and 6 middle leaders (the ICT coordinator, the section chief of curriculum development, the section chief of experiment and research, the section chief of discipline, the section chief of hygiene, and the section chief of physical education).

The school was named by the Taiwanese Ministry of Education (MOE) 'ICT Seed School' because it won the qualification for participating in the ICT Seed School Project (ICT SSP) in 2003. Importantly, the school was successfully continuing the ICT SSP for pursuing a higher level of ICT developments at the time of the research. Moreover, there were 14 out of 30 teachers who were the members of the ICT Instructional Team[1].

4.3 Findings from School A

The findings gained from School A were based on a two-phase design. The first phase was the questionnaires, and the second was the semi-structured interviews. The questionnaires were distributed to 30 teaching staff and a total of 25 returns were achieved; the return rate was 83%. The 25 returned questionnaires used for data analysis were secured from 2 formal leaders (i.e. the director of academic affairs and the ICT coordinator), 13 teachers from within the ICT Instructional Team, and 10 teachers from outside the ICT Instructional Team. All the respondents to the questionnaires were asked to give their answers by registering on a six-level scale ranging from 'very strongly agree' to 'very strongly disagree'. The levels of 'very strongly agree', 'strongly agree', 'agree', 'disagree', 'strongly disagree' and 'very

[1] The ICT Instructional Team within each ICT Seed School was formed by school staff with ICT abilities. Detailed information on the ICT Instructional Team is presented in section 1.3.3.2.

strongly disagree' were translated, respectively, into the scores 6, 5, 4, 3, 2 and 1 in the process of data analysis.

As regards the follow-up interviews, data was gathered from a total of 19 school staff. Of the 19 interviewees, 10 were teachers from within the ICT Instructional Team, 6 were teachers from outside the ICT Instructional Team, and the remaining 3 were the formal leaders (i.e. the headteacher, the director of academic affairs and the ICT coordinator).

In addition, the related documents were collected and scrutinised in order to provide the supplements to the evidence gained from the questionnaires and interviews. Findings gathered through the documentary reviews were concerned with three aspects as follows: the school's ICT resources, teachers' ICT capabilities, and external support for pedagogical innovations in ICT integration.

All findings gained from School A can be divided into four main issues: leadership for ICT integration, organisational processes, ICT resources and teachers' professional development, and external support for the school. The above issues will serve as the headings in the remaining sections of this chapter and lead the analysis of the data obtained from the questionnaires, interviews and documentary reviews.

4.3.1 Leadership for ICT integration in School A

4.3.1.1 Findings from the questionnaires

In the questionnaire phase, statements 1.1-1.3 (see Table 4-1) were designed for examining the staff opinions on their leadership approaches to managing school-wide changes and improvements in ICT adoption in the existing teaching practices. Totalling all questionnaire responses to the 3 statements, nearly all (97%) fell within three levels from 'agree' to 'very strongly agree', with an overall mean of 4.52 (at the level of 'strongly agree'). Based on these figures, there was a strong tendency reflecting that the respondents' opinions on their leadership approaches to implementing ICT across the curriculum were positive.

Table 4-1: Leadership for ICT integration in School A (n=25)

1. **Leadership** for managing pedagogical innovations in ICT integration in **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
1.1 I am satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration	n	1	11	12	1			4.48	Agree
	%	4%	44%	48%	4%				
1.2 There is coordinated action across the staff at all levels in the leadership processes of pedagogical innovations in ICT integration	n	1	12	12				4.56	Strongly Agree
	%	4%	48%	48%					
1.3 There is a good approach to developing teachers' leadership potential for managing school changes and improvements in ICT integration	n	2	10	12	1			4.52	Strongly Agree
	%	8%	40%	48%	4%				
Total Response to Statement 1.1-1.3		5%	44%	48%	3%			4.52	Strongly Agree

In analysing all answers in detail, 2 statements were rated particularly highly. These were statement 1.2 (there is coordinated action across the staff at all levels in the leadership processes of pedagogical innovations in ICT integration) and statement 1.3 (there is a good approach to developing teachers' leadership potential for managing school changes and improvements in ICT integration). As illustrated in Table 4-1, general overviews of all responses to statement 1.2 and to statement 1.3 were classed as the level of 'strongly agree'. Importantly, statement 1.2 attracted 100% positive responses, over half (52%) of which fell within two levels from 'very strongly agree' to 'strongly agree'. In addition, this statement received the top individual mean of 4.56. On this basis, there seemed to exist collegiate work patterns in leadership practices of undertaking whole-school pedagogical innovations in ICT integration.

As regards statement 1.3, nearly all responses (96%) were positive and around half (48%) fell within two levels from 'very strongly agree' to 'strongly agree'. Moreover, this statement was ranked the second highest in the list of individual means. This result reflected that most staff agreed with their in-house mechanisms for cultivating the talented individuals as their future leaders in the domain of ICT developments.

Compared with the above statements, statement 1.1 (I am satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration) was ranked slightly lower. Even so, the general overview of the responses to statement 1.1 was still relatively positive, with a 96% approval rating. Therefore, it can be said that nearly all staff subscribed to the shared views that their overall approach to school leadership was satisfactory, in terms of undertaking pedagogical innovations in ICT integration.

4.3.1.2 Findings from the interviews

Following the questionnaire phase, further exploration in the interviews focused on four main issues:

- Staff working patterns in the leadership processes
- Facilitative factors of collaborative leadership
- Development of future leaders for sustaining ICT implementation
- Reasons for teachers' satisfaction with the leadership approaches to pedagogical innovations in ICT integration

Details of the interviewees' responses to these issues are elaborated as follows.

4.3.1.2.1 Staff working patterns in the leadership processes

Corresponding to the questionnaire results, a particularly strong theme which emerged in the interview phase was that the teachers generally felt pleased with working together and getting involved in leadership practices of implementing pedagogical innovations in ICT integration. All teachers who were interviewed expressed the same views, arguing that their school leadership was not treated as the prerogative of any individual staff. In the interviews with the teachers from outside the ICT Instructional Team, their common opinions were that they were becoming increasingly comfortable with taking the leadership role in the processes of school-wide pedagogical innovations in ICT integration. For example:

> I enjoy participating in the leadership and management processes in this school…As long as you are able to toss around your ideas and show people how to get the expected outcomes achieved, you are sure to have the chance of being in the leadership position and directing the colleagues to run new practices.
>
> (Teacher 11, non-member of the ICT Instructional Team)

An inexperienced teacher, who was in her fourth year in the school, also appreciated that:

> This school is like a family and the morale is very high…Although I was not the member of the ICT Instructional Team in my first year [in School A], many teachers, including formal leaders like the ICT coordinator and directors, invited me to join their team discussion and decision-making processes…It was really heart-warming that everyone here tried making me feel accepted.
>
> (Teacher 5, member of the ICT Instructional Team)

Indeed, in the interviews with the headteacher, he claimed that:

> The credit for our achievements in ICT integration should not go to my own or any individual's lead, but to the coordinated action across all members of our staff…Without the continuous and joint efforts of the director of academic affairs, the ICT coordinator and other teachers in carrying out school-wide pedagogical innovations, it would have been almost impossible to allow our school to have today's outcomes.
>
> (Headteacher)

Based on the above findings, it can be assumed that school leadership for pedagogical innovations in ICT adoption was not restricted to a limited staff in leadership positions or with specifically strong skills in ICT at the implementation stage of ICT development.

4.3.1.2.2 Facilitative factors of collaborative leadership

Speaking of the key drivers for the staff collaboration and active engagement in school leadership for pedagogical innovations in ICT integration, the interviewees' responses can be divided into two categories:

- The headteachers' inspiration of the staff participation in the leadership processes
- A deep-rooted collaborative culture within the staff workplace

Findings pertaining to the two categories are demonstrated as follows:

1) The headteachers' inspiration of the staff participation in the leadership processes

All teachers in the interview phase claimed that the headteacher was in the central role in shaping a school culture within which individual staff became used to coordinating with each other in undertaking the leadership tasks of promoting ICT integration. For example:

> Our headteacher always makes everyone here feel free to exercise leadership for managing new projects for improving our school practices…It doesn't matter which post you are holding, your voices are always respected.
>
> (Teacher 8, non-member of the ICT Instructional Team)

> People in this school care about others' feelings and thoughts. I think that this is part of our school culture. Of course, this is because our headteacher he is very receptive to our opinions and treats everyone with respect…Under his lead, our team always feel excited about taking up the leadership role in promoting the ICT-integrated teaching practices in our school.
>
> (Teacher 5, member of the ICT Instructional Team)

Echoing the teachers' responses, the formal leaders, such as the director of academic affairs and the ICT coordinator, appreciated the headteacher's great trust in their abilities. They both agreed that the headteacher enabled them to enjoy a strong sense

of freedom in managing whole-school ICT developments. The director of academic affairs went further, adding that:

> We all understand that our headteacher is not specialised in new technologies. However, I deeply appreciate that he invests his energy and time in working with us and listening to our comments on our school policy for managing ICT integration…He does not take the direct lead in managing all the details about ICT adoption, but he inspires staff with interests either in school management or in new teaching practices of ICT application to assume the leadership tasks. Therefore, even those not in the ICT Instructional Team usually volunteer to work with us in planning together for achieving the agreed target of ICT implementation.
>
> (Director of academic affairs)

2) A deep-rooted collaborative culture within the staff workplace

Around 82% of the teachers' responses (n = 13) reflected that the ethos of collaborative leadership had been deeply embedded in their workplace before embarking on the ICT SSP for pedagogical innovations in ICT integration. More specifically, the teachers attributed their prevailing collaborative culture not only to their present headteacher's efforts, but also to the contribution of other school leaders, the director of academic affairs and the former headteacher[2], in particular. For example, a teacher recalled that:

> In fact, before we started the ICT SSP, our former headteacher and the director of academic affairs both paid attention to teachers' collective learning…They arranged staff training courses or workshops at least once a week. Since then, we had become used to working together and sharing pedagogical skills regarding new practices…These experiences made us teachers learn that we were benefiting more from teamwork than working in isolation. Because of this, we are now at the point that we are quite happy working closely and collaboratively

[2] The former headteacher was retired nearly two years before School A launched the ICT SSP.

> with the director of academic affairs and the ICT coordinator in the processes of implementing ICT.
>
> (Teacher 7, member of the ICT Instructional Team)

Corresponding to the statements by Teacher 7, other interviewees went further, stating that:

> Like the incumbent headteacher, the former headteacher he treated us teachers as professionals…He [the former headteacher] always inspired us to assume the leadership tasks and told us that we were able to be good leaders in our specialised areas….He endeavoured to create a supportive atmosphere in the then school in order to make us have confidence in undertaking leadership activities. Since then, more and more teachers here have become comfortable being in charge of school-level projects regarding new teaching practices.
>
> (Teacher 14, non-member of the ICT Instructional Team)

> It is quite natural for us to collaborate with colleagues in the leadership processes, particularly when the reform movement intervenes in our school…It is just part of our culture that people here are active in working together and even undertaking the leadership role in dealing with new practices – whether involving ICT or not...In our school, teachers' willingness to participate in the leadership activities is not only due to the encouragement from the current headteacher and the director of academic affairs, but also due to the former headteacher's openness to our involvement in the leadership processes.
>
> (Teacher 16, non-member of the ICT Instructional Team)

More specifically, the responses from all teachers reached the similar comments, highlighting the fact that shouldering the leadership tasks offered them more opportunities of working closely with senior and middle leaders in proposing and revising the strategies for making new practices fit well with the existing classroom practices. The teachers, therefore, felt that getting involved in the leadership activities strengthened their confidence in conducting new teaching practices of ICT adoption.

4.3.1.2.3 Development of future leaders for sustaining ICT implementation

In the interview phase, the staff expressed their positive views on the question about their in-house mechanisms for developing teachers' leadership potential to implement ICT. The interviewees' common replies can be summarised as two points:

- Good designation of the key staff
- Continuation of developing potential leaders

Detailed information relating to the two points is presented as follows:

1) Good designation of the key staff

For all teachers in the interviews, the school's initial and current achievements in ICT implementation lay in the headteacher's good appointment of the suitable teachers as the key leaders for whole-school development in the field of ICT education and its application. All teachers made the similar comments, stating that their ICT coordinator was very ICT-focused, highly-committed and had sufficient interpersonal skills. For example:

> Our headteacher bears a good plan for our school's future and understands people's quality…Before the ICT SSP, he had already selected the suitable teacher as our ICT coordinator.
>
> (Teacher 8, non-member of the ICT Instructional Team)

> Our ICT coordinator is very enthusiastic about helping us out whenever we have trouble with the computer. He is like our total guide with ICT. Of course, we teachers are happy shouldering the tasks of developing the ICT-integrated curriculum. However, I think that without him, most of us would be lost in the change process of implementing ICT.
>
> (Teacher 15, non-member of the ICT Instructional Team)

> Our headteacher is quite visionary and has well-targeted development plans for managing human resources…He is pretty clear about our interests and

> skills…He selected ‘the right person’ as the ICT coordinator. I think this is the important base for our school’s outcomes of ICT implementation.
>
> (Teacher 4, member of the ICT Instructional Team)

> When noting that our school got the chance and funding for running the ICT SSP, my colleagues and I felt quite excited about being part of the ICT Instructional Team. Of course, we had been informed about some possible setbacks in advance. However, we trusted in our ICT coordinator’s competent knowledge and skills in guiding us through the difficulties in managing pedagogical innovations in ICT integration.
>
> (Teacher 6, member of the ICT Instructional Team)

Indeed, in the interviews with the ICT coordinator, he said that:

> The headteacher treats our opinions with respect…When our school started the ICT SSP, he empowered the director of academic affairs and I to organise people here to from the ICT Instructional Team. He also allowed us to enjoy the entire freedom to decide and appoint the core leaders for the ICT Instructional Team. I think that people here feel respected.
>
> (ICT coordinator)

2) Continuation of developing potential leaders

The headteacher’s investment in fostering the future leaders for sustaining ICT implementation was the crucial issue which was raised frequently and positively in the interview phase. Apart from this, it was worth noting that the strong support from another formal leader – the director of academic affairs – in the overall course of developing individuals’ potential to manage school changes in ICT adoption. This is because when praising the headteacher’s efforts to cultivate leadership abilities of individual staff, the teachers also highlighted the director of academic affairs’ hands-on approaches to leading others by examples. As can be seen in the interviewees’ replies:

Our director of academic affairs is a very competent leader. I think he has good interpersonal skills…Even though we are not in the ICT Instructional Team, he still comes to us, inviting us to join leadership activities. Because his invitation and passion, we teachers usually participate in the leadership processes…Some of us have become quite interested in the leadership post in our school or other schools, since we started taking up the leadership tasks sometimes in the change process of implementing ICT.

(Teacher 16, non-member of the ICT Instructional Team)

Although we are not part of the ICT Instructional Team, we are still welcomed to join leadership activities….The director of academic affairs stays his patience with us, letting us know the way to manage new projects…I think that the experiences of working with them [the ICT Instructional Team and the formal leaders] increase my leadership skills in some way.

(Teacher 1, non-member of the ICT Instructional Team)

I think both the headteacher and the director of academic affairs are very supportive for what we do…The headteacher allows us to exert leadership in the field which we are familiar with…The director he coaches us by showing how to do and how to make things better. I think he is an excellent, a very approachable leader.

(Teacher 12, member of the ICT Instructional Team)

I appreciate the headteacher for always supporting our efforts…Our director of academic affairs is also very supportive. Like the headteacher, the director he always knows how to cheer us up…The director he cares about us and leads us by example.

(Teacher 7, member of the ICT Instructional Team)

When the first time some of my colleagues and I shouldered the leadership tasks of running the short-term ICT project for this school, we were quite panic in the beginning. However, the director of academic affairs eased our nerves by showing us the practical strategies for leading others and managing the project…I think that he is really competent for “leading us to understand how to lead”

(Teacher 6, member of the ICT Instructional Team)

The formal leaders clarified their strategies for guiding the staff throughout the change process by making the following arguments:

> I've never seen making whole-school pedagogical innovations as an easy job…Of course, making effective change is even more challenging…However, being a leader, you need to do your best to comfort teachers' nerves. For me, the best way of persuading teachers into making changes in their teaching practices is to engage them in the leadership processes…I've never requested teachers to do tough jobs by themselves. It is my belief that you need to show them the way how to embark on new projects and share some experiences with them in advance. It's really a joy to work with people here, because I feel I also learn a lot from classroom teachers whenever we work together.
>
> (Director of academic affairs)

> It is my belief that all our staff have the potential for being leaders in their specialised field if they've got appropriate opportunities for providing leadership. I trust our teachers as professionals. I expect that they can do their best to pool their efforts and show their leadership abilities…If they can propose their ideas and action plans for improving our schooling, I feel that it's my duty to give them 100 percent support…I work toward the best of my ability to set a supportive environment within which they can feel free to live up to their ideas and exercise leadership practices.
>
> (Headteacher)

Based on the above interviewees' responses, it was evident that in order to construct the supportive conditions of implementing and sustaining pedagogical innovations in ICT integration, the headteacher invested much energy in identifying the competent individuals as the core leaders at the very start of the change process. Apart from this, the headteacher and the director of academic affairs both provided adequate support for the ICT coordinator in the aspect of nurturing and renewing human resources within the school throughout the change process. Moreover, it was encouraging to note that for those from outside the ICT Instructional Team, getting involved in leadership practices was perceived to be beneficial for future career plans. The

positive feelings about exercising leadership in the change process seemed to motivate the staff to become more willing to participate in leadership activity involving ICT implementation.

4.3.1.2.4 Reasons for teachers' satisfaction with the leadership approaches to pedagogical innovations in ICT integration

In analysing the interview data, 15 out of 16 teachers (94%) approved their school leadership for managing changes of ICT integration without dissent. When further explaining why they felt satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration, the interviewees' responses can be divided into two key points. First, the success in gaining official recognition of initiating and continuing the ICT SSP allowed the staff to receive more support from the government to develop and improve the ICT-integrated instructional modes. This, in turn, yielded the benefits for the teaching and learning processes. Second, the school's image and competitive capabilities improved throughout the course of whole-school developments in new practices of ICT application. In the interviews, the teachers claimed that:

> Most of us felt overwhelmed at the very beginning [of the change process], but now we're at a point that we feel proud of being part of the staff here. We've got a good image within our parents and community. Our neighbouring schools all know that integrating ICT into the curriculum has become the key feature of our school….We enjoy working with our colleagues in dealing with the reform movement which is introduced in our school.
>
> (Teacher 5, member of the ICT Instructional Team)

Importantly, the overwhelming majority of the teachers (94%, n = 15) considered their leadership approaches to be successful in nearly every aspect of handling pedagogical

innovations and developments, not simply in the aspect of implementing ICT across the curriculum. Moreover, the interview results showed that, when noting the things which the school could change and improve, the teaching staff were keen on giving their voice in the staff meeting or even proposed their ideas directly to the headteacher or other formal leaders.

4.3.2 Organisational processes in School A

4.3.2.1 Findings from the questionnaires

Statements 2.1-2.9 in the questionnaires (see Table 4-2) were designed for exploring the respondents' views on their school's overall process of commencing and implementing pedagogical innovations in ICT integration. As Table 4-2 illustrates, the overall mean gained from the questionnaire responses to the 9 statements was 4.34 which was categorised as the level of 'agree'. In addition, around 92% of the responses were found to be positive. Based on these figures, the respondents were generally content with their organisational processes of undertaking pedagogical innovations in ICT integration.

Based on the results gained from the 4 statements regarding the acceptance of teaching with ICT, the respondents generally held highly positive attitudes towards integrating ICT into the curriculum. Detailed responses to the 4 statements are presented as follows. In examining the responses to statement 2.7 (I believe that ICT integration reduces teachers' workload), there was a high proportion (80%) of agreement and the general overview of all responses was classed as the level of 'agree'. Apart from this, in terms of statement 2.6 (I believe that ICT integration enhances students' learning outcomes), there was a higher approval rating (88%) and the general overview of the responses fell into 'agree'.

Table 4-2: Organisational processes in School A (n=25)

2. **Organisational processes** of managing pedagogical innovations in ICT integration in **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
2.1 There is a clear vision for integrating ICT into the curriculum	n	1	9	13	2			4.36	Agree
	%	4%	36%	52%	8%				
2.2 There is joint planning among the staff at all levels	n	4	9	10	2			4.60	Strongly Agree
	%	16%	36%	40%	8%				
2.3 There is adequate consultation with teachers on key decisions of dealing with ICT integration	n	2	9	12	2			4.44	Agree
	%	8%	36%	48%	8%				
2.4 There is a suitable approach to holding teachers accountable for their work	n	1	6	16	2			4.24	Agree
	%	4%	24%	64%	8%				
2.5 I am clear about my role and responsibility	n		9	16				4.36	Agree
	%		36%	64%					
2.6 I believe that ICT integration enhances students' learning outcomes	n	4	6	12	3			4.44	Agree
	%	16%	24%	48%	12%				
2.7 I believe that ICT integration reduces teachers' workload	n		6	14	5			4.04	Agree
	%		24%	56%	20%				
2.8 I support the idea of ICT integration	n		12	13				4.48	Agree
	%		48%	52%					
2.9 I am ready for ongoing pedagogical innovations in ICT integration	n		13	12				4.52	Strongly Agree
	%		52%	48%					
Total Response to Statement 2.1-2.9		5%	35%	52%	7%			4.34	Agree

More specifically, statement 2.9 (I am ready for ongoing pedagogical innovations in ICT integration) was rated even higher, with a 100% approval rating. In addition, the general overview of the responses to this statement was at the level of 'strongly agree'. Another 100% approval rating was for statement 2.8 (I support the idea of ICT integration), on which the general overview of the responses was categorised as the level of 'agree'. Based on these figures, it can be assumed that the school seemed to foster a relatively supportive culture within which the staff generally held the common and positive beliefs that ICT application assisted in relieving their workload, and that students were able to benefit from new practices of ICT integration into

classes. It was also encouraging to note that all respondents were found to be confident, feeling well-prepared for continuing teaching with ICT.

In analysing the data gained through the other 5 statements regarding their school's goal-setting, decision-making and accountability mechanisms, the teachers' responses were found to be positive. The evidence is presented as follows. Statement 2.5 (I am clear about my role and responsibility) attracted a 100% approval rating, with the general overview of the responses which fell into the level of 'agree'. The other 4 statements also scored highly, in that they all attracted 92% positive answers. These were statement 2.1 (there is a clear vision for integrating ICT into the curriculum), statement 2.2 (there is joint planning among the staff at all levels), statement 2.3 (there is adequate consultation with teachers on key decisions of dealing with ICT integration), and statement 2.4 (there is a suitable approach to holding teachers accountable for their work). In addition, the general overview of the responses to statement 2.2 was at the level of 'strongly agree'. As regards statements 2.1, 2.3 and 2.4, the general overview of the responses was categorised as the level of 'agree'. According to these findings, it would appear that the staff worked closely and collaboratively in making whole-school plans for managing pedagogical innovations in ICT integration. The findings also reflected that there seemed to be precisely defined roles of the post-holders in the processes of undertaking school-wide changes of ICT integration. In addition, there was a strong tendency that the respondents expressed their satisfaction with their in-house strategies for monitoring their progress in the change process.

4.3.2.2 Findings from the interviews

In the interview phase, further exploration focused on three main issues:

- Decision-making and goal-setting processes
- Monitoring and reward systems
- Teachers' readiness for continuation of the ICT-integrated pedagogies

The following presents detailed findings relating to each of these issues in turn.

4.3.2.2.1 Decision-making and goal-setting processes

When asked their strategies for making decisions and setting targets for the school in the overall course of implementing ICT, all teachers' responses reflected upon the same views that the school had no formalised committee structure to exert decision-making power and to set the school's targets. Even so, the teachers stressed that mutual communication between teaching staff and those with leadership positions was commonplace in the organisational processes of constructing their shared values and developing a consensus before decisions were made. Moreover, 12 teachers (75%) in the interviews argued that they enjoyed being involved in the decision-making processes. All teachers' responses revealed that everyone in the school felt free to participate in the goal-setting and decision-making processes of pedagogical innovations in ICT integration. For example, the interviewees said that:

> In this school, whenever decisions are made, they are usually done between teachers and managerial staff.
>
> (Teacher 6, member of the ICT Instructional Team)

> Colleagues are very receptive to others' ideas…Of course, sometimes we have criticisms of some people's idea, we will still try it out. If it doesn't work, then we'll usually go back. Then, try another way to do it again.
>
> (Teacher 14, non-member of the ICT Instructional Team)

> Whilst it is inevitable that some proposed ideas incurred our criticism at the very start, we are still willing to try them out to see how they work for our school. This is how we do things here.
>
> (ICT coordinator)

In addition, around 56% of the teachers (n = 9) maintained that wide-ranging debates arose frequently and naturally both in staff meetings and in informal discussions. Notably, the teachers admitted that contentious issues in staff discussions sometimes resulted in conflicting tensions, particularly at the initial stage of managing school-wide changes of ICT adoption. Despite this, the teachers appreciated that with the prompt mediation of the headteacher and the director of academic affairs, the conflicts turned into the constructive discourse, and this allowed the teachers to consider deeply the issues under discussion. More specifically, the teachers' replies also revealed that the appropriate involvement of the headteacher and the director of academic affairs in the organisational processes was at the very heart of assisting the staff in reviewing and reaffirming the agreed goal which the entire school aspired to. For example:

> What our headteacher usually does is to 'step back, watching over all interactions among each of us'…If the issues under discussions are in our specialised fields, the headteacher he never intervenes in our communications unless necessary and he only does so for helping us turn the fierce debates into the constructive or productive ones.
>
> (Teacher 1, non-member of the ICT Instructional Team)

> We all know that the headteacher and other leaders always welcome us teachers to give our voice in the organisational processes…Teachers in this school work

> closely with the management team…Most decisions are made collaboratively through staff discussion and negotiations.
>
> (Teacher 12, member of the ICT Instructional Team)

In the interviews with the formal leaders, they pointed out that:

> It is really important to make teachers feel free to exert leadership in their professional field. Yet, the headteacher and I also agree that it is equally important to make teachers be clear that such freedom comes inside certain boundaries of what we expect in our school.
>
> (Director of academic affairs)

> I'm happy to see our staff working together in tossing around their ideas and giving their voice…However, before the issues are brought to the discussion, the managerial staff and I achieve the initial consensus and allow all our staff to know the key direction and the boundaries of what our school can or cannot do…Our staff do enjoy the freedom of making decisions for our school, and yet I'm sure that they also understand that such freedom comes inside certain boundaries of what's expected in here.
>
> (Headteacher)

According to the above findings, it was clear that speaking of the organisational processes of dealing with school-wide ICT adoption, the staff naturally accepted mutual communications or even wide-ranging debates as the useful and essential approaches to leading them to establish the shared vision and agreed goals. More than this though, the highly-responsive reaction of the formal leaders (e.g. the headteacher and the director of academic affairs) to the tensions and conflicts which arose in the decision-making and goal-setting processes was worthy of note. This is because both formal leaders not only promoted open debates in staff discussions, but also offered timely assistance in moving conflicting opinions forward to productive dialogues. All these findings from the interviews supported the results from the questionnaires. As presented in the questionnaire data (see section 4.3.2.1), nearly all teachers (92%)

were clear about their school's visions and thought that their school plans were made through staff collaboration. Apart from this, the same percentage (92%) of the questionnaire responses tended to reflect that there was sufficient consultation in the decision-making processes.

4.3.2.2.2 Monitoring and reward systems

As mentioned in chapter 3, when asking the questions about the school's accountability mechanisms, the meaning of 'accountability/accountable' was clarified to the staff members. Notably, however, in the interview phase, the staff repeatedly mentioned 'the in-house accountability mechanisms' in connection with their monitoring and reward systems. In other words, within this research context, there was a strong tendency that the interviewees identified 'monitoring' and 'rewards' as their key measures to hold people accountable or responsible for their work. The terminological issues of 'accountability' were beyond the scope of the present study. Rather, this study focused on the approaches to developing teachers' responsibilities in the overall course of implementing ICT. Given the above, the findings presented in this section are based on the interviewees' responses with respect to the issues of monitoring and reward systems in the processes of implementing ICT, although the interviewees were asked directly about their in-house accountability mechanisms.

According to the interview data, the accountability mechanisms within the school seemed to be adaptive to different job-holders throughout the course of managing pedagogical innovations in ICT integration. That is, considering teachers' appointed jobs and individualised needs, the school used diverse strategies for promoting teachers' responsibility for and commitment to their own tasks of implementing ICT. For example, in terms of the approaches to monitoring and measuring teachers'

effectiveness of their work in the change process, the interviewees pointed out that differences existed between the teachers from within ICT Instructional Team and those from outside this team. The following demonstrates the extracts from the interviewees' replies:

> I feel that what our headteacher and the director of academic affairs are trying to do with us is to promote our abilities to manage pedagogical innovations as well as our sense of responsibility in the whole-school change process. Hence, it doesn't matter which job positions you are holding, your efforts and contribution throughout the change process of implementing ICT are monitored and evaluated on a regular basis…A high level of pressure and expectation are particularly put on the teaching staff enacting the leadership roles in the change process. For example, compared with teachers without joining any leadership activity, those who volunteer to assume leadership responsibilities for moving the ICT SSP forward have more frequent meetings about examining and reflecting upon their progress and achievements in managing changes for the whole school.
>
> (Teacher 1, non-member of the ICT Instructional Team)

> In fact, when starting the ICT SSP, some colleagues and I myself we simply facilitated, rather than being 'directly' involved in, the processes of implementing ICT. Despite this, I appreciate our headteacher and other formal leaders for not making teachers here, like me, with very little interests in new technologies feel uncomfortable throughout the change process…Also, compared with colleagues with leadership experiences and higher ICT capacities, we receive a more supportive, less demanding approach within our school's monitoring system.
>
> (Teacher 8, non-member of the ICT Instructional Team)

> Our formal leaders are always trying to make us feel motivated and they care about teachers' different needs throughout the monitoring process, especially when pedagogical innovations are taking place. Because of this and because I have come to realise that we non-members of the ICT Instructional Team can make contribution to assisting colleagues from this team in developing the ICT-integrated instructional modes, I am currently trying to devote myself much more to the course of managing the ICT-integrated pedagogy.
>
> (Teacher 15, non-member of the ICT Instructional Team)

The ICT Instructional Team also recognised the diversity in the approaches used in the monitoring processes. Even so, the team seemed to feel satisfied with these diverse approaches within the monitoring system when school change was under way. As the teachers from within the ICT Instructional Team stated:

> Of course, compared with colleagues from outside the ICT Instructional Team, our team members' collective and individual progress in ICT implementation are reviewed and evaluated more frequently in the monitoring process. I am quite happy with these flexible and different approaches used within our school's monitoring system. This is because the monitoring measures applied to our team are not about forcing us to demonstrate the formal leaders the way of developing the ICT-integrated instructional modes. These measures are about enabling us to build up our confidence in coming to grips with the leadership tasks in the processes of implementing ICT.
>
> (Teacher 2, member of the ICT Instructional Team)

> I think it is a good idea that our school applies different approaches to dealing with the staff shouldering different responsibilities and holding different positions throughout the change process. Colleagues in our team and I myself feel that the strategies for monitoring our progress are quite acceptable.
>
> (Teacher 4, member of the ICT Instructional Team)

Echoing the above interviewees' responses, the formal leaders added that:

> In our school, teachers who are non-members of the ICT Instructional Team are always welcomed to work together with us in planning for ICT and developing the ICT-integrated instructional modes in the leadership processes. We monitor teachers' progress and provide them with the assistance they request…We use different strategies for ensuring that teachers are accountable for their work. For example, we set up a heavy level of the monitoring system to scrutinise and evaluate the progress of the ICT Instructional Team. As for the non-member of this team, the monitoring process is like a 'light touch'. That is, when monitoring teachers' efforts to conduct new practices involving ICT integration, we give non-members of the ICT Instructional Team less demanding approach, compared with those from within this team…The monitoring system does not focus particularly on dealing with some paperwork and reports about teachers'

> improvements. Rather, it is the process that involves reflective evaluations and knowledge sharing among staff members. The director of academic affairs and I we also share our ideas and experiences of managing whole-school projects with teachers engaging in leadership practices throughout the monitoring process.
>
> (ICT coordinator)

> In the processes of monitoring our teachers' work involving ICT implementation, we have never tried to force them to enact the leadership roles. Instead, we are trying to promote our teachers' commitment to whole-school changes by showing them how we could do for them…Like the headteacher, the ICT coordinator and I we also believe that leading people by example is a good way to develop our teachers' commitment to the jobs they assume…Once in a week, the ICT coordinator and I work together with the team in reviewing and examining what we have done and have not yet achieved. In addition, we share our experiences about managing school changes with the team. Whenever needed, we join them, guiding them to direct the non-members to deal with the ICT SSP for whole-school pedagogical innovations…We try our best to let the staff understand how much we care about their feelings and contribution as well as how we could change for better. I think this is the main reason why our teachers – whether from within or outside the ICT Instructional Team – generally have high commitment to our whole-school pedagogical innovations in ICT integration.
>
> (Director of academic affairs)

Moreover, it appeared that the ICT Instructional Team, though having more pressure than the staff not within this team, still identified the schools' monitoring system as the facilitator of motivating the teachers to continue moving towards the expected goal. As the interviewees maintained:

> My colleagues and I have been part of the ICT Instructional Team and shared the leadership responsibilities for implementing ICT for such a long time. Yet, we do not think of the monitoring system applied to us as being demanding and scary. We feel that a higher level of expectation and pressure placed on our team through the regular monitoring of our progress usually motivate us to strive for excellence…Also, we can get timely help and individualised support from the formal leaders, such as the director of academic affairs and the ICT coordinator, throughout the monitoring process…In my view, it is the combination of the

> monitoring and adequate support that energises us to be quite happy with undertaking the leadership responsibilities in the overall course of managing school changes of ICT implementation.
>
> (Teacher 3, member of the ICT Instructional Team)

> The headteacher encourages us all the time, but we all know that he sometimes gives us pressure, to some degree. Yet, I do believe that the necessary pressure is needed, particularly in the change process.
>
> (Teacher 7, member of the ICT Instructional Team)

In addition to the monitoring measures, the school's reward system seemed to have the potential to enhance teachers' incentive to work hard for achieving the agreed targets of pedagogical innovations in ICT integration. Based on the interview data, there were two forms of rewards which were particularly set up for motivating the staff to assume leadership tasks and have higher commitment to undertaking whole-school changes involving ICT adoption. One of the rewards was offering teachers release time (i.e. reducing class-teaching hours) in accordance with their daily workload of leadership practices regarding ICT implementation. The other form of the rewards was that teachers' leadership experiences in managing whole-school changes of ICT integration were put into consideration in the promotion process. For the interviewees, while gaining release time was not completely comparable to the time and energy which the staff spent in handling new practices of ICT integration, both forms of the reward measures made them feel respected when getting involved in the leadership processes of managing pedagogical innovations. In addition, half of the teachers (50%, n = 8) felt that their engagement in leadership practices allowed them to recognise the skills which they needed to develop to further enhance their own leadership capacity. The teachers' positive feelings about the school's reward system, in turn, made them become more willing to dedicate themselves to the course of

whole-school pedagogical innovations in ICT integration. For example, the interviewees observed that:

> In the beginning of the change process of running the ICT SSP, I did not think about joining the ICT Instructional Team. This was because I was unsure if I would be able to cope with so many tasks in my day-to-day working practices, and if I could meet the expectations and achieve the agreed targets set up for the team. However, in the course of school changes in implementing ICT, I have come to realise that these doubts seemed to be unnecessary, because I saw colleagues from within the team feeling satisfied with what our school improved as well as the rewards for their hard work…For example, two of our teaching colleagues, who used to join the ICT Instructional Team and made great contribution to our school's ICT developments, gained the external promotion in the second year when we continued the ICT SSP. Now they are both in leadership positions as directors in our neighbouring schools. For me, having more chances to get further promotion is a quite strong incentive to make me decide to become part of the ICT Instructional Team and to get involved in the leadership activity involving ICT adoption.
>
> (Teacher 10, member of the ICT Instructional Team)

> The rewards about having release time are part of the encouragement inspiring some of my colleagues to become willing to join the leadership process of implementing ICT. Indeed, I am also happy with this form of reward...For me, the reward about gaining further promotion based on our leadership experiences in managing the ICT-related projects was another stimulant to make me persist in taking up the leadership responsibilities for implementing ICT in this school.
>
> (Teacher 13, member of the ICT Instructional Team)

The overarching message from the above findings was that the in-house accountability mechanisms could fit well with teachers' individual working condition throughout the change process. By receiving adequate individualised support, associated with the necessary pressure, within the monitoring and reward systems, the teachers have become comfortable with and confident of engaging in whole-school change of ICT implementation. As satisfaction and confidence gradually rose in the

change process, the teachers felt motivated and possessed higher commitment to the appointed tasks of pedagogical innovations in ICT integration.

4.3.2.2.3 Teachers' readiness for continuation of the ICT-integrated pedagogies

Based on the interviews with all teachers, before commencing school-wide ICT adoption, the headteacher placed an emphasis on sharpening the staff consciousness of the potential benefits of using ICT across the curriculum. For instance, explaining the reasons behind applying for the ICT SSP, a teacher confirmed that:

> The headteacher himself is quite visionary and ambitious about establishing our school's reputation for making pedagogical innovations regarding ICT application. Of course, other leaders, like the ICT coordinator and the director, they are also keen on ICT developments in our school. They understand some of us are interested in trying out new teaching approaches which can be beneficial for our children.
>
> (Teacher 6, member of the ICT Instructional Team)

The headteacher reported that:

> Indeed, I had fostered a vision of making our school famous for ICT education and ICT application across the curriculum since arriving in here. Yet, joining the ICT SSP did not rely on my own opinions…When noting this government-funded change project [ICT SSP], the ICT coordinator, the director and some teachers came to me. They proposed their ideas and action plans for running this project if our school would be able to win the chance. Of course, if you say you value each teacher, there is nothing more important than favouring their good ideas with your full support.
>
> (Headteacher)

More specifically, when directly asked about the key to making them feel well-prepared for continuing the ICT-integrated pedagogies, all teachers expressed the similar views as follows: having confidence in overcoming the potential difficulty in teaching with ICT was the key. Moreover, the two formal leaders (the director of

academic affairs and the ICT coordinator) were regarded by all teachers as the primary facilitators in making the teaching staff become increasingly confident of teaching with ICT when school-wide change of ICT integration was under way. When explaining how the director of academic affairs and the ICT coordinator strengthened teachers' capacities for dealing with the possible challenges of the ICT-integrated pedagogies, the interviewees gave the following examples:

> Our ICT coordinator and director of academic affairs work together with the ICT Instructional Team in helping the entire implementation of ICT in our school…They are quite 'resourceful' and of course, they are hands-on leaders. They give us prompt feedback and individual counselling whenever we are caught in trouble about ICT adoption in our classes.
>
> (Teacher 11, non-member of the ICT Instructional Team)

> Some teachers in the ICT Instructional Team continue working with the ICT coordinator in conducting teaching trials of new ICT-integrated pedagogical modes…sometimes they manage action research of these ICT-integrated pedagogies…The team and the ICT coordinator let us know their results and share their experiences of ICT integration with us on a regular basis. They also share their strategies for overcoming challenges which they encountered in their teaching processes. I think that's why people here normally feel comfortable trying out these new pedagogies.
>
> (Teacher 14, non-member of the ICT Instructional Team)

Other non-members of the ICT Instructional Team also agreed that the ICT coordinator, the director of academic affairs and the team were very helpful by offering instructional and technical assistance in meeting teachers' individualised demands for teaching with ICT. Indeed, in the interviews with the ICT Instructional Team, their common responses in association with staff motivation for implementing ICT were: the teachers perceived the expected target which students would have the potential to achieve if computer technology was used effectively for teaching purposes. As a teacher highlighted:

> When realising what you've done and what you can do for helping your children learn better and learn with fun, as a teacher you are sure to have this strong will to make a change, and it's just like that…Deciding to conduct this new practice [embedding ICT in the curriculum] is a kind of 'instinctive reaction' for us.
>
> (Teacher 9, member of the ICT Instructional Team)

It was evident that the joint efforts between the formal leaders and the ICT Instructional Team allowed the teachers to gain the timely and suitable assistance in solving their problems with undertaking new pedagogies of ICT adoption. Given the above features and positive effects of the problem-solving mechanisms, there seemed to be no surprise that in the questionnaire phase, all responses reflected that the staff felt that they were well-prepared for continuing the ICT-integrated pedagogies.

