The Implementation of ICT in Primary Schools in Hong Kong: Perspectives from School Heads and Teachers

Thesis submitted for the degree of

Doctor of Education

at the University of Leicester

by

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December 2005
Dedicated in loving memory to my mother (1930-2003)
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Acknowledgements

First, this thesis is dedicated in loving memory to my mother, who passed away nearly three years ago, while I was busy in data collection for this study. She gave great love and care to her family all of her life. I am deeply indebted to her and regret my inability to spend more time with her. It is the most deeply regrettable matter for me, although she has never put any blame.

Doing a thesis is a long winding journey. Fortunately I have not been alone, but instead accompanied by many people on my intellectual adventure. It is now in the present moment that I want to express my great gratitude to all those who accompanied me on my journey and enabled me to complete my thesis.

I would like to convey my most heartfelt gratitude to Dr Mark Lofthouse. He was my first tutor in the University of Leicester, and after leaving for several years, he returned and became my thesis supervisor once again, as I was completing the last and the most critical mile of my “long journey”. He always gave me great help in very tight time limit. His proofreading and advices provided remarkable improvements to my humble rough drafts.

I would also express my sincere thanks to my former tutors at the University of Leicester. Chronologically they are Professor Maurice Galton, Professor Ken Fogelman, Dr Linda Hargreaves, and Professor Paul Cooper. I received invaluable advice, inspiration and support from them. I would also thank all other faculty members and administrative staff in the School of Education who assisted whenever needed and always provided me with an extremely supportive environment.

Collecting research data was probably the most difficult part of the study. I was extremely fortunate to receive a lot of help from many different and kind parties. For instance, Patricia Snipe and Mr S. W. Yeung helped me to approach many different participants. Many friends who are teachers also helped greatly in preparing and revising the questionnaire. Yam Wu, Eddie Ho, Fion Kong and Emily Ho are just a few of the many. They not only served as the “guinea pigs” for the pilot surveys, but also helped collect pilot data from their teacher colleagues.

As I prepared the interview schedule and conducted the interviews, Wendy Chan and Omni Fung offered their apt expertise. They are experienced interviewers, and I was accompanied by each of them when conducting the first and second interviews. They gave me invaluable assistance during the interviews and offered invaluable feedback after the interviews. In that way I gained confidence to do the ensuing interviews on my own and move in the best direction for the research.

I am also grateful to my “research assistants”. Winnie Leung helped me distribute and collect questionnaires when I was not able to show up in person. I am also especially grateful to my sister-in-law, Ho-ling, who
voluntarily helped me enter much of the questionnaire data to SPSS. Offloading this kind of labour intensive task let me have more time to synthesise the analysis and write the chapters.

Many of my classmates in the EdD programme have given me exceptional peer support. To name a few, there were Karen Fedderholdt, Wendy Chan, Winnie Tang, Shirley Li, Fanny Chow and Ming Cherk Lee. They shared ideas, reference materials, research experiences, and their own theses to allow me to make my own unique academic journey not alone.

Professor Vincent Lum is probably the most influential person in my academic life. He was the Professor of Systems Engineering and Engineering Management at the Chinese University of Hong Kong and the Chairman of that department. He supervised my Master’s thesis and taught me the correct way to do academic research. At the time, I recognised the immense difference between doing undergraduate and graduate research. My interest in undertaking research has expanded greatly since then. Professor Lum is such a serious academic that the research attitudes and techniques he imparted to me have become permanently imprinted on my mind. These concepts remain greatly beneficial to me in my current research and will remain to assist me in future endeavours. Although he has now retired from academics, he continues to be forever my teacher, mentor, and friend. He still frequently encourages me, through emails, to move forward on my current doctoral thesis. His words have always inspired me, especially whenever I felt overwhelmed.

My list of those to whom I’m intensely grateful would be incomplete if I forgot the most important category of supporters for this project. They were the anonymous participants in my surveys and interviews. Data collected from them gave rise to the most essential asset of this research. Without their voluntary participation, either in pilots, pre-studies, or the main studies, the research would have failed. Some of the interviewees were so generous with their help that many new participants were introduced to join the research. Finally I am of course grateful to all the institutes that granted the author permission to collect data in their workshops, seminars, and conferences.

In closing, my deepest and sincere gratitude goes to my wife, Mei-lan, for her patient support, love, and caring throughout the entire thesis writing period. She has taken over my responsibility as father and looked after our daughter, Zee-meng, now three and a half years old. Thankfully, they both added much colour and love to my busy life.

All the individuals I have named and many others who remain anonymous have allowed me to complete this thesis. My messages of gratefulness could be extended much farther, but to all who assisted me in completing my work, my measure of full appreciation will never be accurately expressed by mere words.

Kit-pui Wong, December 2005
Abstract

In recent years, the use of Information and Communications Technology (ICT) in education has become a widely discussed issue. This paper starts with a brief examination of the relationship of political changes to the rapid educational reforms in recent years, including the school-level implementation of ICT. Specifically, the implementation of ICT in Hong Kong primary schools is investigated. Primary data are collected from school heads and teachers while secondary data are collected from the scholarly literature. In addition, supplementary data were collected for comparison from several areas in the UK.

A number of research questions are proposed for the study, including the potential benefits and shortcomings of ICT in education, the difficulties of ICT implementation, and the relative cost effectiveness of ICT.

Quantitative and qualitative methods emerged from the different research paradigms of positivism and interpretivism. Both are discussed in the research design chapter. A mixed-method approach was selected for the entire research project. Under this approach, quantitative data were collected through survey techniques and qualitative data were collected through in-depth interviewing. These two data collection processes were undertaken independently. The design and application of data collection for both categories of data are discussed at length. Eventually, 681 questionnaires and 17 interviews were analysed. The findings were consolidated and triangulated when possible, and are discussed in the concluding chapter. Throughout the study, responses to several important issues, including workload, time, professional development and school organisation, have been elicited from the participants.

Finally, some recommendations are made that attempt to optimise the use of ICT in education. Further research areas are also proposed. In sum, the research suggests that ICT is a 2-sided tool. On one hand, ICT can provide numerous benefits to teaching and learning. On the other hand, stakeholders must be aware of its potential negative side effects. Moreover, ICT should be treated as only one of many instructional media, and it should be used carefully. Over-reliance on ICT should be avoided.

Keywords

ICT, Qualitative Research, Quantitative Research, Primary Education
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ANOVA</td>
<td>Analysis of Variance – an inferential statistical tool</td>
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<td>CERI</td>
<td>The Centre for Education Research and Innovation</td>
</tr>
<tr>
<td>DfES / DfEE</td>
<td>Department for Education and Skills / formerly Department for Education and Employment (England)</td>
</tr>
<tr>
<td>EMB</td>
<td>The Education and Manpower Bureau (HK)</td>
</tr>
<tr>
<td>HK / HKSAR</td>
<td>Hong Kong / The Hong Kong Special Administrative Region, People’s Republic of China</td>
</tr>
<tr>
<td>HSD</td>
<td>Tukey Honestly Significant Difference Test – an inferential statistical tool</td>
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<tr>
<td>ICT / IT</td>
<td>Information and Communication Technology / Information Technology</td>
</tr>
<tr>
<td>LPAT</td>
<td>Language Proficiency Assessment for Teachers (HK)</td>
</tr>
<tr>
<td>MMLC</td>
<td>Multimedia Learning Centre</td>
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<tr>
<td>NGfL</td>
<td>National Grid for Learning (UK)</td>
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<tr>
<td>NOF</td>
<td>New Opportunities Fund (UK)</td>
</tr>
<tr>
<td>OECD</td>
<td>The Organisation for Economic Co-operation and Development</td>
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<tr>
<td>OFSTED</td>
<td>The Office for Standards in Education (England)</td>
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<tr>
<td>QEF</td>
<td>Quality Education Fund (HK)</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences – a commonly used statistical software</td>
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<tr>
<td>TDA / TTA</td>
<td>Training and Development Agency for Schools – formerly Teacher Training Agency (UK)</td>
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<tr>
<td>TSS</td>
<td>Technical Support Services</td>
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<td>WWW</td>
<td>World Wide Web</td>
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Chapter 1 Introduction

That's the reason they're called lessons... because they lessen from day to day.