4.3.3 ICT resources and teachers' professional development in School A

4.3.3.1 Findings from the questionnaires

According to the findings gained from the questionnaires, the respondents tended to hold positive opinion on their ICT resources and professional development for supporting ICT adoption. As can be seen in Table 4-3, in total there were 93% positive answers, with an overall mean of 4.35. The general overview of the responses to all 7 statements in Table 4-3 was classed as the level of 'agree'.

Having an insight into the data gained from the first 3 statements concerned with the in-house ICT infrastructure and technical support, the respondents' opinions were found to be relatively positive. As the results reported, statement 3.1 (ICT hardware meets my needs) gained nearly all (96%) agreement and the general overview of the responses to this statement fell into the level of 'agree'. The general overview of the

responses to statement 3.2 (ICT software meets my needs) was also classified as the level of ‘agree’, with an 88% approval rating.

Table 4-3: ICT resources and teachers’ professional development in School A (n=25)

3. **ICT resources** and **teachers’ professional development** in **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
3.1 ICT **hardware** (i.e. computers, digital projectors and other technological instruments for teaching purposes) meets my needs	n		6	18	1			4.20	Agree
	%		24%	72%	4%				
3.2 ICT **software** (i.e. online teaching and learning materials and the ICT-integrated instructional modes) meets my needs	n		6	16	3			4.12	Agree
	%		24%	64%	12%				
3.3 Technical support meets my needs	n		10	12	3			4.28	Agree
	%		40%	48%	12%				
3.4 I use ICT appropriately to support teaching and learning	n		9	13	3			4.24	Agree
	%		36%	52%	12%				
3.5 I have been trained in all aspects of ICT necessary for my teaching	n		10	11	4			4.24	Agree
	%		40%	44%	16%				
3.6 Good practices of teaching with ICT are shared widely across the school	n		7	18				4.28	Agree
	%		28%	72%					
3.7 Teachers are stimulated to reflect upon the value of ICT integration	n	8	11	6				5.08	Strongly Agree
	%	32%	44%	24%					
Total Response to Statement 3.1-3.7		5%	34%	54%	8%			4.35	Agree

In addition, the respondents’ opinions on their technical support were found to be positive. As illustrated in Table 4-3, the general overview of the responses to statement 3.3 (technical support meets my needs) was at the level of ‘agree’. Furthermore, this statement received an 88% approval rating. Based on these highly positive responses, it was evident that the respondents seemed to have adequate access to the ICT facilities and the required technical support.

In terms of the respondents' views on the remaining 4 statements focusing on the school's professional development for supporting teachers' ICT adoption, the responses were generally positive. As shown in Table 4-3, statement 3.4 (I use ICT appropriately to support teaching and learning) gained an 88% approval rating, and received the general overview of the responses which fell into the level of 'agree'. Statement 3.5 (I have been trained in all aspects of ICT necessary for my teaching) was also ranked highly. This statement attracted an 84% approval rating, with the general overview of the responses at the level of 'agree'. Compared with statements 3.4 and 3.5, the respondents' opinions on statement 3.6 (good practices of teaching with ICT are shared widely across the school) were more positive. As the data reported, statement 3.6 received a 100% approval rating and gained the general overview of the responses at the level of 'agree'.

The remaining one was ranked even higher, and this was statement 3.7 (teachers are stimulated to reflect upon the value of ICT integration). This statement gained a 100% approval rating, with the general overview of the responses which was at the level of 'strongly agree'. According to the above figures, it would appear that the teachers in the school were confident ICT users, and that the school was able to attend to the teachers' demands for pedagogical knowledge and skills in ICT application. Moreover, it was encouraging to note that for all the respondents, the school fostered a quite supportive learning culture within which the teachers were encouraged to evaluate and rethink the value of conducting new practices of ICT integration, rather than simply making changes for the sake of change.

4.3.3.2 Findings from the interviews

The interview results presented in this section were derived from the staff responses to the issues focusing on the following aspects:

- The in-house ICT resources
- The in-house professional development

4.3.3.2.1 The in-house ICT resources

Echoing the findings from the questionnaires, the majority of the teachers (88%, n = 14) in the interviews confirmed that they had convenient access to the school's ICT resources (i.e. ICT infrastructure and technical support). The teachers also agreed that both ICT hardware and software fit well with their existing teaching practices. Specifically, all teachers, on the one hand, stressed that the adequate in-house ICT infrastructure and timely technical support were essential and particularly instrumental for enhancing their willingness to put the ICT-integrated pedagogies into practice at the very start of the change process. On the other hand, their responses seemed to reflect that the school was able to offer an equal level of access to the quality ICT instruments for each staff member – whether from within the ICT Instructional Team or not. These findings can be evidenced by the following extracts from the interviewees' responses:

> Shortly after we were qualified for implementing the ICT initiative for school-wide pedagogical changes, our headteacher and other leaders, such as the ICT coordinator, managed the ICT instruments quite well so that even non-members of the ICT Instructional Team, like me, had the same level of access to all these instruments as colleagues in the team. For us non-members of the team, this equal access to the hardware was a good feeling then…We were quite excited about and looked forward to undertaking these new practices of ICT adoption at the start of the change process.
>
> (Teacher 8, non-member of the ICT Instructional Team)

> Even though I have never been part of the ICT Instructional Team, teaching with ICT has become part of my curricular activities for a long time. This is not only because I feel that my students enjoy learning with ICT, but also because both hardware and software have become handy for us and students as well, soon after our school started the ICT SSP.
>
> (Teacher 11, non-member of the ICT Instructional Team)

Speaking of the ICT hardware, the interviewees remarked that:

> For me, among all the instructional technologies in our school, digital projectors are of the greatest use...There are many types of ICT instruments available for us to support our teaching…Depending on which year you are teaching, you will use some particular instruments more frequently. For us teaching the lower-level group[3], we usually give our children lessons through whole-class teaching approaches…We ask children to sit in formal rows facing the front. Then we show the online teaching and learning materials via the digital projector…The ready access to hardware, like the computer and the digital projector in our classroom, and all the online resources set by colleagues in the ICT Instructional Team and the ICT coordinator are really useful for our teaching and children's learning, I think.
>
> (Teacher 1, non-member of the ICT Instructional Team)

> Teachers in many schools in this county they themselves still need to borrow and set up ICT instruments, even including digital projectors, whenever they want to use these facilities in classes…In our school, teachers and students are quite lucky…Nearly all ICT instruments have already been set up well in each of our classrooms…Teachers and students are free to use all the ICT instruments you see in here…With such convenient access to the ICT instruments and the user-friendly learning platform in our school, we have no reasons for missing the good chances to provide our students with more personalised learning approaches and to keep improving the existing teaching practices by means of ICT adoption.
>
> (Teacher 10, member of the ICT Instructional Team)

[3] Primary school systems in Taiwan include 6-year (3-level) education. Years 1 and 2 (7-8 years old) are known as the 'lower-level group', years 3 and 4 (9-10 years old) are referred to the 'middle-level group', and years 5 and 6 (11-12 years old) are categorised as the 'upper-level group'.

In addition to the ICT hardware, all teachers highlighted the convenience and usefulness of the ICT software (i.e. the school's online learning platform and the ICT-integrated instructional modes). More importantly, the teachers' perceived usefulness of the ICT-integrated pedagogies by recognising the increase in students' learning motives when learning with ICT. For example:

> Our school's online learning platform allowed students to receive their individualised and immediate feedback in their own learning processes…The ICT coordinator and the director of academic affairs they set a specific system, namely 'wisdom token savings'[4] in our school, for students…The learning platform, together with the idea of wisdom token savings, is an excellent design for promoting our students' learning motives, especially in the beginning of our ICT implementation…In my classes, students they are keen on learning via the online learning platform.
>
> (Teacher 8, non-member of the ICT Instructional Team)

Corresponding to Teacher 8, Teacher 9 agreed that the application of the online learning platform was instrumental for students' individualised learning processes. Teacher 9 pointed out that:

> Our online learning platform is a very useful and practical tool for our students and for us teachers…The diverse online teaching and learning resources and a mutual interface between teachers and students are just over there [the learning platform]. Because of the convenient access to the online resources and the usefulness of our learning platform, it is like a 'natural reflex' for us teachers to use ICT for teaching and learning.
>
> (Teacher 9, member of the ICT Instructional Team)

[4] 'Wisdom tokens' of School A are not real currencies, but represented by the school's reward system which was deliberately set for inspiring students to learn with ICT (e.g. the online learning platform). That is, all students in School A had their own virtual 'wisdom bank accounts' in which students saved their 'wisdom tokens' when learning through the learning platform. After gaining sufficient wisdom tokens, students were allowed to join School A's online auction to gain the prizes, such as hard disks, stationary products, having a meal with the headteacher and so on.

Specifically, Teacher 16, who used to feel nervous about using new technologies for teaching purposes at the very start of ICT implementation, stressed that the user-friendly ICT software within the school allowed her to become increasingly comfortable teaching with ICT in the change process. Teacher 16 went further, adding that:

> I am entirely satisfied with our ICT software for teaching purposes, such as the ICT-integrated instructional modes and the online learning platform…The ICT coordinator and the ICT Instructional Team they developed these online instructional tools by carefully considering our demands and our children's needs so that these instructional tools are applicable to my teaching practices…These ICT-based instructional tools are also easy for every teacher to use…You do not need to have specialised ICT skills and you normally have no difficulties using these online instructional tools.
>
> (Teacher 16, non-member of the ICT Instructional Team)

Corresponding to Teacher 16, another teacher declared that:

> Our school provides a wide range of the ICT-integrated instructional modes for us …We are able to find the one [mode] fitting well with our curricular plans…Referring to the modes, you can create your own ICT-integrated curricula for your class…If you do not have confidence in developing your own ICT-integrated curricula, you can simply follow the modes and apply them to your teaching practices. This was also what I did when the first few times I undertook the ICT-integrated pedagogies.
>
> (Teacher 15, non-member of the ICT Instructional Team)

4.3.3.2.2 The in-house professional development

As regards the ICT-related training, the teachers viewed the regular staff training for the ICT SSP as the useful approach to promoting their capacities for ICT adoption. Of special note was that the teachers pointed out that the in-house ICT-related training catered for their individualised demands. This was because the school set different

levels of training sessions. Extracts from the interviewees' responses are presented as follows:

> Our ICT training is excellent, because the content of our training is good quality and wide-ranging…We have many choices. If you are a beginner, you can choose the basic courses each Wednesday after lunchtime. If you want to absorb some higher-level skills in ICT and its application, you can attend the specialised professional training and workshops on Friday afternoon.
>
> (Teacher 4, member of the ICT Instructional Team)

Apart from echoing the statements by Teacher 4, other interviewees added that:

> Actually, in the first year when we commenced the ICT SSP, our headteacher used to require all staff members to attend the ICT training every Wednesday afternoon…Since the second year [of continuing the ICT SSP], the Wednesday training sessions on Wednesday have been no longer compulsory for us because we have come to realise the appropriate approaches to using ICT for teaching and learning in the change process…Even though currently we are not asked to attend any ICT-related training, most of us still take part in the in-house ICT training sessions regularly.
>
> (Teacher 14, non-member of the ICT Instructional Team)

> Our ICT coordinator, the director of academic affairs and colleagues from within the ICT Instructional Team they pay attention to teachers' needs…They ask for our feedbacks on the training courses which they organise within our school…They set different types of training courses for teachers here so that basically, you never feel that you've got nothing to learn…Our knowledge and skills involving ICT application are improving and at the same time our school's training contents are improving as well.
>
> (Teacher 13, member of the ICT Instructional Team)

Confirming the diversity in the in-house training sessions, the headteacher maintained that:

> Basically, we have two main types of regular training courses. One was part of the 'staff Wednesday training'[5], aiming at the development of teachers' ICT skills and showing the usage of the specific instructional technologies which would be set in the school in the near future. Staff Wednesday training courses are funded by the government…The other professional development for teachers' ICT skills in our school is not that formalised. It is informal learning, and we name it 'ICT development group'. Because it is the advanced and informal professional learning for ICT skills, teachers are free to join. Of course, teachers do not need to join if they have no interests in the advanced skills.
>
> (Headteacher)

Importantly, further exploration showed that in comparison with the availability of ICT resources, the teachers' perceived compatibility of ICT adoption with their existing teaching practices seemed to be the more crucial determinant of their persistency in the ICT-integrated pedagogy. As all teachers in the interviews pointed out, it was their understanding of the usefulness of ICT and procedures for integrating ICT that inspired them to continue teaching with ICT. For example:

> For most of us, compared with our access to the ICT facilities, whether or not the ICT-integrated pedagogy can fit in our current practices is much more influential on our decision of keeping using ICT in classes.
>
> (Teacher 1, non-member of the ICT Instructional Team)

Of special note was that after the initial success in running the ICT SSP, the ICT coordinator continued working with the teachers from within the ICT Instructional Team in conducting the teaching trials of different types of ICT-integrated instructional modes. They also reported the results from their teaching trials at regular staff meetings. For many teachers (88%, n = 14), the evidence-based reports offered

[5] The term 'staff Wednesday training' is widely used by Taiwanese primary school teachers for covering all sorts of training courses which are run on Wednesday afternoon. Since all primary schools in Taiwan have no classes after Wednesday lunchtime, most schools arrange each Wednesday afternoon for holding the regular staff training sessions. Generally the staff Wednesday training in each school is free and open to all teachers within and from other schools.

by the ICT coordinator and the ICT Instructional Team had a positive impact on making the teaching staff become increasingly determined to sustain the ICT-integrated pedagogies, despite the inevitable setbacks in the processes of ongoing innovations. For example, the teachers acknowledged that:

> The ICT coordinator and the ICT Instructional Team run the teaching trials regularly. Their report allows us to know about the divide between what was already achieved and what could be improved throughout the process of school-wide change in ICT adoption. This makes us know what we can do or what we can change for better.
>
> (Teacher 8, non-member of the ICT Instructional Team)

> Because of the ICT Instructional Team's demonstration and their knowledge sharing, I have become clear that ICT integration into the curriculum does not simply mean that a new and high-tech tool intervenes in our classroom practices…What I said is that ICT adoption brings about an innovation in our teaching and learning approaches…I feel that using ICT in classes really brings benefits to our students, because this new practices provides them with more diverse learning approaches.
>
> (Teacher 1, non-member of the ICT Instructional Team)

> The regular and convincing reports by the ICT coordinator and the ICT Instructional Team help us realise that the ICT-integrated pedagogy can be quite helpful for increasing the opportunities to meet our students' individualised needs in the teaching and learning processes.
>
> (Teacher 12, non-member of the ICT Instructional Team)

On this basis, it could be said that teaching trials and action research run by the ICT coordinator and the ICT Instructional Team offered the staff an explicit picture of students' improvements in the ICT-embedded classes. This may allow the teachers to precisely recognise the gap between what was already fulfilled and what could be improved when school change of ICT adoption was under way. Further exploration in the interview phase pointed out that sharing good practices of ICT adoption in

informal groups with colleagues was accepted as part of teachers' working routine. As the interviewees maintained that:

> I feel that learning is everywhere in this school. For example, regular formal training sessions, collaborative learning in informal groups…Sometimes some colleagues organised teacher forums on an informal basis. I think that keeping learning informal you're allowing much more people to get involved.
>
> (Teacher 10, member of the ICT Instructional Team)

> We do have many formal training courses or workshops, but we also have many informal learning opportunities...I personally feel that it is more useful and practical to learn with colleagues in informal discussion groups…Professional development doesn't need to be a matter of formality, I think.
>
> (Teacher 8, non-member of the ICT Instructional Team)

Reinforcing the teachers' opinions, the headteacher observed that:

> The work you see coming out of our school is not coming from some structured committee who assumed a task and went away with it. Our teachers' work is usually the result of colleagues out in the staff room who relax at the end of the day, tossing around their ideas.
>
> (Headteacher)

4.3.3.3 Findings from the documentary reviews

The findings demonstrated in this section were based on the reviews of the official report by Yilan County Bureau of Education (2005) and the documents secured from the school.

1) The in-house ICT infrastructure

The school had 193 networked desktop personal computers (PCs), 19 of which were mainly used for administrative and managerial purposes (the headteacher office had a

PC and other offices and departments had 18 PCs in total). The allocations of the remaining 174 PCs were as follows:

- 72 PCs were set in 21 classrooms of year 1-6 and in 3 classrooms for specialist subjects. Each classroom was equipped not only with 1 PC for teachers to deal with teaching and administrative tasks, but also with 2 PCs for students' use.
- Another 72 PCs were sited in 2 computer labs which were set up before the school joined the ICT SSP. Apart from 2 PCs for teachers' use, the other 35 PCs in each computer lab were set for students' use.
- 20 PCs were sited in 2 ICT-integrated classrooms which were established in 2004 when the school continued the ICT SSP. The ICT-integrated classrooms were deliberately designed for students' group learning associated with the ICT-embedded pedagogies. Each group with 3-5 students was provided with a computer connected to the Internet, and this allowed students to use ICT for managing their joint work during classes.
- 9 PCs were put in the computer area in the library and 1 PC was in the audio-visual studio.

The ratio of students and school staff to PCs was around 3:1. The school also had 3 laptops, 13 digital cameras and 2 digital camcorders, and students were provided with the same level of access to these instruments as teachers. Moreover, 27 digital projectors (one in each class, computer lab, ICT-integrated classroom, the library and audio-visual studio) were installed and connected to teachers' computers. As regards software, the computer operation system was Microsoft Windows XP, with Microsoft Office package installed on all PCs. Apart from fixed networks, the school had a wireless network, which all installed by the local government before the ICT SSP was launched.

2) Teachers' ICT skills and the ICT software for teaching purposes

With reference to the staff ICT skills, all teachers and the headteacher gained the nationally recognised qualifications of teachers' ICT capacities in 2003 (Yilan County Government 2005). The school had its own online learning platform which was constructed by the ICT coordinator and the director of academic affairs. All students had the ready access to the online learning materials on the learning platform. A wide range of ICT-integrated instructional modes were available for all teachers on the school's learning platform. These instructional modes were mainly developed by means of the joint work among the director of academic affairs, the ICT coordinator and the ICT Instructional Team. In addition, those from outside the ICT Instructional Team were more or less engaged in the process of developing the ICT-integrated instructional modes. In order to promote ICT integration in different school contexts, School A allowed teachers from other schools to have ready access to its ICT-integrated instructional modes. Moreover, since 2004 when School A continued the ICT SSP, the school's ICT-integrated instructional modes had been introduced in many schools both within and outside of the local county (Yilan County Bureau of Education 2005).

4.3.4 External support for School A

4.3.4.1 Findings from the questionnaires

Based on the questionnaire responses, the respondents generally felt satisfied with the support from outside their school. As demonstrated in Table 4-4, the overall mean was 4 (which was classed as the level of 'agree') and a total of 78% responses were found to be positive.

Table 4-4: External support for School A (n=25)

4. **External support** for **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
4.1 Cross-school ICT-related workshops and training enhance my abilities to deal with pedagogical innovations in ICT integration	n		9	13	3			4.24	Agree
	%		36%	52%	12%				
4.2 Parents' support is crucial to pedagogical innovations in ICT integration in our school	n		7	14	4			4.04	Agree
	%		28%	56%	16%				
4.3 The government offers suitable support for pedagogical innovations in ICT integration in our school	n			18	17			3.72	Agree
	%			72%	28%				
Total Response to Statement 4.1-4.3			21%	57%	21%			4.00	Agree

In examining the responses to each inquiry, statement 4.1 (cross-school ICT-related workshops and training enhance my abilities to deal with pedagogical innovations in ICT integration) was ranked the highest, with an 88% approval rating. The general overview of the responses to this statement was classed as the level of 'agree'. With respect to the responses to statement 4.2 (parents' support is crucial to pedagogical innovations in ICT integration in our school), the general overview of the responses was categorised as the level of 'agree', with 84% of positive answers. Statement 4.3 (the government offers suitable support for pedagogical innovations in ICT integration in our school) was also ranked highly, with a 72% approval rating. Moreover, the general overview of the responses to this statement was categorised as the level of 'agree'.

All these above findings can be summarised as saying that the respondents appeared to benefit from learning and networking with teaching staff from other schools in the

processes of implementing ICT across the curriculum. In addition, gaining support from parents seemed to be perceived by the teachers to be important to the processes of implementing ICT in the school. Finally, the respondents tended to feel satisfied with the access to the external support from the government in order to undertaken school-wide changes in implementing ICT.

4.3.4.2 Findings from the interviews

Findings presented in this section were derived from the interviewees' responses to the two main issues. One of the issues focused on the effect of the ICT SSP. The other issue was concerned with the influence of the three sources of external support – the governmental support, parental support and teachers' cross-school learning (i.e. ICT-related workshops and training courses) – on the school's sustainability of implementing ICT. Through data analysis, the interviewees' replies to these questions can be divided into two key issues. These were:

- Crucial role of the government's support
- Benefits from parental support and teachers' cross-school learning

The following demonstrates further information pertaining to each of these issues in turn.

4.3.4.2.1 Crucial role of the government's support

When asked to compare the influence of the three sources of external support on the school's capacity for sustaining pedagogical innovations in ICT integration, all teachers in the interviews made the similar comments that the government's adequate support was much more crucial than the remaining two – parental support and benefits gained from teachers' cross-school learning. In addition, around 69% of the teachers (n = 11) were satisfied with the government's support for promoting ICT

integration in the school, whilst the others (31%, n = 5) showed their reserve in this regard. The interviewees pointed out the problems by saying that:

> Some government-run training courses are not suitable for what we need…Quite often the training contents are just related to some basic ICT skills…I prefer to know much more about leadership skills and some hands-on skills about managing the changes involving ICT implementation at a school-wide level.
>
> (Teacher 6, member of the ICT Instructional Team)

> I do not think our school can rely on the government's funding alone, even though this support is the most important financial source for our school. Of course, the government did offer us funding for upgrading our ICT facilities, but the money did not come to our school in time…Our school did not really get the entire financial aids from the government at the very start.
>
> (Teacher 7, member of the ICT Instructional Team)

Corresponding to the teachers' statements, the formal leaders also claimed that:

> The government offers us many opportunities and specific funding for supporting our professional learning in the change process…[However,] the government needs to improve the training contents….The training for our ICT skills is good, of course. Yet, I think that now what we, including our teachers, really need is more skills relating 'management'. For example, skills about leadership, managing new practices, resources management and so on.
>
> (Director of academic affairs)

> There is still much room for the government to improve [with respect to the government-run training sessions]…Nearly all staff members in our school now are fluent ICT users and teachers they generally feel comfortable teaching with ICT. So, not only us [the formal leaders], but also our teachers they really want to gain much more expertise about change management and leadership skills.
>
> (Headteacher)

Despite the emergence of some negative opinions on the inadequate support from the government, further exploration in the interviews reflected upon a particularly

interesting finding as follows. It was the strong support and high expectation from the formal leaders throughout the change process that allowed the teachers, including those without high satisfaction with the government's support, to react positively to the educational initiative regarding ICT adoption. As an interviewee maintained:

> Like the headteacher, the ICT coordinator and the director of academic affairs they are very supportive lead teachers…The contribution of both ICT coordinator and director to the leadership and change process is as important as the headteacher.
>
> (Teacher 6, member of the ICT Instructional Team)

Moreover, recalling the initial stage of undertaking educational change of ICT integration, the ICT coordinator highlighted the headteacher's timely and wholehearted assistance in solving the shortage of financial resources for improving ICT infrastructure:

> When the government's funding is not sufficient enough for us to upgrade our ICT instruments, the headteacher is sure to make efforts to solve the 'money problems'…This is really helpful…He encourages us, helping us overcome the growing pains in the course of whole-school changes of implementing ICT.
>
> (ICT coordinator)

Indeed, attributing the school's readiness for pedagogical innovations to teachers' joint efforts, the headteacher personally also placed a high priority on cultivating a prevailing culture within which people were simulated to embrace educational change and innovation. As the headteacher stressed:

> Setting a strong atmosphere supporting innovations and changes is essential for driving our school to continue moving ahead.
>
> (Headteacher)

4.3.4.2.2 Benefits from teachers' cross-school learning and parental support

As mentioned above, all teachers in the interviews perceived parents' support and teachers' cross-school learning to be less influential than the government's support, in terms of the impact on the school's capacity for sustaining pedagogical innovations in ICT integration. Even so, many teachers (81%, n = 13) still agreed with the advantages of networking with teachers from other schools in the change process of implementing ICT. As the interviewees claimed:

> Meeting teachers from different schools sometimes can give us different insights into new practices – whether concerning ICT or not, I think. Because of this, I enjoy nearly all cross-school learning opportunities.
>
> (Teacher 7, member of the ICT Instructional Team)

> Of course, I like to work together with teachers from other schools. Sometimes we talk about our experiences of developing the ICT-integrated curricula. We can exchange our own ideas through these cross-school training sessions. This is really helpful for broadening our mind, I think.
>
> (Teacher 16, non-member of the ICT Instructional Team)

It was also worth noting that an equally large proportion of the teachers (81%, n = 13) thought that the financial support from the parents' association was one of the main source for the school to enlarge the ICT infrastructure. More specifically, the teachers stressed that securing the funding from the parents' association was particularly important and helpful when the school was at the initial stage of implementing the ICT SSP. For example:

> When starting the ICT SSP for implementing ICT, we did not have sufficient support from the government…The government did give us the funding for managing this new practice, but actually we did not get the money in time at the very beginning in the change process. It was the support from our parents' association that allowed us to enlarge our ICT infrastructure at that time and then,

> we were able to celebrate the initial success in undertaking the ICT-integrated pedagogy at the early stage.
>
> (Teacher 2, member of the ICT Instructional Team)

> Definitely, I personally believe that the government's strong support and long-term investment in ICT developments are much more influential to our school's continuation of pedagogical innovations in ICT integration. However, in our school, at the outset of running the change project for conducting the ICT-integrated pedagogy, we actually got more practical and useful support from our parents, rather than the government…I am not saying that the government's support is out of importance. What I mean is that the government's support is indeed essential and important for our school's long-term ICT adoption and developments. Yet, most of my colleagues and I myself also feel that without parent's timely support at the very beginning, we may have encountered difficulties in successfully initiating the new practices of ICT adoption.
>
> (Teacher 6, member of the ICT Instructional Team)

4.3.4.3 Findings from the documentary reviews

According to the official report by the Yilan County Bureau of Education (2005), prior to being involved in the ICT SSP, School A was short of ICT resources. However, since making achievements in implementing and sustaining the ICT SSP, the school has become publicly acknowledged as an ICT-capable school and officially recognised by the Ministry of Education (MOE) as a model for other schools. Apart from this, the school's successful experiences in change management in the area of ICT integration was disseminated around many schools in Taiwan. The Yilan County Bureau of Education (2005) described the school as 'a community centre' in its local area, in that the headteacher was proactive about guiding the entire staff to engage the parents in the school's activities, and that the school led its neighbouring schools to 'grow up together' with respect to ICT development.

Based on the documents obtained from School A, the school built the partnerships with four schools in the local area and successfully assisted these schools in progressing from being traditional rural schools to being part of the ICT Seed Schools in 2003. In addition to keeping good relationships with its partner schools, School A networked with another 7 schools (2 schools in Yilan County and 5 schools in other counties) by means of mutual visits and holding cross-school ICT workshops and training courses from 2004 to 2006.

4.4 Summary of the key findings from School A

4.4.1 Key findings of school leadership for ICT integration

On the whole, the interview results corresponded to three key findings from the questionnaires. First, the leadership processes of pedagogical innovations in ICT integration were collaborative, and thus the leadership tasks were shared among multiple members of the staff, irrespective post or ICT background. Second, the school made investment in nurturing potential individuals as future leaders for steering the whole school toward ongoing developments in ICT adoption. Third, the staff celebrated their overall approach to school leadership for implementing ICT and they generally had a strong desire for continuous progression in their teaching practices.

Importantly, further exploration in the interview phase revealed that shared or distributed leadership did not exist automatically in the change process within the school. Instead, a distributed form of leadership for implementing ICT was developed and underpinned by two main conditions as follows:

1. One condition was that the headteacher's good appointment of the competent teacher as the ICT coordinator at the very start, together with the strong support from the director of academic affairs for the ICT Instructional Team, was the key to engaging classroom teachers in leadership activities in the processes of implementing ICT.

2. The other condition lay in the fact that the headteacher endeavoured to enlarge teachers' ICT and leadership skills by means of continuing fostering a cluster of talented teaching staff as lead teachers or teacher pioneers in the domain of ICT. Specifically, apart from the headteacher, other formal leaders, such as the director of academic affairs and the ICT coordinator, were proactive about forming a collaborative culture. This promoted teachers, whether from within the ICT Instructional Team or not, to perceive the value and necessity of working as a team in assuming leadership tasks throughout the change process. Hence, although inevitably there existed a certain degree of dependence upon the guidance from the ICT coordinator and the ICT Instructional Team, teachers without strong ICT background became increasingly active, getting involved in the leadership activities of implementing ICT.

In a sense, the overarching message was that: there was no doubt that staff collaboration and leadership dispersal were the crucial prerequisites or co-requisites to the school's success in initiating and implementing pedagogical innovations in ICT integration. More than this, though, it was the coexistence of the above two conditions which allowed the shared or distributed patterns of leadership to exert a positive and powerful influence on the school's sustainability of good practices involving ICT adoption.

4.4.2 Key findings of the organisational processes

It was evident that following the questionnaire phase, the interview phase reinforced three key findings. First, the staff had the shared and positive beliefs in teaching with ICT before making school-wide changes of ICT integration. Second, staff collaboration was commonplace in the organisational processes of implementing ICT. Third, the school's accountability mechanisms were able to make the staff members responsible for their work in the change process. More importantly, evidence from the interviews further revealed that the crucial features of the school's organisational processes created the supportive conditions which facilitated teachers developing the common beliefs and inspired them to move toward the agreed goals of ICT integration. These features are:

1. The formal leaders endeavoured to sharpen classroom teacher' perceptions of value of ICT integration into the curriculum. Importantly, the headteacher effectively conveyed the high expectations of pedagogical changes and improvements by means of making teachers aware that the expected targets, though ambitious, were in fact achievable. Even more importantly, the ICT coordinator led the ICT Instructional Team to conduct teaching trials of new practices of ICT integration before the commencement of school-wide pedagogical innovations regarding ICT adoption. These school-based teaching trials of the ICT-integrated pedagogy provided teachers with information of students' benefits from learning with ICT, problem-solving strategies for coping with the possible challenges of using ICT in classes. It is for these reasons that even teachers from outside the ICT Instructional Team, on the one hand, perceived value of using ICT for their own teaching practices. On the other hand, they became increasingly confident, firmly believing that if their colleagues were able

to overcome the challenges of pedagogical innovations in ICT integration, then they would be able to do so. Teachers' perceived usefulness of ICT adoption, together with their confidence in teaching with ICT, could give the reason why all questionnaire respondents felt ready for continuing pedagogical innovations in ICT integration.

2. It was evident that a collaborative culture permeated through the school and thus, collective plans and establishing a shared vision and an agreed goal through open debates and mutual communications appeared to be deeply rooted in the staff working processes. However, special attention should be drawn to the fact that the headteacher the director of academic affairs not only respected the divergence of individuals' opinions, but also assisted in moving wide-ranging debates forward to constructive dialogues for reaching common values among the staff. In a sense, it can be assumed that in the organisational processes within the school, the headteacher and the director of academic affairs seemed to enact the crucial role in developing teachers' consensus about the issues under discussion.

3. It would appear that the school's accountability mechanisms were featured as a combination of the monitoring and reward systems. The teachers from within the ICT Instructional Team, though having more pressure than the others, still identified the schools' monitoring means as the helpful trigger for teachers' high incentives to continue moving ahead towards the target which the entire school aspired to. Compared with those from within the ICT Instructional Team, the non members of this team gained less demanding and more supportive approaches within the monitoring system. Apart from the monitoring process, the school's reward measures (i.e. the release time for teachers' work reduction and access to

further promotion) were highly likely to promote teachers' motives to keep striving for excellence in the change process. Moreover, the formal leaders' joint efforts to lead by example in the change process were at the core of weaving the suitable support with the school's monitoring system. All these above can be summarised as saying that the school's accountability mechanisms were adaptable and flexible. Given these features and positive effects of the in-house accountability mechanisms, there seemed to be no surprise that in the questionnaire phase, the majority of the teachers (92%) were found to feel positive about the school's overall approach to holding the staff accountable for their work in the change process.

4.4.3 Key findings of ICT resources and teachers' professional development

Echoing the findings from the questionnaires, evidence from the interviews reaffirmed the teachers' highly positive opinions on the access to their in-hose ICT resources and staff professional development for supporting ICT adoption. The importance of sufficient ICT equipment and ICT-related training for school staff cannot be over emphasised, in that similar findings were well documented in other studies concerning successful ICT implementation in school settings in England (Selwood 2007) and in Taiwan (Chen 2004; Chiang 2005; Tang 2007; Yang 2004). More than this, though, data gained in the interview phase reflected upon two motivating conditions which reinforced teachers' determination to continue teaching with ICT. These motivating conditions are elaborated as follows:

1. The ICT coordinator not only noted the importance of the availability of the ICT resources, but also put emphasis on demonstrating how to use the school's new ICT instruments for supporting teaching and learning. The ICT coordinator's clear

demonstration strengthened teachers' perceptions of the purpose and potential value of applying new ICT facilities to their existing teaching practices. As the interview data reported, one of the core motivating factors which made teachers become willing to teaching with ICT lay in the fact that they strongly perceived both usefulness and convenience of employing their ICT instruments for teaching purposes.

2. The approach of frequently auditing staff skills and differentiated training courses based on individuals' needs were worthy of note. The findings also revealed that in addition to formal ICT-related training, knowledge sharing among staff members in an informal manner facilitated teachers in perceiving the advantages of ICT integration and assimilation of new pedagogies regarding ICT into their teaching strategies.

It could be summarised from these findings that the teachers were willing to deal with challenges caused by technological adoption, as long as they felt that using ICT for teaching and learning were compatible with their present instructional experiences and matched their needs.

4.4.4 Key findings of external support

In parallel to the findings from the questionnaires, data gained through the interviews also revealed that the staff appreciated the support from parents and the opportunities of learning and working together with teachers from other schools. The interview results reconfirmed that the staff recognition of the sufficiency in the government's support, in the aspect of school-wide changes in ICT integration. Apart from this, evidence collected in the interview phase reflected upon some interesting findings

which were worthy of note. These findings can be divided into two key points as follows:

1. It would appear that the staff recognised the impact of parents' support and teachers' cross-school learning on the overall course of implementing new practices of ICT integration. Moreover, when it came to the school's sustainability of new practices of ICT integration, the general opinions of the staff seemed to reveal that neither parental support nor teachers' cross-school learning could exert the same level of impact as the governmental support did. Despite this, however, securing support from parents at the initial stage of the change process was still accepted by the staff as being particularly helpful for successfully commencing the ICT SSP for pedagogical innovations in ICT integration.

2. The teachers were strongly conscious of the formal leaders' endeavours to lead the school in establishing good relationships with parents and the local community. The solid school-community connection facilitated the school garnering financial support from parents for upgrading the in-house ICT infrastructure in the processes of implementing ICT. It is for these reasons that the teachers had a strong will to work hard in making pedagogical innovations involving ICT adoption, whilst they noted that their school was limited in ICT resources at the very start of the development process. To a certain extent, it can be said that the teachers' commitment to change management of ICT implementation highly depended on their perceptions of school leaders' support and resolution to improve schooling.

Overall, data from the interviews and documentary reviews substantiated the key findings from the questionnaires. Furthermore, the interview results not only added credibility and validity to the questionnaire results, but also offered a close insight into the issues of change management of ICT implementation in School A.

Chapter 5

Educational Context and Findings of School B

5.1 Introduction

This chapter contains three sections which present the background and findings of 'School B' – the target school which was identified as not yet successfully sustaining pedagogical innovations in ICT integration. The first section demonstrates the educational context of the school. The second section shows the data collected though questionnaires, interviews and documentary reviews. The final section summarises the key findings from the school.

5.2 Educational context of School B

School B, like School A (see chapter 4), is a rural primary school located in Yilan County in Taiwan. With 32 classes, School B had 875 students on roll (450 boys and 425 girls). The staffing of the school was the headteacher and a total of 50 teaching staff (15 subject teachers, 32 classroom teachers and 3 special needs teachers). The management team of the school was formed by 16 teaching staff, who concurrently assumed designated managerial roles either as senior leaders or as middle leaders. Among the 16 staff within the management team, there were 4 senior leaders (the director of academic affairs, the director of student affairs, the director of counselling, and the director of general affairs) and 12 middle leaders (the ICT coordinator, the section chief of curriculum development, the section chief of experiment and research, the section chief of teaching facilities, the section chief of registration, the section chief of discipline, the section chief of hygiene, the section chief of student activities, the section chief of physical education, the section chief of guidance and counselling, and 2 section chiefs of special education).