Carroll, Lewis (1832-1898), Alice in Wonderland

Overview

The term “Information and Communications Technology” (ICT), or “Information Technology” (IT), is used interchangeably with “computers.” However, computers are just one of many facets of ICT. Generally speaking, ICT involves machines, instruments and technologies that “process information” (Starker, 1989, p. 2). A few typical examples are “video recorders, telephones, calculators, cash tills and, of course, computers” (p. 2). Computers actually form a subset of ICT. Nonetheless, as long as computers are “probably the most versatile form” of ICT (p. 2), ICT is commonly understood to be computers and their peripherals.

The use of ICT in schools has grown gradually since the 1980s when microcomputers started to become popular and available to individual families. The importance of communication networks, particularly the Internet, should not be ignored in any discussion of “computers” or ICT.

Networks can interconnect sectors of educational institutions in a region, a nation, or even a group of countries. With the pervasive spread and usage of the Internet throughout society, these networks are becoming an essential feature of education... The institutions which are linked up by networks include not only high education institutions but also high schools, primary schools, and even kindergartens.

(Kwok and Eastham, 2002, p. 557)

The communication networks have established a powerful infrastructure, which is able to link up all computers round the globe, particularly in recent years. It has given a strong impulse to the application of ICT in education.
ICT Initiatives

Although the promise of contributions of ICT to education has been around for many years, the use of ICT has been mainly found in the daily administration of schools and in a few technology subjects, such as Computer Literacy or Computer Studies. However, in the past few decades, there have been certain memorable projects in implementing ICT in education, projects such as PLATO, TICCIT, WICAT, MECC and CONDUIT, etc. (Merrill et al, 1996, p. 56-59; Alessi and Trollip, 2001, p. 4, Gall, 2002). These projects are more experimental than practical. Interest in them has been mainly within the research and academic community. These projects “basked briefly in the sun prior to the microcomputer age and then rapidly disappeared from the classrooms” (Venezky and Davis, 2002, Para 113).

The limited use of ICT in schools has begun to change since the introduction of the Internet (Alessi and Trollip, 2001, p. 4-5), and, subsequently, the World Wide Web (WWW), which “dramatically altered the computer landscape” since the early 90s (Gall, 2002). The Internet has become one of the most ubiquitous incarnations of ICT (Wheeler, 2001).

Originally, the Internet had been a U.S. military exercise in creating a network without central control... One of its most successful experiments was the World Wide Web... Its usability and extensibility (to include graphics, audio, video, and numerous specialized data formats) have been fundamental to its adoption and continued success

(Gall, 2002, p. 383)

Concurrent with the spread of the Internet infrastructure, the World Wide Web (WWW) has appeared as an important application area of it. WWW has brought a very important change in people's attitudes towards the use of ICT in education.

Computer designers and software developers, along with some educators, have been promising a technology-based revolution in teaching for at least 40 years but until the World Wide Web began growing exponentially, schools exhibited limited enthusiasm for any use of computers outside of word processing, spread sheets, programming, and graphing and drawing. (Venezky and Davis, 2002, para 113, emphasis added)

A forty-years' promise of ICT in education had never been realized until the appearance of WWW. Thereafter, “many educators, administrator, and others involved in education feel that teaching through the Internet is learner-centred per se, since it can provide learning to everybody, anywhere, any time” (Verbeeten, 2002, p. 160). This kind of flexibility had never occurred before the appearance of the Internet.

The advantages of the Internet and its sister, the World Wide Web, caught the interests of most educators very soon after its introduction. This has been one of the factors that led to great changes in educational
policies. It was 1997, shortly after the introduction of the Internet and World Wide Web, and changes in politics occurred which accelerated the changes in both Hong Kong and the UK.

A Year of Changes – 1997

The year of 1997 was important to the Hong Kong people because Hong Kong was returned from a colony of Britain to a Special Administrative Region (SAR) of China. In the same year, C.H. Tung became the first Chief Executive of the Hong Kong Special Administrative Region (HKSAR) government. This year was also important to educational policy in general, and educational ICT policy in particular, because the Chief Executive’s Policy Address (Tung, 1997, para 83-87) initiated a number of reforms to the education system in Hong Kong, such as upgrading the post requirements of primary teachers to university graduates; greater use of the mother tongue in teaching; the Native-speaking English Teachers (NET) scheme, and language benchmarking for teachers. In addition, the speech emphasized the importance of ICT in today’s economy:

The world economy is undergoing a tremendous transformation. It has entered an era of increasingly open, free and borderless competition. Rapid developments in information technology will change the way mankind works and lives. Hong Kong now faces the challenge of the information age. We must look to new concepts with which to assess our competitiveness and set new courses for development...

(Tung, 1997, para 4)

We will launch a five-year IT education strategy to promote the use of IT to enhance teaching and learning. The main tasks are to equip our teachers with the necessary IT skills; to apply computer-assisted teaching and learning across the curriculum; and to place students in an environment where they can use this technology as part of their daily activities and grow up to use it creatively.

(Tung, 1997, para 46)

In Tung’s speech, ICT was treated as an essential factor to maintain the growth of economy. Its role in education became important and students were expected to “grow up to use it creatively.” To achieve those objectives, the following facilities were proposed.

Within five years, we are aiming to have teaching in at least 25% of the curriculum supported through IT. Within ten years, we aim to see IT being applied comprehensively in school life, and all our teachers and Secondary 5 graduates being able to work competently with IT tools. To move firmly in that direction, within the next school year we will:

1 In the past, the minimum requirement for primary teachers was a sub-degree diploma in education. In this proposal, all new coming primary teachers must be degree holders.
- increase the number of computers in each primary school from 15 to an average of 40 and in each secondary school from 20 to an average of 82;
- procure and develop new software to support teaching, especially for languages;
- enhance training to over 30,000 teachers in IT use, and set up an IT Education Resource Centre to support the management of school IT systems;
- introduce pilot schemes in 20 schools to establish best practices for IT applications in teaching and learning;
- connect all schools to the Internet; and
- make preparations for an education-specific intranet for multi-dimensional communication and sharing of information within the school sector.

(Tung, 1997, para 47)

These provisions were for both secondary and primary schools. Since the speech, the ICT initiative has been properly started, together with huge amounts of financial resources.

The year 1997 was important not only to the people of Hong Kong but also to the British. After nearly two decades of government by the Conservative Party, the Labour Party was elected to power in the British government. Shortly after that, the Labour government published a consultation paper called “Connecting the Learning Society: National Grid for Learning” (DfEE, 1997). In this paper, the British government emphasized the importance of ICT in tomorrow’s world and a strong commitment to develop a UK-wide infrastructure for the “Information Superhighway” in the next few years. The Prime Minister, Tony Blair, had the following statements in this paper.