The school was named by the Taiwanese Ministry of Education (MOE) 'ICT Seed School' after gaining the qualification for running the ICT Seed School Project (ICT SSP) in 2003. Despite this, the school was unable to meet the government's standard for gaining the official funding for continuing the ICT SSP in 2004 (MOE 2005). Since the pressure imposed by the government for running the ICT SSP disappeared, the school's change efforts of ICT adoption had faded away. In addition, there were 6 out of 50 teachers who were part of the ICT Instructional Team. During the academic year of implementing the ICT SSP for school-wide change in ICT adoption, none of the ICT Instructional Team left the school.

5.3 Findings from School B

The findings from School B were collected through the questionnaires and the follow-up semi-structured interviews. In total, the questionnaires were distributed to 50 teaching staff. There were 41 completed forms from the questionnaires, with a return rate of 82%. The 41 returned questionnaires used for data analysis were obtained from the headteacher, and 2 formal leaders (i.e. the director of academic affairs and the ICT coordinator), 5 teachers from within the ICT Instructional Team, 34 teachers from outside the ICT Instructional Team. All the respondents to the questionnaires were asked to give their answers by registering on a six-level scale ranging from 'very strongly agree' to 'very strongly disagree'. The levels of 'very strongly agree', 'strongly agree', 'agree', 'disagree', 'strongly disagree' and 'very strongly disagree' were translated, respectively, into the scores 6, 5, 4, 3, 2 and 1 in the process of data analysis.

With respect to the interview phase, data was collected from a total of 22 school staff. Among all the interviewees, 6 teachers were the members of the ICT Instructional

Team, 13 teachers were from outside the ICT Instructional Team, and the remaining 3 were the formal leaders (i.e. the headteacher, the director of academic affairs and the ICT coordinator).

Moreover, data gathered through documentary reviews focused on three areas: the school's ICT resources, teachers' ICT capabilities, and external support for pedagogical innovations in ICT integration. Findings from the documents were used as the supplements to the evidence gained from the questionnaires and interviews.

The findings collected from the school can be categorised as four key issues: leadership for ICT integration, organisational processes, ICT resources and teachers' professional development, and external support for the school. These four issues will serve as the headings in the following sections of this chapter and lead the analysis of the results gained through the questionnaires, interviews and documentary reviews.

5.3.1 Leadership for ICT integration in School B

5.3.1.1 Findings from the questionnaires

Table 5-1 presents the questionnaire respondents' opinions on their school leadership for pedagogical innovations in ICT integration. As the data reported, the general picture of the questionnaire responses was found to be negative. This was because over half (52%) of the total response fell within two levels from 'disagree' to 'strongly disagree'. In addition, the overall mean was 3.46, which was categorised at the level of 'disagree'. According to these figures, it was evident that there was a discrepancy in staff opinions on their school leadership for managing changes in ICT integration. Moreover, compared with those with positive views, more staff felt negative about their school leadership in this regard.

Table 5-1: Leadership for ICT integration in School B (n=41)

1. **Leadership** for managing pedagogical innovations in ICT integration in **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
1.1 I am satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration	n		3	22	14	2		3.63	Agree
	%		7%	54%	34%	5%			
1.2 There is coordinated action across the staff at all levels in the leadership processes of pedagogical innovations in ICT integration	n			19	22			3.46	Disagree
	%			46%	54%				
1.3 There is a good approach to developing teachers' leadership potential for managing school changes and improvements in ICT integration	n			16	20	5		3.27	Disagree
	%			39%	49%	12%			
Total Response to Statement 1.1-1.3			2%	46%	46%	6%		3.46	Disagree

In examining the responses in detail, statement 1.2 (there is coordinated action across the staff at all levels in the leadership processes of pedagogical innovations in ICT integration) received somewhat less than half (46%) of the approval and over half (54%) of the disapproval from the respondents. Moreover, the general overview of the responses to this statement was categorised as the level of 'disagree', according to the individual mean of 3.46 which was calculated from the responses. At first sight, this general picture of the responses appeared to be a negative verdict; however, it can be considered as a source of concern. This is because the above figures – slightly more than half (54%) disagreement as well as nearly half (46%) agreement – revealed division of the respondents' opinions on this statement. In other words, the results, on the one hand, indicated that collegiate working patterns in the leadership processes of implementing ICT in the school fell short of some of the respondents' expectations, to some degree. On the other hand, they can be interpreted as the fact that a certain

percentage of the respondents might feel satisfied with their existing leadership approaches to implementing ICT without dissent. This disparity in perception is noteworthy and is further discussed in chapter 6 to explain why some of the respondents may have been more reticent in agreeing the helpfulness of leadership processes at all staff levels across the school.

With respect to the responses to statement 1.3 (there is a good approach to developing teachers' leadership potential for managing school changes and improvements in ICT integration), the percentage of approval was even lower. The general overview of the responses to statement 1.3 was classified as the level of 'disagree', with less than 40% (39%) of positive responses. Furthermore, 12% of the responses were categorised as the level of 'strongly disagree'. Based on these figures, it could be assumed that the respondents were not fully satisfied with their in-house mechanisms for nurturing the competent individuals as their future leaders in the domain of ICT developments.

Interestingly however, in responding to statement 1.1 (I am satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration), the general overview of the responses fell into the level of 'agree', with 61% positive answers. Furthermore, 7% of the positive responses were categorised as the level of 'strongly agree'. At first sight, this general picture of the responses seemed to be a positive verdict; however, it can be seen as a source of concern. This is because the finding raised the question of why 61% of the respondents still supported their leadership approaches to managing pedagogical innovations in ICT integration, even though the school was identified as not being able to successfully sustain this new practice. Although it is difficult from the questionnaire data alone to gain an impression of exactly why a certain percentage (61%) of the responses were found to

be positive about the school leadership for implementing ICT, the interview results presented in the next section give the underlying reasons behind the questionnaire respondents' satisfaction with their school leadership in this regard.

5.3.1.2 Findings from the interviews

School staff in the interviews were asked their opinions on four main issues:

- Staff working patterns in the leadership processes
- Barriers to collaborative leadership
- Development of future leaders for sustaining ICT implementation
- Reasons for teachers' satisfaction with leadership practices

The following of this section presents detailed findings relating to these issues in turn.

5.3.1.2.1 Staff working patterns in the leadership processes

Supporting the questionnaire results, data from the interviews reconfirmed that staff collaboration was not commonplace in the leadership processes of managing school-wide pedagogical innovations in ICT integration. More than half (52%, n = 10) the teachers who were interviewed admitted that the leadership functions of promoting ICT integration were not stretched over the work of many members of the staff. Interestingly, the interviewees did not claim that the leadership responsibilities for implementing ICT were always restricted to their formal leaders (i.e. the headteacher, the director of academic affairs and the ICT coordinator). Instead, based on the interviewees' common arguments, it was the teaching staff from within the ICT Instructional Team that usually bore the leadership responsibilities for directing the entire staff in dealing with pedagogical innovations in ICT integration throughout the change process. The interviewees, for example, recalled that:

> To be honest, when our school was undertaking the ICT SSP, only 2 colleagues who were not in our team usually came to us and assisted us in drawing out action plans for managing changes in ICT adoption at each stage.
>
> (Teacher 13, member of the ICT Instructional Team)

> Colleagues not in our team generally had very little interest in participating in the leadership activities of promoting ICT integration. Of course, we welcomed all teachers to join us, but you could not push them if they had no interest in getting involved in the leadership processes.
>
> (Teacher 14, member of the ICT Instructional Team)

Two interviewees went further, criticising that:

> Like my colleagues in this team, I was 'full of energy' and really wanted to make big changes and improvements not only in my own classroom practices but in others' as well. Yet, as you may know, after our school won the honour and was officially recognised by the government as being part of the ICT Seed Schools, very few teachers from outside our team volunteered to work with us in managing whole-school issues and tasks of implementing ICT…It seemed that all the practices concerning ICT adoption was our team's business. That's why we [the team] felt quite frustrated and exhausted in the processes of managing school-wide improvements in ICT integration.
>
> (Teacher 19, member of the ICT Instructional Team)

> Of course, the non-members of the ICT Instructional Team usually said that they would like to 'help' us when we were busy dealing with things like developing ICT-integrated curricular modes…However, it's my opinion that this sort of pedagogical change should have mattered to everyone…I think that teachers should have be more active about this school-wide change.
>
> (Teacher 15, member of the ICT Instructional Team)

Two formal leaders admitted that:

> In my opinion, our teachers from within the ICT Instructional Team did an excellent job when our school was running the ICT SSP. I really appreciated the team's good work at that time, especially when considering that very few

> teachers here were interested in joining the team to manage school-wide pedagogical innovations together. Of course, I have never prevented these innovations. However, as a school leader, I cannot insist on our teachers' participation in the team because I don't want to let our teachers become overloaded with their work.
>
> (Headteacher)

> The headteacher and I we respect our teachers' interests and decisions. Therefore, when the ICT initiative for implementing ICT was under way, we could not force our teachers to teach with ICT unless they themselves felt happy with this new teaching approach. That's why I personally do not think that at that time we could be particularly helpful for facilitating the change process unless teachers at the forefront of classroom practices were really interested in the new practices involving ICT adoption.
>
> (Director of academic affairs)

5.3.1.2.2 Barriers to collaborative leadership

When asked their reasons for feeling little interests in participating in the leadership processes of dealing with whole-school changes and innovations in ICT implementation, the interviewees' responses can be divided into two categories:

- Teachers' little perception of the necessity of taking up the leadership tasks
- Formal leaders' inadequate support for staff involvement in the leadership processes

Findings pertaining to the two categories are demonstrated as follows:

1) Teachers' little perception of the necessity of taking up the leadership tasks

In the interview phase, the teachers from outside the ICT Instructional Team tended to consider it to be unnecessary to give their voice in the leadership processes. This was not only because the teachers were not fully confident of their own ICT expertise, but also because of their limited knowledge and skills in the area of change management and leadership approaches. The interviewees, for example, asserted that:

> I am not in the ICT Instructional Team…I know very little about the ICT Instructional Team's plans and strategies for achieving this change project (the ICT SSP)…Most non-members of the team are just like me. We generally have no leadership skills or particular experiences of undertaking leadership practices involving change management, particularly the ICT-related changes. Consequently, I just feel that it is unnecessary for us non-members to get involved in the leadership processes of implementing ICT, in that we may not be of much help to the ICT Instructional Team in this regard.
>
> (Teacher 7, non-member of the ICT Instructional Team)

> The issues of school leadership for extending the use of ICT in classes merely attracted the concerns of the teachers who formed the ICT Instructional Team.
>
> (Teacher 2, non-member of the ICT Instructional Team)

> Of course, I know that my colleagues in the ICT Instructional Team welcome us from outside their team to join their discussions and work with them in promoting ICT integration. Yet I have never got involved in their group work because like most teachers here, I fully trust the team's leadership abilities.
>
> (Teacher 10, non-member of the ICT Instructional Team)

> Like me, most teachers not in the ICT Instructional Team are not enthusiastic about the leadership processes in our school...We teachers are generally not interested in the ways in which our headteacher and the ICT instructional team reached the agreement on the strategies for developing ICT in our school. However, we will not refuse to cooperate with the ICT Instructional Team if they let us know what we can do for them.
>
> (Teacher 11, non-member of the ICT Instructional Team)

In addition to the above statements of the non-members of the ICT Instructional Team, it was interesting to point out that for the ICT Instructional Team, staff collaboration in the leadership processes and adequate delegation of decision-making power to other teachers were perceived to be beneficial for undertaking pedagogical innovations in ICT integration. Unfortunately, despite their awareness of the benefits

of collaborative leadership for whole-school changes and improvements, the ICT Instructional Team seemed to be disappointed, claiming that they felt unable to change the existing school culture within which most teachers preferred to work in isolation, rather than working closely and collaboratively in the change process. For example, the interviewees observed that:

> It is part of our school culture…Very few teachers feel interested in undertaking the joint tasks of school change and management.
>
> (Teacher 13, member of the ICT Instructional Team)

> It seems to be quite 'natural' that nearly all our colleagues from outside our team had never undertaken leadership and managerial tasks of whole-school ICT development, since the ICT SSP was launched.
>
> (Teacher 3, member of the ICT Instructional Team)

> Since we started the ICT SSP, many of our colleagues from outside our team had taken it for granted that implementing ICT seemed to be nothing to do with them, but the 'exclusive' duty of the teachers in our team.
>
> (Teacher 15, member of the ICT Instructional Team)

> Our team always welcome them colleagues from outside the ICT Instructional Team to join our discussion and to share the leadership responsibilities with us in the processes of running the ICT SSP…However, in practice, they generally preferred to let us decide everything, instead of working with us in discussing and drawing the plan for our school in the area of ICT developments.
>
> (Teacher 14, member of the ICT Instructional Team)

Based on the above interview data, it would appear that the outcomes of school change of ICT integration was not a fully collaborative effort of the staff at all levels, but the collective contribution of a few teacher pioneers from within the ICT Instructional Team. In addition, the staff not in the ICT Instructional Team generally felt no need to claim their ownership of exercising school leadership or even simply to

join the leadership and management processes throughout the process of pedagogical innovations in ICT integration

2) Formal leaders' inadequate support for staff involvement in the leadership processes

The responses from 12 out of 19 (63%) teachers can be treated as the similar and negative comments on their headteacher's leadership capacity. This is because the 12 teachers' statements reflected that the headteacher shirked his requisite duty of making the entire staff feel the need for working together in sharing the responsibilities for whole-school changes and improvements in ICT implementation. In the interviews with the headteacher, it was his belief that 'making changes is necessary for school improvement'. He also noted the contribution of the ICT Instructional Team to steering the school to move forward in the area of ICT development. Contradictorily however, the headteacher admitted that in practice, he was not particularly active in shaping a culture which could be supportive to new teaching practices involving ICT application. He went further, explaining that:

> Of course, I would like to do my best to support educational projects for school changes and improvements, as long as our teachers feel ready to bear the growing pains in the change process. I think that whatever change projects we are working on, teachers' individual volition should be a top priority. Thus, when we were undertaking the ICT SSP, I did not constantly highlight teachers' participation in the processes of managing this change project. I was afraid that my particular emphasis on this change project may burden our teachers too much pressure and workloads. Therefore, I preferred to let our teachers make their own decision of whether or not getting involved in the entire course of change management involving whole-school ICT development.
>
> (Headteacher)

Echoing the headteacher's statements, the director of academic affairs supported the ideas that:

> As a school leader, you need to understand teachers' heavy workloads and to respect teachers' decisions and interests. This is our common beliefs. We did highlight the ICT SSP at staff meetings when this project was introduced in our school. Yet, to be honest, the headteacher and I were not relatively keen on promoting teachers to get involved in the leadership processes of managing this ICT-related pedagogical innovation.
>
> (Director of academic affairs)

5.3.1.2.3 Development of future leaders for sustaining ICT implementation

In responding to the question about the school's mechanisms for cultivating teachers' leadership potential for sustaining ICT, around 58% of the teachers' responses (n = 11) reflected that the headteacher's good appointment of the suitable teacher as the ICT coordinator was the key to the school's initial success in implementing ICT. Unfortunately, the teachers' replies also revealed that their formal leaders were not relatively proactive about developing future leaders for the school's long-term pedagogical developments in ICT adoption. Extracts from the interviewees' responses are as follows:

> We had a very competent ICT coordinator when we undertook the ICT initiative. Hence, our school could succeed in managing the ICT initiative at the very beginning.
>
> (Teacher 16, non-member of the ICT Instructional Team)

> Our headteacher he knows people's quality and interests, I think. Because of this, he appointed the passionate teacher as the ICT coordinator to lead us at the very start…Having an excellent ICT coordinator was the key to enabling our school to enjoy the sense of achievements in becoming part of the ICT Seed Schools.
>
> (Teacher 12, non-member of the ICT Instructional Team)

However, when it came to the long-term development of individuals' leadership potential to implement ICT, the interviewees stated that:

> As far as I know, our school does not have any particularly measures for nurturing teachers' leadership potential in this regard. Yet, I personally do not think that the headteacher or any other formal leader has to put much emphasis on this matter, because pedagogical developments involving ICT adoption is not part of our school culture.
>
> (Teacher 10, non-member of the ICT Instructional Team)

> To be honest with you, even though our school used to be part of the ICT Seed School, we have never had any long-term plan for developing teachers' leadership abilities to guide others in dealing with ICT implementation. It is really a shame, but the headteacher he does not strongly support our ideas of developing teachers' leadership ability in this regard.
>
> (Teacher 15, member of the ICT Instructional Team)

> Without the particular mechanisms for identifying and enlarging teachers' potential for managing changes involving ICT adoption was one of the key reasons why we [the ICT Instructional Team] were struggling to implement this ICT-related innovation when we were running the ICT SSP.
>
> (Teacher 13, member of the ICT Instructional Team)

> Colleagues from within our team and I myself agreed that our initial success in ICT integration could not be kept for long if most teachers had no leadership skills in sharing the responsibility with us in the processes of implementing ICT. However, the headteacher and the director of academic affairs did not think that it was necessary to focus particularly on teachers' leadership in this regard.
>
> (Teacher 3, member of the ICT Instructional Team)

Given the above responses, there seemed to be no surprise that in the interviews, the teachers from within the ICT Instructional Team and the ICT coordinator admitted that they became exhausted in the change process. Their replies further revealed that without the direct lead from the ICT Instructional Team, no one from outside this

team had either interests in or capacities for steering the school toward ongoing developments in ICT adoption.

The results from the interviews may give the reasons why the general overview of the questionnaire responses seemed to reflect that the school did not have a good approach to developing future leaders for continuing pedagogical innovations in ICT implementation. Importantly, the above findings from the interviews also revealed that good appointment of the initial leaders without continuation of developing the future leaders in the area of ICT developments cannot guarantee the school's sustainability of ICT implementation.

5.3.1.2.4 Teachers' satisfaction with leadership practices

When asked directly about whether they felt comfortable with their leadership practices of managing school-wide pedagogical innovations in ICT integration, 11 out of 19 teachers (58%) tended to express the views that their school leadership in this regard was successful. This positive result could correspond to the findings from the questionnaires which reported that 61% of the teachers were pleased with the overall approach to school leadership for pedagogical innovations in ICT integration. An interviewee, for example, said that:

> Our colleagues in the ICT Instructional Team provided assistance for our neighbouring schools in embedding ICT in classes effectively. Hence, I think our school did a good job in this regard [school change of ICT adoption]…I don't think we have any problem with our leadership approaches or strategies for managing pedagogical innovations involving ICT adoption.
>
> (Teacher 7, non-member of the ICT Instructional Team)

Despite the above positive opinions, it was worth noting the underlying reasons behind the 11 teachers' (58%) satisfaction with their leadership practices with respect to pedagogical innovations in ICT integration. This is because when asked about their satisfactory efforts of implementing ICT, 9 out of the 11 teachers referred to the initial success in introducing the ICT-integrated pedagogy in their school, but were less likely to comment on developing this further. In addition, the common replies of the 9 teachers reflected that they were inclined to be happy with their current practices and were less likely to change often.

> I am happy with the leadership approaches in terms of the introduction of the new pedagogy [teaching with ICT] in our classroom practices. I like the way how our colleagues, especially those in the ICT Instructional Team, led our school to become ICT-capable when we just started the ICT SSP…Although now most colleagues and I myself do not keep working on the development of the ICT-integrated instructional modes, I still think that the current status of ICT integration in our school is generally acceptable.
>
> (Teacher 12, non-member of the ICT Instructional Team)

> Probably you have already heard that currently very few of my colleagues are still enthusiastic about the ICT-integrated pedagogy. Well, this is pretty true. You may imagine that in this circumstance, even fewer teachers now have the strong drive for continuing developing and improving the ICT-integrated instructional modes. Even so, I think that our school leadership for change management regarding ICT implementation is still laudable, and there are some successful experiences in initiating the ICT-related pedagogical innovations which are what we teachers feel proud of. For example, we had predominant achievements in promoting the ICT-integrated pedagogy in our school as well as some neighbouring schools in the beginning of running the ICT SSP.
>
> (Teacher 17, non-member of the ICT Instructional Team)

The other 2 teachers and 3 formal leaders, on the one hand, noted that the levels of pedagogical innovations in ICT integration in the school did not meet their expected target. On the other hand, their responses seemed to reflect that they had learnt to

accept the existing approaches to their school leadership. Extracts from the interviewees' responses are presented as follows:

> As classroom teachers, we individually cannot do anything about the problem with our morale, because most people here have got by with this deeply-rooted problem. I think that it is a factor of the teaching climate in general.
>
> (Teacher 1, non-member of the ICT Instructional Team)

Having an 8-year teaching experience in the school, a teacher complained that:

> We classroom teachers have come to realise that the headteacher does not act effectively on the problems we address, even though he usually asks our opinions in the process of undertaking the educational initiative. Because of this, some of my colleagues and I have learnt to keep away from the missions relating to leadership and management in this school, but simply focus on teaching and learning in our own classes.
>
> (Teacher 4, non-member of the ICT Instructional Team)

As one of the formal leaders, the ICT coordinator also admitted that:

> We do have some problems with our approaches to dealing with pedagogical innovations in ICT integration, but people here seem to get by with these problems anyway.
>
> (ICT coordinator)

Different from the above interviewees' positive opinions, 8 out of 19 teachers (42%) strongly criticised their leadership practices of implementing school-wide changes in ICT adoption. Despite this, however, the 8 teachers seemed to feel no need to communicate their thoughts either with their teaching colleagues or with the formal leaders. The teachers went further, accusing their formal leaders of not being proactive about forming a positive organisational ethos within which school staff were

comfortable with exercising leadership practices. For example, the interviewees stated that:

> To be honest, I feel that our headteacher and other leaders, such as the ICT coordinator and the director of academic affairs, should have taken the blame for teachers' low morale in the processes of dealing with whole-school ICT development.
>
> (Teacher 18, member of the ICT Instructional Team)

> My colleagues not in the ICT Instructional Team may appreciate that the headteacher is generous with empowering our team to provide leadership for directing whole-school changes in the area of ICT. Of course, we feel free to do what we want, but I don't think every thing should work like this all the time. What I mean is that the headteacher he was not really concerned about what we were doing and what we needed for managing this tough school-wide change…I feel that our headteacher seems to be 'laisser-faire' in the aspect of managing whole-school changes involving ICT adoption.
>
> (Teacher 19, member of the ICT Instructional Team)

> To be honest, I do not think our headteacher is really 'sharing' leadership responsibility with us. I feel that it is a kind of 'relinquish' the required duty which the headteacher should assume.
>
> (Teacher 15, member of the ICT Instructional Team)

It would appear that the responses from the ICT Instructional Team in the interview phase reflected upon strong criticisms behind the seemingly positive impression about school leadership which was revealed in the questionnaire data (see section 5.3.1.1). In addition, the replies gained in the interviews may indicate that the staff generally became used to their existing working patterns in the leadership processes of managing school changes of ICT integration.

5.3.2 Organisational processes in School B

5.3.2.1 Findings from the questionnaires

Table 5-2 demonstrates the teachers' opinions on 9 statements which inquired into their school's entire course of commencing and implementing pedagogical innovations in ICT integration. Totalling all responses, the majority were found to be positive, based on a 63% approval rating and an overall mean of 3.67, which was categorised as the level of 'agree'. These findings could be summarised as saying that the teachers tended to feel comfortable with their organisational processes of implementing school-wide changes in ICT adoption.

Table 5-2: Organisational processes in School B (n=41)

2. **Organisational processes** of managing pedagogical innovations in ICT integration in **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
2.1 There is a clear vision for integrating ICT into the curriculum	n	3	3	17	18			3.78	Agree
	%	7%	7%	41%	44%				
2.2 There is joint planning among the staff at all levels	n		4	16	11	8	2	3.29	Disagree
	%		10%	39%	27%	20%	5%		
2.3 There is adequate consultation with teachers on key decisions of dealing with ICT integration	n		5	24	12			3.83	Agree
	%		12%	59%	29%				
2.4 There is a suitable approach to holding teachers accountable for their work	n		1	19	18	2	1	3.41	Disagree
	%		2%	46%	44%	5%	2%		
2.5 I am clear about my role and responsibility	n	3	9	28	1			4.34	Agree
	%	7%	22%	68%	2%				
2.6 I believe that ICT integration enhances students' learning outcomes	n	2	7	23	8	1		4.02	Agree
	%	5%	17%	56%	20%	2%			
2.7 I believe that ICT integration reduces teachers' workload	n	2	3	25	8	2	1	3.80	Agree
	%	5%	7%	61%	20%	5%	2%		
2.8 I support the idea of ICT integration	n		5	23	12	1		3.78	Agree
	%		12%	56%	29%	2%			
2.9 I am ready for ongoing pedagogical innovations in ICT integration	n			11	16	6	8	2.73	Disagree
	%			27%	39%	15%	20%		
Total Response to Statement 2.1-2.9		3%	10%	50%	28%	5%	3%	3.67	Agree

In examining the general overview of the responses to 4 statements regarding the acceptance of teaching with ICT, 3 statements gained approval. However, the remaining 1 statement which inquired into continuation of pedagogical innovations in ICT integration received disapproval. Detailed responses to the 4 statements are elaborated as follows. In terms of the responses to statement 2.6 (I believe that ICT integration enhances students' learning outcomes), there was a high proportion (78%) of agreement and the general overview of the responses was classed as the level of 'agree'. As regards the responses to statement 2.7 (I believe that ICT integration reduces teachers' workload), there was another high approval rating (73%), with the general overview of the responses which was at the level of 'agree'. Statement 2.8 (I support the idea of ICT integration) was also ranked high, with nearly 70% (68%) approval and the general overview of the responses which was at the level of 'agree'. Although the responses to the above 3 statements were generally positive, statement 2.9 (I am ready for ongoing pedagogical innovations in ICT integration) was ranked relatively low. As illustrated in Table 5-2, statement 2.9 attracted less than 30% (27%) positive responses. Moreover, the general overview of the responses to statement 2.9 was categorised as the level of 'disagree', due to its overall mean of 2.73.

Having an insight into the findings gained through statements 2.6, 2.7 and 2.8, around 73% of the respondents accepted new teaching approaches involving ICT adoption. Ironically however, despite this encouraging and positive result, evidence gained through statement 2.9 reflected that there were also 73% of the respondents who did not feel ready to continue use ICT for supporting their teaching practices. To some degree, the respondents' high acceptance of ICT adoption, but together with their low readiness for continuation of ICT adoption, can explain why the school made rapid but fleeting success in pedagogical innovations in ICT integration.

In terms of the general overview of the responses to the other 5 statements focusing on the processes of goal-setting, decision-making and accountability mechanisms, 3 statements attracted approval, whilst the rest received disapproval. Detailed results are presented as follows. Among the 5 statements, statement 2.5 (I am clear about my role and responsibility) scored the highest. As illustrated in Table 5-2, the general overview of the responses to statement 2.5 was categorised as the level of 'agree', in that this statement received an individual mean of 4.34 and a relatively high (98%) approval rating. Statement 2.3 (there is adequate consultation with teachers on key decisions of dealing with ICT integration) gained the general overview of the responses at the level of 'agree', with a 71% approval rating. Through the above examination of the responses to statements 2.3 and 2.5, it could be assumed that the respondents were quite clear about their individual responsibility and the school's vision in the change process. In addition, the respondents generally felt that when undertaking school-wide changes of ICT adoption, they were kept well informed in respect of key decisions.

Based on the individual mean of 3.78 calculated from all respondents' replies to statement 2.1 (there is a clear vision for integrating ICT into the curriculum), the general overview of the responses to was classed as the level of 'agree'. Apart from this, more than half (56%) of the responses fell within three levels from 'agree' to 'very strongly agree'. Even though this statement received the seemingly positive replies from over half the respondents, attention should be paid to the discrepancy in the responses themselves. This is because in addition to the positive answers, nearly half (44%) of the responses were found to be negative. According to these findings, it could be assumed that some respondents may have a good understanding of the school's vision for implementing ICT. However, for the others, their uncertainty about

the school's vision in this regard might give the indication that there was still some room for the school to improve the overall process of articulating the expected goal and proposed strategies for undertaking the ICT-related pedagogical innovations. Further discussion of the underpinning reasons for the divided opinions among the respondents is presented in chapter 6.

As regards the remaining 2 statements (statements 2.2 and 2.4), both of them received disapproval from approximately half of the respondents. In responding to statement 2.2 (there is joint planning among the staff at all levels), 51% of the replies fell within three levels from 'disagree' to 'very strongly disagree'. Moreover, the general overview of the responses to this statement was categorised into the level of 'disagree', in accordance with the individual mean of 3.29 illustrated in Table 5-2. Although the tendency of the responses was somewhat negative, a certain percentage of the positive replies should not be ignored. As the data reported, while receiving around half (51%) disapproval, statement 2.2 still gained approval from nearly half (49%) of the respondents. The above divided responses to the issue of joint efforts among the staff to plan for ICT can be explained by considering the related evidence from this research (presented previously in section 5.3.1.1), which reported that approximately half (54%) of the respondents did not think that staff coordination was commonplace in the leadership processes of undertaking pedagogical innovations in ICT integration.

In terms of statement 2.4 (there is a suitable approach to holding teachers accountable for their work), slightly over half (51%) of the responses fell within three levels from 'disagree' to 'very strongly disagree'. Apart from this, the individual mean calculated from all replies to this statement was 3.41, which indicated that the general overview

of the responses was categorised into the level of ‘disagree’. The above figures implied that the general picture of the responses tended to be somewhat closer to the level of disagreement than agreement. Notably, however, despite 51% of the negative replies, there were nearly half (49%) of the respondents who agreed with statement 2.4. According to these findings, it can be inferred that for around half of the respondents, the strategies used within their in-house accountability system may need improving. For the others, their in-house accountability mechanisms were more or less acceptable. It is difficult from the questionnaire data alone to gain an impression of exactly why there was a tendency that some respondents felt more positive about their accountability mechanisms within the school, and that the others’ replies to the same issues were closer to disapproval than approval. Considering this as well as the potentially crucial differences in the respondents’ replies, the follow-up interview phase further examined the possible and underlying reasons for the disparity in the questionnaire respondents’ views on their accountability mechanisms. The related findings of the interviewees’ opinions on their in-house accountability system are presented in section 5.3.2.2.2.

5.3.2.2 Findings from the interviews

Following the questionnaire phase, further exploration in the interviews focused particularly on three issues:

- Decision-making and goal-setting processes
- Monitoring and reward systems
- Teachers’ readiness for continuation of the ICT-integrated pedagogies

Details of the interviewees’ responses to these issues are demonstrated as follows.

5.3.2.2.1 Decision-making and goal-setting processes

When asked directly about their decision-making and goal-setting processes of implementing school-wide change in ICT adoption, all teachers confirmed that everyone was free to get involved in these processes and to give their voice. Even so, most teachers (79%, n =15) went further, subscribing to the same views that apart from the formal leaders, only those from within the ICT instructional Team engaged in the goal-setting and decision-making processes on a regular basis. More specifically, over half the teachers (53%, n = 10) did not consider it to be necessary to construct the school's vision and directions through mutual communication among the staff at all level. Moreover, the teachers stressed that they were entirely comfortable deferring to the decisions made either by the formal leaders or by the ICT Instructional Team. For example:

> I always trust the ICT Instructional Team's abilities to make the right decisions and to lead us in improving our school in the area of ICT developments…I do not think that it is necessary for us non-members of the team to join the decision-making and goal-setting processes regarding ICT adoption…Basically, I myself have no problem with following the team's decisions about the ways of implementing ICT.
>
> (Teacher 7, non-member of the ICT Instructional Team)

> In our school, most of us from outside the ICT Instructional Team are quite happy with letting colleagues from within the team make the decisions and set up the key targets about ICT application. This is because we non-members generally do not have the particular expertise or interests in computer technology or things like that…I personally also agree that it is a good idea to let our formal leaders or the ICT professionals, like the ICT Instructional Team, help our school make the good decisions and deal with the goal-setting matters, in terms of our ICT developments.
>
> (Teacher 12, non-member of the ICT Instructional Team)

For 6 teachers in the ICT Instructional Team, the rest of the teaching staff seldom volunteered to work with them either in the decision-making processes or in developing ICT-integrated curricula. A teacher went further, saying that:

> In order to understand teachers' ideas of ICT integration and the potential problems with running the ICT SSP, we (the ICT Instructional Team) invited all staff members to join our discussion in advance. We always welcome each staff member to be part of this team. However, in practice, most staff here would rather let our team decide everything than join us for reaching our 'common' decisions.
>
> (Teacher 13, member of the ICT Instructional Team)

In addition, 9 teachers (47%) made negative comments, blaming the headteacher for not bearing the requisite duty of facilitating constructing a supportive communications channel among school staff. The main criticism from the teachers with regard to the goal-setting and decision-making processes of implementing ICT was that the ICT Instructional Team gained very limited timely support from the formal leaders. Extracts from the interviewees' replies are as follows:

> We did feel excited when seeing our children enjoying learning with new technology in classes…However, to be honest, I had been worn out after we started the ICT SSP…The headteacher and the director of academic affairs were not highly proactive about joining us for working on the school plan for pedagogical innovations in ICT integration.
>
> (Teacher 3, member of the ICT Instructional Team)

> After our school met the government's standard for running the ICT SSP, what we team members really felt about the headteacher was that he seldom shown sufficient concerns about the processes of managing this change project. What I mean is that instead of engaging in our decision-making processes and making us feel well-supported, the headteacher would rather pay more attention to what we

> were required to ‘produce’ and ‘demonstrate’ when the officials came for evaluation and supervision of our progress in this change project.
>
> (Teacher 15, member of the ICT Instructional Team)

The above interview data can be summarised as two points. First, around half (53%) of the teachers, who felt comfortable with the overall course of decision-making and goal-setting, did not perceive the importance of their active engagement in the organisational processes of managing school-wide change in ICT adoption. Rather, they easily yielded their decision-making power to ICT experts or those at the top of the school hierarchy. Second, the other teachers (47%), who noted the problems with their organisational processes, on the one hand, made negative remarks about the headteacher’s leadership skills. On the other hand, they tended to take it for granted that the headteacher was the single most important person who should have exerted power to bring about the change. In a sense, the overarching message which emerged in the interview phase might reflect that the teachers generally did not view themselves as part of the change process.

5.3.2.2.2 Monitoring and reward systems

When asked about their in-house accountability mechanisms, the interviewees in School B were provided with the meaning and explanation of the term ‘accountability/accountable’. Similar to the interview phase in School A, the interviewees in School B generally replied to the questions of the in-house accountability mechanisms by raising their opinions on the school’s monitoring and reward systems. Hence, the findings demonstrated in this section focused on the interviewees’ responses to the issues of monitoring and reward systems within their school.

Based on the findings from the interviews, the school had the monitoring and reward systems which were treated as the main strategies for scrutinising teachers' progress in the change process of implementing ICT. However, the monitoring and reward systems were not widely used for reviewing all teachers' efforts, but mainly applied to examining the progress of the ICT Instructional Team. As the interviewees said:

> Our school has a certain type of accountability mechanisms. However, I personally do not think the strategies used within our accountability system throughout the change process are well-established. For example, the staff, like me, from within the ICT Instructional team were required to go through the monitoring process. Yet, colleagues without joining our team were not monitored even when the ICT SSP was under way. That is, when running the change project of school-wide ICT adoption, we did not have an explicit policy about the way of monitoring all teachers' responsibilities for their own tasks.
>
> (Teacher 18, member of the ICT Instructional Team)

> I feel that colleagues from within the ICT Instructional Team seem to go through a certain level of pressure throughout the change process of implementing ICT, in that their progress was reviewed and examined in the monitoring processes. In addition, as far as I know, the team members themselves set up their own strategies for monitoring their collective work within their regular team meetings. Quite often I heard that they did self-reflections and shared good practice within their group discussions. As for us non-members of the team, we are quite 'free' from the pressure caused by the monitoring process and system in this regard. Even though the school also monitors and scrutinises our working effectiveness, the monitoring measures and processes applied to us are not concerned with management of the new practices of ICT integration.
>
> (Teachers 1, non-member of the ICT Instructional Team)

> We have the strategies for dealing with the monitoring and rewards in order to motivate our teachers to take up the responsibilities for whole-school pedagogical innovations. For example, we provide release time for teachers from within the ICT Instructional Team, because they are burdened with more stress of leadership tasks throughout the change process and they need to spend much more time developing the ICT-integrated instructional modes for our school, compared with the others…The ICT coordinator and I reviewed and monitored

> the ICT Instructional Team's collective achievements in the processes of managing new practices of ICT integration. Even though at that time we did not deal with the monitoring matters regularly, the headteacher and us we trusted our teachers from within the ICT Instructional Team as professionals. We always believe that the team members have high commitment to their responsibilities, and that they know the best approaches to improving our school practices…As for the non-members of this team, we did not put particular emphasis on monitoring their progress throughout the course of implementing ICT.
>
> (Director of academic affairs)

In addition, the interview data revealed that teaching staff may recognise the benefits from setting up the monitoring system applied to the staff as a whole. However, the data also reflected that the formal leaders seemed to express their reservation about the effect of the monitoring measures on teachers' willingness to contribute to whole-school changes of ICT adoption. For example, the interviewees claimed that:

> We do not think that pushing teachers with little interests in computer technology within the monitoring system can really motivate them to engage in whole-school pedagogical innovations in ICT integration. Instead, it is our beliefs that providing adequate 'space' for our teachers without joining the ICT Instructional Team can be helpful for increasing their interests in assuming the tasks involving ICT adoption. We, therefore, do not think that it is necessary to include any rules or norms about the rewards and monitoring in this regard in our school policy.
>
> (ICT coordinator)

> We team members used to ask the headteacher's opinions on setting the reward and monitoring systems. He told us that he did not want to make all teachers here feel overwhelmed with too much pressure.
>
> (Teacher 18, member of the ICT Instructional Team)

> The headteacher did not think that it would be a good idea to set a regular monitoring system, or even reflective evaluation…He claimed that he did not want to let people have too many daunting tasks…Yet, sometimes necessary pressure is a must, I think.
>
> (Teacher 14, member of the ICT Instructional Team)

> Basically, I believe that most teachers in our school are generally willing to absorb new skills and knowledge and to try our new pedagogies. However, I also believe that if our school leaders they expect teaching staff at the frontline of classroom practices to have high commitment to school-wide changes, then they need to give us suitable support as well as a certain degree of pressure in the overall course of managing changes.
>
> (Teachers 2, non-member of the ICT Instructional Team)

As regards the in-house rewards for teachers' contribution and progress in the change process of implementing whole-school pedagogical innovations in ICT integration, the typical rewards which were mentioned repeatedly in the interviews were the provision of release time for teachers by means of reducing class-teaching hours. Interestingly, the interviewees did not think that their teaching workload could be directly comparable to the burden resulting from their involvement in whole-school pedagogical innovations. Despite this, the interviewees agreed that to some degree, reducing class-teaching hours for teachers who enacted the leadership roles in implementing ICT was instrumental for making teachers feel the importance of their responsibilities and engagement in the processes of pedagogical innovations in ICT integration. Extracts from the interviewees' responses are as follows:

> I have never been the member of the ICT Instructional Team since the ICT SSP was introduced. Yet, I know that our school will reduce our class-teaching hours if we become part of the ICT Instructional Team and engaged in leadership practices as well. Even though I am not fairly interested in computer technology and the ICT-related teaching approaches, I myself quire support the idea of offering the rewards for the particularly enthusiastic teachers who make their efforts to undertake whole-school pedagogical innovations…To some extent, the rewards like offering release time is helpful for decreasing our resistance to taking up the tasks and

> additional responsibility for working on whole-school changes involving ICT implementation.
>
> (Teacher 5, non-member of the ICT Instructional Team)

> I think that it is a good idea to provide release time for teachers who are part of the ICT Instructional Team. Even though it does not mean that we can feel completely relax when shouldering responsibilities for managing whole-school pedagogical innovations, the rewards can really make us 'feel respected'. For us, it is not the matter with how much release time we get. It is about our feelings.
>
> (Teacher 3, member of the ICT Instructional Team)

> For me, the rewards are something about making us feel respected and feel recognised by what we are doing as well as what we have already achieved. It is this feeling that makes us have more enthusiasm about undertaking leadership tasks and feel happy with being part of the ICT Instructional Team to manage school-wide change project for implementing ICT.
>
> (Teacher 13, member of the ICT Instructional Team)

The above responses gave the evidence that the school established a certain form of monitoring and reward systems as the core mechanisms for inspiring the staff, particularly those in the ICT Instructional Team, to become more responsible for and dedicated to the appointed tasks involving school-wide pedagogical innovations in ICT integration. Even so, not all staff members were well-informed about the school's monitoring and reward measures in the processes of implementing ICT. As the interviewees stated:

> I feel that having no clear school policy or strategies for putting a focus on 'all' teachers' progress in ICT implementation is the key reason why some colleagues do not feel the importance and necessity of getting involved in the processes of managing whole-school changes in implementing ICT.
>
> (Teachers 11, non-member of the ICT Instructional Team)

> I am sure that colleagues in the ICT Instructional Team are clear about all matters about the monitoring and reward measures or the accountability mechanisms as you said…However, if you ask me about my understanding of the monitoring and evaluation processes and norms about the rewards for managing pedagogical innovations in ICT integration, then I have no clue to these issues.
>
> (Teacher 12, non-member of the ICT Instructional Team)

> I have no idea about the accountability measures for monitoring and evaluating teachers' progress of implementing ICT across the curriculum. Probably, we had some informal strategies for doing this type of evaluation...Well, I'm not pretty sure, because I'm not in the ICT Instructional Team.
>
> (Teacher 17, non-member of the ICT Instructional Team)

According to the above findings from the interviews, it seemed that the monitoring and reward systems within the school were not ready for holding all staff members accountable for their own work in the change process of implementing ICT. In consequence, the efforts of the teachers from outside the ICT Instructional Team to implementing ICT in the change process may not be recognised within the existing monitoring system. Apart from this, the teachers from outside the ICT Instructional Team expressed some degree of uncertainty about their in-house reward measures for teachers' efforts to implement ICT.