*Education is the Government’s number one priority. It is key to helping our businesses to compete and giving opportunities to all. That is why we intend to lift educational standards in Britain to the level of the best in the world. This will mean making the most of technological change. Technology has revolutionised the way we work and is now set to transform education. Children cannot be effective in tomorrow’s world if they are trained in yesterday’s skills. Nor should teachers be denied the tools that other professionals take for granted…*

*By 2002, all schools will be connected to the superhighway, free of charge; half a million teachers will be trained; and our children will be leaving school IT-literate, having been able to exploit the best that technology can offer. We believe this strategy will be good for our children and our companies.*

(DfEE, 1997, Foreword by Tony Blair)

This message clearly shows that ICT was regarded as important to help “business to compete.” In both the documents from the post-1997 British government and Hong Kong SAR government, ICT has been commonly regarded as a non-negotiable element in today’s and tomorrow’s economy. Both governments
have emphasized the use of ICT in education to maintain or improve competitiveness in the market of the world economy. Both governments have assumed, if not believed, that the blooming of ICT in recent years (around 1997) will have a great impact in business and even in daily life in tomorrow's world. Education will be a tool to maintain a place in the competitive world. In turn, ICT will be a powerful tool in tomorrow's education. Much of the literature agrees that the economy has been a major driving force for the use of ICT in the community, particularly in education. For instance, Hawkridge (1991) points out six motivations for nations or governments to spend money and set up policy to use of ICT in education, as shown in Table 1-1.

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Related Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>Computers are important in society, thus students should be equipped to deal with them</td>
</tr>
<tr>
<td>Vocational</td>
<td>Students should use computers to prepare for future jobs</td>
</tr>
<tr>
<td>ICT industrial</td>
<td>Supporting computers in schools will help build up a market for a country's internal hardware and software production capability</td>
</tr>
<tr>
<td>Pedagogical</td>
<td>Computers can improve instruction in traditional subject areas</td>
</tr>
<tr>
<td>Catalytic</td>
<td>Computers will set off wide-ranging changes in the educational system itself and change the nature of teaching and learning.</td>
</tr>
<tr>
<td>Cost-effectiveness</td>
<td>Computers can replace teachers or some of the costs of teachers</td>
</tr>
</tbody>
</table>

Adapted from Hawkridge (1991)

From the motivations listed in Table 1-1, half of them, namely social, vocational and industrial motivations, are directly or indirectly related to the economy. On the other hand, the pedagogical and catalytic motivations could be considered as the objectives of applying ICT in the process of teaching and learning itself. It is interesting to think about the sixth point, i.e. cost-effectiveness, or, cost-reduction. This motivation may no longer be valid since there has not yet been any evidence of replacing teachers with ICT.

Some researchers, such as Williams (2000), reported that certain teachers were afraid of computers which might replace their role in classroom – “the teachers in the future will become redundant, their teaching functions largely replaced by sophisticated 'teaching machines'” (Williams, 2000, p. 15). In fact, not only has this scenario not happened, i.e. the workload of teachers has not become less, but the opposite has turned out, more workload has been put on teachers. The workload issue will be re-visited in the next chapter. To implement ICT in school, more manpower, such as teachers, technology coordinators, and supporting technicians, would be required.

No sophisticated “teaching machine” has ever been created. There has not been any sign of redundant teachers, or any other kind of staff, due to the introduction of ICT. In other words, no reduction of educational cost is expected due to ICT, at least for the time being and in the foreseeable future. In fact,
there is no recent literature reporting that any teacher still worries about being replaced. In contrast, more and more teachers are complaining about being overloaded. This issue will soon be discussed in chapter 5.

There is the question of whether the introduction of ICT in education was driven more by educational needs or by political needs. However, this question is raised only for the readers' awareness and is beyond the scope of this thesis. This current study is attempting to investigate the educational justifications for ICT, regardless of any political considerations from the policy makers.

**Resources Input by the Hong Kong Government**

Although the Hong Kong SAR is not a separate country, it has the autonomy of independent financial budgets and educational policies, according to the Basic Law of the Hong Kong Special Administrative Region (NPC, 1990, Article 106). Independent education policies are elaborated in the following statement:

> On the basis of the previous educational system, the Government of the Hong Kong Special Administrative Region shall, on its own, formulate policies on the development and improvement of education, including policies regarding the educational system and its administration, the language of instruction, the allocation of funds, the examination system, the system of academic awards and the recognition of educational qualifications...

*(NPC, 1990, Article 136)*

Shortly after the Chief Executive assumed his duties with the Hong Kong SAR government, he proposed many reforms in education in his first Policy Address (Tung, 1997). Subsequent to this speech, the implementation of ICT at the school level was formally ignited and propelled by cash. The following table lists a few important milestones of ICT implementation in recent years.

<table>
<thead>
<tr>
<th>Table 1-2</th>
<th>Major Events in ICT in Education in Hong Kong SAR since 1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Event</td>
</tr>
<tr>
<td>Jan 1998</td>
<td>Quality Education Fund (QEF) formally established</td>
</tr>
<tr>
<td>April 1998</td>
<td>Announcement of 20 pilot schools</td>
</tr>
</tbody>
</table>

2 Currency in Hong Kong Dollars (HKD), 1 GBP ≈ 13.5 HKD at the time of writing.
In 1998, an important policy paper called “Information Technology for Learning in a New Era – Five-Year Strategy 1998/99 to 2002/03” (EMB, 1998) was published with the following intrinsic “vision”:

... [ICT] is also quickly transforming the way in which education is delivered in schools by breaking down the traditional boundaries of teaching and learning... We should help our students to develop an understanding of the pervasive impact of IT on the society and their daily lives, higher order thinking skills, as well as abilities to seek, evaluate, organise and present information. They also need to develop habits of life-long learning so as to ride on the tides of rapid changes. To respond to these new requirements, our school education needs to see a paradigm shift - from a largely textbook-based teacher-centred approach to a more interactive and learner-centred approach.... To effect the paradigm shift, there have to be changes to the mind set and culture among teachers, parents and students; the way in which the curriculum is designed and delivered; student assessment etc.... IT in education is part and parcel of this overall plan. As a powerful educational tool, IT can play a catalyst role in the transformation of school education in such direction.

(EMB, 1998, para 1.1–1.3)

In the paper, the Hong Kong SAR government drafted a beautiful picture of the potential benefits deliverable to education by the use of ICT. According to a survey conducted by the Education Department, “more than 90% of the principals and about 70% of the teachers who responded were positive about the benefits that [ICT] could bring to teaching and learning in the classroom.” (EMB, 1998, Para 2.2). However, there was no further description in that paper of how such a positive result could be achieved.

The same 1998 policy paper includes impressive figures of investment made to apply ICT in teaching and learning, for example, spending HK $2,880 million in capital costs and HK $260 million in annual recurring costs in 1997 (EMB, 1998, para 2.4). These expenditures include the purchase of 65,000 computers for primary and secondary schools and over 45,000 training places for teachers (EMB, 1998, para 2.4). There were approximately 0.9 million primary and secondary students studying in Hong Kong public-sector schools in 1998/99 (Financial Services and the Treasury Bureau, 2000, Head 40). Assuming that the expenditures have been evenly spent for primary and secondary students, an average of HK $3000 for
capital costs and $300 annual recurring costs have been spent on each student. Although these averages are rough figures based on several inaccurate assumptions, they give a very coarse idea about expenditures for ICT per student.

Since 1998, another HK $334 million of capital costs and annual recurring costs of $294.5 million have been projected (EMB, 1998, Para 2.5). With these amounts of money, further initiatives would be introduced, including the provision of ICT coordinators for 250 schools and enhancing technical support for all schools in Hong Kong. (EMB, 1998, para 2.5). The ICT coordinator coverage scheme was then extended to every publically funded primary and secondary school.

After that, the Hong Kong SAR government has kept pouring money into supporting the implementation of ICT before knowing which area(s) should be emphasized. In addition to the regular educational funding mentioned above, the Quality Education Fund (QEF) was established in 1998 with an initial allocation of 5 billion Hong Kong dollars (QEF, 2005). Since then, a total of HK$3,181.4 million has been granted to 5801 projects. Table 1-3 and Figure 1-1 show the allocation of money to different kinds of educational projects.

<table>
<thead>
<tr>
<th>Project Nature</th>
<th>No of Applications</th>
<th>$M Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective learning</td>
<td>1164</td>
<td>530.0</td>
</tr>
<tr>
<td>All-round education</td>
<td>1850</td>
<td>461.6</td>
</tr>
<tr>
<td>School-based management</td>
<td>1059</td>
<td>419.3</td>
</tr>
<tr>
<td>Education research</td>
<td>71</td>
<td>115.2</td>
</tr>
<tr>
<td>ICT</td>
<td>1657</td>
<td>1655.3</td>
</tr>
<tr>
<td>Total</td>
<td>5801</td>
<td>3181.4</td>
</tr>
</tbody>
</table>

Adapted with modifications from Government Information Centre (2005)

Although the QEF is not meant to focus on ICT alone, approximately half of the money, i.e. HK $1,655.3 million, has actually been absorbed by ICT-related projects.

In addition to the project-based funding of the QEF, a large amount of public money allocated through regular educational expenditures has been poured into the implementation of ICT. Data from a variety of sources indicate that the Hong Kong SAR government has spent or promised to spend a huge amount of money for ICT in education. Taxpayers might question these expenditures in relation to the value received for that money. Arguments on this issue will continue after a brief description of the resources allocated by the UK government.
Resources Input by the UK Government

Since the release of the consultation paper in 1997 (i.e. DfEE, 1997), the implementation of ICT has been as strongly promoted by the UK government as by the Hong Kong government. From 1998 to 2004, a sum of £1.8 billion has been spent or is planned to be spent through the National Grid for Learning (NGfL)\(^3\) scheme, as detailed in the following:

*DFES funding for the NGfL amounted to £657 million over four years and began in April 1998. This was distributed to LEAs via the Standards Fund. In 2001, the NGfL scheme was extended, with £710 million of additional funding for 2002/04. The total spend – actual and planned – over all related initiatives from 1998 to 2004 is £1.8 billion.*

(OfSTED, 2002a, para 11)

*From April 1999, £230 million of Lottery funds were made available, across the UK, from the NOF to help increase the competence of all teachers in their use of ICT in teaching and learning. The scheme uses independent training organisations, approved by the NOF and quality-assured in England by the TTA\(^4\). The NOF training has been extended to December 2003, with schools having to sign up for the training by March 2002. In England, 340,000 teachers, about 83% of those eligible, had signed up for the programme by December 2001...*  

(OfSTED, 2002a, para 12)

\(^3\) Details of NGfL are available on their website: [http://www.ngfl.gov.uk/](http://www.ngfl.gov.uk/)

\(^4\) The Teacher Training Agency (TTA) was re-organised as the Training and Development Agency (TDA) in September 2005 ([http://www.tda.gov.uk/](http://www.tda.gov.uk/))
In addition to regular funding, the People's Lottery White Paper (Secretary of State for Culture, Media and
Sport, 1997) proposed that additional resources be allocated to raise the ICT proficiency of in-service school
teachers and librarians. Since the training initiative started in April 1999, a total of £230 million has been
allocated from the Lottery funds for this training purpose through the New Opportunities Fund (NOF)\(^5\) ICT
Training Initiative scheme.

There are other indicators to show the amount of money being spent by the UK government related to the
improvement of ICT in educational use. An example of running expenses focused on ICT spent in 2002-03 is shown in the following table.

| Table 1-4 Educational Running Expenditure in England 2002-03, £ Million |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| Running Expenses                | Primary School | Secondary School| Special Education| Total           |
| Learning resources (not ICT)    | 472.5           | 595.8           | 51.0            | 1119.4          |
| ICT learning resources          | 122.6           | 158.6           | 9.7             | 290.9           |
| Total Running Expenses          | 2235.9          | 2467.6          | 210.9           | 4914.5          |

Adapted with focus in ICT from DfES (2005, Table A4)

The allocation of capital invested in ICT in education also increased between the years 1994/95 to 2003/04.
The actual figures are listed in Table 1-5 and its trend is displayed in Figure 1-2.

| Table 1-5 Schools Capital Allocations in Real Terms, £ Million in 2003-04 Prices |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| PFI Credits                      | 41      | 146     | 386     | 381     | 478     | 874     | 850     |         |         |
| Capital Support                  | 775     | 768     | 812     | 849     | 1,092   | 1,157   | 1,798   | 1,859   | 2,210   | 2,930   |
| ICT Capital*                     | 56      | 55      | 109     | 161     | 278     | 384     |         |         |         |         |
| Total                            | 775     | 768     | 812     | 890     | 1,295   | 1,598   | 2,288   | 2,499   | 3,361   | 4,164   |

Extracted from DfES (2005, Table A7)

\(^5\) Details of NOF is available at: [http://www.nof.org.uk/](http://www.nof.org.uk/)
A rapid growth of capital investment between 1998/99 and 2003/04 is clearly shown in Figure 1-2.

**Claims and Challenges**

In earlier years, computers were commonly regarded as a cost effective tool in education:

*They [computers] are cheap and very powerful tools; they will get cheaper and more powerful... The invention of the cheap computer will probably be as significant as the invention of the printing press...*

(Straker, 1989, p. 3, emphasis added)

When readers and taxpayers know the amount of money invested in ICT, as presented in previous sections, they will probably doubt, if not reject, the claims in Straker’s statements. The investment seems to be growing because of a few reasons. First, the life cycle of a piece of computer equipment may be as short as three to five years, and budgets are always reserved for the replacement of old machines.

Second, even if the price of computer hardware is going down, it will be offset by more and more demanding hardware requirements for new software. For instance, 128 MB memory was a very good configuration a few years ago. Today a computer may need 512 MB or 1024 MB memory to run certain software packages smoothly. Consequently, users are unlikely to enjoy any cost benefits due to technology advancement.
Third, the costs of software and technical support are also major components in the entire cost model of ICT expenses. There is no observable trend of costs dropping for these components. In other words, the overall capital and operating costs of ICT may not be significantly reduced even if the price of hardware itself is dropping. All in all, cost-saving due to technology advancement is dubious. Oppenheimer (2003) strongly criticises these kinds of “seductive,” but false, claims.

Every few years, right around the time that educators have forgotten yesteryear’s predictions, the schools are treated to a whole new definition of the landscape. All those old computer programs were no good anyway, they’re told. Now we’ve finally got something that’s truly useful. It’s easy to handle; it’s less expensive; it finally opens up some powerful learning opportunities. On and on it goes, the message is so seductive – no wonder schools fall for it. A few years and many millions of dollars later, here come the computer hucksters again with yet another offering. But what about that last generation of “educational” software? Oh, the computer promoters say, it turned out to be harder to use than we thought. It was difficult to integrate into the curriculum. It was too expensive. It taught the wrong material. It didn’t coordinate with the new state tests. It was too demanding. It wasn’t demanding enough. The list of excuses is endless. The schools hear them again and again, year after year. And they fall for them again and again, year after painful year.

(Oppenheimer, 2003, p. 401-402, emphasis added)

These statements describe Oppenheimer’s investigations in the United States. Similar phenomena also occur in other educational systems in the world. As discussed in the previous sections, both the British and Hong Kong governments have been investing a vast amount of money in the implementation of ICT in the past decade. It is questionable whether these investments have ever generated any benefits for teaching and learning. Are they merely false hopes, such as those criticised by Oppenheimer?

Unfortunately, many benefits have been assumed, instead of supported by concrete evidence. It has been commonly “taken for granted that the use of technology in education is a ‘good thing’” (Selwyn 2002, p. 3, quotes in original). Alessi and Trollip also argued that computers, an instance of ICT, generate only a “small” educational effect:

Hundreds of research studies have been conducted to prove that using computers to teach is better than using books, teachers, films, or other more traditional methods. Overall, reviews of these studies claim a small effect in favour of computer-based instruction.