5.3.2.2.3 Teachers' readiness for continuation of the ICT-integrated pedagogies

Corresponding to the findings from the questionnaires, a large proportion of the teachers (68%, n = 13) in the interviews agreed with the potential benefits of teaching and learning with ICT. In addition, the teachers shared the same views, appreciating their headteacher for taking the active role in making the staff aware of the value of teaching and learning with ICT before the start of school-wide ICT adoption. For example, Teacher 19, a member of the ICT Instructional Team, praised the

headteacher's effort to persuade the teaching staff into experimenting with new pedagogies of ICT integration in the very beginning of running the ICT SSP. Even so, Teacher 19 also pointed out that the headteacher did not continue facilitating in raising teachers' motivation. Teacher 19 recalled that:

> The headteacher seemed to be quite ambitious about transforming our school into the ICT-capable school…He attended the specific meetings whenever the key decisions required his permission at the very start….However, after we were running the ICT SSP for nearly two months, the headteacher seemed to become quite busy. Since then, he seldom worked with us in the processes of discussing and drawing our school plan for developing ICT.
>
> (Teacher 19, member of the ICT Instructional Team)

Despite the teachers' acceptance of the new teaching practices involving ICT adoption, their responses in the interview phase still reflected upon the fact that the teachers generally had relatively weak determination to continue the ICT-integrated pedagogies. This interview result echoed the questionnaire data which reported that less than 30% of the teachers (27%) were well-prepared for persisting in using ICT in their teaching practices. When further asked about the barriers to their readiness for continuing the ICT-integrated pedagogies, most teachers (74%, n = 14) in the interviews raised the same point as follow: there was limited information of the strategies for coping with ongoing challenges regarding teaching with ICT.

5.3.3 ICT resources and teachers' professional development in School B

5.3.3.1 Findings from the questionnaires

According to the data from the questionnaires, the respondents generally felt positive about their ICT resources and professional development within the school. As illustrated in Table 5-3, the overall mean was 3.81, which meant that the general

overview of the responses was at the level of ‘agree’. In addition, a total of 70% answers were found to be positive.

Table 5-3: ICT resources and teachers’ professional development in School B (n=41)

3. **ICT resources** and **teachers’ professional development** in **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
3.1 ICT **hardware** (i.e. computers, digital projectors and other technological instruments for teaching purposes) meets my needs	n	2	4	28	7			4.02	Agree
	%	5%	10%	68%	17%				
3.2 ICT **software** (i.e. online teaching and learning materials and the ICT-integrated instructional modes) meets my needs	n		7	29	5			4.05	Agree
	%		17%	71%	12%				
3.3 Technical support meets my needs	n		4	29	8			3.90	Agree
	%		10%	71%	20%				
3.4 I use ICT appropriately to support teaching and learning	n	3	10	23	5			4.27	Agree
	%	7%	24%	56%	12%				
3.5 I have been trained in all aspects of ICT necessary for my teaching	n	2	8	17	12	1	1	3.88	Agree
	%	5%	20%	41%	29%	2%	2%		
3.6 Good practices of teaching with ICT are shared widely across the school	n			19	17	5		3.34	Disagree
	%			46%	41%	12%			
3.7 Teachers are stimulated to reflect upon the value of ICT integration	n	2	1	11	20	3	4	3.20	Disagree
	%	5%	2%	27%	49%	7%	10%		
Total Response to Statement 3.1-3.7		3%	12%	55%	25%	3%	2%	3.81	Agree

In examining the findings collected through the first 3 statements concerned with the school’s ICT equipment and technical support, the general overview of the responses fell into the level of ‘agree’. As the data reported, statement 3.1 (ICT hardware meets my needs) gained an 83% approval rating. Statement 3.2 (ICT software meets my needs) attracted an even higher (88%) approval rating. In addition to their high satisfaction with the school’s hardware and software, the respondents’ opinions on their technical support were found to be relative positive. As demonstrated in Table

4-3, statement 3.3 (technical support meets my needs) received an 80% approval rating. According to these highly positive opinions, the teachers generally had convenient access both to their ICT equipment and to the necessary technical support.

In examining the general overview of the responses to 4 statements centring on staff application of ICT to supporting teaching and learning, 2 statements (statements 3.4 and 3.5) received approval, while the other 2 (statements 3.6 and 3.7) received disapproval. As can be seen in Table 5-3, statement 3.4 (I use ICT appropriately to support teaching and learning) gained an 87% approval rating, with the general overview of the responses which was at the level of ‘agree’. Statement 3.5 (I have been trained in all aspects of ICT necessary for my teaching) was also rated highly, with the general overview of the responses which was at the level of ‘agree’ and a 66% approval rating. Based on these findings, it can be assumed that 87% of the respondents seemed to be confident ICT user, in that their responses indicated that they could teach with ICT without difficulties. In addition, the findings provided the impression that 66% of the respondents may feel satisfied with the school’s professional training for increasing their pedagogical knowledge and skills in ICT application.

As regards statement 3.7 (teachers are stimulated to reflect upon the value of ICT integration), the general overview of the responses was classed as ‘disagree’, in accordance the individual mean of 3.2. Moreover, there were nearly 70% of the negative responses which fell within three levels from ‘disagree’ to ‘very strongly disagree’. Given this high percentage of disapproval, it can be inferred that the school may not possess a highly powerful trigger for teachers’ incentive to reflect upon or evaluate the usefulness of teaching with ICT.

With reference to statement 3.6 (good practices of teaching with ICT are shared widely across the school), the general overview of the responses was categorised at the level of ‘disagree’, based on the individual mean of 3.34. In examining the responses to statement 3.6 in detail, 54% fell within two levels from ‘disagree’ to ‘strongly disagree’; the rest (46%) were at the level of ‘agree’. These figures, on the one hand, seemed to suggest that the general picture of the respondents’ views on statement 3.6 tended to be closer to the level of disagreement than agreement. On the other hand, they gave the impression that there was potentially important discrepancy in the respondents’ opinions on their satisfaction with knowledge sharing concerning the new teaching practices of ICT integration. The possible reasons for the divided responses to the issues of sharing good practices of ICT integration are further discussed in chapter 6. In addition, more than half the teachers’ negative responses to statements 3.6 and 3.7 could be interpreted as the fact that a learning culture did not completely permeate the school as a whole.

5.3.3.2 Findings from the interviews

Following the questionnaire results, the interview phase further explored the staff responses to the following issues:

- The in-house ICT resources
- The in-house professional development

5.3.3.2.1 The in-house ICT resources

Consistent with the findings from the questionnaires, the interview data reflected upon the teachers’ satisfaction with the sufficiency in the school’s ICT resources (i.e. ICT infrastructure and technical support). As evidenced by the majority of teachers (84%, n = 16) in the interviews, the staff enjoyed the ready availability of the in-house ICT

resources. The teachers also agreed that their convenient access to ICT resources within the school had a positive bearing on their use of ICT in the curriculum. On this basis, it was encouraging to point out that the school's provision of ICT resources was able to match teachers' demands. It was also notable that the teachers from outside the ICT Instructional Team were quite satisfied with the same level of access to the quality ICT facilities as the ICT Instructional Team. All these findings can be seen in the following interviewees' replies:

> We are quite satisfied with the current supply of the ICT hardware and software, since these resources are easily accessible not only to the members of the ICT Instructional Team, but also to the non-members like me.
>
> (Teacher 7, non-member of the ICT Instructional Team)

Teacher 5, who recognised that she used to have limited capacity for designing the ICT-integrated curriculum in the beginning of the change process, expressed her positive views on the school's ICT facilities:

> I merely have basic capacities for using computer technology, not to mention designing the ICT-integrated teaching and learning activities…Yet recently, I have become used to using digital projectors, computers and some online teaching materials in classes because these ICT facilities had been well settled in our classrooms. There is no need to spend much time dealing with its availability and connection to the computer before classes begin.
>
> (Teacher 5, non-member of the ICT Instructional Team)

Speaking of the in-house technical support, the interviewees gave their positive responses as follows:

> I am totally satisfied with technical support in this school. Whenever the ICT facilities go wrong, colleagues in our year group can come to help me. Sometimes I ask the ICT coordinator and the ICT Instructional Team for help. Of

> course, the ICT technician from the Bureau of Education will come, helping us to solve more serious problems. Yet, it is much more efficient and convenient to ask help from colleagues with strong ICT background, I think.
>
> (Teacher 6, non-member of the ICT Instructional Team)

> I do not think that teachers in our school have difficulties in using ICT for teaching purposes, since they all have been trained well for applying ICT to teaching and learning and so that they have sufficient ICT skills…I think that our teachers also have convenient access to receiving technical support when confronting ICT problems which they personally are not able to deal with. This is because our headteacher he arranges at least one teacher with strong ICT background in each year group. Hence, it is quite convenient for teachers to get the prompt technical assistance if needed.
>
> (ICT coordinator)

Feeling confident of the teachers' ICT capabilities, the headteacher said that:

> I do not think that the issue about technical support is a problem in our school. This is because our teachers had sufficient ICT skills so that they normally can use ICT in their classes fluently. Also, our ICT coordinator and some ICT experts from within the teaching staff they are happy with helping others cope with these technical problems if needed. Yet, if the problems are too serious, we turn to the technicians from the Bureau of Education.
>
> (Headteacher)

When it came to the ICT software for teaching purposes, the teachers recognised that the contribution of the ICT Instructional Team to setting the ICT-integrated instructional modes which allowed the staff to have the ready access to the ICT-based teaching materials. Unfortunately, 10 out of 16 teachers (63%) from outside the ICT Instructional Team, on the one hand, agreed with the potential usefulness of the ICT-integrated instructional modes. On the other hand, they admitted that they did not

use the ICT-integrated instructional modes in the existing practices frequently. As the teachers declared:

> I appreciate that our colleagues in the ICT Instructional Team developed all these ICT-integrated instructional modes for the entire teaching staff. Yet, to be honest with you, teachers like me (those from outside the ICT Instructional Team) seldom applied these instructional modes to delivering lessons, even when we were running the ICT SSP. I feel that the biggest hurdle with our use of these instructional modes was that we had no time to learn the way of applying them to supporting our teaching.
>
> (Teacher 1, non-member of the ICT Instructional Team)

> Basically, these ICT-integrated instructional modes could have been of great value for our teaching practices if we had been given sufficient time for getting more frequent with the use of these modes.
>
> (Teacher 8, non-member of the ICT Instructional Team)
>
> I personally think that if at that time we had possessed adequate time in our workday to promote these modes and to share our ideas of teaching via these modes, teachers here would have had more motives for trying out these ICT-integrated instructional modes and had more interests in using these modes frequently.
>
> (Teacher 19, member of the ICT Instructional Team)

Indeed, the responses from the formal leaders reflected that the school did not adjust its original timetable to allow teachers with interests in the ICT-integrated instructional modes to have specific time for reflection and discussion about the utility of ICT integration. For example:

> Our teachers are active learners, I think…The director of academic affairs and I do not think that it is necessary to set any specific measures or to change our original school timetable to make teachers learn new things. They have already worked hard and learned all the time for their self-improvements. Because of this,

> to be honest with you, we have never focused exclusively on the action of implementing ICT to modify the routine operating procedures of our school.
>
> (Headteacher)

> I believe that teachers in our school embrace every chance to learn new things…Because the headteacher and I we respect teachers' individualised interests and their own teaching approaches, we do not want to make teachers feel stressful by setting the timetable for staff discussions on the ICT-integrated instructional modes or other online teaching materials. Of course, 'knowledge sharing' is good but it should be based on teachers' individual autonomy, I think…We believe that our teachers they are able to manage their time for exchanging their ideas and tips about teaching with ICT.
>
> (Director of academic affairs)

5.3.3.2.2 The in-house professional development

Supporting the questionnaire results, data from the interviews reinforced the positive impact of the teachers' opportunities of formal learning (i.e. learning through the in-house ICT training courses and workshops). Based on the common views held by the majority of the teachers (74%, n = 14), the in-house ICT training courses and workshops increased the staff ICT capabilities and this, in turn, promoted their confidence in teaching with ICT. The teachers also agreed with the usefulness of learning with and from others through knowledge sharing and social interactions in the training courses. For example, recalling the in-house ICT training sessions in the period of running the ICT SSP, the interviewees said that:

> The ICT training and workshops held in our school at that time [when the school was running the ICT SSP] were open to teaching staff within and outside of our school… I felt that our school's ICT training and workshops were good channels for us teachers to exactly understand others' tips of dealing with the ICT-related pedagogical changes. These regular learning opportunities eased our nerves when our school was undertaking the ICT initiative.
>
> (Teacher 2, non-member of the ICT Instructional Team)

> When running the ICT SSP, our school offered us adequate opportunities of professional development for enhancing our pedagogical skills of ICT integration…The ICT Instructional Team, the director of academic affairs and the ICT coordinator they made efforts to arrange a series of ICT training courses and workshops every Wednesday afternoon…I learned a lot from my colleagues by attending these training sessions and workshops. It is necessary for us classroom teachers to attend these courses at that time, I think…We did need more ICT skills, particularly pedagogical skills in ICT adoption, to manage the new practices.
>
> (Teacher 16, non-member of the ICT Instructional Team)

> The training helped me a lot in strengthening my ICT capacities. It is because of the one-year and regular training for managing the ICT SSP that I have become not scared and nervous about using ICT in classes as I did before.
>
> (Teacher 5, non-member of the ICT Instructional Team)

Despite the above positive responses to the school's formal ICT training and workshop, the issue of teachers' perceived compatibility of new teaching practices of ICT integration warranted more attention. As further exploration in the interviews pointed out, all teachers' responses tended to reveal that in comparison with ICT resources, whether the ICT-integrated pedagogies fit in the existing teaching practices was much more influential to teachers' determination to continue using ICT in their classes. Importantly, more than half of the teachers (57%, n = 11) felt that not only the formally scheduled ICT training, but also informal learning opportunities (e.g. informal discussions in the staff office or in the hallway between classes) could function as a potential source of sharpening teachers' consciousness of the utility of ICT in the existing practices. Despite this, however, according to 63% of the teachers' responses (n = 12), learning on an informal basis did not occur frequently within their workplace in the change process of implementing ICT. All these findings can be evidenced by the interviewees' statements as follows:

> I personally think that learning in an informal way can be helpful for us teachers to enhance our abilities and intention to use ICT…However, our school does not have a sort of culture which inspires teachers to learn with and from colleagues in informal groups. I mean that I do not blame anyone for this 'culture' problem, in that this problem has been deeply rooted in our school for a long time.
>
> (Teacher 11, non-member of the ICT Instructional Team)

> 'Learning in an informal way' may be helpful but it is not part of our culture, I think…It is a bit embarrassing that even being part of the ICT Instructional Team, I am unable to do anything to solve the problem with our school's learning culture. Perhaps most staff here have already got used to this culture anyway.
>
> (Teacher 18, member of the ICT Instructional Team)

> Of course, sharing teaching experiences of ICT adoption through informal discussions and informal meetings and things like that can be useful and practical pathways for keeping our colleagues well informed about the compatibility of new teaching approaches with the existing practices…Some members from the ICT Instructional Team and I we used to try encouraging teachers to simply 'talk about' their ideas of ICT more frequently outside of the training courses. Yet, it did not work well throughout our change process of running the ICT initiative.
>
> (ICT coordinator)

Based on the interview results, it could be said that in terms of the learning approaches to enhancing teachers' skills and knowledge of ICT integration, learning with colleagues in an informal manner may not be part of the process of teachers' professional development in the school. Rather, there seemed to exist a dominant culture within which the teachers were highly dependent upon the formalised training courses set by the ICT Instructional Team. This finding could give the reason why the data from the questionnaires reported that in general the teachers, on the one hand, praised the in-house formal training for developing their pedagogical skills in ICT adoption. On the other hand, they tended to disagree that the school fostered a culture

which assisted teachers in considering deeply the potential benefits from using ICT in the existing teaching practices.

5.3.3.3 Findings from the documentary reviews

Data presented in this section was based on the reviews of the official report by Yilan County Bureau of Education (2005) and the documents secured from School B.

5.3.3.3.1 The in-house ICT infrastructure

The school had 206 networked desktop personal computers (PCs), 11 of which were mainly used for administrative and managerial purposes (the headteacher's office had a PC and other departments had 10 PCs in total). The allocation of the remaining 195 PCs was as follows:

- 45 PCs were set in classrooms and mainly used by teachers for dealing with teaching and administrative tasks. 32 of these PCs were in the first-year to sixth-year classes, 7 were in the classrooms for specialist subjects, and the other 6 were in the special needs classroom.
- 40 PCs were set in the science classroom for students' use.
- 60 PCs were sited in the computer lab for teachers' and students' use.
- 15 PCs, a laser printer and a scanner were installed in the staff research office, mainly used for teaching and research purposes.
- 35 PCs were put in the computer area in the library for students' use.

The ratio of pupils and school staff to PCs was around 4:1. The school also had 5 laptop computers, 4 digital cameras and 2 digital camcorders, and pupils were provided with the same level of access as the teachers to these instruments. Moreover, 10 digital projectors (1 in each year group; 8 in the computer lab, science classroom and staff research office; and the remaining 1 in the department of academic affairs)

were installed and connected to teachers' computers. As regards software, the computer operation system was Microsoft Windows XP, with Microsoft Office package installed on all PCs. In addition to fixed networks, the school had a wireless network, which had been installed by the local government before the ICT SSP was under way.

5.3.3.3.2 Teachers' ICT skills and the ICT software for teaching purposes

All teachers and the headteacher in the school already had the nationally recognised qualifications of teachers' ICT capacity in 2003 (Yilan County Government 2005). In terms of the schools' ICT software for teaching purposes, the ICT coordinator and the ICT Instructional Team developed the online learning materials which were available for all students via the school's website. Even though the school failed to meet the government's standard for continuing the ICT SSP in 2004, some members from within the ICT Instructional Team kept updating the school's online learning materials for students' use. In order to ensure the staff convenient access to ICT-based teaching materials, the ICT Instructional Team developed diverse ICT-integrated instructional modes in 2003 when the school was running the ICT SSP. All these ICT-integrated instructional modes were also available for teachers from other schools when the ICT SSP was under way. However, after the school discontinued the ICT SSP, none from within the staff assumed the responsibility for persisting in developing the ICT-integrated instructional modes.

Based on the results from the documentary reviews, it was clear that the school staff were able to reach official standards for teachers' ICT skills. Due to this evidence, there seemed to be no surprise that the findings from the questionnaires and interviews consistently showed that the teachers were confident ICT users in general.

In addition, the above documents revealed that owing to the passion of the ICT Instructional Team for managing school-wide ICT adoption, the staff were provided with the ready access to a varied set of ICT-integrated instructional modes. Unfortunately, these well-established instructional modes were unable to be retained after the school discontinued the ICT SSP. This result seemed to be reasonable given the interview data that even when the ICT SSP was under way, there existed a low frequency of teachers' use of the ICT-integrated instructional modes.

5.3.4 External support for School B

5.3.4.1 Findings from the questionnaires

Table 5-4 showed that the respondents' opinions on the support from outside their school. In general, the responses were found to be positive. This was not only because a total of 61% fell within three levels from 'agree' to 'strongly agree', but also because the overall mean was 3.6, with the general overview of the responses at the level of 'agree'.

Table 5-4: External support for School B (n=41)

4. **External support** for **this school**:		Very Strongly Agree (score 6)	Strongly Agree (score 5)	Agree (score 4)	Disagree (score 3)	Strongly Disagree (score 2)	Very Strongly Disagree (score 1)	Mean	General overview
4.1 Cross-school ICT-related workshops and training enhance my abilities to deal with pedagogical innovations in ICT integration	n		6	30	5			4.02	Agree
	%		15%	73%	12%				
4.2 Parents' support is crucial to pedagogical innovations in ICT integration in our school	n			22	19			3.54	Agree
	%			54%	46%				
4.3 The government offers suitable support for pedagogical innovations in ICT integration in our school	n			17	19	3	2	3.24	Disagree
	%			41%	46%	7%	5%		
Total Response to Statement 4.1-4.3			5%	56%	35%	2%	2%	3.60	Agree

In analysing the responses to each inquiry, statement 4.1 (cross-school ICT-related workshops and training enhance my abilities to deal with pedagogical innovations in ICT integration) was ranked the highest, with an 88% approval rating. In addition, due to the individual mean of 4.02, the general overview of the responses to this statement was categorised as the level of 'agree'. All these findings gave the impression that in general, the respondents recognised that they may have benefited from networking with other schools throughout the change process of managing pedagogical innovations in ICT integration.

As regards the responses to statement 4.2 (parents' support is crucial to pedagogical innovations in ICT integration in our school), the general overview of the responses was classified as the level of 'agree', in accordance with the individual mean of 3.54. Apart from this, slightly over half (54%) of the replies were found to be positive. However, despite the above positive responses to statement 4.2, the respondents' negative opinions should not be neglected, in that they reached nearly half (46%) of the replies. Based on all these findings, it can be said that for around half of the respondents, gaining parents' support may be influential to the change process of implementing ICT in the school. The remaining respondents, however, may not consider parents' support to be particularly critical to whole-school pedagogical innovations in ICT integration. Notably, the findings also indicated that there was a small divide in the percentage of the respondents' approval and disapproval with respect to the issue of the importance of parents' support in whole-school changes involving ICT implementation, even though the general picture of the responses to this issue tended to be closer to the level of agreement than disagreement. The possible reasons for this disparity in response to the impact of parents' support on pedagogical innovations in ICT integration are further discussed in chapter 6.

However, most respondents' opinions on the external support from the government were found to be negative. As can be seen in the responses to statement 4.3 (the government offers suitable support for pedagogical innovations in ICT integration in our school), there was around 41% of agreement. The general overview of the responses to this statement was classified as the level of 'disagree', due to the individual mean of 3.24. According to this result, there was a tendency that the teachers felt unsatisfied with their access to the government's support in the change process of implementing ICT in the school.

5.3.4.2 Findings from the interviews

Findings presented in this section were based on the interviewees' responses to the two main issues. One of the issues focused on the impact of the ICT SSP on the school practices. The other issue centred on the influence of the three sources of external support – the government's support, parents' support and teachers' cross-school learning (i.e. ICT-related workshops and training courses) – on the school's sustainability of implementing ICT. The interviewees' replies to these questions can be categorised into two key areas:

- Crucial role of the government's support
- Benefits from parental support and teachers' cross-school learning

Detailed information of both issues is demonstrated as follows.

5.3.4.2.1 Crucial role of the government's support

When further asked to compare the impact of the three sources of external support on the school's sustainability of pedagogical innovations in ICT integration, all teachers in the interviews subscribed to the same view, considering the government's adequate support to be much more influential, in comparison with gaining support from parents

and benefits gained from cross-school learning. In addition, it was worth noting the teachers' statements of the government's inadequate or unsuitable support in the change process of implementing ICT across the curriculum, although only around half (53%) of the teachers brought this issue up. This is because many studies have pointed out that whether the government's support can satisfy teachers' needs is crucial for whole-school change involving ICT adoption (Lam et al. 2002; Tang 2007). Within this research, the interviewees' comments on the government's support are as follows:

> The government did not offer timely financial support when the ICT SSP was introduced in our school...Without adequate support, the change efforts of ICT implementation in our school was doomed to be not quite successful and sustainable.
>
> (Teacher 11, non-member of the ICT Instructional Team)

> Even though we attended the government-run training regularly in the change processes, we have never been trained in the aspect of school management in the field of ICT adoption. It is quite ironic, I think…Of course, pedagogical knowledge in ICT application is important. Yet, we cannot effectively implement ICT without practical tips of managing this ICT-related innovation.
>
> (ICT coordinator)

> When we started the ICT SSP, the government did not provide us with the specialised training for enhancing school leaders' abilities to manage and retain school-wide change in ICT adoption. So, it was not that easy for us to make the early success sustainable…I have been quite pleased that our teachers from within the ICT Instructional Team were able to bring about effective change at the very beginning of the change process.
>
> (Headteacher)

According to the above findings, the overall message was that the government's support for the school did not carefully consider the school-based needs and the diverse demands of school staff who held different posts. This result may explain the

findings from the questionnaires, which tended to show that in general the teachers did not agree that the government offered appropriate support for the school in the change process of managing pedagogical innovations in ICT integration.

5.3.4.2.2 Benefits from teachers' cross-school learning and parents' support

For all teachers in the interviews, parents' support and teachers' cross-school learning were less influential than the government's support, considering the impact on the school's capacity for sustaining pedagogical innovations in ICT integration. Even so, many teachers (79%, n = 15) recognised the benefits from networking with teachers from other schools. In addition, more than half the teachers (53%, n = 10) thought that the extra funding secured from the parents' association was the important facilitator of enlarging the in-house ICT infrastructure, particularly when the school was at the initial stage of running the ICT SSP. As the interviewees claimed:

> Our school did not have sufficient financial support when we just started the change initiative for implementing ICT. However, the parents' association offered us help by providing some funding…Parents' support was quite important for increasing our schools' ICT infrastructure, especially in the beginning of the change process.
>
> (ICT coordinator)

> We did not have adequate ICT facilities as you see now…It was quite ironic, because we did not have the immediate financial aids from the government at the outset of the change process. Instead, our parents' association supported our school's pedagogical innovations by giving us some funding. In consequence, we could afford to purchase new ICT hardware at that time…Of course, we also got the funding from the government, but we did not get this funding until we had been running the ICT SSP for a while.
>
> (Headteacher)

As regards the staff opinions on their cross-school learning, the interviewees gave their positive responses as follows:

> When we were running the ICT SSP, all the ICT training sessions held in our school were not only open to the teachers here, but also to teachers from our neighbouring schools…It was really good to have many chances to interact with teachers in other schools, because learning with or from teachers from different schools stimulated me to think things from different perspectives. This was also quite useful for us teachers to reflect upon our teaching practices.
> (Teacher 10, non-member of the ICT Instructional Team)

> The cross-school training courses or workshops at that time when running the ICT SSP gave us the opportunities for learning and interacting with others. Learning in this way was quite helpful, and I really enjoyed this.
> (Teacher 8, non-member of the ICT Instructional Team)

Based on all the above findings, teachers' cross-school learning and parents' support were perceived to be instrumental for implementing ICT in the school, to a certain degree. In a sense, networking with other schools and securing support from parents in the overall course of managing school-wide change in ICT adoption cannot be overlooked, even though the impact of the two sources of external support may not be considered by the interviewees to be as crucial as the government's support.

5.3.3.4 Findings from the documentary reviews

There were no official reports which offered the information of the networks between the School B and other schools. However, based on the documents secured from School B, during the academic year of implementing ICT SSP, the school formed the partnerships with four of its neighbouring schools and successfully facilitated transforming these schools into part of the ICT Seed Schools. Apart from this, when School B was running the ICT SSP, the ICT coordinator and the ICT Instructional

Team organised regular cross-school ICT-related training and workshops for teachers from within and from outside the school. Nonetheless, discontinuation of the ICT SSP made the school have no extra funding for keeping managing the cross-school professional development for promoting teachers' pedagogical skills in ICT integration.

5.4 Summary of the key findings from School B

5.4.1 Key findings of school leadership for ICT integration

The findings from the interviews supported the responses gained in the questionnaire phase. The key results of the questionnaires and interviews can be divided into three points:

1. A collaborative culture was somewhat stifled in the school, even when whole-school change of ICT adoption was under way. Despite this, however, the teachers from outside the ICT Instructional Team tended to take it for granted that colleagues from within the ICT Instructional Team and the formal leaders were required to bear all leadership responsibilities for school-wide pedagogical innovations in ICT integration. This common feeling of most teachers was one of the key reasons why only the formal leaders and the ICT Instructional Team took up the leadership activities throughout the change process of implementing ICT. Notably, it would appear that as school leaders, the headteacher and the director of academic affairs did not consider it to be essential to encourage teachers to work together in shouldering leadership tasks of managing school-wide pedagogical innovations. These findings may explain why in general, the staff from outside the ICT Instructional Team were not particularly active in enacting the leadership role in the processes of implementing ICT.

2. It was encouraging to point out that in order to ensure a successful start of pedagogical innovations in ICT integration, the headteacher attended to people's quality and carefully appointed the competent teacher as the ICT coordinator. In addition, the headteacher empowered the ICT coordinator with decision-making power to select the appropriate teachers to constitute the ICT Instructional Team. Unfortunately, however, neither the headteacher nor other senior leaders recognised the importance of continuing cultivating and renewing human resources from within the staff in the domain of ICT developments. Due to very little attempt to nurture the future leaders in the ICT field within the school, a limited number of the teachers from within the ICT Instructional Team and the ICT coordinator seemed to feel overloaded with the leadership tasks throughout the change process.

3. Following the questionnaire phase, evidence gained from the subsequent interviews revealed that the teachers' satisfaction with their school leadership for implementing ICT generally resulted from their recognition of the school's initial change efforts to embark on the ICT SSP. As the interview data reported, instead of referring to their current ICT developments and improvements, the teachers were inclined to cite the school's previous success in commencing the ICT-integrated pedagogy to support their positive comments on their school leadership for change management. This, in turn, seemed to act as a potential obstacle which prevented the staff from feeling the urgent needs for making changes and improvements. In addition, for those noting the weaknesses of their school leadership for managing changes, some had learnt to adjust themselves to the existing leadership approaches. Some questioned, or even felt negative about, the leadership capacities of their school leaders, particularly the headteacher.

Apart from all these above, the most common thought of the teachers was that at the top of the hierarchy, the headteacher was expected to take the initiative in brining about changes if needed.

5.4.2 Key findings of the organisational processes

Evidence from the questionnaires and interviews concerning the organisational processes in School B can be summarised as three points as follows:

1. In terms of the teachers' attitudes toward the ICT-integrated pedagogies, both questionnaire and interview results showed that the teachers generally held the positive attitudes toward making pedagogical innovations in ICT integration at the outset of the change process. However, despite the teachers' common and positive attitudes toward ICT adoption, there was a tendency that the teachers did not feel ready to continue the ICT-integrated pedagogy. Further findings in the interview phase provided an explanation for the gap between the teachers' positive beliefs in ICT adoption and their readiness for continuation of ICT integration into the curriculum. To some degree, the results reflected that the teachers' positive attitudes toward implementing pedagogical innovations in ICT integration did not completely guarantee their determination to sustain these new practices.

2. As regards goal-setting and decision-making in the change process, the questionnaire results revealed a positive picture that the teachers were generally clear about the school's goal and decisions of implementing ICT across the curriculum. Even so, the interview data further reflected that the school's goal and key decisions, though clear to the teachers, were rarely set or reached by means of mutual communication and joint work among many members of the staff. Instead,

the goal-setting and decision-making tasks were simply shouldered by the formal leaders and the teachers from within the ICT Instructional Team. However, although empowering the ICT Instructional Team with a certain degree of decision-making power, the school's overall course of goal-setting and decision-making was not based on a consensus and collaborative approach.

3. With reference to the monitoring and reward systems, the research findings can be divided into two key points. First, the school did not have an explicit policy for monitoring all teachers' efforts and progress throughout the change process of implementing ICT. In other words, only teachers from within the ICT Instructional Team were required to go through the monitoring process when the school was undertaking pedagogical innovations in ICT Integration. Second, the reward measures may be able to raise teachers' commitment to undertaking the new practices of ICT integration. Even so, not all teachers were clear about these reward measures in the change process of implementing ICT. It is for these reasons that teachers from outside the ICT Instructional Team generally did not consider it to be necessary for them to shoulder the responsibilities for whole-school pedagogical innovations in ICT integration.

5.4.3 Key findings of ICT resources and teachers' professional development

On the whole, the key findings from both questionnaires and interviews can be divided into two aspects as follows:

1. In the aspect of the in-house ICT resources, the results from both questionnaires and interviews showed a positive picture that the teachers tended to be satisfied with the availability of their in-hose ICT facilities and technical support. Further

evidence from the interviews showed that for the teachers, the most practical and common source of technical support during classes was their nearby colleagues with ICT expertise. However, despite the teachers' high satisfaction with their access to the school's ICT facilities and technical support, the interview data indicated that the ICT instruments installed in classrooms had not been widely used in teaching practices, even when the ICT SSP was under way. The low frequency of teachers' application of ICT in their teaching practices can be explained by considering their uncertainty about the compatibility between the ICT-integrated pedagogies and their curricular activities.

2. With respect to the ICT-related professional development within the school, the questionnaire data reported that the school's in-house training sessions were able to meet teachers' needs. However, it also pointed out that the school did not have a strong culture which promoted teachers' knowledge sharing on an informal basis. Following the questionnaire phase, the interview data showed an interesting finding that 74% of the teachers were relatively satisfied with their existing learning approaches. Around 26%, though not fully satisfied with the learning culture within the school, blamed their headteacher for not being active in inspiring teachers to pursue professional growth with respect to ICT adoption. This finding gave the impression that instead of taking the initiative in pursuing school changes and improvements, the teachers tended to feel comfortable with maintaining the status quo or waiting for others, particularly the headteacher, to act on school-wide changes.

5.4.4 Key findings of external support

An overall picture of the findings from the questionnaires indicated that the teachers generally felt positive about the following support from outside the school: parental support, teachers' cross-school learning opportunities and the government's support. Notably however, while the teachers' general opinions on their external support appeared to be positive, detailed information from both questionnaires and interviews raised some interesting findings. These findings can be presented as two main points:

1. Among the three sources of external support, the government's support was viewed by the staff as the most influential determinant of the school's capacity for continuing the ICT-integrated pedagogies. Even so, further analysis of the questionnaire responses reflected that nearly 60% of the teachers were unsatisfied with the government's support for the school's pedagogical innovations in ICT integration. Similar findings were reported in the interview data. More than this, though, the results from the interviews highlighted the fact that 63% of the teachers regarded the lack of appropriate support from the government as the most serious barrier to their sustainability of pedagogical innovations in ICT integration. In this sense, the staff tended to attribute their difficulties in successfully continuing pedagogical innovations to the inadequate support from the government.

2. For the staff, neither parental support nor teachers' cross-school learning had the same degree of impact as the governmental support did. Even so, both parental support and teachers' cross-school learning were still at the core of assisting the school in moving the plan for ICT implementation forward, particularly at the early stage of the change process.

On the whole, data from the interviews and documentary reviews reinforced the key findings from the questionnaires. Apart from adding credibility and validity to the results gained from the school, the interview results provided more in-depth information of the change process of ICT implementation by further exploring the underlying reasons for the questionnaire responses.

Chapter 6

Discussion

6.1 Introduction

Chapters 4 and 5 presented the results gained from School A, which succeeded in implementing and continuing pedagogical innovations in ICT integration, and from School B, which was identified as not yet successfully sustaining pedagogical innovations in this regard. Based on the results from the two target schools, this chapter discusses and examines how the differences and similarities between School A and School B influenced their sustainability of school-wide improvements in teaching practices of ICT integration. Moreover, it interprets the findings from the present research and compares their implications with the related studies which were reviewed in chapter 2. The discussion within this chapter is presented under the headings which are guided by the research questions of this study.

6.2 School leadership for pedagogical innovations in ICT integration

<u>Research question 1</u>: Is there any difference between the two target schools with respect to their leadership approaches to pedagogical innovations in ICT integration?

The findings from the present research confirmed that there was a striking difference between the two target schools with respect to their leadership approaches to pedagogical innovations in ICT integration. This apparent difference can be evidenced by the following results:

As the questionnaire data reported, in School A, the general overview of the responses to the overall list of 3 statements (statements 1.1 – 1.3) regarding the leadership approaches to implementing ICT was at the level of ‘strongly agree’. However, in School B, the general overview of the responses was categorised as the level of ‘disagree’. In addition, 2 specific statements concerned with staff collaboration in the leadership processes of implementing ICT (statement 1.2) and development of the potential leaders in the ICT field (statement 1.3) both gained ‘strong agreement ’ from School A, but received ‘disagreement’ from School B. Such differences between the two target schools were reaffirmed in the follow-up interview phase.