Obviously, a gap exists between the high expectation and the “small” effect. High quality research is therefore needed to draw the real picture and help policymakers and educators utilize educational funding in a more effective way.
Scope of Study

According to the issues discussed so far, it is interesting and necessary to learn the real picture related to the implementation of ICT at the school level. Consequently, the following key research questions are proposed for the current study:

- As perceived by primary school heads and teachers, what are the benefits and pitfalls of ICT for teaching?
- What are the difficulties experienced by headteachers and teachers during the implementation of ICT in primary schools?
- Have the resources spent in ICT actually improved teaching and learning?

In considering time and other resources, this research study concentrates on the implementation of ICT in primary schools in Hong Kong SAR. The educational system in the UK (mainly England) is studied as a companion. Primary data will be mainly collected from school heads and teachers (including ICT coordinators, if applicable) using survey and interview techniques. Details of these studies are covered in Chapter 3 through Chapter 5. Secondary data are collected through literature material, which is covered in Chapter 2. Various sources of information in different stages of the study are summarised in Table 1-6.

<table>
<thead>
<tr>
<th>Educational System</th>
<th>Information Source</th>
<th>Literature Material</th>
<th>Survey</th>
<th>Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>UK (mainly England)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>✓</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Summary

In this chapter a broad definition of ICT has been introduced. Resource input in educational ICT has been discussed. Political changes, instead of pedagogical needs, could be a driving force of rapid reform in education. The ICT policies in Hong Kong and the UK are good examples. Both governments changed in 1997, and major reforms in education, including ICT initiatives, were launched soon after the new governments came to power. Strong evidence shows the close connection between politics and education. Both governments have devoted vast amounts of resources to bring ICT into schools, including hardware, software, technical support, and professional development for teachers and headteachers.
Both the UK and Hong Kong SAR governments have invested a great amount of capital in these areas. However, there has not been any commonly agreed educational effect of ICT in education. The current study has been proposed to investigate the implementation of ICT primarily in Hong Kong and secondarily in England. Literature material, research methods, and collection and analysis of data will be covered in the next few chapters.
Chapter 2  Literature Review

I am turned into a sort of machine for observing facts and grinding out conclusions.

_Darwin, Charles R. (1809-1882)_

Overview

This chapter begins with the introduction of some key concepts in this study. Then a review of the use of ICT at the school level in various regions of the world, mainly Hong Kong and the UK, will be examined from various sources of literature and released materials from different governments and educational bodies. In addition to identifying the positive effects of ICT, this chapter will also examine some arguments made against the use of ICT in schools. From time to time, this thesis will criticize the slow adaptation of ICT at the school level. However, it does not imply that a successful implementation will lead to success in raising educational attainment.

Conceptual Framework

Vygotsky’s Theory

In discussing the relationship between ICT and learning, the Zone of Proximal Development (ZPD) and other theories by Vygotsky (1978; 1986) are important. These theories were considered as the bible for the role of ICT in learning. In Luckin (2001), for example, ZPD was considered “the foundation of a [educational] software design framework.” “It was considered that the ZPD is a useful theoretical construct for educational design” (Luckin, 2001, p. 57). There has been a vast amount of discussion of Vygotsky’s ZPD theory with ICT in learning, for example, Ager (2000, p. 11-13); Chang (2001); Downes, Arthur and Beecher (2001); and Luckin (2001).

In Vygotsky’s theory, each individual child has an actual developmental level which the child could achieve without any help from external parties. A child also has a potential developmental level. To achieve that level, a child must get the help from external parties, such as parents, teachers or even more capable peers. Zone of Proximal Development (ZPD) is defined as the “distance”, or “gap”, between the actual developmental level and the potential developmental level of a particular child. (Vygotsky, 1978, p. 86; David, 1999, p. 4; Nutbrown, 2001, p. 136).

Traditionally, parents, teachers, and peers have been regarded as the key people to help bridging the gap between the actual and potential development levels of children. Many recent studies have been conducted
with the objective of developing children's potential levels with the use of ICT as an alternative or supplement to the work of parents or teachers. For instance, Luckin (2001, p. 66) explored "the nature of effective collaborative assistance" through a few variations of Ecolab software in the learning of ecology.

Vygotsky also proposed that learning was both an individual and a social activity (Ager, 2000). Moreover, Ager (2000, p. 12) suggested that children collaboratively working in front of a computer could create an environment in which everyone in the group could progress as a result of the scaffolding effect. When ICT begins to supplement the role of teachers, the traditional teacher-pupil relationship changes. Instances of "peer-to-peer tutoring" becomes notable and, in particular cases, "pupils instructing teacher" is also observed. (Lawson and Comber, 2000, p. 426-427). From a positive viewpoint, this kind of scaffolding effect enhances the pupil-to-pupil and pupil-to-teacher inactivity in the classroom. Interactivity is recognized as one out of "five characteristics of the most successful teaching" (Hargreaves, et al., 2003, p. 218). It is also noted that interactive teaching happens when "pupils' contributions are encouraged, expected and extended" (p. 218). ICT is generally supposed to provide a favourable environment.

Acting as teachers in the ZPD model, Bornas and Llabrés (2001) studied sixty low achieving third-grade children to determine the effectiveness of ICT. They classified computer software into three scaffolding levels, namely (a) minimal level, (b) cognitive level, and (c) meta-cognitive level. Bornas and Llabrés concluded that computer software must reach the meta-cognitive level in order to successfully act as the role of teacher. Unfortunately, this type of software had not yet been developed and it was difficult to predict when it would become available (Bornas and Llabrés, 2001).

**Learning of ICT or Learning with ICT**

ICT has been taught as a subject, usually called Computer Studies or Computer Applications, for secondary students in Hong Kong secondary schools prior to 1997. These lessons mainly focused on "why" and "how" the computers and other components in technology worked. ICT was learnt as a subject and students were involved in the learning of ICT itself.

![Figure 2-1 Two main categories of ICT activities at the school level](image)

Adapted with modifications from Geisert and Futrell (1995, p. 15)
Since 1997, ICT has been introduced into Hong Kong primary schools and ICT has become an instrument, in addition to a subject, for learning. In other words, primary children are involved in learning with ICT. They are represented in the Venn diagram in Figure 2-1.

Learning of ICT mainly concentrates on the principles, theory, or application of the technology itself. Students learn one or more programming languages, from BASIC or Pascal in earlier days to Java more recently. Learning with ICT involves learning software generally known as Computer Aided Learning (CAL) software, Computer Aided Instruction (CAI) software, or other similar names. More and more learning software has been developed for this purpose and has gone through an evolution from technology-centred software, to user-centred software, and finally to learner-centred software (Moursund, 1998).

Being a typical application of ICT, "simulations are perceived as more interesting and motivating than many other methodologies, a better use of computer technology, and more like 'learning in the real world'" (Alessi and Trollip, 2001, p. 213, quotes in original). However, a teacher in Ferneding's (2003) study worried about the over-use of computer simulations in replacing hands-on experiments:

... Education would become too dependent on its usage [computer simulations], such as one school she [the teacher] visited that had adopted a computer-driven science lab and had completely abandoned its hands-on instruction. She believed that this was a huge pedagogical error and that such practices raised serious moral questions for teachers... In addition, Janet [another teacher] also worried about possible over-reliance on technology by educator. But this perception was dismissed by the pragmatic reality that students need the exposure and technical skills to be competitive in school and the job market.

(Ferneding, 2003, p. 226)

As Ferneding pointed out, although some teachers were worried about the "over-reliance" on technology, they were still forced to use it, due mainly to the expectation of the schools, community or the job market.

In earlier days, most learning systems were stand-alone or very loosely coupled systems. This has changed recently as networking has grown. For instance, many web-based learning tools have become very important for higher education and distance learning.