Importantly however, caution should be exercised given the division of the responses gained from School B to the inquiry regarding the collegiate working patterns in the leadership processes of managing pedagogical innovations in ICT integration (statement 1.2). This is because the general overview of the questionnaire responses to this statement was at the level of ‘disagree’. However, there were also nearly half (46%) of the respondents approving statement 1.2, although over half (54%) expressed their dissent. Considering this potentially important disparity in the responses, future work may further explore whether or not there is any key factor or factors which could result in the divided opinions from the staff, in terms of their leadership processes of implementing ICT. For example, some staff may have indicated agreement in order to effect strategic compliance, while others may have declined involvement, feeling that support, including leadership support, was insufficient and their engagement was hence not secured.

As regards statement 1.1, which inquired into the staff satisfaction with their leadership approaches to implementing ICT, the general overview of the responses

from each target school fell into the level of ‘agree’. Despite this similarity, exploration in the interviews particularly raised the concerns about the two target schools’ remarkable differences, in terms of the underlying reasons behind the teachers’ satisfaction with their school leadership for managing changes involving ICT adoption.

All the above findings from School A and School B are further examined and discussed under four headings:

- Staff working patterns in the leadership processes of school-wide change in ICT adoption
- Key factors influencing teachers’ involvement in the leadership processes of implementing ICT
- Development of future leadership for sustaining ICT implementation
- Teachers’ satisfaction with the leadership approaches to pedagogical innovations in ICT integration

6.2.1 Staff working patterns in the leadership processes of school-wide change in ICT adoption

Following the questionnaire results, the interview phase reinforced the distinctions between School A and School B with respect to their leadership processes of school-wide changes in ICT adoption. As the data from the interviews showed, in School A, the leadership tasks of maximising the use of ICT for teaching purposes were fulfilled through considerable synergies and interactions of many staff members, irrespective of post or ICT expertise. There seemed to exist a distributed form of leadership approaches to implementing ICT in School A. Yet, in School B, leadership practices of managing school-wide changes in ICT integration tended to be accepted

as the prerogative of the ICT coordinator and the staff from the ICT Instructional Team. That is, leadership functions for school-wide change regarding ICT integration in School B may be restricted to a limited number and specific individuals of the staff.

It was evident that in comparison with School A, leadership in School B was much more hierarchical and bureaucratic. Considering the distinctions between the two target schools in terms of their leadership approaches and sustainability of ICT implementation, it would appear that teachers' coordinated actions and active engagement in the leadership processes were at the heart of making school-wide pedagogical innovations in ICT integration successful and durable. The findings from this research resonate with the related studies focusing on school change in ICT integration in other countries. For example, Tearle's case studies (2003) centred on an acknowledged outstanding school in England which succeeded in implementing and sustaining ICT integration. According to Tearle's findings, teachers' collaboration in shouldering leadership responsibility in the change process was at the core of enlarging their school's leadership capacity for continuing pedagogical innovations in ICT implementation. Moreover, based on Wong and Li's findings (2006), compared with bureaucratic or hierarchic modes of school leadership, the headteacher's appropriate distribution of leadership and teachers' active participation in leadership practices were verified to be much more instrumental for successful school change regarding ICT implementation in Hong Kong.

Moving beyond the scope of the literature on pedagogical innovations involving ICT adoption, the findings from the present research also support the studies concerning the link between leadership approaches and school improvements. As Leithwood's international multi-case studies (2005) pointed out, teachers' intense involvement and

close collaboration in leadership activities were found to be essential for effective leadership which brought about successful changes and improvements in school settings in nearly all educational contexts. Indeed, the literature on school leadership consistently highlights the powerful and positive impact of leadership distribution to teachers on system-wide changes and long-term developments in school settings (e.g. Fullan 2006; Harris & Chapman 2002; Spillane 2006).

On this basis, there seems to be no doubt that distributed leadership is crucial for successfully sustaining school-wide change – whether involving ICT implementation or not. Notably, if distributed leadership is perceived to be central to the success in continuing pedagogical innovations in ICT integration, then it is worth examining the possible facilitators of and barriers to teachers' participation in the leadership practices in the change process. Considering this, the next section further discusses the key factors which potentially increased and decreased teachers' willingness to take up the leadership role in the processes of implementing ICT in the two target schools.

6.2.2 Key factors influencing teachers' involvement in the leadership processes of implementing ICT

Based on the findings, there were two key and interrelated factors which influenced teachers' involvement in leadership activity of implementing ICT in their own school. One factor referred to teachers' perceptions of staff collaboration in leadership activity; the other factor was related to the impact of the headteacher on an organisational culture. The following discusses each of these factors in turn.

6.2.2.1 Teachers' perceptions of staff collaboration in leadership activity

As data from the interviews pointed out, in School A, teachers generally accepted their collaboration and collegiality in the leadership processes of implementing ICT as a natural and an important part of their work routine. However, the results gained from School B tended to reflect that neither working collaboratively with colleagues, nor getting involved in the leadership processes was widely perceived as a necessity, even when school-wide pedagogical innovations in ICT integration were under way.

Such between-school differences in teachers' perceived importance of their own involvement and collegial interaction in leadership activity could account for the two target schools' different patterns of the change process of managing school-wide changes in ICT integration[1]. To a certain degree, the findings demonstrated here corresponded to Harris' (2004) and MacBeath's (2005) studies of distributed leadership in school settings. Both authors' central and common assertions are that where teachers recognise their own crucial role in taking up leadership activity, the possibilities of generating distributed forms of leadership are greatly enhanced.

The present research also echoed the recent studies in the field of school change focusing particularly on ICT implementation. For example, Sheppard's multi-case studies (2003) explored schools' capacities for sustaining pedagogical innovations regarding ICT adoption in the Canadian educational context. Based on Sheppard, one of the predominant determinants of the schools' success in continuing new teaching practices of ICT integration was that teachers were conscious of the necessity and value of their collaboration in leadership practices. Thus, in these successful schools,

[1] Staff working patterns of managing pedagogical innovations in ICT integration in both target schools were discussed previously in section 6.2.1.

there existed a high level of working morale and most teachers naturally had the initiative to assume leadership tasks throughout the change process of implementing ICT. Similarly, the literature on ICT integration in school settings in England stresses that teachers' strong awareness of the importance of their participation in leadership activity is at the core of successfully managing and continuing the change initiative involving ICT adoption (Fox 2003; Kennewell et al. 2000; Tearle 2003).

Moreover, a particularly interesting finding was that the staff from both target schools expressed similar views, claiming that colleagues' common thoughts about being engaged in the change process of school-wide pedagogical innovations in ICT integration profoundly influenced individual teachers' willingness to embark on leadership tasks in this regard. In a sense, this result could resonate with the assumption of Ajzen's Theory of Planned Behaviour. As the Theory of Planned Behaviour asserts, 'subjective norm[2]' is one of the predominant determinants of individuals' intention to undertake an innovation or a change which intervenes in an organisation. Stated in terms of the present research, teachers' perceptions of their colleagues' reaction to participation in the overall process of implementing ICT (i.e. subjective norms) could account for individual teachers' determination to assume the leadership tasks of managing school-wide changes regarding ICT integration (i.e. individuals' intention to undertake an innovation or a change). The findings from this research also reinforced those from Chou's studies (2006), which used the Theory of Planned Behaviour to explore teachers' acceptance of the new educational initiative of ICT integration in the Taiwanese schools. In his findings, Chou verified Ajzen's concept of 'subject norm' (which was treated as teachers' desire for social approval

[2] Ajzen (1985) defines 'subjective norm' as individuals' perceptions of social expectations and pressures which stimulate individuals to perform or not perform the given behaviour (see section 2.6.3 for the details).

received from colleagues in Chou's research) as being highly influential to teachers' involvement in the change process of implementing ICT and their intention to enact the leadership role in undertaking this whole-school change.

As with the studies by Fullan (2001) and Harris and Chapman (2002), the evidence within the present research confirmed the potential impact of the property of the entire school staff on an individual's reaction to the change initiative which is under way. In this sense, a school-wide culture cannot be overlooked if teachers are expected to be directly and actively engaged in the processes of implementing ICT. More importantly, though, in the literature of school changes and improvements, it is widely accepted that transforming a school into a learning organisation is the key base for nurturing a supportive working culture which makes teachers foster new mindsets to think differently and to respond positively to educational change (e.g. Fullan 2001; Hargreaves 1995; Harris & Lambert 2003). That is, schools functioning as learning organisations have the potential to reduce teachers' resistance to making pedagogical innovations. On this basis, in order to increase the likelihood of schools' success in implementing and sustaining ICT through teachers' close collaboration in the change process, more empirical work of exploring the strategies for constructing schools as learning organisations is required in the field of educational change involving ICT adoption.

6.2.2.2 Impact of the headteacher on an organisational culture

According to the interview data, in School A, the teachers generally acknowledged the formal leaders' proactive roles in nurturing a supportive school-wide culture which made staff members become used to working together in exerting leadership in their fields of expertise. In consequence, the staff, even those without particularly strong

ICT background, felt comfortable getting involved in the leadership tasks of implementing ICT throughout the change process. Having a closer insight into the findings from School A, a pervasive collaborative culture seemed to be formed through a long-term process. Moreover, the establishment of a collaborative culture within teachers' workplace entailed the joint contribution of multiple school leaders, instead of relying on any specific individual's leadership. Similar results were also shown in Tearle's studies (2003) of effective school change for ICT development.

Nonetheless, in School B, there existed a tendency that the teachers blamed their low working morale in the leadership processes of implementing ICT on a particular formal leader – the headteacher. The findings from School B seemed to give the impression that the headteacher was expected to be the single most important leader who was responsible for transforming and improving a school-wide culture if this change was needed. It would appear that in School B there existed a prevailing organisational culture within which teachers generally accepted singular leadership provided by the headteacher (Muijs & Harris 2003), rather than a distributed mode of leadership.

The overarching message emanating from both target schools was that the headteacher's sufficient investment in shaping a positive organisational culture could act as the base for engaging teachers in leadership activity and developmental tasks which were directly influential to moving the entire school forward. This result resonated with the literature on school leadership (e.g. Fullan 2001; Harris & Lambert 2003; Southworth 2004). These authors subscribe to the same views that successful school leaders exert an indirect but powerful impact on schools' capacity for change management through nurturing a positive school-wide culture which promotes

teachers' collaborative learning and good-quality collegial interaction. They also consistently highlight the contribution of strong collegial relationships among teachers to positive changes and continuing developments in school settings.

Based on all these above, it is seems that singular leadership exerted by the headteacher or any other particular individual staff limits a school's capacity for managing changes regarding ICT adoption. Specifically, lessens learnt from the two target schools further revealed that distributed leadership can have the powerful and positive impact on school-wide change involving ICT implementation only if a school function as a learning organisation which promotes teachers' collegial interaction and continuous learning. More than this though, effective transformation of a school into a learning organisation entails the strong and joint support of the headteacher and other formal leaders.

6.2.3 Development of future leadership for sustaining ICT implementation

Corresponding to the questionnaire result, the findings from the interviews also reflected the differences between School A and School B, in terms of developing the talented teachers as the future leaders in the domain of ICT. As the interview data reported, in order to pursue long-term and school-wide pedagogical developments in ICT adoption, both the headteacher and another senior leader (e.g. the director of academic affairs) in School A continued nurturing the potential staff as lead teachers in the ICT field. In School B, it was encouraging to point out that a competent teacher was appointed as the formal leader for guiding the others to implement ICT. However, neither the headteacher nor other senior leaders made investment in continuing cultivating the talented staff members in the ICT field. Rather, they were inclined to

yield the responsibilities for developing future leaders to the staff from within the ICT Instructional Team.

The clear differences between the two target schools with respect to their long-term development of potential leaders in the ICT field can be one of the underlying reasons for the apparent divide between their sustainability of ICT implementation. This is because many authors have considered the headteacher and other senior leaders to be central to building leadership capacity of the school as a whole (e.g. Chapman 2003; Harris & Lambert 2003). These authors also hold similar opinions, stressing that continuation of cultivating potential teachers as the future leaders in their professional fields are essential and important if school change is to be effective and durable over time.

In addition, as with the studies by Rhodes et al. (2008), the evidence demonstrated within the present research revealed that the school's in-house mechanisms for developing leadership talent have a considerable bearing on its overall leadership capacity, and that the headteacher and other senior leaders should be more proactive and visionary about preparing and cultivating potential leaders from within the staff. Moreover, echoing the literature on sustainable leadership and school change, the results from this study reflected that the headteacher's competence in identifying and continuing fostering individuals' leadership potential may function as the primary base for making the initial success in school change become durable (Fullan 2006; Hargreaves & Fink 2006).

On this basis, it could be assumed that a school's capacity for sustaining ICT implementation entails not only good designation of the suitable staff as the key

leaders at a very start, but also ongoing development of the potential teachers' leadership abilities. In other words, it would appear that only with the long-term plans and systemic strategies for enhancing leadership capacities of many staff members can a school have sufficient capacity for moving the change and improvement efforts beyond the initial success to the continuation phase.

6.2.4 Teachers' satisfaction with the leadership approaches to pedagogical innovations in ICT integration

Echoing the positive questionnaire responses from the two target schools, the findings from the follow-up interviews showed that 94% of the teachers in School A and 58% in School B were in favour of the overall leadership approach to undertaking pedagogical innovations in ICT integration within their own school. In spite of these positive opinions, it was important to note the clear differences between the two target schools with respect to the underlying reasons for the teachers' positive recognition of their school leadership for managing pedagogical innovations in ICT integration.

In School A, it was encouraging to note that 15 out of 16 teachers (94%) approved their school leadership for managing changes of ICT integration without dissent. Apart from this, the teachers considered their leadership approaches to be successful in nearly every aspect of handling pedagogical innovations and developments, not simply in the aspect of implementing ICT across the curriculum. More specifically, when noting things which the school could change and improve for better, the teachers were keen on giving their voice in the staff meeting or even proposed their ideas directly to their formal leaders. In a sense, an overarching message which emerged in School A was that the rationale for the teachers' high praise for their

school leadership lay in their strong awareness of the ongoing and whole-school progression throughout the change process.

As regards School B, at first sight, the questionnaire results – which showed that around 61% of the respondents agreed with their school leadership for handling pedagogical innovations in ICT integration – may be interpreted as a positive verdict. However, further exploration in the follow-up interviews reflected upon two potential dangers which resided in the questionnaire respondents' seemingly positive opinions on their leadership approaches. One of the dangers was that 9 out of the 11 approvers of their school leadership, though noting the school's very little progression in ICT implementation, seemed to feel satisfied with their present practices as well as what the school already improved in the very beginning of the change process. They, therefore, were less likely to change often. The other danger was that even those with consciousness of the weaknesses in their leadership practices preferred to adapt themselves to accepting their current leadership approaches, rather than making changes for the better. To a certain degree, the two potential dangers inherent in the leadership practices can be treated as the threats to the long-term and school-wide pedagogical innovation and development. In addition, the remaining teachers (42%, n = 8) questioned and expressed their negative opinions on the leadership capacities of their school leaders, the headteacher in particular. Despite their dissatisfaction, the teachers did not express their feelings to any leaders in the school.

According to the findings from both target schools, it could be inferred that one of the radical impulses for school staff to continue moving the existing success in ICT implementation forward was that the school fostered a dominant culture within which people held a high-level commitment to striving for excellence. That is, teachers'

awareness of the necessity for school change underpinned their intentions to keep improving in ICT implementation even when challenges occurred. Indeed, the literature of educational improvement notes that school staff are usually willing to undertake change and development when feeling a critical need for doing so (Fullan 2001; Hargreaves 1994).

Furthermore, evidence gathered from School A reflected that there existed a supportive culture within which the staff, irrespective teaching experience or post, were quite receptive to others' opinions. According to the common ideas proposed in the studies of organisational learning, an institution functioning as a learning organisation typically fosters a positive culture within which individuals are open to others' opinions and are inspired to continue making changes for better performance (DiBella et al. 1996; Fullan 2001; Senge 1990). This open and supportive culture, in turn, enhances an organisation's overall capacity for pursuing innovations and developments on an ongoing basis (Garvin 1994). In a sense, it could be said that schools are required to function as learning organisations if pedagogical changes and innovations are to be successful and institutionalised.

More importantly, the findings of leadership approaches within the two target schools could show that the overall leadership capacity for implementing ICT in School A was relatively strong. This was not only because the new practice of ICT integration in School A was successfully initiated, but also because the leadership approaches in the school enabled this good practice to flourish over time. As regards School B, leadership capacity for implementing ICT was strong to a certain degree, when considering the teachers' successful commencement of whole-school pedagogical innovations in ICT integration at the very start of the change process. Unfortunately,

good practices of ICT integration in School B were unable to continue developing and thriving after the initial success in undertaking the ICT SSP. Despite this however, it is important to point out that the processes and outcomes of pedagogical innovations in ICT integration can also be influenced by the time available for school leaders and other staff members to act in this respect. As shown in the literature on school change of ICT implementation, planning for pedagogical innovations in ICT integration can be much more challenging and complicated than managing changes in most other curriculum areas (Fox 2003; Yang 2004). This is not only because of the nature of technology itself (e.g. the rapid rate of technological progress), but also because integrating ICT into classes for supporting teaching and learning is a cross-curricular task. Given the above, even though there are actions which school leaders can take to increase the chance of sustaining good practice of pedagogical innovations in ICT integration, this must be scrutinised against a background of other competing demands within and beyond the school as well as staff members' day-to-day working.

6.3 Organisational processes of pedagogical innovations in ICT integration

Research question 2: Is there any difference between the two target schools with respect to their organisational processes of making pedagogical innovations in ICT integration?

The findings from the present research showed that the teachers' opinions gained from the two target schools on their own organisational processes of pedagogical innovations in ICT integration were somewhat similar, with several differences. As can be seen in the following results:

Based on the findings, the teachers from School A and from School B were generally satisfied with the organisational processes of making pedagogical innovations in ICT integration within their own school. However, in comparison with School B, the teachers from School A were more positive about their organisational processes in this regard. As shown in the questionnaire data, in responding to the overall list of 9 statements (statements 2.1 – 2.9), which focused on teachers' satisfaction with their the processes of implementing ICT across the curriculum, the general overview of the responses gained from School A and from School B fell into the same level – 'agree'. Even so, the overall mean of School A was higher than that of School B by 0.67. Evidence from the questionnaires also revealed that 3 out of the 9 statements attracted 'agreement' or 'strong agreement' from School A; the 3 statements, however, received 'disagreement' from School B. The 3 statements were concerned with the issues of joint planning among the staff (statement 2.2), appropriate strategies for holding the staff accountable for their work (statement 2.4), and the staff readiness for continuing the ICT-integrated pedagogies (statement 2.9).

Echoing the questionnaire results, the interview data reinforced that School A and School B were relatively different in the respondents' opinions on three areas: decision-making and goal-setting processes, accountability mechanisms, and teachers' reaction to continuing pedagogical innovations in ICT integration. Considering that these apparent differences could potentially affect the two target schools' sustainability of ICT implementation, the following further examines and discusses the three areas in turn.

6.3.1 Decision-making and goal-setting processes

In both questionnaires and interviews, mutual communication among the staff members in School A was found to be relatively effective. Hence, the staff in leadership positions were able to convey clearly the expected targets and proposed plans for ICT to the others in the processes of implementing ICT. Effective mutual communication in the organisational processes within the school also assisted the teachers in creating the shared meanings and understanding what the school aspired to at the outset of the change process.

In School B, based on data gained in the interview phase, there seemed to exist a dominant culture within which rather than getting actively and directly involved in the organisational process, the teachers generally became used to relinquishing their decision-making power to those from within the ICT Instructional Team and formal leaders in the organisational processes. In consequence, it appeared that only a limited number of staff members (e.g. those with strong ICT background or at the top of school hierarchy) were expected to assume the responsibility for bringing about the changes, making the key decisions and establishing the targets for the school. Given these findings from the interviews, it may not be surprising that in the questionnaire phase (see statement 2.1), while slightly over half (56%) of the respondents seemed to consider their school's vision for implementing ICT to be clear, a certain percentage (44%) of the respondents still expressed their uncertainty about the school's vision in this regard. The above interview data also offered the impression that coordinated action among the staff in the organisational processes of implementing ICT may simply emerge in the working practices of the teachers from within the ICT Instructional Team and the formal leaders. The others, however, may not be keen on engaging in the school's organisational processes. These working patterns in the

school's organisational processes were highly likely to give the reasons why the questionnaire data indicated that around half (49%) of the respondents felt that there existed joint efforts among the staff in the organisational processes of planning for ICT, while the others (51%) did not feel so.

The above differences between School A and School B can be explained by considering the fact that the overall leadership approach within School A was much more collaborative than that within School B (discussed previously in section 6.2.1). As with the literature on school leadership (Harris & Chapman 2002; Rhodes & Brundrett 2009; Southworth 2004), the evidence from this research reinforced the strong link between shared or distributed modes of leadership and a positive culture of teachers' active involvement in the organisational processes.

More specifically, it would appear that the highly-responsive role of the formal leaders in decision-making and goal-setting served as a prerequisite or co-requisite to teachers' active engagement in the organisational processes when school change was under way. This is because by examining the interview data from the two target schools with respect to goal-setting and decision-making, it was found that there were two crucial and supportive conditions of strengthening teachers' intentions to commence and continue using ICT for supporting teaching and learning. One condition was that not only the headteacher but also the director of academic affairs assumed the tasks of effectively conveying the school's goals of undertaking new pedagogies involving ICT adoption at the very start of the change process. The other condition was that in order to reaffirm the expected targets of ICT integration, the headteacher and the director of academic affairs appropriately mediated in staff discussions and moved wide-ranging debates forward to productive dialogues which

assisted in shaping the common values among the staff throughout the change process.

The above findings echoed Leithwood and Riehl's (2003) assertion of the basic features of successful school changes and improvements in general areas. In their work, Leithwood and Riehl claimed that a successful headteacher has adequate capacity for developing teachers' consensus about the issues under discussion. In his research focusing on school change in England, Brown (2002) also suggested that if school change is to be successful, the headteacher should act as an initiator of educational improvement and a skilled mediator in staff discussions throughout the organisational processes.

Importantly, the findings from this study also reflected that in addition to the headteacher, other senior leaders (e.g. the director of academic affairs) is also required to have sufficient abilities to construct a working condition in which collective plans and shared visions are set through open debates and reflective evaluations if the ICT-integrated pedagogy is expected to be used in existing classroom practices effectively and continually. This result strongly mirrored the recent studies centring on ICT integration in school settings in England. For example, examining and evaluating the elements which affected school changes in ICT application to teaching and learning, Somekh et al. (2007) confirmed the strong link between senior leaders' high commitment to improving school-wide ICT adoption from the outset and levels of ICT integration into classroom practices. The work by Kennewell et al. (2000), who focused on effective incorporation of ICT into the curriculum, also stressed that the key to successfully extending the use of ICT in teaching and learning lay in the headteacher's strong support and other senior leaders' adequate engagement in the

implementation process from the start. Similar conclusions were given in other large-scale studies concerning successful school change in ICT implementation (e.g. Becta 2005).

6.3.2 Monitoring and reward systems

Based on the findings from the present research, the key features of the two target schools' accountability mechanisms throughout the change process of implementing ICT can be summarised as follows:

In School A, the staff tended to be clear about and agree with their in-house monitoring and reward systems which were treated as the key strategies for holding staff members accountable for their own work in the change process of implementing ICT. The monitoring process was undertaken on a regular basis and run through diverse strategies in accordance with individuals' situations (e.g. individualised needs and job positions). There was a higher level of pressure and expectation put on the staff joining the ICT Instructional Team through the regular monitoring of their efforts and progress, in comparison with those not in this team. In other words, the overall course of monitoring the non-members of the ICT Instructional Team tended to be less demanding and more supportive, compared with the members of this team. Even so, the staff – whether from within or outside the ICT Instructional Team – generally felt satisfied with the diverse and flexible strategies used within their monitoring system. Furthermore, the staff were inclined to express the common opinions that the necessary pressure within the monitoring system was instrumental for the school to keep moving forward in the overall course of implementing ICT.

Moreover, it was important to point out that apart from getting involved in the monitoring process, the formal leaders (e.g. the director of academic affairs and the ICT coordinator) offered the timely support for the ICT Instructional Team either by sharing their leadership knowledge or by working with the team in guiding other staff to handle school-wide changes. Teachers who were non-members of this team were also provided with the required and individualised support in the monitoring process. While the headteacher was not directly involved in the monitoring process, the staff appreciated the headteacher for his endeavour to inspire them to work hard towards the ambitious goal which the school aspired to. In addition to the adaptive approaches used within the monitoring system, the school rewarded the staff for their dedication to the pedagogical innovations by offering release time (i.e. reduction of class-teaching hours) and opportunities for further promotion. Since individuals' contribution to whole-school pedagogical innovations was considered in the in-house reward systems, the staff were motivated to assume the responsibilities for facilitating the change process of implementing ICT. In a sense, it could be said that the overall process of the school's accountability mechanisms were the combination of the necessary pressure and suitable support based on individualised demands. This, in turn, seemed to enable the staff, whether from within or outside the ICT Instructional Team, to become willing to bear the responsibilities for embarking on whole-school changes involving ICT integration.

In School B, there also existed the monitoring and reward systems which were established to serve as the main approaches to promoting the staff accountability for their tasks of implementing ICT. However, it would appear that in practice, the monitoring measures were not applied to all individuals, but were particularly used for scrutinising the progress of the ICT Instructional Team in the change process. In

the light of this, it may not be surprising that not all staff members in the interviews were clear about the school's monitoring measures set up for developing teachers' responsibilities for school-wide pedagogical innovations in ICT integration, although those from within the ICT Instructional Team tended to accept the school's reward measures as the stimulant to inspire teachers to get involved in the processes of implementing ICT. Moreover, teachers from within the ICT Instructional Team felt the necessity of establishing the institution-level strategies for conducting the monitoring process. The formal leaders, however, seemed to show their reservation about the positive effect of the monitoring system on development of teachers' accountability for the appointed work.

Given the above, it could be said that when managing pedagogical innovations in ICT integration, School A's mechanisms for holding the staff accountable for their jobs were conducted based on a range of strategies which combined not only the necessary pressure but hands-on support as well. Furthermore, the formal leaders in School A took a much more active role in monitoring individual and organisational performance in the change process of pedagogical innovations in ICT integration, in comparison with School B. In addition, it was observed that the formal leaders in School A applied practical approaches not only to supervising teachers' working effectiveness, but also to guiding teachers through the difficulties in implementing ICT.

The evidence demonstrated here was consistent with the findings reported in Southworth's studies (2004) of successful leadership approaches in primary schools in England. Southworth's studies inquired into the way in which headteachers in small, medium-sized and large schools successfully led the entire staff in working

towards the expected changes and ongoing developments in teaching practices. One of the crucial and common features of the successful headteachers in Southworth's studies was that successful headteachers invested much energy in monitoring both school-level progress and class-level teaching effectiveness. Southworth also found that some headteachers in the successful schools did not directly engage in the in-house evaluation process of teachers' work. These headteachers, however, still had a positive bearing on teachers' strong intentions to make changes for improving by offering sufficient support and encouragement. Moreover, as with more recent studies by Rhodes and Brundrett (2009), the findings from the present research confirmed that the headteacher and other senior leaders are required to take the responsibility for offering teachers both adequate support and necessary pressure if the desired transformation and improvements in school practices are expected to be fulfilled. Similar findings were reported in Chapman's studies (2003), which focused on leadership capacity for successful changes and improvements in an English school.

6.3.3 Teachers' reaction to continuation of pedagogical innovations in ICT integration

The evidence from the present study demonstrated that prior to the start of pedagogical innovations in ICT integration, both headteachers within this research paid attention to raising the staff awareness of benefits from conducting the ICT-integrated teaching approaches. Because of this, the teachers in the two target schools commonly perceived the value of pedagogical innovations in ICT integration. Apart from this, it was encouraging to point out that the teachers in both target schools generally supported the ideas of teaching with ICT.

Based on the above similarities between School A and School B, it can be assumed that the headteacher was placed at the heart of enabling the school to accomplish the initial success in pedagogical innovations by means of making teachers perceive the importance and benefits of undertaking new teaching practices. This result echoed Leithwood and Riehl's (2003) advocacy that the headteacher is required to possess sufficient interpersonal skills to effectively convince teachers of the necessity and value of making changes in the existing practices if new educational initiatives are to be successfully implemented in a school context. Other studies of educational change also subscribe to similar views, asserting that developing teachers' positive beliefs in and perceptions of new practices at the start of the change process is the essential base for producing successful transformation and improvement in school settings (Day et al. 2001; Fullan 2001; Harris & Chapman 2003).

In addition to the above, the results from this research showed strong resonance with the main assumption of Ajzen's Theory of Planned Behaviour. Based on the Theory of Planned Behaviour, 'attitudes towards the behaviour' is one of the three determinants of individuals' acceptance of or resistance to a change/an innovation which is introduced in an organisation. In the present research, the teachers' positive recognitions of the value of the ICT adoption in classes (i.e. 'positive attitudes towards behaviour' in Ajzen's terms) were found to be conducive to teachers' acceptance of teaching with ICT. This research also resonated with the findings from the studies by Sun (2003), who applied Ajzen's notion of the effect of attitudes towards the behaviour to examining the Taiwanese teachers' reaction to the new practices of ICT integration in primary schools. According to Sun's findings, teachers' perceived compatibility of the ICT-integrated teaching approaches was verified to be central to developing teachers' positive attitudes towards ICT adoption. In addition,

Sun's research revealed that teachers' attitudes towards ICT adoption profoundly influenced their acceptance of pedagogical innovations in ICT integration. Sun, therefore, concluded that teachers' attitudes towards ICT adoption had the potential to explain or predict their intentions to conduct the ICT-integrated pedagogy.

Notably however, despite the between-school similarities in teachers' positive attitudes towards the ideas of teaching with ICT, the findings from this research also underlined the apparent between-school differences with respect to teachers' reaction to the continuation of pedagogical innovations in ICT integration. For example, in School A, all teachers in the questionnaire phase held the same views, arguing that they were well-prepared for the ongoing pedagogical innovations regarding ICT application. According to further exploration in the interview phase, the teachers' readiness for the long-term ICT implementation in School A lay in the fact that they had become increasingly confident of teaching with ICT throughout the change process. However, in School B, the teachers in the questionnaire phase generally did not feel that they were ready for pedagogical innovations in ICT integration. The interview data further revealed that the teachers' little confidence in the way of handling the challenges of implementing ICT across the curriculum was the main obstacle to discouraging them from incorporating ICT into the existing teaching practices.

Based on the above similarities and differences between the two target schools, it can be said that teachers' positive attitudes towards teaching with ICT may enable the school to successfully implementing ICT at the very beginning. Even so, the teachers' positive attitude alone did not completely guarantee their positive reaction to undertaking the long-term pedagogical innovations in ICT integration. Instead, it was

the teachers' adequate confidence in teaching with ICT that strengthened their intentions to continue the ICT-integrated pedagogy. As in other studies, in a sense, the findings from this research supported Ajzen's main ideas proposed in the Theory of Planned Behaviour. As the Theory of Planned Behaviour assumed, when an innovation/a change intervenes in an organisation, individuals' perceived behavioural control (PBC)[3] can offer a strong explanation for or predict their intention of accepting or rejecting an innovation/a change, as long as they are provided with the required resources for dealing with this innovation/change. Stated in terms of the present research, the more confidence the teachers have in overcoming the challenges of teaching with ICT (which is Ajzen's concept of 'PBC'), the more likely it is that the teachers can feel ready for implementing and continuing the ICT-integrated pedagogy, given the context in which the teachers from both target schools had the ready access to the in-house ICT resources.

In the light of the above discussion, the results of the present research can be summarised as follows. It would appear that teachers' positive attitudes towards ICT adoption serve as the necessary, but insufficient, condition of successfully sustaining whole-school pedagogical innovations in ICT integration. That is, teachers' perceived value of ICT adoption is possibly instrumental for the school's success in making pedagogical innovations in ICT integration at the initial stage. Yet, only with positive perceptions of ICT adoption in the beginning without sufficient confidence in handling difficulties in teaching with ICT, teachers may not have strong determination to persist in good practices of ICT implementation.

[3] Based on the Theory of Planned Behaviour, PBC refers to whether individuals feel confident of their capacities for handling the impediments to the expected behaviour or behavioural goal (Ajzen 1985).

6.4 ICT resources and teacher' professional development

<u>Research question 3</u>: Do the in-house ICT resources and teachers' professional development affect the two target schools' pedagogical innovations in ICT integration?

The results gained from the present research showed that the teachers, whether from School A or School B, generally felt positive about their in-house ICT resources (the hardware, software and technical support) and ICT-related professional development. Moreover, it appeared that the teachers from School A had a higher level of satisfaction than did those from School B. This result can be evidenced by the following findings:

As can be seen in the questionnaire responses to the overall list of 7 statements (statements 3.1 – 3.7), which inquired into teachers' satisfaction with their ICT resources and professional development, the general overview of the responses of School A and that of School B fell into the same level – 'agree'. The questionnaire data also reported that the overall mean of School A was somewhat higher than that of School B by 0.54. In the follow-up interviews, the findings reconfirmed the similarly positive responses gained from the questionnaires in the two target schools. Apart from this, two common issues which emerged in the interview phase in both target schools were worthy of further attention. One of the issues was concerned with teachers' perceived compatibility of the ICT-integrated pedagogy; the other issue pertained to a learning culture within teachers' workplace. The following discusses each of these issues in turn.

6.4.1 Impact of teachers' perceived compatibility of the ICT-integrated pedagogy

As reported in the interview data, for the overwhelming majority of the teachers (88% in School A and 84% in School B), having adequate ICT resources and ICT-related training was necessary and instrumental to conduct new teaching approaches involving ICT integration, particularly at the outset of the change process. However, in comparison with the availability of both ICT resources and formal training sessions, the compatibility of the ICT-integrated pedagogies with the existing curricular goals was much more influential to teachers' resolution to continue or maximise the use ICT in their teaching practices.

Based on the above findings from School A and School B, it could be said that the sufficient provision of ICT resources and formal training cannot completely guarantee a school's sustainability of ICT implementation. Importantly, evidence demonstrated here did not suggest that teachers' access to the requisite ICT resources and ICT-related training had no impact on a school's capacity for undertaking and continuing pedagogical innovations in ICT integration. Instead, it should be taken as to mean that offering adequate ICT resources and ICT-related training was the essential requirement for effective commencement of whole-school pedagogical innovations in ICT integration. Nevertheless, the potential and pivotal impulse for teachers to successfully sustain ICT implementation was to make them perceive that the ICT-integrated pedagogies were compatible with their present instructional experiences and matched their needs.

The above results from the present research corresponded to the studies of implementing ICT in schools in Taiwan and in the international context. For example,

Wu's studies (2004) applied the Theory of Planned Behaviour to exploring teachers' willingness to incorporate ICT into the curriculum in 14 primary schools in Taiwan. Wu found that as long as schools' ICT resources and training sessions met teachers' demands, the extent to which teachers perceived the compatibility of ICT adoption with their teaching experiences and the existing practices was particularly influential to teachers' intentions to continue implementing ICT across the curriculum. Similar findings were reported in Owston's international research (2007) which examined the determinants of sustaining ICT implementation in contextually different schools. Owston verified that teachers' convenient access to the ICT facilities and technical support was the basic, but insufficient, condition of sustaining pedagogical innovations in ICT integration within school settings. Owston's findings further pointed out that teachers' perceived compatibility of ICT adoption with their teaching practices was the necessary and predominant factor which assisted teachers in continuing the new pedagogies involving ICT application.

However, the findings from this research were different from the results of previous studies undertaken in other primary schools in Taiwan. For example, in order to examine the factors which discouraged teachers from maximising the use of ICT for teaching and learning, Chen (2004) conducted large-scale studies in 200 primary schools in Taiwan. Based on Chen's findings, there were two radical problems with teachers' low frequency of ICT adoption in classes. One problem was that the ICT facilities within school settings were not always available for teachers. The other problem lay in the fact that teachers were unable to gain the immediate technical support when technological instruments went wrong during classes. Similar findings were reported in Chiang's research (2005), which investigated the barriers to integrating ICT into the curriculum in 55 schools in Taiwan. Apart from highlighting

teachers' limited access to the ICT facilities and immediate technical support, Chiang pointed out another barrier which was concerned with schools' inappropriate ICT training sessions.

There were two possibilities for the differences between the present research and the studies by Chen (2004) and Chiang (2005). One of the possibilities was that due to the adequate ICT-related training in the processes of running the ICT SSP, the teachers within this research had sufficient ICT skills which allowed them to encounter fewer technical problems than did those in other schools in Taiwan. The other possibility can be interpreted as the improvements in the ICT infrastructure within schools in the process of running the ICT SSP. As stated in the ICT SSP (see chapter 1), the schools which were evaluated by the government as the eligible ICT Seed Schools, like the two target schools within this research, were able to gain an official funding for upgrading their in-house ICT hardware, software and networks.

6.4.2 Impact of learning cultures within school settings

As discussed in section 6.4.1, the teachers, whether from School A or School B, were pleased with their in-house ICT resources and professional development in general. Even so, further findings from the questionnaires reflected that in comparison with School B, School A fostered a stronger learning culture within which teachers were inspired to learn with colleagues on an ongoing and informal basis. As can be seen in the questionnaires, 2 specific statements both focused on teachers' professional development in an informal manner. One of them explored whether or not good practices of ICT integration were widely shared among school staff (statement 3.6). The other inquired into whether or not the school culture inspired teachers to reflect upon the value in using ICT across the curriculum (statement 3.7). Having an insight

into the general overview of the responses gained from the two target schools, statements 3.6 and 3.7 received ‘agreement’ and ‘strong agreement’ from School A, respectively. Both statements, however, gained ‘disagreement’ from School B.

Following the questionnaire phase, further exploration in the interview phase reinforced the clear differences between School A and School B, with reference to teachers’ opportunities of informal learning in the aspect of ICT integration. As the findings from the interviews pointed out, in School A, sharing good practices of ICT adoption with colleagues either based on regular and formalised training courses or in informal groups appeared to be naturally accepted as part of teachers’ working routine. In School B, it was encouraging to note that the interviewees – whether from within the ICT Instructional Team or not – generally identified the formal ICT training held by their school as the pivotal facilitator of putting the plan for ICT integration forward. Even so, the interviewees’ responses from School B, however, further reflected that knowledge sharing of the ICT-integrated pedagogy and expansion of teaching skills in ICT adoption were usually restricted to formalised training sessions.