With an emphasis in the importance of the modern networking environment, the evolution model of Moursund (1998) is hereby extended by adding a stage for networked learner-centred software, as shown in the following diagram:
The research in applications of web-based learning environments, also called online learning environments, has been a focus in higher education, as seen in Ellis (2003), Li (2003), and Treuhaft (2000), among many others. Recently, the potential advantages of these environments in primary education have become the interest of many researchers, including Bodzin and Cates (2003) and Yuen (2003).

**ICT as a Lever or ICT as a Catalyst**

ICT as a catalyst and ICT as a lever in education look very similar, but they are not. As defined by Venezky and Davis (2002, para 31), a catalyst "provokes or instigates change." Catalysts act as agents producing "revolutionary changes" to peoples' daily lives at the time of their appearance. Venezky and Davis cite movable type printing press and the automobile as examples of catalysts in society. The reactions to these catalysts are spontaneous and, as in the case of the automobile, often unexpected. In contrast to a catalyst, a lever can only be applied to achieve an intended goal. The action must be purposely defined to achieve the desired results. (Venezky and Davis, 2002, par 32).

The distinction between the catalyst and lever natures of the ICT in a particular school setting is emphasized because it serves as a common reference point for both the authors and readers of research. ICT behaves very differently in these two kinds of natures. A school environment in which ICT is said to behave like a catalyst is one in which "the mere application of ICT within a school generally led to more student centred teaching" (Venezky and Davis, 2002, para 33). With this kind of schools, "countries that desired changes in that direction could focus resources solely on bringing a strong ICT infrastructure into schools and assuring that teachers used it in their teaching" (Venezky and Davis, para 33). However, in reality, the introduction of ICT did not spontaneously produce student-centred teaching and learning. In these school environments,
ICT acted "as a lever for change, providing a strong push toward innovative practices, but the direction of change must be carefully mapped in advance and the staff prepared for it" (Venezky and Davis, 2002, para 33). To sum up, ICT appears as a catalyst in a school setting if it leads to innovation and improvement without the need of explicitly planning in advance. In contrast, ICT appears as a lever in a school if explicit planning, implementation, and staff development, etc. are required for a particular result or function. In reality, the latter has been more commonly observed.

The use of ICT in schools does not act as a natural or automatic catalyst for innovation. On this account, neither the amount nor type of ICT provides a good measure to predict change and innovation. One implication is that policy must drive innovation such that uses of ICT can then act as levers for change.

(Wood, 2003, p. 20, emphasis added)

The above statements about the roles of catalyst or lever in a school were found commonly true. Finally, it should be pointed out that the use and distinction between catalyst and lever were not necessarily universal, although it was explicitly or implicitly adopted by many researchers, such as Tearle (2003); and Wood, (2002). However, such a concept enables both the authors and the readers to have a common starting point in the study of ICT in educational environments.

Successful Implementation or Successful Results

The concepts of successful implementation of ICT and the successful results of ICT also look very similar but have different meanings in the current context.

A successful implementation is an immediate or short-term outcome while a successful result is an ultimate or long-term outcome. A successful implementation is a necessary, but not sufficient, condition for a successful result and is easier to observe or to detect than a successful result.

For example, assume that when word processors are introduced to an English writing lesson, all pupils become more active in composing their sentences or essays compared with using the traditional pen and paper approach. The implementation of ICT appears to be successful in that case. However, it is not yet clear whether the ICT has given a successful "result." "The question we must ask, therefore, is: Does the use of word processors really help young students develop their writing skills as many educators seem to believe?" (Armstrong and Casement, 2000, p. 96). Previous research showed that word processors have not always produced positive effects on the writing skills of pupils; the outcomes have been divided among positive, negative, and insignificant effects (Armstrong and Casement, 2000, p. 98)
To identify whether successful results of ICT have occurred, one must see permanent outcomes from the use of ICT. This requires the use of empirical studies, such as that conducted by Olkinuora et al. (2004). Strong evidence must be present to claim that an ICT created permanent results in a school setting.

Unless explicitly specified, references to the success of ICT in a school setting in this and the remaining chapters will only mean success in implementation without any implication of success in the ultimate educational result.

**Review of ICT Implementation in UK**

In the last chapter, there has been an introduction of the resources being spent by both the Hong Kong and UK governments in recent years.

In spite of the increasing amount of resources being spent in the few years following the consultation paper published in 1997, studies show that the outcomes have not met the original expectations. It was reported in a BBC news that “pupils at a junior school in London embraced computers from an early age, but even here it was a challenge making sure that the teachers could cope [with computers]” (Elliott, 2001). The headteacher of the same school expressed the following opinions in an interview:

*We are in the 21st Century and I think computers have a role to play... They [Computers] are never going to replace teachers, and I think it's the quality of teaching that the children are actually going to receive from the teacher that's important... If I worked out the percentage of the week that they're using the computers it's still quite small. Many, many times during the week they're using paper and pen - traditional methods.*

*(Elliott, 2001, no page)*

This interview gives a strong indication that the teachers might not be able to cope with the pace of ICT in classrooms with their children. It might also imply that the demands of children cannot be fulfilled mainly because of the lack of confidence on the part of their teachers.

**OSFSTED and Other Government’s Reports**

Gradually, the British government has recognized the workload of teachers and headteachers to be one of many problems. In 2001, the Department for Education and Skills (DfES) appointed PricewaterhouseCoopers (PwC) as an independent research body to review the workload problem of teachers and headteachers in England and Wales. A report (DfES 2001) has been published based on fieldwork in more than 100 schools and data collected from other sources. At the very beginning of the report, the following situation of teachers is described:
Teachers in many schools perceive a lack of control and ownership over their work, undertaking tasks—particularly documentation—which they do not believe are necessary to support learning, or which could be done by support staff rather than by teachers or more efficiently using Information and Communications Technology (ICT). Some headteachers and senior teachers also report perceived lack of ownership.

(DfES, 2001, para 2)

Teachers were reported as having a strong feeling of lack of ownership in what they should or should not do. Moreover, they were forced to do something, such as documentation, which should have been done by support staff.

Although in general teachers, headteachers and senior teachers welcomed the spirit of many government initiatives, they felt that the pace and manner of change was working against achieving high standards, that they were insufficiently supported to meet these changes, and not accorded the professional trust that they merited. This is notwithstanding the additional resources that in recent years have been made available to schools...

(DfES, 2001, para 3)

The report indicates that teachers and headteachers have not been well supported in the changes and this retarded the achievement of high standards. Moreover, implied from both paragraphs 2 and 3 in DfES (2001c), teachers and headteachers have been very disappointed that they have not been professionally trusted for their work and opinions. The importance of professional trust for teachers and headteachers is noted in the following:

Not only were there issues around job satisfaction and morale, but teachers who perceived a lack of trust felt that it actually increased workload by encouraging an over-cautious approach to accountability at all levels in which being able to provide documentary evidence became a dominant consideration. This suggests that restoring a sense of professional trust at all levels will be an important element in successful implementation of change.

(DfES, 2001, para 8.10)

Without professional trust, teachers might lose “sense of ownership of their work”, “self esteem,” and “long term commitment to the teaching profession” (DfES, 2001, para 8.6)

Relieving the workload of teachers is also a way to improve their sense of ownership of the work. The PriceWaterhouse report (DfES, 2001) suggests a number of ways to achieve that, such as introducing more flexibility in school staffing so that administrative tasks and other routines could be transferred to additional
supporting staff (DfES, 2001, Execution Summary, para 7). Teachers could be more focused in their teaching profession and have more direct contact with pupils.