Given the above, it can be assumed that School A may nurture a strong learning culture which had been deeply rooted in the staff working processes. This, in turn, potentially promoted teachers’ professional development through both formal and informal approaches. In School B, while the school held training sessions on a regular basis, there seemed to be no particularly strong learning culture emerging in the staff workplace. This may prevent the ideas of sharing good practices on an informal basis from permeating through the staff members. In consequence, knowledge sharing among the staff tended to simply rely on the school-run training courses. The results were likely to give the reasons why around half (46%) of the questionnaire

respondents in School B felt that good teaching practices of ICT adoption were shared widely among the staff. The rest (54%), however, did not feel so.

Despite the above differences between School A and School B with respect to learning cultures in the staff workplace, more than 80% of the teachers within this research (88% in School A and 84% in School B) held the same opinions as follows: the ICT-related training was essential and beneficial for teachers to enhance their pedagogical skills in conducting ICT-integrated teaching approaches. The training, in turn, made the teachers feel comfortable teaching with ICT. Notably, the teachers stressed that compared with the in-house formal training, whether there was a prevailing learning culture which resided in the workplace had a more extended and powerful impact on teachers' determination to continue using ICT in their teaching practices.

Based on evidence gained from both target schools, it could be said that providing teachers with suitable ICT-related training throughout the change process of implementing ICT cannot be overemphasised. Nevertheless, a school should not merely invest in teachers' professional development in a formalised or structured manner if pedagogical innovations in ICT integration are to be successful and durable as well.

The results from the present research were consistent with those from recent studies of the sustainability of school innovations in ICT implementation. For example, Sheppard's research (2003) explored the Canadian schools with different levels of sustainability of ICT implementation. Sheppard identified that the foremost factor resulting in differences in the schools' sustainability of ICT implementation lay in the

different patterns of teachers' professional development. The schools which had capacities for continuing ICT implementation fostered a learning culture within which both formal and informal learning were commonplace in teachers' working routine. In the schools which were unable to sustain ICT implementation, there only existed the formalised approaches to promoting teachers' ICT skills and knowledge. Similar findings were also reported in Tearle's studies (2003) concerning an English school which succeeded in undertaking pedagogical innovations in ICT integration over time. According to Tearle, one of the dominant features which allowed the entire school to successfully sustain ICT implementation was as follows: the school itself functioned as a learning organisation, and thus teachers' collaborative learning occurred naturally in their workplace, rather than being confined to formal training courses.

In addition, Owston's multi-case studies (2007) focused on the schools with capacities for sustaining the ICT-based pedagogical innovations in different countries. Based on Owston's findings, teachers' ongoing and informal learning with peers was as important as their formal training sessions in the change and development process of implementing ICT. More specifically, Owston went further, stressing that in some schools, the effect of informal learning overrode that of formal training courses, in terms of teachers' use of ICT.

Given the above discussions, it can be said that not only formal training, but also informal learning with colleagues can be equally or even more influential to teachers' use of ICT across the curriculum, particularly when considering the long-term pedagogical developments in ICT adoption in the school as a whole. Thus, the immediate challenge for a school's continuation of pedagogical innovations in ICT integration is to function as a learning organisation in which teachers are stimulated to

learn collaboratively not only in structuralised training courses, but also on an informal and ongoing basis.

6.5 External support for pedagogical innovations in ICT integration

<u>Research question 4</u>: Does the external support influence pedagogical innovations in ICT integration in the two target schools?

The evidence gathered within the present research confirmed that the teachers in the two target schools tended to agree with the positive impact of the three sources of external support (i.e. governmental support, parental support, and benefits from teachers' cross-school learning) on managing pedagogical innovations in ICT integration their own school. Moreover, compared with School B, teachers from School A generally had a higher level of satisfaction with the three forms of external support throughout the change process of implementing ICT. Further discussion of the findings from both target schools is demonstrated as follows:

In examining the questionnaire responses to the overall list of 3 statements (statements 4.1 – 4.3) regarding the school's external support, the general overview of the responses of School A and that of School B were both categorised as the same level – 'agree'. The overall mean of School A was higher than that of School B by 0.4. However, despite the similarity between the two target schools with respect to the respondents' general opinions on the impact of the external support, further examination of the results raised some interesting issues. These issues will be discussed within this section and presented under two headings: 'impact of the support from the government' and 'impact of parental support and collaboration with other schools'.

6.5.1 Impact of the support from the government

According to the findings from the interviews, all teachers from School A and School B made the same comments, identifying the government's support as being much more crucial to the success of school-wide change in ICT integration, in comparison either with the support from parents or with teachers' cross-school learning. Notably, however, there was an apparent difference between the two target schools, in terms of the teachers' contentment with the support secured from the government. As reported in the questionnaire data, 72% of the teachers from School A felt satisfied with the government's support for pedagogical innovations in ICT integration; however, around 60% of the teachers from School B did not feel so.

In the interview phase, 53% of the teachers in School B criticised that the government's support did not always satisfy teachers' demands. Interestingly however, even in School A, some interviewees (31%) also pointed out the problems with the inappropriate support from the government for pedagogical innovations in ICT integration. It was clear that compared with School B, there were fewer interviewees in School A who expressed their discontentment. Even so, the negative opinions from the two target schools on the government's support in the change process of implementing ICT was worthy of attention. This was because in both target schools, the repeated complaints about the government's support which emerged in the interview phase were similar. The recurring negative comments made by the staff within this research can be divided into three main points as follows:

1) Insufficiency of the official funding at the start of implementing ICT

The interviewees reflected that compared with urban schools, rural schools had fewer ICT resources. However, the government provided all eligible ICT Seed Schools,

irrespective their locations, with the same funds for running the ICT SSP for school-wide pedagogical innovations in ICT integration. This result was different from I would have expected given the teachers' high satisfaction with their in-house ICT resources in general. However, the result demonstrated here may be explained by considered the fact that each target school had the access to the timely support from parents. As nearly 80% of the interviewees claimed (79% in School A and 77% in School B), their own school turned to their parents' association for the funding for making pedagogical innovations and developments in ICT adoption at the initiation stage in the change process.

Although limited research is undertaken to understand rural schools' demands for enlarging their in-house ICT infrastructure in Taiwan, Lam et al.'s studies (2002), which examined schools' external support from the government in the Taiwanese educational settings, provided the findings similar to those from the present research. Lam et al. conducted the studies in 51 primary schools with different contexts, in terms of size and area. They found that compared with urban schools, rural schools generally depended much more on the financial support from the government. Lam et al.'s findings were explained by the fact that schools in rural areas generally secured fewer resources from the local community, in comparison with those in urban areas. Similar results were reported in the more recent studies by Tang (2007), who explored teachers' acceptance of using computer software for dealing with administrative tasks in rural and urban schools. In Tang's findings, the urban schools had wide-ranging channels of gaining financial support from outside the school. However, the schools in rural areas highly depended upon the fixed budget set by the government.

2) Unsuitable training for school staff to manage pedagogical innovations regarding ICT adoption

Based on the responses from the formal leaders and teachers within the ICT Instructional Team, the government-run training for school leaders and the ICT Instructional Team put the emphasis very much on developing trainees' ICT skills and knowledge, rather than the specialised strategies for managing school-wide changes involving ICT implementation. Even though little research has been conducted to exactly diagnose the compatibility of the staff in-service training with the existing school practices in rural areas in Taiwan, previous studies concerning change management of ICT implementation in rural schools provided similar findings. For example, Hsia's case study (2002) explored the elements which influenced the change efforts of extending the use of ICT in classes in a rural school in Taiwan. Hsia found that in addition to teachers' ICT skills, the headteacher's and the ICT coordinator's leadership capacities for dealing with school-wide changes were placed at the very heart of determining the levels of ICT integration into teaching practices. Hsia went further, pointing out that the headteacher and the ICT coordinator felt the strong needs for improving their skills in guiding the entire staff through the difficulties in the change process of ICT implementation. Notably, Hsia's findings also reported that the government's training programme for school staff, including those in leadership positions, did not focus particularly on leadership strategies for coping with pedagogical innovations in ICT integration.

Similar findings were demonstrated in Hsu's large-scale research (2004), which investigated the outcomes of the government-mandated initiative for ICT integration in 155 rural schools in Taiwan. Evidence from Hsu's research reflected upon the significant effect of the headteacher's and other senior leaders' leadership capacities

on the change efforts of ICT integration in school settings. Worryingly however, Hsu also pointed out that even in the schools which were evaluated by the government as being successful in ICT implementation, the headteachers and other senior leaders showed little confidence in making their achievements in ICT adoption continue thriving over time.

In a sense, the negative comments of the interviewees within the present research can be taken as the fact that the government paid insufficient attention to school-based needs throughout the change process of pedagogical innovations in ICT integration. Therefore, for schools with sufficient ICT resources but without appropriate training, their attempts to manage improvements in ICT adoption through the government-funded ICT initiative did not entirely guarantee the expected outcomes. The studies of ICT implementation in school settings in England also reflected the common caution that the government spotlights the results of school change in using new technologies. Yet, at the same time the government is less concerned about school-based needs and not active in guiding schools through the difficulties in the change process (Becta 2005; Heinrich 1995). Similar findings were reported in Owston's international studies (2007), which focused on pedagogical innovations in ICT integration. In Owston's research, one of the common criticisms raised in schools across different countries was that the government offered passive support for schools to deal with pedagogical innovations regarding ICT adoption.

Notably, however, despite School A's and School B's common criticisms about the government's insufficient and unsuitable support in the processes of pedagogical innovations in ICT integration, the differences in the two target schools' reaction to the same change initiative of ICT implementation were in need of much more

attention. As further exploration in the interviews reflected upon, in School A, although some (around 31%) highlighted the government's ignorance of the school-based needs, all teachers' replies reached similar views as follows. The teachers deeply appreciated the formal leaders for their timely support and hands-on approaches to guiding the entire school to go through the growing pains in the overall process of implementing ICT. This deep and general appreciation, in turn, functioned as the potential trigger for teachers' resolutions not only to make changes for improvements, but also to overcome the inevitable difficulties and setbacks in the process of conducting new practices of ICT adoption.

However, in School B, the teachers and the formal leaders generally did not think that they had sufficient capacity for successfully continuing pedagogical innovations in ICT implementation. Despite this, however, instead of carefully scrutinising the potential problems with their leadership approaches to reacting the existing challenges in the change process, the teachers and the formal leaders in tended to simply blame their difficulties in sustaining ICT implementation on the shortage of the support from the government.

Based on the above difference between School A and School B, it can be inferred that the way in which the school staff respond to the change movement of ICT integration profoundly affects the likelihood of a school's success in sustaining the innovative teaching practices concerning ICT adoption. It is also important to point out that the government is required to offer suitable support based on teachers' demands if schools are expected to successfully implement ICT not only at the initial stage, but also on a long-term basis. In addition, it is equally important to note that the government's support can be viewed as a necessary, but not sufficient, condition for the

effectiveness in managing school-wide change of ICT adoption. This is because according to the findings demonstrated here, it was the formal leaders' highly-responsive attitudes towards the challenges and demands from within and outside the school setting that enabled the staff to react positively to the educational change of ICT implementation. Indeed, speaking of the requirements for successful school change in general, the authors, on the one hand, highlight the importance of the proactive support from the government (e.g. Fullan 2006; Harris & Chapman 2002; Leithwood & Riehl 2003). On the other hand, they subscribe to the same views that the key to affecting the whole school's capacity for sustainable change and improvements lies in the way how the headteacher guides other staff members to respond to the unavoidable challenges within and beyond their own school context. In a sense, it can be said that the results of this research corresponded to the common arguments in the literature on school change and improvements in general areas.

6.5.2 Impact of teachers' cross-school learning and parental support

Based on the findings from the questionnaires (statement 4.1), the equally large proportion of the teachers from both target schools (88% in School A and 88% in School B) agreed that teachers' cross-school learning (i.e. learning and networking with teaching colleagues from other schools) was instrumental for promoting pedagogical innovations in ICT integration. Following the questionnaire phase, the interview data gained from School A and School B reinforced the teachers' recognition of the great value of their cross-school learning in the processes of managing school-wide changes involving ICT integration.

Data gained through the questionnaires (statement 4.2) also reported that 84% of the respondents in School A and 54% in School B held similar views, perceiving parents'

support to be crucial to school changes involving ICT implementation. These figures, on the one hand, gave the impression that over half of the respondents from both target schools confirmed the important role of parents' support in the change process of implementing ICT. On the other hand, they indicated that nearly half (46%) of the respondents in School B may not think that parents' support was particular critical to pedagogical innovations in ICT integration. Even so, this indication should not be taken as the fact that the school did not need parents' support throughout the change process of implementing ICT. This is because based on further exploration in the follow-up interviews in School B, the interviewees, on the one hand, stressed that compared with parents' support, the government's investment in the ICT developments seemed to serve as the much more decisive factor which influencing the school's capacity for continuing good practices of ICT integration. On the other hand, the interviewees tended to attribute their school's initial success in implementing ICT to parents' timely financial support at the outset of the change process, rather than the government's funding.

Based on the above findings, it could be inferred that for some school staff, parental support might not have a profound influence on the overall process of implementing ICT and long-term ICT developments as the government did. Instead, parental support seemed to have a major impact particularly on the initial stage of pedagogical innovations. This may give the reason why the general overview of the responses from School B agreed with the important role of parental support in the change process of implementing ICT. However, nearly half of the responses did not completely agree with the potential impact of the support securing from parents on the entire course of school changes involving ICT adoption.

Apart from all these above, a particularly interesting finding was that for all teachers from the two target schools, neither teachers' cross-school learning, nor parental support was considered to be as influential as the government's support in the overall course of implementing ICT across the curriculum. On this basis, the findings from the present research can be interpreted as the fact that the external support either from parents or from other schools was essential, but less important than the government's support, in the processes of managing the long-term pedagogical developments in ICT adoption. To some degree, this result echoes previous studies of school change in ICT integration in the educational context of Taiwan. This is because the three forms of external support – the government's support, parental support and cross-school collaboration – are usually cited as being critical to the success of initiating pedagogical innovations regarding ICT adoption in urban schools in Taiwan (Chen 2004; Chiang 2005; Yang 2004). However, these researchers did not further examine to what extent each of the three forms of external support affected a school's capacity for effectively implementing and sustaining pedagogical innovations in ICT integration, nor did their studies focus on schools in rural areas. Considering this, the questions of the way in which and the extent to which the three sources of external support exert their powerful and positive influence on raising a school's capacity for successfully implementing and sustaining ICT implementation are still in need of further attention and exploration.

6.6 Summary

Whilst generalisations are almost impossible from the results of two case studies, interesting issues can emerge. Through the examinations and comparisons of the findings from the two target schools, the key results can be summarised as follows:

First, in terms of managing changes involving ICT adoption in school settings, there was a clear difference between School A and School B with respect to their leadership approaches to managing pedagogical innovations in ICT integration. Leadership for implementing ICT in School A was collaborative, highly-responsive and sustainable. Leadership for implementing ICT in School B did not stretch over many members of the staff, but was limited to ICT experts (i.e. teachers from within the ICT Instructional Team) and formal leaders in the overall process of implementing ICT. Such differences could be attributed to two interrelated factors. One factor lay in the differences in the teachers' perceived necessities of staff collaboration and involvement in the leadership processes of managing changes. The other factor was the differences in the headteacher's emphasis on shaping a working condition which promoted distributed forms of leadership.

Second, the results showed that the organisational processes in School A and School B were somewhat similar, but with several differences. These differences could be taken as the reason for the divide between the two target schools, in terms of the level of their capacities for sustaining pedagogical innovations in ICT integration. Third, the results showed an encouraging picture that teachers in both target schools were generally content with the accessibility to their in-house ICT resources and professional development. However, further findings reflected that compared with the access to ICT resources and ICT training sessions, teachers' perceived compatibility of the ICT-integrated pedagogy and informal learning had a much stronger link with teachers' determination to continue using ICT across the curriculum. More importantly, it was informal learning that inspired teachers to continue striving for excellence in the aspect of promoting pedagogical innovations in ICT integration.

Finally, the results revealed that the external support from the government, parents and teachers' cross-school learning were influential to the change effort of implementing ICT in both School A and School B. Nonetheless, in terms of the effect on the long-term ICT implementation in both target schools, the impact of the governmental support was found to override parental support and teachers' cross-school learning. Despite this, the impact of parental support on the school's initial stage of the change process cannot be neglected, in that the staff within this research generally accepted parents' support as the key facilitator of the school's successful commencement of pedagogical innovations in ICT integration.

Chapter 7
Conclusion

7.1 Introduction

The main purpose of this chapter is to summarise the key findings of the present study and then, to spotlight their implications for school-wide change in implementing and sustaining pedagogical innovations in ICT integration. This chapter is divided into four sections. First, it summarises the research purposes, design and results. Second, it shows the main contributions of this research. Third, it discusses the limitations within this research. Fourth, it provides the implications for the studies of school leadership for change management and the application of the Theory of Planned Behaviour to explaining teachers' reaction to new practices of ICT integration. Finally, it provides recommendations for the Taiwanese government, school leaders and further studies in the related field.

7.2 Summary of this research

7.2.1 Research purposes and questions

The primary purpose of the present research is to explore the reasons why some schools are relatively successful in implementing and sustaining pedagogical innovations in ICT integration, while others are less so. The second purpose is to examine the way in which the processes of change management within school settings affect school staff reaction to managing new teaching practices of ICT integration. With specific reference to the educational context in Taiwan, this research centres on two rural schools with remarkably different levels of sustainability of their good practices involving ICT application across the curriculum. This research focuses particularly on four main issues:

1. Leadership approaches to pedagogical innovations in ICT integration
2. Organisational processes of pedagogical innovations in ICT integration
3. ICT resources and teachers' professional development
4. External support for pedagogical innovations in ICT integration

Based on these main issues, the research questions are:

1. Is there any difference between the two target schools with respect to their leadership approaches to pedagogical innovations in ICT integration?
2. Is there any difference between the two target schools with respect to their organisational processes of making pedagogical innovations in ICT integration?
3. Do the in-house ICT resources and teachers' professional development affect the two target schools' pedagogical innovations in ICT integration?
4. Does the external support influence pedagogical innovations in ICT integration in the two target schools?

7.2.2 Methodology and research design

A case study approach is used in this research and as such the evidence used covers many sources, since multiple information is highly complementary (Denscombe 2003; Yin 2003). Thus, questionnaires, semi-structured interviews and documentary reviews were used for gathering both quantitative and qualitative data from the target schools (School A and School B). Furthermore, purposeful sampling was applied to ensuring that the two schools selected for the present research had apparent differences with respect to their capacities for sustaining pedagogical innovations in ICT integration.

The two target schools selected for the present research were rural primary schools in Yilan County in Taiwan. In 2003, both target schools were evaluated by the government as being qualified to gain the official funding for embarking on the ICT Seed School Project (ICT SSP) for pedagogical innovations in ICT integration. However, the official document reported that School B was unable to meet the government's standard for continuing the ICT SSP in 2004 (Ministry of Education [MOE] 2005). School A, in contrast, has become publicly acknowledged as an ICT-capable school and officially recognised by the MOE as a model for other schools, and its experiences in change management for ICT disseminated around many schools in Taiwan (MOE 2005).

In School A, questionnaires were distributed to 30 teaching staff and responses were received from 25 (83%). Following an initial analysis of the questionnaire data 19 members of staff were interviewed, 10 were from the ICT Instructional Team, 6 were teachers from outside this team, and another 3 were the formal leaders – the headteacher, the director of academic affairs and the ICT coordinator. In School B, questionnaires were distributed to 50 teaching staff and a total of 41 returns were achieved; the return rate was 82%. Following the questionnaire phase, 22 staff members were interviewed. Among the interviewees, 6 teachers were the members of the ICT Instructional Team, 13 teachers were from outside this team, and the remaining 3 were the formal leaders – the headteacher, the director of academic affairs and the ICT coordinator. All the interviews were recorded and transcribed. Apart from the interviews and questionnaires, data was also collected by reviewing the official reports and the related school documents.

7.2.3 Key findings from this research

The findings demonstrated in this research were gained through examining the opinions of school staff on the following issues: leadership for pedagogical innovations in ICT integration, organisational processes of implementing ICT across the curriculum, ICT resources and teachers' professional development, and external support for school-wide pedagogical innovations involving ICT adoption. Through analysing the questionnaire and interview results and the related documents, the key findings from the present research can be summarised as follows:

7.2.3.1 School leadership for pedagogical innovations in ICT integration

Evidence gathered within the present research confirmed that there was a striking difference between School A and School B, in terms of the overall leadership approach to pedagogical innovations in ICT integration. Findings relating to the leadership approach in this regard can be summarised as three points:

- Staff working patterns in the leadership processes of implementing ICT
- Development of potential leaders for sustaining ICT implementation
- Staff satisfaction with the leadership approaches to pedagogical innovations in ICT integration

7.2.3.1.1 Staff working patterns in the leadership processes of implementing ICT

The results of this research confirmed that there was a clear difference between the two target schools with respect to their leadership processes of managing pedagogical innovations in ICT integration. In School A, the leadership processes were collaborative, supportive of pedagogical innovations in ICT integration, and inclusive of formal leaders and many classroom teachers, irrespective of teaching experience or ICT expertise. Therefore, the leadership tasks of managing innovative teaching

practices of ICT adoption were achieved through the coordinated actions among many members of the staff. In School B, the leadership processes were accepted as the prerogative of those with formal leadership positions or strong ICT background, such as the ICT experts from within the ICT Instructional Team. That is, the leadership function was not stretched over the work of many members of the staff.

Such differences between the two target schools reflected that if a school is expected to successfully sustain pedagogical innovations in ICT integration, leadership function should not be the domain of any individual, but devolved across many members of the staff. Similar findings were reported in the recent studies concerning school-wide pedagogical innovations regarding ICT incorporation in different educational settings, such as Canada (Sheppard 2003), England (Tearle 2003) and Hong Kong (Wong & Li 2006). The common and key results of these studies are that collegial interaction among school staff in the leadership processes is central to enabling teachers as a whole to succeed in embarking on and persisting in new teaching practices of ICT adoption.

The findings from the present research also echoed Leithwood's (2005) international studies regarding successful leadership for school changes and improvements. In his studies, Leithwood tended to identify teachers' collaboration and active engagement in the leadership processes as the crucial requirement for successfully implementing any new educational initiative in nearly all educational contexts. Southworth's work (2004), which focused on successful leadership in primary schools in England, also confirmed that teachers' collegiate work patterns in the leadership processes were the primary base for allowing schools to continue improving. More specifically, as with the work by Hargreaves and Fink (2006), the evidence demonstrated in this research

reinforced that a collaborative or distributed form of leadership could serve as the pivotal base for sustainable educational innovations in school settings.

7.2.3.1.2 Development of potential leaders for sustaining ICT implementation

The findings from the present research showed that there was a similarity between the two target schools, in terms of selecting and appointing the suitable teacher as the key leader (e.g. the ICT coordinator) from the outset of the change process. Given the context in which both target schools were successful in commencing pedagogical innovations in ICT integration at very beginning, it can be inferred that the headteacher's comprehension of the staff's quality, together with good designation of the key leaders, seemed to be essential for success in planning and initiating whole-school ICT developments.

The evidence gathered here was parallel to the related studies focusing on implementing school-wide changes in pedagogical innovations regarding ICT adoption in Canada (Sheppard 2003), England (Kennewell et al. 2000; Tearle 2003) and Taiwan (Chan 2002; Chan & Wu 2003; Hsia 2002). Despite differences in their educational contexts, these studies subscribed to the same views, arguing that identifying and developing the competent teacher as the ICT coordinator (or the 'technology teacher' in Sheppard's terms) was the foremost requirement for brining about the initial success in the change process of school-wide ICT adoption.

Nonetheless, the findings also reflected that the two target schools were relatively different, when it came to the long-term leadership development for talented staff as lead teachers or teacher pioneers in the ICT field. In School A, not only the headteacher but also another senior leader (i.e. the director of academic affairs) put

emphasis on nurturing a cluster of ICT-competent and highly-committed teaching staff as lead teachers in order to make change efforts of ICT integration continue thriving over time. In School B, neither the headteacher nor other senior leaders took up the responsibility for ongoing development of talented teachers' leadership capacities for managing the long-term pedagogical developments of ICT application. The apparent difference in the continuation of cultivating potential leaders from within the teaching staff was highly likely to be the underlying reason behind the divide between the two target schools, in terms of their sustainability of implementing ICT.

Based on the above similarities and differences between the two target schools, it can be assumed that even with good designation of the key leaders at the very start without well-targeted plans and systemic strategies for continuing renewing human resources in the ICT field, it seems to be impossible for a school to prevent its laudable achievements in ICT integration from fading away. Apart from this, the findings gathered within this research reflected upon the profound impact of the headteacher and other senior leaders on their in-house approaches to managing leadership development and succession for individual staff. The emphasis of the headteacher and other senior leaders on leadership development is highly likely to enlarge leadership capacity of the school as a whole. School leaders' engagement and investment in long-term leadership development within their own school could promote teachers' incentives and abilities to enact the leadership role in undertaking school-wide pedagogical innovations. Indeed, active involvement of the headteacher and other senior leaders in the in-house leadership development is usually cited as the prerequisite to a school's high-level leadership capacity (Rhodes et al. 2008). As with the literature on sustainable leadership (Fullan 2006; Hargreaves & Fink 2006;), the

evidence shown in the present research confirmed that effective and long-lasting school changes and improvements entail school leaders' constant attention to developing potential leaders and fostering skilled manpower within the school.

7.2.3.1.3 Staff satisfaction with the leadership approaches to pedagogical innovations in ICT integration

Based on the findings from this research, the overall leadership capacity for pedagogical innovations in ICT integration within School A was considered to be relatively strong. To some extent, leadership capacity within School B in this regard appeared to be strong when considering the school's initial success in undertaking pedagogical innovations in ICT integration at the very start. Yet, good practices of ICT integration in School B did not successfully develop and flourish over time. Despite the differences between the two target schools with respect to their sustainability of the ICT-integrated pedagogy, the staff from both schools were generally satisfied with their leadership approaches to managing changes regarding ICT adoption.

The above results can be explained by the findings from the follow-up interviews. According to the interview data, in School A the rationale for the staff high praise for their school leadership lay in their common and strong awareness of their whole-school progression throughout the change process. Hence, rather than feeling complacent with their initial and current good practices of ICT integration, the staff appeared to be active in embracing the opportunities of continuous developments and changes for the better. In School B, some warning signs resided in the leadership approaches to managing pedagogical innovations in ICT integration. Based on the overarching message from these warning signs, the inherent obstacle to sustaining the

initial good practices of ICT adoption was that the staff generally did not feel the urgent need for tackling the deeply-rooted problems with their leadership practices. This is because some staff members appeared to be pleased with their current practices and were less likely to make innovations. In addition, while some were not fully satisfied with their current practices, they may have become used to or learnt to accept the existing and common working patterns in their leadership processes.

The above differences between the two target schools reflected that the staff awareness of the necessity for school change could underpin their determination to pursue changes and improvements in ICT implementation even when challenges occurred. This result supported the studies by Fullan (2001) and Hargreaves (1994). Moreover, the results from School A reinforced the literature on organisational learning (DiBella et al. 1996; Senge 1990), which observes that high-quality organisational learning assists in forming a supportive culture within which individuals are stimulated to become receptive to others' opinions and are inspired to continue making changes for better performance. On this basis, it could be inferred that if school leaders expect pedagogical innovations can be successful and institutionalised in their own school, then they may need to act as the facilitator of constructing their school as a learning organisation.

7.2.3.2 Organisational processes of pedagogical innovations in ICT integration

In the aspect of the staff opinions on the organisational processes of pedagogical innovations in ICT integration, the results of the present research revealed that the general responses from both target schools were positive, to a certain degree. However, further analysis of the findings reflected upon some distinctions between

the two target schools. Key findings relating to the organisational processes of implementing ICT can be categorised as three points:

- Decision-making and goal-setting processes
- Accountability mechanisms
- Teachers' reaction to continuation of pedagogical innovations in ICT integration

7.2.3.2.1 Decision-making and goal-setting processes

According to the findings, the decision-making and goal-setting processes within School A were different from those within School B. In School A, there existed a prevailing culture within which teachers – whether from within the ICT Instructional Team or not – were generally active in getting involved in decision-making and goal-setting. Both formal meetings and informal discussions were featured as open debates and productive discourse. This, in turn, allowed adequate communication and consultation to function as the key approaches to constructing the shared values among the staff and developing a consensus before the key decisions were made. In School B, rarely did teachers take part in the goal-setting and decision-making processes, except those with strong ICT background, such as members of the ICT Instructional Team. Therefore, the key directions and actions for implementing ICT were not set through mutual communication among most members of the staff, but constructed by the formal leaders and the ICT Instructional Team.

The above differences between School A and School B with respect to the goal-setting and decision-making processes can be explained by considering the two target schools' different working patterns in the leadership processes (presented previously in section 7.2.3.1.1). In addition, many studies concerning school-wide changes in ICT adoption have subscribed to the same views, identifying developing

the common values and mutual trust among the staff through participatory communication as the requirement for effective and long-lasting pedagogical innovations in ICT integration (Sheppard 2003; Tearle 2003). On this basis, it can be assumed that the two target schools' different processes of decision-making and goal-settings could account for their different levels of capacities for managing long-lasting pedagogical developments regarding ICT adoption.

Furthermore, evidence of this research revealed that the headteacher's and other senior leaders' prompt feedback, together with their timely mediation, in staff discussions throughout the organisational processes of managing school changes was worthy of attention. This is because based on the findings from School A, not only the headteacher, but the director of academic affairs was also highly-responsive to the teachers' demands and the tensions which occurred in staff meetings and discussions. More importantly, it was the appropriate involvement of the headteacher and the director of academic affairs in the organisational processes that facilitated moving wide-ranging debates forward to productive dialogues which assisted in reaffirming the important values and expected targets the school aspired to. On the contrary, in School B, little evidence substantiated the headteacher's and other senior leaders' engagement in staff discussion when needed.

On this basis, the result of the present research indicated that the headteacher is required to have sufficient interpersonal skills in order to act as a skilled mediator in the organisational processes, particularly when school change is under way. Similar findings were reported in the studies by Brown (2002) and Leithwood (2005). Apart from this, the results shown in this research reinforced the conclusions of the work by Kennewell et al. (2000) and Somekh et al. (2007). These authors proposed the same

ideas, maintaining that successful school-wide change of ICT integration into the curriculum calls for the headteacher's continuous support associated with other senior leaders' adequate participation in the implementation process from the outset.

7.2.3.2.2 Monitoring and reward systems

Evidence within the present research reflected upon an observable difference between School A and School B, in terms of their approaches to managing the in-house monitoring and rewards. In order to hold all teachers responsible for their work in the change process, School A set up a clear monitoring and reward system, together with diverse evaluation strategies and consultation channels. In School B, while there existed the monitoring and reward system in the change process of implementing ICT, the monitoring means were simply applied to the teachers from within the ICT Instructional Team. Moreover, not all staff members were kept well informed in respect of the norms and strategies used within the monitoring and reward system throughout the change process.

However, of special note was that there existed a similarity between the two target schools, when it came to the teachers' comments on the link between their motivation for conducting new practices of ICT integration and the accountability mechanisms within their own school. As the findings pointed out, all teachers within the present research accepted appropriate accountability mechanisms as the powerful encouragement and required pressure, both of which could inspire school staff to undertake pedagogical innovations in ICT integration. The results of this research, on the one hand, reinforced the common arguments by Chapman (2003) and Southworth (2004) that a school's accountability mechanisms are strongly correlated with teachers' motives for pursuing pedagogical growth and developments. On the other

hand, the present research echoed the statements by Rhodes and Brundrett (2009) that the headteacher and other senior leaders are required to offer adequate support and necessary pressure for teachers if school practices are expected to continue improving.

7.2.3.2.3 Teachers' reaction to continuation of pedagogical innovations in ICT integration

It was encouraging to point out that in general the teachers from both target schools were found to be supportive to the ideas of teaching with ICT. Moreover, it was the headteacher's endeavour to sharpen teachers' recognition of the value in teaching with that increased most teachers' willingness to experiment with the new practices involving ICT adoption at the very start of the change process. Indeed, it is widely accepted that teachers usually have the initiative to make changes and improvements in their teaching practices when perceiving the benefits of doing so (Day et al. 2001; Fullan 2001; Harris & Chapman 2002). In addition, the results of this research supported Leithwood and Riehl's argument (2003) that the headteacher needs to effectively convey the usefulness and importance of new practices to teachers if school-wide change is to be successful from the beginning.

Nonetheless, the findings also highlighted the apparent divide between the two target schools, in terms of the levels of the teachers' readiness for continuing pedagogical innovations in ICT integration. Importantly, based on the further information within this research, it was not the teachers' perceived value of ICT adoption, but rather their confidence in overcoming potential challenges of teaching with ICT that profoundly affected teachers' determination to continue or discontinue the ICT-integrated pedagogy. The result can be explained by considering the assumption provided by

Ajzen's Theory of Planned Behaviour (1985). As the Theory of Planned Behaviour asserts, when a change/an innovation takes place in an organisation, individuals' confidence in dealing with the barriers to their expected behaviour is highly likely to explain or predict their intentions to accept or turn away this change/innovation.

7.2.3.3 ICT resources and teachers' professional development

Based on the evidence within the present research, in general the teachers from the two target schools, on the one hand, felt satisfied with their own school's provision of ICT resources and professional development. On the other hand, they agreed that sufficiency in the in-house ICT resources and adequate opportunities of professional development had a positive influence on school-wide change in ICT adoption. Despite this, further examinations of the findings reflected that compared with the access to ICT resources and ICT-related training (professional development in a formal manner), the other two specific factors were even more crucial for affecting the continuity of new teaching practices of ICT integration. The two factors were teachers' perceived compatibility of the ICT-integrated pedagogy and learning cultures within teachers' workplace. The key findings pertaining to these factors are presented as follows:

- Impact of teachers' perceived compatibility of the ICT-integrated pedagogy
- Impact of learning cultures within school settings

7.2.3.3.1 Impact of teachers' perceived compatibility of the ICT-integrated pedagogy

Nearly all teachers (94% in School A and 95% in School B) within the present research considered ICT resources and ICT-related training to be the essential base for their initial success in school-wide pedagogical innovations regarding ICT adoption.

However, the common findings from both target schools also revealed that even with ready access to ICT resources and ICT-related training without knowledge of the compatibility of the ICT-integrated pedagogy, teachers were unable to have strong motive for continuing the new practices of ICT integration.

On this basis, it can be inferred that adequate ICT resources and suitable ICT-related training sessions are the important requirements for effective school-wide change of ICT adoption, particularly at the initial stage of the change process. Nonetheless, in order to make long-lasting pedagogical developments regarding ICT implementation, it is necessary to enable teachers to perceive the compatibility of the ICT-integrated pedagogy with the existing teaching practices. The result demonstrated here did not fully support the findings provided by Chen (2004) and Chiang (2005), who examined the barriers to integrating ICT into the curriculum in primary schools in Taiwan. In the studies by Chen and Chiang, the inconvenient access to ICT resources was identified as the foremost factor which discouraged teachers from undertaking new practices of ICT integration. In addition, Chiang found that inappropriate ICT-related training for teachers was another key obstacle to the success in school-wide changes in ICT adoption.

However, the result of this research echoed the other Taiwanese study by Wu (2004), who verified that as long as teachers were content with their access to the requisite ICT resources and ICT-related training, teachers' perceived compatibility of the ICT-integrated pedagogy became the overriding determinant of their persistence of ICT adoption in classes. Similar results were reported in more recent studies by Owston (2007), who examined the facilitative elements making schools sustain ICT implementation in different countries.

7.2.3.3.2 Impact of learning cultures within school settings

Evidence gathered within this research revealed that the teachers from both target schools perceived that the formal ICT-related training was instrumental and necessary for teachers to enhance pedagogical skills in dealing with new practices of ICT integration. Notably, however, the teachers from the two target schools also agreed that in comparison with the formal ICT-related training, whether the school fostered a prevailing learning culture had a more extended impact on the school's long-term pedagogical developments regarding ICT application. In a sense, it can be inferred that a school should not merely invest in teachers' professional development on a formalised basis if pedagogical innovations in ICT integration are to be successful and endurable. This is because not only formal training, but also informal learning with colleagues can be equally or even more influential to teachers' use of ICT across the curriculum, in terms of long-term pedagogical developments in ICT adoption in the school as a whole.

The findings demonstrated here corresponded to those from the studies of sustaining pedagogical innovations in ICT implementation in school settings (e.g. Sheppard 2003; Tearle 2003). The common findings from these studies were that schools with sufficient capacities for continuing ICT implementation generally foster a strong learning culture; therefore, both formal training and informal learning are accepted by teachers as part of their working routine. More specifically, Owston's international studies further pointed out that in some cases, the effect of informal learning overrode that of formal training courses, in terms of teachers' acceptance of the ICT-integrated pedagogy.

7.2.3.4 External support for pedagogical innovations in ICT integration

With respect to the impact of the three sources of external support (support from the government, support from parents, and benefits from teachers' cross-school learning), the teachers from the two target schools tended to subscribe to the same views that the government's support was much more influential than the other two. Further findings relating to the school's external support for the overall process of pedagogical innovations regarding ICT adoption are presented under two headings:

- Impact of the support from the government
- Impact of parental support and teachers' cross-school learning

7.2.3.4.1 Impact of the support from the government

The findings showed that considering the long-term pedagogical innovations in ICT integration, the teachers from the two target schools seemed to perceive the government's support to be more influential, compared with both parental support and teachers' cross-school learning opportunities. However, two key criticisms on the government's inappropriate support warranted further attention. One criticism was related to the insufficiency of the official funding in the beginning of managing school-wide changes involving ICT adoption. The other criticism was concerned with the unsuitable training for school staff to cope with the ICT-integrated pedagogical innovations.

In the two criticisms, the former reflected upon the government's little attention to the existing divide between rural and urban schools with respect to their financial support. This finding corresponded to the recent studies undertaken in primary schools in Taiwan (e.g. Lam et al. 2002; Tang 2007). The latter criticism revealed an urgent need to organise the specialised training focusing on school leaders' capacities for

managing changes in ICT implementation. The lack of appropriate training for school leaders to enhance their leadership skills in dealing with school-wide pedagogical innovations involving ICT adoption was also reported in other Taiwanese studies concerning ICT implementation across the curriculum (e.g. Hsia 2002; Hsu 2004).

Of special note was that even though some (around 31%) in School A were not fully satisfied with the government's support, all teachers were conscious of the strong and timely support from the formal leaders from the outset. This, in turn, potentially raised teachers' intentions to overcome the unavoidable challenges in the change process of implementing ICT. Nonetheless, in School B, rather than examining the potential problems with their leadership processes, the teaching staff as well as the formal leaders tended to simply accuse the insufficiency in the government's support of discouraging their school from keeping moving ahead in the course of promoting ICT-integrated pedagogy.