Although the PriceWaterhouse report is a study of teachers' workload, it contains other ideas regarding the educational use of ICT. For instance, it summarizes the obstacles of effective use of ICT in six categories:

<table>
<thead>
<tr>
<th>Table 2-1</th>
<th>Obstacles Limiting the Effective Use of ICT in Schools in England and Wales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lack of availability of ICT for teachers, both for management and curriculum purpose, as well as the limited accessibility from home for teachers</td>
</tr>
<tr>
<td>2</td>
<td>Existence of &quot;skill gap&quot; with teachers, probably resulted from the lack of availability, accessibility or training</td>
</tr>
<tr>
<td>3</td>
<td>Lack of sharing of experiences, expertise and software between schools</td>
</tr>
<tr>
<td>4</td>
<td>Lack of accessibility of existing of web-based resources</td>
</tr>
<tr>
<td>5</td>
<td>Lack of on-site and remote (e.g. web-based, telephone) technical support</td>
</tr>
<tr>
<td>6</td>
<td>Lack of central direction in schools about the achievable targets and limit ICT</td>
</tr>
</tbody>
</table>

Adapted with modification from DfES (2001, para 1.12)

Out of these six categories, only the first one is related to hardware resources. Other obstacles are more or less related to human factors, such as skill gaps with teachers, opportunities for experience sharing, lack of technical support, and the ambiguity in central direction. All these obstacles are as important as resources to buy computers.

The report also clearly defines two types of human support needed for implementation of ICT at the school level, namely (a) technical support and (b) in-class curricular support (DfES, 2001, para 5.24). This kind of clear distinction between technical and curricular needs is also noted in some of the other literature, such as Sandhiltz (2001). In contrast, this kind of distinction, if any, is rarely mentioned in papers from researchers in Hong Kong.

"Strategic leadership of ICT" is also considered an important role in the report (DfES, 2001, para 5.11). Continuous training programs are required for school heads and ICT managers to make the most of ICT investment in schools.

Later reports from OFSTED in England also point out the importance of the skill level of teachers as an essential factor to facilitating good ICT-use in schools.

*In far too many schools, however, the training has disappointed teachers and has failed to meet their needs, whatever their level of ICT expertise. A common failing has been the lack of differentiation in the training programmes, to extend the highly competent ICT users, while also meeting the needs of those teachers who have limited confidence. In particular, many teachers have received too little help in how to use ICT to teach literacy, numeracy and other*
subjects of the curriculum. In half of the schools visited, training has not met the pedagogical need of teachers to apply ICT to lessons in other subjects.

(OFSTED, 2002b, para 18)

The training was so unsuccessful that it had "not met the pedagogical need of teachers" in half of the visited schools. In turn, insufficient training and, consequently, insufficient confidence were suspected in leading to an underdeveloped use of ICT in a school. As OFSTED stated further:

*Where training has not yet started or has failed to meet the needs of teachers, the use of ICT is usually underdeveloped. In schools where this is the case, teachers are only too aware that their lack of confidence and expertise is restricting pupils' progress in using and applying ICT. Where there is a lack of appropriate training of and weak ICT development generally in a school, the teachers have often fallen behind colleagues in other schools in terms of their personal and professional use of new technologies.*

(OFSTED, 2002b, para 19)

Two years later, OFSTED has reported that there have been some, though insufficient, improvements in the "quality of teaching using ICT". However, some teachers are still not ICT-competent enough to "challenge" pupils in their lessons. It is implied that teachers are not able to give stimulation to the pupils for the same reason.

*Although there have been significant gains in the quality of teaching using ICT, a continuing issue is the lack of challenge presented to pupils in many lessons. Often this is because teachers have not gauged the ICT capability of pupils*

(OFSTED, 2004, p. 8)

This point, that some teachers are not confident enough to handle pupils who might have greater ICT capability, matches the BBC news report cited earlier (Elliot, 2001).

The same OFSTED report (2004, p. 12) also identifies that technical support at the school level rarely matches the demand due to rapidly increasing deployment of hardware and software. The deployment of hardware and software is at a speed much greater than that of the increase in technical support, creating problems for teachers. This report also voices the problems of teachers' ICT. Complaints have been made against the majority of training, including the NOF training, which has been badly designed and carried out.

*The expected outcomes of NOF training have still been met significantly in only about a third of all schools and in another third they have not been met at all. The expectations of the NOF-funded ICT training proved over-ambitious. The ICT needs of many primary teachers were more basic than the scheme anticipated, while others had already developed a high level of*
expertise, often through their own efforts. The majority of NOF training was insufficiently differentiated to meet such varied needs... Much training made a limited contribution to their awareness of subject-specific ICT applications and did not encourage them to consider issues of teaching and learning with ICT.

(Ofsted, 2004, p. 12)

Two-thirds of the NOF training has been unsatisfactory compared with the original expectation. The pitfalls of this kind of training, such as over-ambitiousness, insufficient learner-differentiation, insufficient need-orientation, and limited subject-awareness, eventually have dried up the enthusiasm of the learner-teachers, as described in the following:

As the NOF programmes progressed, the original enthusiasm waned and teachers became resistant to training that was inappropriate to their needs.

(Ofsted, 2004, p. 12)

Ideally, training events should be tailor-made and all those shortcomings should be avoided.

In Scotland, although some of her educational policies are different from other parts of the UK, the National Grid for Learning (NGfL) and the New Opportunities Fund (NOF) have also set the fundamental guidelines for ICT development in schools and objectives of staff training in the region. More or less similar to the OFSTED report for England and Wales, the Scottish HM Inspectors' (2004) report, named The use of ICT in Learning and Teaching, also points out a number of unsatisfactory outcomes in the implementation of ICT:

In a few schools, ICT was also used effectively within mathematics programmes to improve pupils' attainment...

Examples of good practice in other curriculum areas were rare...

In the majority of [primary] schools there were important weaknesses in the use of ICT. Many could show some effective practice, but it was usually not sufficiently widespread or consistent across classes, stages or curriculum areas to make a significant impact on pupils' learning or attainment. Effective practice often resulted from the initiative, expertise and enthusiasm of individual teachers, rather than from whole-school strategies and programmes...

(HM Inspectors of Schools, 2004, para 2.6-2.8)

As identified in the last passage, the success of an ICT implementation at the school level has been dependent on the capabilities and attitudes of individual teachers instead of the "whole school strategies." In other words, the whole school strategies have not been successful, and it has been not healthy to see the success of ICT dependent upon individual people instead of strategies.
In a survey study of primary and secondary teachers in Scotland, Williams et al (2000, p. 318) report that "teachers in this sample [were] still in the early stages of ICT development." The researchers have found that the teachers were "motivated and interested in developing their own skills and knowledge." (p. 319) However, more training is needed to allow teachers to enjoy the benefits of ICT in their schools.

Williams, et al (2000, p. 319) further suggest that "training alone" might not be effective to enhance the use of ICT in schools. Training should be "appropriate in terms of skills, knowledge, relevance to educational goals and priorities, and delivery" (p. 319). Provision of a localised and supportive environment is also important in a "holistic approach" to enhance the effective use of ICT in schools.

From the inspectors' reports of schools in England and Scotland, it is evident that ICT implementation between 1997 and 2002 has not been so successful, although improvements in some areas and some schools have been found. In addition to the inspectors' report, other independent studies will be presented in the coming sections.

**Tearle's Study**

Tearle (2003) reports that "although ICT use had permeated the curriculum, there were few signs of radical alteration to existing structures and working practices." Although this case study is focused on a secondary school, some of its findings could be applicable to other levels in the educational system as well.

The school in Tearle's study was named by OFSTED as one of the "Best Schools in Britain." It received "Investors in People," "Investors in Careers," and "Investors in Business Partnerships" awards (p. 571). The school had a very good infrastructure for the development of ICT; it had (a) new building; (b) financial support for hardware and software; (c) ICT training for all staff; and (d) appointments of an ICT coordinator and network manager.