According to these findings, there seems to be no doubt that the government's suitable support cannot be over-emphasised if schools are to be successful in undertaking and continuing ICT implementation. However, it is equally important to point out that the government's support can be considered to be necessary, but not sufficient, for the success in managing school-wide changes of ICT adoption. As the present research reflected upon, it is the appropriate support from the formal leaders that potentially inspired the staff to respond positively and effectively to the new teaching practices of ICT integration.

7.2.3.4.2 Impact of parental support and teachers' cross-school learning

The findings from the present research revealed that the external support either from parents or from networking with other schools was essential, but less important than the government's support, in terms of managing the long-term pedagogical developments in ICT adoption. The results resonated with previous Taiwanese studies of pedagogical innovations in ICT integration in urban schools (e.g. Chen 2004; Chiang 2005; Yang 2004). In these studies, the three forms of external support – government's support, parents' support and cross-school collaboration – were cited as the crucial facilitators of the success in pedagogical innovations regarding ICT adoption in schools.

7.3 Contribution of this research

The present research made several contributions to the body of knowledge in the field of school leadership for implementing and continuing pedagogical innovations. The main contribution of this research is that it is the first attempt to have an insight into the overall process of managing school-wide pedagogical innovations in ICT integration in rural areas and to examine the factors which may affect rural schools' sustainability of ICT implementation. Detailed contributions of this research are elaborated as follows:

1. It is likely that the findings from the present research can be applicable to other primary schools, particularly those in rural areas in Taiwan. Because of this, the result of this research could make the Taiwanese government and school leaders begin to understand the strategies for overcoming the potential challenges in embarking on and continuing pedagogical development involving ICT integration in rural schools.

2. This research provides an important starting point in exploring the processes of managing school-wide pedagogical innovations in ICT integration in rural areas in Taiwan. It is clear that many educational studies have been conducted for detecting teachers' acceptance of making pedagogical innovations in ICT application in urban schools in Taiwan (e.g. Chen 2004; Chiang 2005; Hsia 2002; Hsu 2004; Yang 2004). Nonetheless, little empirical work has been undertaken to investigate how rural schools implement ICT-based pedagogical innovations. The present research, although small in scale, is rich in its findings gained from the specific rural schools which were engaged in the same change initiative for pedagogical innovations in ICT integration. In this sense, the present research could provide both the Taiwanese and overseas researchers with an opportunity to understand the overall approach to managing changes in ICT integration in primary schools in Taiwan, particularly those in rural areas. Apart from this, the results of this study may function as a benchmark against which findings from future studies of the leadership approach to implementing ICT in primary schools in other countries are compared.

3. There remains a lack of empirical work which examines the facilitators of and barriers to schools' success in sustaining pedagogical innovations – whether involving ICT integration or not – both in Taiwan and internationally. Even so, the present research makes a start for discussion and conjecture about the reasons why some schools are very successful in implementing and sustaining ICT-based innovations, whilst others less so. Hence, it is highly likely that the between-school differences demonstrated within this research illuminate the underlying reasons for making a school move towards or away from effective and sustainable pedagogical innovations regarding ICT adoption.

4. Through the case study approaches, the present research offers an insight into how leadership is enacted and how contextual factors shape and interact with the leadership approaches to managing changes and improvements in two rural schools. It was evident that there were remarkable differences between the two target schools with respect to the leadership processes of managing pedagogical innovations in ICT integration. That is, in both target schools, not only those with leadership positions, but classroom teachers also had different levels of involvement in leadership activity of dealing with school-wide pedagogical innovations. Given this context, this research could provide the incumbent school leaders and teachers who have desire for further promotion with the opportunity to compare and reflect upon these differences and their correlation with leadership practices and the change efforts within schools. Hence, this study could be of value for the current and future school leaders to consider the alternatives to enhancing their own leadership skills and to developing the collective leadership capacity of their schools.

7.4 Limitations

There are three main limitations of the present study which should be noted and addressed in the future research. These were:

1. The present research is limited in its focus on change management of extending the use of ICT for teaching purposes within two rural schools in Taiwan. The findings from the present study may have implications and offer the base for further research into the Taiwanese rural schools. However, generalisations are almost impossible from the results of this study to other educational settings unless similar characteristics are found.

2. All findings from the present research were based on the opinions of school staff. Yet, according to the findings, gaining extra financial resources from parents at the very start of the change process, though not as influential as the governmental support, still had a positive bearing on school-wide pedagogical innovations in ICT integration, to a certain extent. On this basis, if parents' support is an imperative for school change and improvement in general, then it is equally important to understand parental expectations of successful leadership for managing changes in the domain of ICT integration, in particular. Consequently, for future studies of school leadership for managing and sustaining pedagogical development involving ICT adoption, it can be worth considering not only the opinions from school staff, but also parents' thoughts.

3. Due to the scope of the present research, the findings were gained through a series of intensive visits to two target schools within two months. However, this short-term process of data collection might have restricted the opportunity for detecting the overall approach to building up leadership capacity by comparing the patterns of the leadership approaches in different phases of managing school-wide changes in ICT adoption. This, in turn, may limit the findings of the pathways to increasing leadership capacity of the entire school, since strong leadership capacity for underpinning pedagogical innovations and sustaining good practices takes a long time to develop and nurture (Fullan 2006; Rhodes et al. 2008). Apart from this, technology is continually developing and thus its implementation in school practices can make teachers encounter ongoing pedagogical innovations and challenges as well. On this basis, for future studies, longitudinal research of examining effective leadership approaches to

whole-school pedagogical development involving ICT implementation at different stages of the change process is required.

7.5 Implications

Implications provided in this section are based on the findings from the present research and the available literature which is reviewed and discussed in Chapter 2. The implications are presented under two headings: (1) implications for change management in school settings; (2) implications for application of the Theory of Planned Behaviour (TPB) to school change of ICT integration.

7.5.1 Implications for change management in school settings

It should be noted that the present research did not intend to be a comparative study for examining either differences between pedagogical innovations in general subject areas and those in ICT integration in particular, or differences between rural and urban schools with respect to change management of implementing ICT. In a sense, it is anticipated that the findings from this research do not necessarily translate directly into an urban context and further work is needed. Despite this, however, a number of implications for managing pedagogical innovations – whether in rural or urban schools – may still be drawn from this research by means of scrutinising the research findings and the related studies reviewed in this thesis. The implications offered here are divided into two sections as follows: (1) change management of pedagogical innovations in ICT integration and in general subjects; (2) change management of ICT implementation in rural and urban schools.

7.5.1.1 Change management of pedagogical innovations in ICT integration and in general subjects

1) Leadership dispersal and schools as learning organisations

As with the literature on leadership approaches to managing school change (Chapman 2003; Fullan 2001; Muijs & Harris 2003), the results from this research affirm that singular leadership exerted by the headteacher or any other particular staff member limits a school's capacity for managing pedagogical innovations in ICT integration. Apart from this, based on the lessons learnt from both target schools, it seems that leadership dispersal can exert its powerful and constructive effect on the long-term and school-wide pedagogical innovations in ICT integration when a school functions as a learning organisation in which teachers' collegial interactions are commonplace in their learning and working routine. This result may not be surprising, in that many authors have accepted that productive and endurable pedagogical innovations entail a distributed or shared form of leadership (Fullan 2006; Leithwood & Riehl 2003; Hargreaves & Fink 2006). Moreover, these authors subscribe to the same views that effective leadership distribution needs to rely on adequate and good-quality manpower which is more likely to be promoted in the school engaging more frequently in organisational learning behaviour. Indeed, many studies focusing on pedagogical innovations in ICT integration also verified that schools which successfully manage new practices of ICT integration generally share the common features as follows: leadership is collaborative and distributed and organisational learning is accepted as a natural part of teachers' working practices (e.g. Sheppard 2003; Tearle 2003).

Given the above, there seems little doubt that appropriate distribution of leadership to school staff can be instrumental for implementing pedagogical

innovations – whether in ICT integration or in many other subject areas. Importantly, distributed leadership is likely to have a great impact on a school's sustainability of good practices when formal leaders are able to shape a supportive working condition within which organisational learning and teachers' synergy in leadership activity are embedded in a school's daily routine.

2) The government's support and school-based needs

Based on the findings from the present research, the government's investments in the required instructional facilities and teachers' in-service training were verified as the crucial determinants of successfully commencing and sustaining new practices of ICT adoption in the Taiwanese rural schools. More than this though, the results from this research indicate that whilst the government's investments are perceived to be important and necessary, it is equally important for the government to ensure that its investments can be adaptive to schools' local context and attend to their specific needs throughout the change process. Similar comments were also given in other Taiwanese studies of school changes regarding ICT implementation (e.g. Lam et al. 2002; Tang 2007).

In addition to the evidence from the present research and previous Taiwanese studies, many international studies of school change – whether in ICT integration in particular (e.g. Owston 2007; Venezky & Davis 2002) or in general subjects (e.g. Leithwood 2005) – have made the similar comments that the government's support for educational change is required to cater for school-based needs if good practices are to be sustainable. Therefore, future studies of examining the adequacy of the government's support for promoting pedagogical innovations may start from the understanding of schools' local context and their individualised

demands and challenges in the change process. By doing this, more practical and adaptive strategies may be provided for the government to offer each school suitable support when the new educational initiative is under way.

3) **Parents' support and teachers' cross-school learning opportunities**

Echoing the literature on successful school change in general areas (Leithwood & Riehl 2003; Morrison 2002), the findings from both target schools within this research reveal that parents' support and teachers' cross-school learning opportunities tended to act as a co-requisite for success in implementing pedagogical innovations in ICT integration. Similar findings were reported in previous Taiwanese studies of pedagogical innovations in ICT integration in urban areas (e.g. Chen 2004; Chiang 2005; Yang 2004). Based on the common results from these studies, parents' support and teachers' cross-school learning were verified as the essential external facilitators of successful school change of ICT integration.

In this sense, the present research accepts the ideas that parents' support and teachers' cross-school learning opportunities could serve as the crucial requirements for successful pedagogical innovations whether in ICT integration in particular or in other subjects. That is, school-wide pedagogical innovations may be potentially affected by parents' opinions and teachers' learning opportunities based on school networks. For future studies, researchers may probe into the way of establishing the strong parent-school relations and solid cross-school networks throughout the change process of undertaking new educational initiatives.

Based on all the above, change management of ICT integration seems to share some common features with managing changes in general subject areas. Even so, however, it is evident that ICT has its own unique attributes (e.g. rapid and continuous technological progress), and perhaps this makes implementing new practices involving ICT adoption more challenging than undertaking pedagogical innovations in most other subjects (Fox 2003). Therefore, it can be assumed that the approaches to managing school-wide changes of ICT integration merit particular attention. On this basis, the next section gives the implications for change management of ICT implementation in rural and urban schools.

7.5.1.2 Change management of ICT implementation in rural and urban schools

1) Joint effort of the ICT coordinator and ICT experts from within the teaching staff

As mentioned above, it has become widely accepted that appropriate leadership dispersal is at the heart of successful school change (see section 7.5.1.1). While supporting this view, the present research would also argue that compared with managing changes in other subjects, the processes of pedagogical innovations in ICT integration call for more engagement of school staff from different subject areas.

As evidence from this research reports, the key to successful commencement of ICT SSP in both target schools lies in close collaboration between the ICT Instructional Team (constituted by teachers with ICT capacities and pedagogical expertise in their own subject areas) and the ICT coordinator in planning for and implementing ICT. Previous studies of change management of ICT implementation in school settings also confirmed that working on ICT integration

into classes is a form of whole-school and cross-curricular pedagogical innovation (Fox 2003). It is for this reason that pedagogical innovation in ICT integration is usually regarded as a more demanding task, in comparison with conducting new practices in most other curriculum areas (Fox 2003). Given the above, unsurprisingly, the findings from this research reflect that pedagogical innovations in ICT integration may not simply rely on leadership exercised by the ICT coordinator alone. Rather, whole-school change involving ICT integration entails coordinated action across the staff specialising in different subjects. In other words, the present research reinforces other Taiwanese researchers' common arguments that successful ICT implementation in a school setting calls for not only the ICT coordinator's strong leadership but also the joint efforts from other teaching staff (Chan 2002; Yang 2004). It was also found that by acting as the communicators between the headteacher and teaching staff, the ICT coordinator and the ICT Instructional Team in each target school could affect the way in which other staff members reacted to new practices of ICT adoption. That is, through their influence in the change process, the ICT coordinator and the ICT Instructional Team had the potential to put the school's vision and plan for ICT integration forward, to a certain degree.

Considering the impact of the staff collaboration and involvement on the overall course of ICT integration, attention should be drawn to the strategies for enabling teachers to share the leadership responsibilities with the ICT coordinator in the change process of implementing ICT. Hence, future studies, on the one hand, may examine the common and essential quality of the talented leaders from within the staff, in terms of directing the school to develop ICT. On the other hand, they may further probe a school's in-house mechanisms for developing teaching staff as

teacher pioneers/lead teachers to coordinate their efforts and guide colleagues in the change process of implementing ICT.

2) Training content

Agreeing with the common arguments in the literature on school change in general areas (Fullan 2001), the findings from this research reinforce the importance of teachers' in-service training in the change process of implementing ICT. Apart from this, the present research suggests that when implementing pedagogical innovations in ICT integration, in-service training programmes should put emphasis not only on promoting teachers' ICT capacities, but also on another two areas. One of the areas involves expanding the knowledge base for managing sustainable ICT developments in the school as a whole. The other area is concerned with increasing the required pedagogical capacities for incorporating ICT with the existing teaching materials and curricular plans.

As shown in the findings from both target schools, in-service training for strengthening teachers' ICT skills was perceived to be essential for success in initiating the ICT-integrated pedagogy. Notably, however, the findings further reflected that hands-on procedures for integrating ICT with current teaching practices and specialised strategies for planning for school-wide and long-term ICT developments deserved high priority in the staff training sessions. The findings from the present research could provide responses to studies by Hsia (2002) and Hsu (2004), who raised the main challenges in leadership practices of implementing ICT in the Taiwanese schools. As the same cautions given in Hsia's and Hsu's studies reflected upon, even in the schools which were improving with respect to ICT implementation, the headteacher and other formal leaders were still

somewhat anxious about whether or not their leadership capacities would be adequate to continue steering their school towards ongoing improvements in ICT adoption.

In this sense, the present study would suggest that the content of in-service training in the change process of implementing ICT should be tailored to teachers' current and individualised demands. By doing this, it is more likely that school staff can be well-prepared for adopting the role of change agents when pedagogical innovations in ICT integration are under way. This could also have implications for pedagogical change in other curriculum areas.

3) Highly–responsive leadership approaches in rural schools

It is generally accepted that new educational initiatives which are introduced in school settings are difficult to be successfully implemented, and that successful school changes at the initial stage are even more difficult to be sustained (Fink 2000; Fullan 2006; Hargreaves 2002). This may be particularly true for rural schools which undertake new practices involving ICT adoption, due to the challenging local context as well as the complexity of managing the ICT-integrated pedagogy itself. Despite this, the present research, however, would argue that implementing and sustaining pedagogical innovations in ICT integration in rural areas is not always bleak. Rather, there is still a likelihood that a rural school has capacity for successfully embarking on and continuing good practices of ICT integration if the leadership approaches throughout the change process are able to be highly-responsive and adaptive to the existing challenges which the school encounters.

As shown in the findings from the present research, formal leaders' appropriate and timely reaction to the challenges and demands from within and outside their own school could act as a powerful driver for making teachers respond positively to the new educational initiative of ICT integration. For example, the common features of the two target schools were that the formal leaders led the staff to establish good relationships with parents. This, in turn, allowed both target schools to enjoy the initial success in implementing ICT by gaining the immediate financial support from their own parents' association, while the government's funding was unable to satisfy the school-based needs at the very beginning. However, in previous Taiwanese studies, staff members in urban schools were generally found to be satisfied with the governmental funding for ICT implementation in the change process (e.g. Chen 2004; Chiang 2005; Yang 2004). More recent Taiwanese studies further revealed that compared with urban schools, rural schools tended to gain less support from the government at the outset of managing pedagogical innovations involving ICT adoption (Lam et al. 2002; Tang 2007).

Considering the government's support has been generally accepted as being critical to the success of integrating ICT in school settings (Harris 1999; Lam et al. 2002), the present research would accept that leading the staff in making educational change involving ICT integration in rural schools seemed to be even more challenging than managing this change in urban schools. More than this, though, as with Chapman's work (2003) regarding leadership capacity for school change, the present research would accept that successful leadership approaches – which are more likely to guide a school encountering challenge to effectively manage changes of ICT integration – are required to be highly-responsive to the

local context in which the school is situated. Interestingly, the present study did not reveal that the contextual factors, such as parents' social status and an urban/rural cultural gap, were perceived by the staff as the key to affecting their own school's sustainability of ICT implementation. Instead, it was found that the main challenge was a financial disparity between urban and rural schools at the very start. The findings further implied that the government's little attention to rural schools' specialised demands for immediate and massive investment at the outset of the change process potentially prevented these schools from implementing and continuing pedagogical innovations in ICT integration.

Generalisations may be limited from the findings of the two case-study schools within the present research. Moreover, there is still very little research focusing on the leadership approaches to implementing ICT in the Taiwanese rural areas. Given the above, perhaps it can be worthwhile for future research to apply comparative approaches to examining similarities and differences between rural and urban schools, in terms of their leadership processes of implementing ICT. By doing this, there could be a higher likelihood of understanding whether rural schools entail a particular form of leadership approach to initiating and sustaining good practices of ICT integration.

7.5.2 Implications for application of the Theory of Planned Behaviour (TPB) to school change of ICT integration

Whilst the present research was not designed for testing the Theory of Planned Behaviour developed by Ajzen (1985), some evidence from this research supports the main assumptions of Ajzen's Theory. In this sense, it is expected that this research can probably offer a number of implications for the application of the Theory of Planned

Behaviour in explaining or predicting the reaction of school staff to the new educational initiative involving ICT adoption. The implications offered in this section are divided into two areas. The first area shows the research evidence which verifies the applicability of the Theory of Planned Behaviour to school settings in which the new educational initiative of ICT integration is introduced. The second area gives further consideration to the potential for using Theory of Planned Behaviour to explain teachers' responses to implementing pedagogical innovations in ICT integration.

7.5.2.1 Applicability of the Theory of Planned Behaviour to School Settings

The present research supports the key arguments of Ajzen's Theory of Planned Behaviour, in terms of the powerful effect of three factors – 'attitudes toward the behaviour', 'subjective norm' and 'perceived behavioural control' – on individuals' intention to accept or reject the expected changes/innovations which occur in an organisation. According to the findings from both target schools within this research, the teachers' responses to school change of ICT integration were found to be affected by three key factors as follows:

Factor 1- Individual attitudes toward conducting the ICT-integrated pedagogy (i.e. attitudes toward the behaviour)

One of the common findings from both target schools identified teachers' positive attitudes toward teaching with ICT as an essential prerequisite for successful commencement of the government-mandated pedagogical innovations in ICT integration. These findings may not be surprising, in that previous studies (e.g. Sun 2003; Wu 2004) have verified Ajzen's Theory of Planned Behaviour as a useful framework for examining the

relationships between the Taiwanese teachers' attitudes toward new practices of ICT integration and their decisions to undertake these practices. In this sense, it could be said that Ajzen's concepts of the powerful impact of individuals' attitudes toward the behaviour can assist in explaining or predicting teachers' intentions to implement the expected pedagogical innovations in ICT integration in the Taiwanese educational context.

Factor 2- Individual perceptions of colleagues' opinions on implementing ICT across the curriculum (i.e. subjective norms)

There was some evidence of social interaction in leading to persuasion to participate. This would seem to concur with Ajzen's notion of 'subjective norm'. Approval received by individuals from their peers may be influential in such persuasion not only in a Taiwanese context, but also in other international contexts (e.g. Agarwal & Prasad 1997). Although a Taiwanese cultural influence cannot be exclusively discounted, it is suggested that this potential cultural influence is not highly determinative. In the present study, the effect of subjective norms on individuals' intentions in the change process of implementing ICT was demonstrated by the following evidence.

Based on the results from both target schools, colleagues' general opinions on the tasks of conducting the ICT-integrated pedagogy were found to be influential to teachers' willingness to participate in the leadership activity of implementing ICT across the curriculum. These findings can be interpreted as the fact that to a certain degree, teachers' desires for social

approval from peers and school leaders have a potential impact on teachers' intentions to embark on leadership practice of managing pedagogical innovations in ICT integration.

The findings from the present research resonate with the studies by Chou (2006), who applied Ajzen's Theory of Planned Behaviour to examining the Taiwanese teachers' acceptance of new teaching practices of ICT integration. Based on Chou's findings, teachers' positive responses to the new practices were profoundly affected by their feelings about subjective norms (i.e. social expectations or even social pressures within their workplace). However, despite strong evidence from this research and previous studies which applied Ajzen's Theory of Planned Behaviour, attention should be drawn to a certain degree of rationalisation of individuals' intentions which might have occurred in the intervening period between intentions and interviews. That is, although it was encouraging to point out that use of the Theory of Planned Behaviour has been instrumental for probing findings, future research may seek to reduce the time period between intentions and interviews.

Factor 3- Individual confidence in handling difficulty in teaching with ICT (i.e. perceived behavioural control)

Within this research, the findings from both target schools verified that constructing teachers' positive attitudes toward ICT adoption was essential for successful commencement of pedagogical innovations in ICT integration which was introduced by the government. Notably however, the between-school differences in this research reflected that teachers from

School A had much more confidence in their own abilities to deal with difficulty in using ICT across the curriculum, in comparison with those from School B. Hence, it can be said that positive 'attitudes toward ICT integration' alone (attitudes toward the behaviour) without sufficient 'confidence in handling ICT-related problems in classes' (perceived behaviour control), teachers perhaps are very unlikely to 'persist in the government-mandated initiative regarding ICT integration' (the expected changes/innovations which are not completely based on individuals' willingness). In this sense, supporting Ajzen's arguments in the Theory of Planned Behaviour, this research provides the evidence that in the processes of managing school change of ICT integration, it is highly likely that teachers' perceived behaviour control has the potential for moderating the effect of their attitudes toward the behaviour or even can exert a direct impact on their behaviour when the expected changes/innovations which occur in their workplace are not exactly in accordance with teachers' willingness.

Given the above, supporting the common conclusions drawn from other Taiwanese studies (Chou 2006; Sun 2003; Wu 2004), evidence from this research reinforces the applicability of Ajzen's Theory for exploring the reasons for differences in the degree to which teachers' willingness to undertake school change of ICT integration in the Taiwanese educational context. Therefore, as with the comments by Mathieson (1991), who examined the application of Ajzen's Theory of Planned Behaviour to individuals' technological acceptance in school settings, the present research would suggest that it is effective and justifiable to examine teachers' different degree of ICT acceptance in school practices based on the key concepts proposed in the Theory of Planned

Behaviour. Considering the applicability of Ajzen's Theory of Planned Behaviour to school settings, the next section further discusses some potential for applying Ajzen's Theory to the school context in which pedagogical innovations of ICT integration are introduced.

7.5.2.2 Potential for using the Theory of Planned Behaviour to examine school change of ICT integration

1) Determinants of individuals' attitudes toward the behaviour

According to the Theory of Planned Behaviour, individuals' attitudes toward the behaviour in the change process could be affected by a set of 'behavioural beliefs' (i.e. original perceptions of the expected changes/innovations). Agreeing with the potential influence of individuals' original perceptions on their attitudes, the findings from this research further indicate that there may be a specific perception which is more likely to be at the core in determining individuals' attitudes toward conducting the ICT-related changes/innovations. This indication can be seen in the research evidence as follows:

Based on the findings from both target schools within the present study, when examining the potential determinants of teachers' attitudes toward undertaking school change of ICT integration, the effect of teachers' 'perceived compatibility' of the ICT-integrated pedagogy overrode the effect of their 'perceived easiness' of using ICT for teaching purposes. Moreover, these findings are consistent with the conclusions drawn from other Taiwanese studies which applied Ajzen's Theory of Planned Behaviour to exploring teachers' acceptance of school change of ICT integration (e.g. Sun 2003; Wu 2004). Considering the important role of individuals' attitudes in deciding the expected behaviour, future research using

Ajzen's Theory may further scrutinise the crucial determinants behind teachers' attitudes toward school change of implementing ICT. This could enhance the applicability of the Theory of Planned Behaviour to school settings in which the ICT-related educational change is under way.

2) Impact of perceived behavioural control

In the Theory of Planned Behaviour, Ajzen emphasises that in comparison with the other two factors (i.e. 'attitudes toward the behaviour' and 'subjective norms'), 'perceived behavioural control' may have more powerful and direct impact on the expected behaviour when individuals feel satisfied with the requisite resources used for managing the given changes in an organisation. Apart from agreeing with the critical role of perceived behavioural control in determining individuals' behaviour, the present research would suggest that for future studies, the questions of how perceived behavioural control attenuates the effect of the other two factors throughout the change process of implementing ICT may warrant further exploration. This is because evidence from this research offered an indication that teachers' perceived behavioural control was likely to have greater influence than their general attitudes toward ICT adoption. Consequently, teachers' self-confidence in teaching with ICT took the key role in allowing them to continue good practices of ICT integration. However, within this research, there was no adequate proof which directly verified that teachers' perceived behavioural control was more influential than their perceptions of subjective norms in the overall course of managing changes of ICT integration.

In the light of the potential contribution of individuals' perceived behavioural control to the expected behaviour in the change process, the correlation between perceived behavioural control and the other two factors (i.e. attitudes toward the

behaviour and subjective norms) may merit more attention in future work. Therefore, for further studies, researchers may examine in which circumstances and the way in which perceived behavioural control can directly exert its positive and potential effect on the expected behaviour which assists in implementing institutional change. This could be helpful for increasing teachers' motivation and determination to embark on and persisting in good practices of ICT integration even when the inevitable challenge and setbacks emerge in the change process.

7.6 Recommendations

Recommendations presented in this section are based on the findings from the present study and the implementations offered within this thesis. The recommendations are divided into three categories: recommendations for the Taiwanese government, recommendations for school leaders, and recommendations for further research.

7.6.1 Recommendations for the Taiwanese government

1) Offering support by considering school-based needs

Although it was encouraging to find that the two target schools appreciated the government's funding for their in-house ICT infrastructure, evidence from the present research also reflected that both target schools were short of financial support from the government at the very start of implementing the ICT initiative. Due to the lack of sufficient and timely aids from the government, the two target schools turned to their own parents' association for assistance. Even so, the support from the parents' association was considered to be not sufficient for the two target schools to pursue long-term developments in ICT. As discussed above, rural schools may confront more challenges than urban schools, particularly when educational change involving ICT implementation is taking place (see section 7.5.1). That is, differences are likely to

exist, in terms of potential difficulties which rural and urban schools could face throughout the change process of managing the same educational initiative. In this sense, if the government wishes to narrow the existing digital gap between schools in rural and urban areas, then there is a need to provide support by considering the local setting in which schools are situated. A thorough understanding and close examination of the challenge and demands within and beyond the school context could be helpful for the government to offer the support which caters for a school's specialised needs.

2) In-service training for enhancing school leaders' skills in change management is in need

The findings from this research reflected that the school staff were generally trained well in the aspect of ICT skills and knowledge. Even so, the common but negative opinions held by the staff members, particularly the incumbent school leaders, on the government-funded training can be taken as the fact that in-service training for improving the existing knowledge base of school leadership for managing pedagogical innovations is in great demand. On this basis, if the government expects to achieve system-wide and long-lasting developments in current teaching practices, then there may be a need to set up the training programmes which focus on promoting the incumbent and future leaders' expertise and skills in dealing with whole-school pedagogical innovations.

7.6.2 Recommendations for school leaders

1) Development of potential leaders function as the key base for distributed leadership

Distributed or shared leadership could be instrumental for managing and sustaining school changes and development. Appropriate leadership dispersal, however, it entails broad-based leadership capacity and long-term development of potential leaders from within the staff. That is, school leaders may take the initiative not only in appointing the talented staff as lead teachers from the beginning, but also continuing nurturing potential leaders for the long-term school changes and improvements. Through strategic and systemic development of talented leaders, a school could increase its capacity for moving its initial success in pedagogical innovations forward to durable developments and continuous progress.

2) Highly-responsive leadership approach to managing school changes

Successful leadership for sustaining educational change calls for school leaders' highly adjustable leadership approaches to dealing with the challenges within and beyond their own school. That is, school leaders should be sensitive to others' individualised demands and highly responsive to the context in which their school is situated. The findings from School A within this research reflected that the school was short of resources in the beginning of the change process. However, it was the timely support offered by the formal leaders (e.g. the headteacher and the director of academic affairs) that enabled the entire staff to have the strong determination to overcome the inevitable difficulties in the change process and to make the school continue improving as it did. In other words, the strong lead provided by the formal leaders from the very beginning is necessary but not sufficient conditions of successful school changes involving ICT implementation. Providing suitable support

for satisfying teachers' different needs throughout the change process is particularly essential for inspiring teachers to devote themselves to school-wide and endurable pedagogical innovations in ICT integration.

7.6.3 Recommendations for further research

1) Parents' engagement in the processes of managing school-wide change is worthy of further examination

As discussed above, securing support from parents, though not as crucial as the government's support, was still verified to have a positive impact in the change processes of implementing ICT in the two target schools. Considering the important role of parents in the change process, future research may examine parents' thoughts of effective leadership for school-wide changes in ICT implementation. In addition, more empirical work may be conducted to explore the way in which school leaders engage parents in the change process of educational change.

2) The way in which and what extent to which school networks can actively promote schools' sustainability of pedagogical innovations warrant further exploration

The findings demonstrated in this research confirmed the positive effect of teachers' cross-school learning and collaboration on managing changes of ICT implementation, even though this effect was verified to be less predominant than the government's support. That is, there is a certain impact of networking with other schools on increasing teachers' ability to cope with pedagogical innovations in ICT integration. Considering this, it is suggested that the next steps would entail a further exploration of how networked learning communities across schools can effectively exert a

profound impact on an individual school's capacity for long-lasting pedagogical developments in ICT implementation.

3) More empirical work of testing and confirming the applicability of the Theory of Planned Behaviour to the school context is required

The present research illuminates the potential of the intention-based theory – Ajzen's Theory of Planned Behaviour – for explaining teachers' acceptance of or resistance to school-wide changes regarding ICT adoption (see section 7.5.2). While generalisations are relatively limited from the results of two case-study schools, it is widely accepted that individuals' intention to accept or refuse new practices can usually determine whether or not school-wide change is to be effective (e.g. Fullan 2001; Harris & Lambert 2003). Hence, more empirical work may be required to further examine and confirm the fitness of the Theory of Planned Behaviour to explain individuals' reaction to new practices of ICT adoption in the school context. Moreover, perhaps it can be worthwhile for future studies involving school change of ICT implementation to combine the main ideas from the change literature in the educational field with the key assumptions of the Theory of Planned Behaviour in the research design. In this way, there could be a higher likelihood of diagnosing the facilitators of and barriers to teachers' uptake the ICT-integrated pedagogy, and this may be useful for generating the strategies for overcoming teachers' resistance to new practices involving ICT implementation.

Importantly, despite strong evidence from the present research and other studies which used Ajzen's Theory of Planned Behaviour (e.g. Agarwal & Prasad 1997; Chou 2006), caution needs to be exercised given the intervening period between intentions and interviews. In other words, some degree of rationalisation of individuals'

intentions could have taken place. Application of the Theory of Planned Behaviour has been helpful in probing findings and further studies may seek to reduce the time period between intentions and interviews.

4) Further work may expand the time scale of interviews and include researchers' active involvement in the context under study

In the present research, spending time in having conversations with the staff and getting involved in their school events, on the one hand, served as important and useful strategies for establishing the relationships with the staff before the interviews were undertaken. On the other hand, they were particularly instrumental for me to have an initial understanding of the staff members' individual attitudes towards new practices, working patterns and subjective norms within their own school. This research process reinforced Robson's assertion (2002) that researchers' engagement in (or interaction with) the context which they investigate can be potentially helpful to detect research participants' individual and collective values and thoughts. In addition, in the processes of conducting the present research, sufficient explanation of the key issues was achieved and every opportunity was given for interviewees to discuss the issues fully and add any additional points they thought to be relevance.

Whilst all the above procedures have been useful in gaining access to the information on the staff members' attitudes and subjective norms in their workplace, the short time scale of the interviews (varying from 30 to 40 minutes) within the present research might have limited the depth of the interview data, to some degree. Considering this limitation as well as the strengths of researchers' participation in the research context, future work may be required to expand the time scale of interviews in the research process.

5) Longitudinal research into leadership for effectively managing pedagogical innovations in ICT integration in rural schools is needed

As stated above, in Taiwan, the studies concerning pedagogical transformation and developments usually put the emphasis very much on leadership approaches in urban schools, rather than schools in rural areas. However, the literature on educational leadership stresses that leadership practices are interacted with, or even shaped by, the context in which they are exercised (e.g. Leithwood et al. 1999; Rhodes et al. 2008; Southworth 2004). Even within the same school, the forms of leadership approach are usually different at different stages in the change process (Fink 2000; Harris & Chapman 2002). In addition, more recent studies undertaken in the Taiwanese educational context shed the light on the divide between rural and urban schools in terms of external resources (see Lam et al. 2002; Tang 2007). This divide, in turn, is highly likely to result in the gap between rural and urban schools with respect to their capacities for undertaking educational change, particularly when changes are involved with ICT adoption. Given this challenging context within and beyond rural schools – as well as considering the important role of school leadership in the change process – it can be of value to apply the in-depth and longitudinal approaches to further exploring the way in which leaders in a rural school steer the entire staff toward the desired and durable pedagogical innovations in ICT adoption.

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Appendix 1
Questionnaire
(English version)

May/2007

Dear teachers,

The aim of this questionnaire is to understand the change process of making pedagogical innovations in ICT integration in the school. All your answers will be kept confidential and only for academic research. Your response is very important. Please answer the following questions carefully by ticking the appropriate boxes. Thank you very much.

Supervisor: Dr. Christopher P. Rhodes
Postgraduate student: Yih-Shyuan Chen
School of Education
University of Birmingham, UK

Please add a tick in the appropriate box.

1. Including the current year as one full year, how long have you been teaching in this school? _____
2. What is your current job/role title: _____
3. Including the current year as one full year, how long have you been in your current job/role? _____
4. Which year groups are you teaching in this current school year? <u>If applicable please mark more than one box.</u>

   ☐ year 1 ☐ year 2 ☐ year 3 ☐ year 4 ☐ year 5 ☐ year 6
5. Which subjects are you teaching during this school year? <u>If applicable please mark more than one box.</u>

   ☐ Chinese ☐ Maths ☐ Science ☐ History & Society ☐ Health & Physical Education (PE)

   ☐ Others (Which subjects? _____)
6. Are you a member of the ICT Instructional Team?

   ☐ Yes ☐ No
7. Do you have any experience of integrating ICT into teaching?

   ☐ Yes (Which subjects? _____) ☐ No

Please mark one box for each statement. How far do you agree with the following statements?

1. Leadership for managing pedagogical innovations in ICT integration in **this school**:	Very strongly agree	Strongly agree	Agree	Disagree	Strongly disagree	Very strongly disagree
1.1 I am satisfied with the overall approach to school leadership for pedagogical innovations in ICT integration	☐	☐	☐	☐	☐	☐
1.2 There is coordinated action across the staff at all levels in the leadership processes of pedagogical innovations in ICT integration	☐	☐	☐	☐	☐	☐
1.3 There is a good approach to developing teachers' leadership potential for managing school changes and improvements in ICT integration	☐	☐	☐	☐	☐	☐
2. Organisational processes of managing pedagogical innovations in ICT integration in **this school**:	Very strongly agree	Strongly agree	Agree	Disagree	Strongly disagree	Very strongly disagree
2.1 There is a clear vision for integrating ICT into the curriculum	☐	☐	☐	☐	☐	☐
2.2 There is joint planning among the staff at all levels	☐	☐	☐	☐	☐	☐
2.3 There is adequate consultation with teachers on key decisions of dealing with ICT integration	☐	☐	☐	☐	☐	☐
2.4 There is a suitable approach to holding teachers accountable for their work	☐	☐	☐	☐	☐	☐
2.5 I am clear about my role and responsibility	☐	☐	☐	☐	☐	☐
2.6 I believe that ICT integration enhances students' learning outcomes	☐	☐	☐	☐	☐	☐
2.7 I believe that ICT integration reduces teachers' workload	☐	☐	☐	☐	☐	☐
2.8 I support the idea of ICT integration	☐	☐	☐	☐	☐	☐
2.9 I am ready for ongoing pedagogical innovations in ICT integration	☐	☐	☐	☐	☐	☐
3. ICT resources and **teachers' professional development** in **this school**:	Very strongly agree	Strongly agree	Agree	Disagree	Strongly disagree	Very strongly disagree
3.1 ICT **hardware** (i.e. computers, digital projectors and other technological instruments for teaching purposes) meets my needs	☐	☐	☐	☐	☐	☐
3.2 ICT **software** (i.e. online teaching and learning materials and the ICT-integrated instructional modes) meets my needs	☐	☐	☐	☐	☐	☐
3.3 Technical support meets my needs	☐	☐	☐	☐	☐	☐
3.4 I use ICT appropriately to support teaching and learning	☐	☐	☐	☐	☐	☐
3.5 I have been trained in all aspects of ICT necessary for my teaching	☐	☐	☐	☐	☐	☐
3.6 Good practices of teaching with ICT are shared widely across the school	☐	☐	☐	☐	☐	☐
3.7 Teachers are stimulated to reflect upon the value of ICT integration	☐	☐	☐	☐	☐	☐
4. External support for **this school**:	Very strongly agree	Strongly agree	Agree	Disagree	Strongly disagree	Very strongly disagree
4.1 Cross-school ICT-related workshops and training enhance my abilities to deal with pedagogical innovations in ICT integration	☐	☐	☐	☐	☐	☐
4.2 Parents' support is crucial to pedagogical innovations in ICT integration in our school	☐	☐	☐	☐	☐	☐
4.3 The government offers suitable support for pedagogical innovations in ICT integration in our school	☐	☐	☐	☐	☐	☐

Many thanks for taking time to complete the questionnaire.

Appendix 2
Questionnaire
(Standard Chinese version)

敬愛的教育先進：
您好！感謝您撥空填寫這份問卷，此問卷的目的在於瞭解貴校執行資訊融入教學創新的改革狀況與相關影響，您的回答內容絕對保密且僅用於學術研究，敬請安心填寫，由於您提供的寶貴資料是此研究的重要依據，請仔細閱讀題目後在適當的□中打「∨」。

敬祝　教安

英國伯明罕大學教育學院研究所
指導教授: Dr. Christopher P. Rhodes
研究生：　陳奕璇　敬上
中華民國九十六年五月

請在下列各題勾選或填寫最合適的答案:

1. 您在**本校**的任教年資（請將今年視爲一整年）：共_____年
2. 您**目前**的工作職稱：_____
3. 您在本校擔任**目前**職位的年資（請將今年視爲一整年）：共_____年
4. 您目前在本校的教學對象爲何？（**可複選**）

   □ 一年級　□ 二年級　□ 三年級　□ 四年級　□ 五年級　□ 六年級
5. 您目前在本校的任教課程爲何？（**可複選**）

   □ 國語　□ 英語　□ 數學　□ 自然與生活科技　□ 社會　□ 藝術與人文

   □ 健康與體育　□ 綜合活動　□ 其他（請寫下課程名稱：_____）
6. 您是否曾爲資訊種子教師？ □ 是　□ 否
7. 您是否有將資訊融入課程的教學經驗？ □ 是（融入於哪些課程？_____）　□ 否

請在下列各題的答案欄中勾選一個您最滿意的答案:

1. **本校**在推動資訊融入教學創新時的**領導**過程：	非常同意	相當同意	同意	不同意	相當不同意	非常不同意
1.1 我滿意本校推動資訊融入教學創新時的整體領導方式	□	□	□	□	□	□
1.2 本校在推動資訊融入教學創新時的領導過程，各階層成員會協同合作	□	□	□	□	□	□
1.3 本校有良好的途徑來發展教師的領導潛能以進行校內在資訊融入方面的改革與進步	□	□	□	□	□	□
2. **本校**在推動資訊融入教學創新時的**組織運作歷程**：	非常同意	相當同意	同意	不同意	相當不同意	非常不同意
2.1 本校有明確的願景以推動資訊融入的教學創新	□	□	□	□	□	□
2.2 本校各階層成員間會彼此合作計畫以推動資訊融入的教學創新	□	□	□	□	□	□
2.3 本校在為資訊融入的教學創新進行重要決策時，會和教師作充分的諮詢	□	□	□	□	□	□
2.4 本校運用適切的途徑來掌握教師在推動資訊融入教學創新時的職責	□	□	□	□	□	□
2.5 我清楚我的角色與職責	□	□	□	□	□	□
2.6 我相信資訊融入教學可提升學生的學習成效	□	□	□	□	□	□
2.7 我相信資訊融入教學能減輕老師的工作負擔	□	□	□	□	□	□
2.8 我支持資訊融入教學的理念	□	□	□	□	□	□
2.9 我準備好要繼續從事資訊融入方面的教學創新	□	□	□	□	□	□
3. **本校**的**設備資源**與**教師專業發展**：	非常同意	相當同意	同意	不同意	相當不同意	非常不同意
3.1 校內的資訊硬體設備符合我的需求	□	□	□	□	□	□
3.2 校內的資訊軟體設備符合我的需求	□	□	□	□	□	□
3.3 校內的資訊相關的技術支援符合我的需求	□	□	□	□	□	□
3.4 我能適切地運用資訊設備來支援我的教學	□	□	□	□	□	□
3.5 我參與過教學所需的一切資訊技能訓練	□	□	□	□	□	□
3.6 教師彼此會廣泛分享良好的資訊融入教學範例	□	□	□	□	□	□
3.7 本校會鼓勵教師反思資訊融入教學的價值性	□	□	□	□	□	□
4. **本校**的**校外資源**：	非常同意	相當同意	同意	不同意	相當不同意	非常不同意
4.1 跨校性的資訊相關專題研討會與訓練能提升我在進行資訊融入教學創新方面的能力	□	□	□	□	□	□
4.2 家長的支持對本校進行資訊融入的教學創新有決定性影響	□	□	□	□	□	□
4.3 政府提供本校適切的支持以推動資訊融入的教學創新	□	□	□	□	□	□

～非常感謝您的協助　此問卷到此結束～

Appendix 3
Interview format
(English version)

1. How does/did your school manage pedagogical innovations in ICT integration, such as the ICT SSP?
2. What role do you take in the overall process of managing pedagogical innovations in ICT integration? (question asked the headteacher, only)
3. How do you feel about your school's leadership processes of managing changes of ICT Implementation?
4. Does your school have any plan for developing potential teachers as the future leaders for managing pedagogical innovations in ICT integration?
5. How does your school make key decisions and set the school's goal for achieving pedagogical innovations in ICT integration?
6. Does your school have any accountability measure for holding teachers responsible for their own work of pedagogical innovations regarding ICT adoption?
7. Do you think that ICT resources in your school are adequate?
8. Would you please you talk about your opinions on the ICT training or workshops held in your school?
9. Does your school possess a culture which is supportive for staff collaboration in working and learning in an informal manner?
10. To what extent do the three sources of external support – the governmental support, parental support and cross-school learning – affect pedagogical innovations in ICT integration in your school?

Appendix 4
Interview format
(Standard Chinese version)

1. 學校方面如何推行資訊融入的教學革新(例如資訊種子計劃)？
2. 當學校在推動資訊融入的教學革新時，您扮演什麼角色？(只訪談校長)
3. 您滿意學校在推動資訊融入教學的領導過程嗎？
4. 學校在資訊融入教學革新這方面，有培育教師領導力的相關計畫嗎？
5. 學校在推動資訊融入教學過程時，如何訂定重大決策與目標？
6. 學校對於教師在進行資訊融入教學革新時，透過什麼策略來確認教師的職責歸屬？
7. 您覺得校內的資訊資源充裕嗎？
8. 您對於教師資訊能力方面的專業發展訓練或研習的看法如何？
9. 您覺得校內擁有支持教師進行非正式的合作學習與工作的組織氣候？
10. 您覺得政府資源、家長資源與跨校學習三種校外資源，對於學校在推動資訊融入教學革新方面的影響分別爲何？

Appendix 5
Example of Interview Transcripts

The interview with the headteacher in School A
Date of the interview: 12th June 2007
Place of the interview: headteacher's office
(The headteacher had been in post in School A for 6 years at the time of this research)

Researcher (R): How does your school manage pedagogical innovations in ICT integration, such as the ICT SSP?

Headteacher (H): It is because we have excellent teachers that our school can effectively undertake the change initiative of pedagogical innovations in ICT integration. What I mean is that we have a collaborative culture so that teachers they help each other, and that they work closely when we are running the change initiative of implementing ICT.

To be honest with you, the credit for our achievements in ICT integration in our school should not go to my own or any individual's lead, but to the coordinated action across all members of our staff. Just like what I said, there is a collaborative and healthy working culture among our school staff. Hence, most teachers they were positive about trying out new teaching practice of ICT implementation when the ICT SSP was introduced in our school. Indeed, everyone was so supportive at that time.

Therefore, I deeply feel that without the continuous and joint efforts of the director of academic affairs, the ICT coordinator and other teachers in carrying out school-wide pedagogical innovations, it would have been almost impossible to allow our school to have today's outcomes as you see now.

R: What role do you take in the overall process of managing pedagogical innovations in ICT integration?

H: I have never been the only one champion of educational change, since I came to this school. As you may know, we have excellent school staff, such as our ICT coordinator and the director of academic affairs, in particular. Our ICT coordinator is a very enthusiastic teacher and leader as well. He has very strong motives for ICT development. Just like the ICT coordinator, the director he is a highly professional in computer technology and passionate for school improvements.

Also, importantly, they both consider teachers' feelings and treat others' ideas with respect. Therefore, other staff members are willing to work with both of them in pursuing better schooling for our children. Even in the very beginning of running the ICT SSP, it was entirely natural for teachers with interests in new teaching practices to form the ICT Instructional Team and promote whole-school ICT implementation.

What I always do is to encourage teachers and supply resources for meeting their needs. I do trust teachers as professionals, and empower them with freedom in making decisions which may affect the school as a whole. Of course, with my limited knowledge in new technologies, I may not be able to be fully involved in the detailed steps of managing ICT development. Yet, I still attend staff meetings all the time, and this enables me to comprehend and to give immediate response to teachers' thoughts and decisions of the approaches to ICT implementation. In addition, whenever the ICT Instructional Team needs me to communicate with the government, our parents' association and the local community, I'm quite pleased with acting as a negotiator.

R: How do you feel about your school's leadership processes of managing change of ICT Implementation?

H: I am very proud of our staff. Our teachers are very helpful and open to new ideas. It doesn't matter if these new practices are involved with ICT or not. Most teachers here are very receptive to new things. I have never felt that I am managing the ICT initiative by myself. I do not think that our present status of ICT development is strongly related to my leadership alone. This is because I have never been predominant in directly leading the all staff members in ICT development.

R: Does your school have any plan for developing potential teachers as the future leaders for managing pedagogical innovations in ICT integration?

H: We do not have any specific plan for managing this. However, I know that we need someone with sufficient passion and capacity for being the ICT coordinator to develop our school's ICT. That is why I appointed Mr. Chang as our ICT coordinator. After we successfully transformed our school into the ICT Seed School, the director of academic affairs, the ICT coordinator and I we were thinking about the way of making this innovation sustainable. Then, we came up with the ideas to encourage our classroom teachers to join leadership practice of implementing ICT. It is my belief that all our staff have the potential for being leaders in their specialised field if they've got the appropriate opportunities for providing leadership. I trust our teachers as professionals. I expect that they can do their best

to pool their efforts and show their leadership abilities. Hence, if they can propose their ideas and action plans for improving our schooling, I feel that it's my duty to give them 100 percent support. I mean that I work toward the best of my ability to set a supportive environment within which they can feel free to live up to their ideas and exercise leadership practices.

R: How does your school make key decisions and set the school's goal for achieving pedagogical innovations in ICT integration?

H: I'm happy to see our staff working together in tossing around their ideas and giving their voice, particularly when we were in the beginning of managing school-wide change regarding ICT integration. However, before the issues are brought to the discussion, the other formal leaders, the ICT Instructional Team and I achieve the initial consensus. Also, we enable all our staff to know the key direction and the boundaries of what our school can or cannot do. I think that setting basic boundaries is very important, in that it at least helps teachers to remind themselves of respecting each other when they are making very strong arguments. I think that our staff have been used to getting together in discussing key issues. I can tell that our staff do enjoy the freedom of making decisions for our school, and I am sure that they also understand that such freedom comes inside certain boundaries of what's expected in here.

R: Does your school have any accountability measure for holding teachers responsible for their own work of pedagogical innovations regarding ICT adoption?

H: Yes, we set the reward system for inspiring teachers to take the leadership role, and it work well throughout the change process. Now, many teachers feel interests in assuming leadership tasks. Also, we measure teachers' performance against the responsibilities they are undertaking. We use different standards to measure teachers who hold different jobs in the processes of implementing ICT.

R: Do you think that ICT resources in your school are adequate?

H: I think that ICT resources in our school can meet our teachers' demand, in that they have convenient access to all ICT facilities for teaching purposes. In addition, all teachers in our school has sufficient ICT capacities, they seldom meet difficulties in teaching with ICT. However, if they do have some problems with ICT, we provide them with many choices to solve their problems. For example, we arrange at least one ICT expert in each year group. This allows our teachers to get the prompt help if the ICT coordinator and the ICT Instructional Team are too busy to help them at the moment. Also, if the in-house assistance cannot appropriately solve our teachers' problems, then we will contact the technicians from

the Bureau of Education. So, teachers in our school they are generally quite happy with what we offer them. Of course, even so, the ICT coordinator and the director of academic affairs and I always keep an eye on teachers' feedback and suggestions on our in-house ICT resources. It is obvious that ICT resources are the base for implementing ICT. Therefore, if we fail to satisfy teachers' needs, then it is impossible to expect them to make good use of ICT in classes.

R: Would you please you talk about the ICT training or workshops held in your school?

H: Basically, we have two main types of regular training courses. One was part of the 'staff Wednesday training', aiming at developing teachers' ICT skills and showing the usage of the specific instructional technologies which would be set in the school in the near future. Staff Wednesday training courses are funded by the government. In the beginning of running the ICT SSP, I asked the teachers to attend the training on Wednesday. Now I do not ask them to do so. However, teachers are still keen on attending these training courses in our school. In addition to the training on Wednesday, the other professional development for teachers' ICT skills in our school is not that formalised. It is much more related to informal learning, and we name it 'ICT development group'. The training offered within the ICT development group is the advanced and informal professional learning for ICT skills, and teachers are free to join. Of course, teachers do not need to join if they have no interests in the advanced skills.

R: Does your school have a culture which is supportive for staff collaboration in working and learning in an informal manner?

H: Yes, of course. For example, the work you see coming out of our school is not the result of some structured committee who took a task and went away with it. Quite often, our teachers' best work comes from our colleagues out in the staff room who are relaxing at the end of the day, tossing around ideas. That is, to be honest with you, where our best work comes from as opposed to formal-committee-type operations. I think because we have this culture so that we do not need to ask teachers to learn and work together and they have been used to learning and working together. I'm really proud of our teachers' creativity and openness to new things. I'm pleased that our teachers enjoy the freedom and feel secure about trying out their ideas without limit. Therefore, it is not because of my individual effort, but because of our teachers' high commitment and self-expectation that enable our school to succeed in managing changes in ICT application and to continue developing ICT-integrated curricula.

R: To what extent do the three sources of external support – the governmental support, parental support and cross-school learning – affect pedagogical innovations in ICT integration

in your school?

H: I think that the governmental support is the most important among these three sources of support. I am not saying that the other tow sources of external support are not important. Rather, cross-school learning is quite useful and beneficial for our teachers to improve their pedagogical skills in ICT adoption, I think. Yet, we still need to rely on the government's funding for continuing managing cross-school training sessions and workshops. I mean that for our school's external support for implementing ICT, the government's support is the essential base.

Also, the support from parents is quite important, especially when we were at the start of the change process of implementing ICT. This is because the financial aid from the government 'did not come in time' when we started the ICT SSP. I really appreciate our parents' association for their extra funding for allowing our school to increase the ICT infrastructure in the beginning of running the ICT SSP, even though the financial resources secured from parents were still somewhat limited then.

It was a few months later when the ICT SSP was underway, our school gained the government's funding. Because of the regular funding from the government, we are able to keep upgrading our ICT facilities and managing the formally scheduled training courses for enhancing teachers' skills in ICT adoption.

Of course, I know that the government has made some improvements in modifying the training courses for us. I also appreciate that the government for giving us the chance to make change and improvements in ICT implementation. However, I would argue that there is still much room for the government to improve, such as the government-run training courses for the staff. As you may know, nearly all staff members in our school now are fluent ICT users and they generally feel comfortable teaching with ICT. So, not only us [the formal leaders for the ICT Instructional Team), but also some of our teachers they really want to gain much more expertise about change management and leadership skills. If the government can do much more in this regard, teachers can gain more abilities and may have more interests in getting involved in the change and development process. I think this will bring benefit to our students in the long run.

Appendix 6

Coding System of the Interviews Undertaken in School A

Code	Current job/role title	Teaching experience in School A (years)	Teaching subjects	Members of the ICT Instructional Team (Yes/No)	Experiences in developing ICT-integrated pedagogical modes
Headteacher	Headteacher (has been in post in School A for 6 years)	No class-teaching responsibility		No. The formal leader	No class-teaching responsibility
Director of academic affairs	Subject teacher (and director of academic affairs)	10	Science	No. The formal leader	Science
ICT coordinator	Subject teacher (and ICT coordinator)	12	1. ICT 2. Science	No. The formal leader	1. Chinese 2. Science
Teacher 1	Year-one classroom teacher	4	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Living 5. Maths	No	1. Chinese 2. Health & PE 3. Living
Teacher 2	Year-two classroom teacher	6	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Living 5. Maths	Yes	1. Chinese 2. Comprehensive Activities 3. Living
Teacher 3	Year-three classroom teacher (and section chief of experiment and research)	10	1. Arts & Humanities 2. Chinese 3. Health & PE 4. Maths	Yes	1. Arts & Humanities 2. Chinese 3. Health & PE 4. Science 5. Social Studies
Teacher 4	Year-three classroom teacher	7	1. Chinese 2. Maths 3. Social Science	Yes	1. Chinese 2. Maths 3. Social Science
Teacher 5	Year-four classroom teacher	10	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities	Yes	1. Arts & Humanities 2. Chinese 3. Maths

			4. Health & PE 5. Maths		
Teacher 6	Year-four classroom teacher	8	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Health & PE 5. Maths	Yes	1. Arts & Humanities 2. Chinese 3. Health & PE
Teacher 7	Year-four classroom teacher	16	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Health & PE 5. Maths	Yes	1. Arts & Humanities 2. Chinese 3. Health & PE
Teacher 8	Year-five classroom teacher	10	1. Arts & Humanities 2. Chinese 3. Health & PE 4. Comprehensive Activities 5. Maths	No	1. Chinese 2. Health & PE 3. Social Science
Teacher 9	Year-five classroom teacher	5	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Maths	Yes	1. Chinese 2. Comprehensive Activities
Teacher 10	Year-five classroom teacher	10	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Maths	Yes	1. Chinese 2. Comprehensive Activities
Teacher 11	Year-six classroom teacher	6	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Health & PE 5. Maths	No	1. Chinese 2. Health & PE
Teacher 12	Year-six classroom teacher	5	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Health & PE	No	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities

			5. Maths		4. Health & PE 5. Maths
Teacher 13	Year-six classroom teacher	8	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Health & PE 5. Maths	Yes	Comprehensive Activities
Teacher 14	Subject teacher (and section chief of curriculum development)	8	1. Arts & Humanities 2. Social Science	No	1. Arts & Humanities 2. Social Science
Teacher 15	Subject teacher (and section chief of hygiene)	16	Social Science	No	Social Science
Teacher 16	Subject teacher	15	1. Arts & Humanities 2. Social Science	No	1. Arts & Humanities 2. Social Science

Appendix 7

Coding System of the Interviews Undertaken in School B

Code	Current job/role title	Teaching experience in School B (years)	Teaching subjects	Members of the ICT Instructional Team (Yes/No)	Experiences in developing ICT-integrated pedagogical modes
Headteacher	Headteacher (has been in post in School B for 6 years)	No class-teaching responsibility		No. The formal leader	No class-teaching responsibility
Director of academic affairs	Subject teacher (and director of academic affairs)	15	1. Health & PE 2. Taiwanese	No. The formal leader	Health & PE
ICT coordinator	Subject teacher (and ICT coordinator)	10	1. ICT 2. Science	No. The formal leader	1. Chinese 2. Science 3. Social Studies
Teacher 1	Year-one classroom teacher	6	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Living 5. Maths	No	1. Chinese 2. Living
Teacher 2	Year-one classroom teacher	6	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Living 5. Maths	No	None
Teacher 3	Year-four classroom teacher	10	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. ICT 5. Maths	Yes	1. Health & PE 2. Maths 3. Social Studies
Teacher 4	Year-five classroom teacher	8	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Maths 5. Social Science	No	Social Studies

Teacher 5	Year-five classroom teacher	18	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Maths 5. Taiwanese	No	1. Comprehensive Activities 2. Taiwanese
Teacher 6	Year-five classroom teacher (and section chief of hygiene)	4	1. Chinese 2. Comprehensive Activities 3. Maths	No	Chinese
Teacher 7	Year-six classroom teacher	4	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Maths	No	Chinese
Teacher 8	Year-six classroom teacher	5	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Health & PE 5. Maths	No	None
Teacher 9	Year-six classroom teacher	8	1. Chinese 2. Comprehensive Activities 3. Maths	No	1. Chinese 2. Maths
Teacher 10	Year-six classroom teacher	6	1. Chinese 2. Comprehensive Activities 3. Health & PE 4. Maths 5. Taiwanese	No	None
Teacher 11	Year-six classroom teacher	7	1. Arts & Humanities 2. Chinese 3. Comprehensive Activities 4. Maths 5. Science 6. Social Studies 7. Taiwanese	No	1. Chinese 2. Social Studies
Teacher 12	Subject teacher (and director of student affairs)	5	1. Health & PE 2. Science	No	1. Health & PE 2. Science

Teacher 13	Subject teacher (and director of general affairs)	10	1. Arts & Humanities 2. Science	Yes	Science
Teacher 14	Subject teacher (and section chief of curriculum development)	10	Social Science	Yes	Social Studies
Teacher 15	Subject teacher (and section chief of experiment and research)	14	Arts & Humanities	Yes	Arts & Humanities
Teacher 16	Subject teacher (and section chief of discipline)	6	1. Health & PE 2. Science	No	1. Arts & Humanities 2. Chinese 3. Science
Teacher 17	Subject teacher (and section chief of PE)	8	Health & PE	No	None
Teacher 18	Subject teacher	11	Science	Yes	Science
Teacher 19	Special needs teacher	6	Special needs teacher	Yes	Science

Appendix 8 Supporting paper

Implementing and Sustaining Educational Change and ICT: A Case Study of a Taiwanese Primary School

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Abstract. This paper is a case study of a school in Taiwan. The School in this study has successfully implemented and sustained the integration of ICT across the curriculum to support teaching and learning, whilst other similar schools have failed to maintain the impetus of a national project. By using questionnaires, interviews and document analysis the leadership and management, organisational processes and decision-making, and ICT resources and technological adoption were analysed. The study highlights the importance of shared, collaborative leadership in implementing and sustaining the integrating of ICT into teaching and learning.

Keywords: ICT, educational change, leadership, teacher attitudes.

1 Introduction

The introduction and/or extension of the use of Information and Communications Technologies (ICT) in school settings has been of concern for some time, as is evidenced by studies of change management and ICT integration in school settings [10, 12, 14]. The significance and importance of ICT in education is widely acknowledged. Nevertheless, research has often highlighted barriers to ICT implementation in schools [5]. Studies by Kennewell et al. [6] and Tearle [14] examined factors which underpin successful ICT implementation in schools in the UK, identifying the key attributes of the ICT-capable schools: the headteacher's and senior managers' strong lead and active involvement in ICT development, collegiate work patterns amongst the staff, convenient access to ICT resources and support, and adequate staff ICT training. The above attributes were also verified by Sheppard [12] and Wong and Li [16] to be crucial for whole-school change and ICT integration in other educational contexts, including Canada and Hong Kong. Yet these researchers went further, concluding that shared leadership tended to be a radical driver for a collaborative culture which had a potential impact on sustaining school improvement in ICT development. Indeed in his studies, Selwood noted that the role of school leadership and management, particularly the headteacher's leading style, was the core of success in the widespread use of ICT in schools [11].

The ICT Seed School Project (ICT SSP) was a national ICT-related project announced by the Taiwanese Ministry of Education in 2002, that aimed to extend the

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use of new technologies in schools by integrating ICT into the curriculum. These ICT Seed Schools were given training and financial support to expand their use of ICT across the curriculum. They were then expected to support other schools with their ICT development. Some schools in the ICT SSP were very successful in implementing and sustaining the project, others less so.

Given the above context, the aim of the present research is to explore the effect of school leadership and management on educational change for ICT development. Centring on a specific rural primary school in Taiwan, this study examined the way in which the entire staff succeeded in transforming a traditional school with limited technological resources into an acknowledged ICT-capable school. Thus, the findings can possibly show the patterns of change management concerning ICT development in Taiwanese rural schools.

2 Theoretical Framework

The theoretical framework of this study was built on two areas of literature. The first of these concerns school change and improvement, with a focus on the issues of school leadership and management. Leithwood [7] examined the features of effective school management in various countries and identified three common principles of successful leadership practices: 'setting directions' – the development of a shared vision, consensus about school targets and high performance expectations for staff work; 'developing people' – enhancing teachers' individualised and professional support, staff commitment, and important values for school development; 'redesigning the organisation' includes shaping a collaborative learning culture, motivating staff to participate in decision-making, and building the relationships with parents and the community.

The other area of work that influenced the design of this research was school staff's responses to the introduction of new technologies in teaching practices. These intention-based theories are essential in bringing about an understanding of and an ability to predict individuals' attitudes and reactions when new technologies intervene in school contexts [8, 13]. Therefore, the literature concerning intention-behaviour models, such as the Theory of Planned Behaviour constructed by Ajzen [1] and the studies of individuals' acceptance of ICT adoption [2, 13], were used in this research to explore teachers' reactions to ICT adoption.

3 Methodology

A case study approach is used in this research and as such the evidence used covers many sources, since multiple information is highly complementary [17]. Questionnaires, semi-structured interviews and document analyses were used for gathering both quantitative and qualitative data from the case study school. Purposeful sampling was applied to ensure the school selected for this study was an information-rich site in which the ICT Seed School Project (ICT SSP) was continuing at the time of the research.

The school selected for this research was a rural primary school in Taiwan and had 21 classes, with 578 pupils on roll, and 30 teaching staff plus the headteacher. Prior to being involved in the ICT SSP the target school was short of technological resources. However, it has become publicly acknowledged as an ICT-capable school and officially recognised by the Ministry of Education as a model for other schools, and its experiences in change management for ICT disseminated around many schools in Taiwan. In addition the school also provides training sessions in the use of ICT for parents and teachers from other schools. Furthermore, to confirm the school's status as a high achieving school the researchers carried out a measure of its "ICT maturity" using the tool developed by Underwood and Dillon [15] and the school showed a high level of ICT maturity.

Questionnaires were distributed to 28 school staff and responses were received from 25 (89%). Following an initial analysis of the data 22 members of staff were interviewed: 10 were from the ICT instructional team[1], 6 were teachers from outside this team, and another 6 were seen as key personnel (the ex- and current headteachers, ex- and current directors of academic affairs, the ICT coordinator and an ex-teacher). All the interviews were recorded and then transcribed. Data was also collected by analysing official school documents such as development plans, school policies and minutes of meetings.

4 Findings

The findings from this research were obtained by examining the staff's opinions on the following issues: leadership and management, organisational processes and decision-making, and ICT resources and technological adoption.

4.1 Leadership and Management

The research data showed that a large proportion of respondents (97% from the questionnaires and 100% from the interviews) were positive about the leadership and management approaches to ICT development in the school. The leadership style was seen as collaborative and supportive by all respondents and 92% of the questionnaire respondents felt that the school's aims and direction were clear when undertaking educational change resulting from central government initiatives.

Supporting the data from the questionnaires, all teachers who were interviewed confirmed that the headteacher's strong leadership, together with a clear school vision and strong support for educational innovations, encouraged them to accept the need to implement ICT innovations. When asked about their opinions on the governmental action on educational shift, 16 interviewees (73%) felt positively that change was essential for progress in all aspects of education. They also concluded that the staff generally welcomed educational change for school improvement and were prepared to take risks as part of the improvement process. For instance one teacher said:

> *"Of course, making change cannot always guarantee the desirable outcomes."*

[1] The ICT instructional team was an ICT-focused learning community within the school whose members were the headteacher, departmental directors, ICT coordinator and classroom teachers.

Delegation of responsibilities to the staff was also mentioned positively and repeatedly in the interviews. As the headteacher declared, he personally did not take a direct lead in ICT innovations in the school. Instead, it was his belief that delegating power to the teachers with ICT knowledge and great enthusiasm about school management was the way of strengthening their commitment to strive for excellence in ICT implementation. On this basis, he felt comfortable empowering the staff with ICT expertise to lead the school in making progress in implementing ICT. Indeed the headteacher contended that:

> *"Without the continuous and joint efforts of the ICT coordinator, director of academic affairs and classroom teachers in managing school-wide educational innovations, it would have been almost impossible for our school to launch and sustain ICT improvement."*

The headteacher's firmly-held belief in shared leadership and management may explain why all interviewees attributed their present level of ICT implementation not only to the strong lead from the headteacher, but also to the exceptional competence of both the ICT coordinator and director of academic affairs in guiding the school through the difficulties in integrating ICT.

For the ICT coordinator and director of academic affairs, it was the headteacher's great trust in their abilities and that they were able to have a strong sense of freedom in managing whole-school ICT improvements. The ICT coordinator also maintained that:

> *"We all understand that our headteacher is not specialised in new technologies...[Yet] whenever the government's funding is not sufficient enough for us to upgrade our ICT equipment, he [the headteacher] is sure to make efforts to solve the "money problems"...This is really helpful...He encourages us, helping us overcome the growing pains in the course of managing the ICT SSP."*

When explaining how staff collaborated in implementing ICT across the curriculum, 96% of the interviewees raised a common example as follows. In order to put the plan for ICT integration forward, the ICT coordinator and director of academic affairs invited classroom teachers, particularly those who were ICT competent, to constitute the ICT instructional team which offered instructional and technical assistance in meeting teachers' individualised demands for teaching with ICT.

Importantly, apart from the headteacher and other managers, teaching staff in the ICT instructional team were identified by many interviewees (77%) as teacher pioneers in extending the use of ICT in the school. This is mainly because before the start of school-wide technological adoption, the ICT instructional team worked together with the ICT coordinator in developing and experimenting with different modes of ICT-integrated curricula in selected classes. These trials, associated with action research, enabled the ICT instructional team to share their experiences of ICT integration, including suggesting strategies for overcoming challenges, with other teachers in advance. As a result, most teachers came to realise the ways of preparing themselves for confronting the educational innovations in teaching practices. Given this context, it may be unsurprising that 76% of the respondents to the questionnaires reflected that the staff as a whole were always ready to engage in educational change, and that the

processes of change management in the school were generally acceptable. It could be said that not only the formal leaders and managers (i.e. the headteacher and directors), but also teachers from the ICT instructional team were the core in permeating the ICT culture throughout the school.

However, it would appear that the ethos of collaborative leadership had been rooted in the school before the current headteacher took up his post. For instance, in the interview with the ex-headteacher, he asserted that all teachers could be good leaders in their specialised areas if they were given suitable opportunities. Like the current headteacher, the ex-headteacher had also enabled school staff to feel free to exercise leadership practices in the school. As all teachers in the interviews contended, before undertaking the ICT SSP, the staff were frequently involved and participated in planning and decision making. Moreover, 86% of the interviewees pointed out that before commencing the ICT SSP, regular staff workshops for sharing individuals' experiences and new knowledge had already served as a solid foundation for constructing a positive atmosphere for staff teamwork. The interviewees specifically said that their previous experiences in implementing and managing government initiatives had taught them that mutual support within the staff assisted in overcoming difficulties. Hence, the staff accepted working and learning together with their colleagues as a natural part of the approach to dealing with educational change.

Notably, sharing responsibilities in leadership and management seemed to be a commonplace in the school, rather than being restricted to the area of ICT implementation. As the interviewees highlighted, distributed leadership was not restricted to ICT developments but applied to all areas of the school.

4.2 Organisational Processes and Decision-Making

Staff views on organisational processes and decision-making in the school were found to be generally very positive. All respondents believed that the staff at all levels were involved in decision-making and vested with adequate decision-making power, and that each of them took a defined role and responsibility in the organisational processes. Open debates and reflective evaluations were regarded by most respondents (96%) as the usual approach to assessing the overall organisational performance. An equally large number of respondents (96%) felt that staff communication was effective, and that they were kept well informed in respect of executive decisions and school policies. A considerable number of respondents (92%) recognised that sharing responsibilities and close collaboration between teachers and leaders/managers was commonplace, particularly when making school plans. The same proportion (92%) confirmed that leaders consulted teachers about decisions which would affect the whole school.

Further information from the interviews reflected that 91% of the staff enjoyed being involved in the decision-making processes. Although many admitted that contentious issues sometimes resulted in conflicting tensions, the interviewees claimed that with the prompt mediation of the headteacher and other senior managers, the conflicts turned into the constructive discussions, and this allowed them to consider deeply the issues under discussion, and this facilitated shaping shared values and developing a consensus before decisions were made.

One experienced teacher said:

> *"It doesn't matter which post you are holding, your voices are always respected. People in this school care about others' feelings and thoughts both at formal meetings and in informal discussion. Whilst it is inevitable that some proposed ideas incurred our criticism at the very start, we are still willing to try them out to see how they work for our school. This is how we do things here."*

While an inexperienced teacher noted:

> *"This school is like a family and the morale is very high... It was really heart-warming that everyone here tried making me feel accepted."*

4.3 ICT Resources and Technological Adoption

It is apparent that even with good leadership without technological equipment and technical support a school can not integrate ICT effectively. Thus staff were asked their opinions on these aspects. Responses to the questionnaire showed that staff believed - hardware matched their needs (100%), software met their needs (96%), technical support catered for their needs (96%), ICT resources were useful for their teaching (92%), application of ICT enhanced teaching effectiveness (92%), and ICT resources were always accessible to the staff (88%).

The questionnaire data revealed that generally speaking teachers were confident and competent users of ICT. All respondents showed their confidence in ICT adoption, claiming that they were competent users of ICT and that they applied ICT appropriately to support teaching and learning; 88% believed that ICT adoption reduced their workload, and the same percentage (88%) felt that the staff had been trained in all aspects of ICT necessary for their teaching. More importantly, nearly all respondents (96%) were satisfied with the long-term training for the ICT SSP.

As might be expected given teachers' positive responses to the questionnaire, the interview data reported the staff's high satisfaction with the access to ICT facilities and technical support in the school. The interviewees also stressed that the ICT training held in the school demonstrated the strategies for developing the ICT-integrated curriculum. Thus, staff members, including those who at the start of the ICT SSP had limited ICT skills, became clear about the ways and benefits of using new technologies in teaching and learning. More importantly, the ICT instructional team and the ICT coordinator conducted the regular audits of teachers' ICT skills and needs. Based on these audits, the school then provided differentiated training sessions to meet staff and school needs. In addition, knowledge sharing through staff meetings and informal discussions enabled teachers to understand the utility of ICT and procedures for integrating ICT. For the interviewees, formal ICT training and informal staff discussions were useful for improving understanding the concepts of ICT adoption into their teaching practices.

The questionnaire data revealed that sufficient equipment, timely technical support and suitable training sessions were the base for extending the use of ICT in the school. However, when, compared with the responses concerning leadership and organisation processes above, 94% of the teachers in the interviews rated the strong determination and high expectations of the headteacher and other senior managers in

pursuing ICT improvement was most influential on their willingness to engage in instructional innovations with ICT. Interviewees also stressed the endeavours of the headteacher and other senior managers to lead the school in establishing good relationships with parents and the community so that this solid school-community connection facilitated the school obtaining financial support from parents and neighbouring colleges, particularly when technological resources were limited at the commencement of ICT implementation.

5 Discussion

Whilst generalisations are impossible from the results of one case study, interesting issues can emerge. With respect to school leadership and management, it was clear that the evidence reinforced the conclusions of recent studies that the supportive and proactive lead from the headteacher in educational change is critical for school-wide instructional innovations concerning ICT integration [11, 16]. Furthermore, it is apparent that the headteacher's comprehension of the staff's quality (i.e. skills and interests), together with his good appointment of the competent teachers as leaders and managers (i.e. the ICT coordinator and departmental directors), seemed to be essential for success in planning and initiating whole-school ICT developments. Moreover, school leadership for innovations in ICT was not limited to managers and ICT experts at the implementation stage of ICT development. The leadership of a group containing classroom teachers (the ICT instructional team) helped the entire implementation of ICT by providing prompt feedback and solution of staff's individual problems.

The above findings reflect that leading and managing in the school was not the domain of any individual, but devolved across many members of staff. Furthermore, it appears that the headteacher's delegation of leadership to specific staff with vision and passion about ICT development, in the very early stages of implementing ICT, was critical for the effective commencement and continuity of whole-school ICT improvement. Such findings support the international multi-case studies by Leithwood [7], who affirmed teachers' participation in school leadership as an important foundation for successful change in nearly all educational contexts. The findings also support Sheppard's work, which reported that schools succeeding in developing ICT had participative or shared leadership but had at least one key person who acted as a leader and champion of school change for ICT implementation [12].

There is no doubt that staff collaboration in leadership and management is instrumental in school change. The evidence gathered here demonstrates that staff's collegial interaction and applying shared leadership to managing school improvements were formed through a long-term process, and were not confined to a particular domain, but permeated all aspects of school improvement. Similar results were also shown in Tearle's studies of effective school change for ICT development [14].

In addition, teachers in the school seemed to readily accept new ideas and educational change. The staff's awareness of the necessity for school change underpinned their intentions to keep improving in ICT implementation even when challenges occurred. Indeed the literature of educational improvement notes that school staff are typically willing to undertake change and development when feeling a critical need for doing so [3, 4].

The findings related to organisational processes and decision-making made it evident that the school fostered high morale and a collaborative culture where collective plans and establishing a shared vision through open debates and reflective evaluations appeared to be deeply rooted in the staff working processes. This finding, that there is a strong link between shared leadership and a positive culture for school staff collaboration, has been well documented in other studies concerning successful ICT implementation [12, 14, 16].

The headteacher and senior managers not only respected the divergence of individuals' opinions, but also assisted in moving wide-ranging debates forward to constructive dialogues for reaching common values amongst the staff. More specifically, even without formal management duties, some classroom teachers voluntarily managed and strengthened social networks of colleagues, and this was considered by the staff as instrumental for dealing with school-wide change. Again, these finings could correspond to Leithwood's assertion of the basic features of effective school management [7]. In his work, Leithwood claimed that successful headteachers have capacities for developing teacher consensus about the issues under discussion. On the other hand, they are competent in encouraging teachers to spontaneously engage in instructional innovations by means of reflecting upon existing practices critically, questioning taken-for-granted assumptions and participating in organisational processes.

With reference to staff views on ICT resources and technological adoption, the evidence showed the importance of sufficient ICT equipment and staff training cannot be over emphasised. Similar findings were also reported in other studies [11]. The approach of frequently auditing staff skills and needs and differentiated training based on this is worthy of note.

Furthermore, both formal ICT training and knowledge sharing amongst staff members in an informal manner facilitated teachers in perceiving the advantages of ICT integration and assimilation of new pedagogies regarding ICT into their teaching strategies. It could be summarised from these findings that the teachers were willing to deal with challenges caused by technological adoption, as long as they felt that using ICT for teaching and learning were compatible with their present instructional experiences and matched their needs. The studies by Chau and Hu [2], who explored organisational members' acceptance of technological adoption outside the educational field, also found that compatibility was the primary factor which determined whether individuals accepted or resisted the use of new technologies.

A particularly interesting issue which emerged in this study was that teachers' commitment to ICT development seemed to highly depend on the perceptions of their colleagues' resolution to improve schooling. Indeed, the interviews showed the teachers were conscious of the efforts of the school leaders (i.e. the headteacher, directors and ICT coordinator) and ICT instructional team to transform the school into an ICT-capable school, and this raised the entire staff's determination to launch and sustain ICT developments. Therefore, even though the school was limited in ICT resources at the very start of the development process, the teaching staff still had a strong will to work together in managing school improvement for ICT integration.

6 Conclusion

The school's achievement in implementing and sustaining its use of ICT was not simply the result of the headteacher's strong leadership, but the joint and intense engagement of

staff members in leadership and management. Although the factors which affected ICT implementation in the school were inter-related rather than discrete, it was evident that collaborative leadership played the key role in underpinning school change for ICT implementation. Indeed, the finding of this study may be parallel to Morrison's argument that 'change concerns people more than content' (p. 15) [9]. Finally, as with work of Sheppard [12], this case study highlights the essential link between leadership and successful implementation of ICT in schools.

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