The school has adopted a "staged" approach in its development of ICT. That is, "ICT development started off in a small way and gradually built up," emphasizing a "natural grouping of departments." (Tearle, 2003, p. 576) As facilities became available, more departments were "invited" to join the ICT implementation program. "Strong" departments, those with enthusiasm and capable staff, started first. Soon after, "the resulting positive outcomes, evident for others [departments] to see, created a climate where the implementation of ICT was seen as desirable." (Tearle, 2003, p. 576)

This kind of staged approach has another advantage - the ICT coordinator is able to undertake a "manageable task." That is, "by focusing in on one or two departments at a time, it has been possible to attend to their specific needs and address difficulties as they arise; hence improving the likelihood of success and positive response from those involved" (Tearle 2003, p. 576).
In spite of the many advantages or privileges of the school discussed so far, ICT is still being applied as a “tool” (i.e. lever), instead of a “catalyst.” Tearle (2003) summarises from this and other studies that it is easier for ICT to appear as “just another tool” to be used by teachers, such as “using an OHP or whiteboard instead of a blackboard” (p. 579). However, it is difficult to generate a “more exciting and challenging vision of ICT to revolutionise the way” of teaching and learning. Moreover, Tearle concludes the outcomes of ICT as follows:

_In this study although ICT use had permeated the curriculum, there were few signs of radical alteration to existing structures and working practices, or even evidence of particularly innovative application of ICT to enhance and extend learning opportunities. It is suggested that ICT was being used as a tool for learning with little recognition of its potential role as a catalyst for social and educational change... What is needed to ensure the situation [gradual integration of ICT] continues to change, and that when the time is right the “revolution” takes place?_ (Tearle, 2003, p. 579 and 581)

In the case study of Tearle (2003), although the school had sufficient, if not more than sufficient, hardware and software resources, a team of capable staff members, and a good plan for ICT implementation, compared with other schools, ICT was still serving at a “tool”, i.e. a “lever” in Venezky and Davis’s (2002) definitions, instead of a “catalyst” which might cause revolutionary changes in curriculum. In reality, a catalytic reaction seldom happens, as has also been noted by Wood (2002). Finally Tearle states:

_What emerges then is not an argument as to whether equipment, support or training is the more important, but much broader debate about mindsets, assumptions, beliefs and values of individuals and organisations... It almost certainly means however that piecemeal approaches which address discrete elements which are perceived to impact on increasing ICT use, will at best have limited outcome._ (Tearle, 2003, p. 581)

The implementation of ICT should, therefore, take a holistic approach, instead of a “piecemeal approach,” which can only produce “limited outcomes” at most.

**Goodison’s Study**

Goodison (2003) gives a very interesting comparison of lessons conducted by two teachers. The first one was not an “early adopter of technology” (p. 551) while the other was “more confident to use ICT to teach”
Surprisingly, the findings show that the former gave a much better lesson with the use of ICT than the latter did.

In Goodison's (2003) case study, two out of twenty video-taped primary lessons in a UK primary school were analysed in detail. The first one was a science lesson conducted by an experienced part-time teacher (Teacher A). "Like many older staff, he was not an early adopter of technology" (p. 551). However, it was a surprise that "the software and hardware he used to teach this particular topic (basic electricity) had a dramatic effect on the effectiveness of the session."

The second one was a history lesson conducted by a "much younger" but "still very experienced" teacher. (Teacher B). "She was more confident in using ICT to teach than Teacher A and had a broader and deeper knowledge of computers in general" (p. 551-552).

Goodison (2003) applies the "principles of learning" defined by Bransford et al (1999, quoted in Goodison, 2003, p. 550) as "a lens through which current practice can be viewed." The principles propose that four conditions must be satisfied to provide an optimised learning environment, namely (a) learner centred; (b) knowledge-centred; (c) formative assessment-centred; and (d) community-centred. These principles of learning and their implications for designing learning environments apply equally to child and adult learning. Having watched and analysed the taped lessons, Goodison greatly appreciated Teacher A's classroom practices:

**Without doubt, teacher A adopted a learner-centred approach, paying particular attention to the needs of the newcomer to the class and always supporting and encouraging the class as a whole as they tried to use the concept he was teaching. It is also evident that his approach was knowledge-centred in that he constantly prompted his class to question why a particular circuit did or did not work. As for assessment, although the observed teaching did not include formal assessment, the use of simulation software on the interactive whiteboard meant precisely that the pupils' thinking was made apparent to the teacher and the class: it was implicit in what they did with the virtual components [i.e. meeting the assessment-centred objective]. Finally, the sense of "intellectual camaraderie" [required for building a sense of community] in the class, as they grappled with the increasing complexity of the demands made on them, is evident even from the verbal record alone... [dialogue omitted] ... It would appear that this particular teacher carries his very own classroom around with him, as it were, and recreates it during his lessons.**

(Goodison, 2003, p. 558-559)

Teacher A's lesson fulfilled all four of Bransford et al's (1999, cited in Goodison, 2003) criteria for a good learning environment. Even though Goodison found that Teacher B had more advantages over Teacher A in terms of ICT competence, excellent relations with pupils, and evident enthusiasm for the subject, the observed lesson turned out to be unsatisfactory, partly because of the design of the lesson.
... the design of the lesson was flawed in a number of significant respects which meant that the pupils did not gain as much as they might have done from the lesson and the technology used to support it was not used to maximum advantage... To what extent is the “classroom” created by the teacher [B] in this lesson learner-centred, knowledge-centred, assessment-centred and community-centred? Evidently it is not fully learner-centred in that little time is spent probing the attitudes and preconceptions that they brought with them to this lesson. If anything, the focus is on the presentation itself i.e. the framework provided by the teacher. The lesson also falls short in terms of being knowledge-centred, since the ability to recall facts occupies centre stage, with relatively little time being spent on developing understanding. As for assessment, there are very few occasions where pupils' thinking is made visible to the teacher and the rest of the class, whereas if it had been the pupils themselves who had created the presentation (and these children all have the requisite technical competence), this criterion would probably have been met. Finally, because the pupils' attention is focused on the framework that the teacher has produced for them, there are few opportunities to exercise the kind of “intellectual camaraderie” that characterises what Bransford terms the community-centred classroom.

(Goodison, 2003, p. 564-565)

The major finding of this study indicates that teachers who are more ICT-competent than others may not necessarily apply ICT in their lessons better than teachers less ICT-competent. It implies that the use of ICT in the classroom is more dependent on the pedagogical skills, instead of technological skills, of a teacher. The design of the lesson is also critical to the success or failure of ICT integration. Based on the provisional findings of this study, the providers of training for teachers should be aware of the objectives and deliverables of their lessons – whether it should be technologically focused or pedagogically focused.

**OECD/CERI’s Cross-Country Study**

The Centre for Educational Research and Innovation (CERI) of the Organisation for Economic Co-operation and Development (OECD), with headquarters in Paris, was established in 1968. “Since then, it has established an international reputation for pioneering educational research, opening up new fields for exploration and combining rigorous analysis with conceptual innovation” (OECD/CERI, 2005). The organization coordinated a cross-country study of ICT in education in 2000 and 2001. A total of 94 schools across 23 countries or regions participated in this study, Twenty-one (21) of the participating countries are OECD members; the other two are Israel and Singapore. The reports on all participating schools have been collected and published on OECD’s website. A summary report was prepared by Venezky and Davis (2002), which is also available on OECD’s website. Unfortunately, Hong Kong did not participate in this research. Otherwise, there would have been a good opportunity to compare the implementation of ICT in Hong Kong and other regions in the world on the same basis.
Three (3) schools in England were involved in the OECD/CERI study. One of these schools was at primary level. The other two were secondary schools, including one specialist technology college. Nevertheless, in this chapter, the main focus is on the primary school. The leader of the research team in the UK, Leask (2001), reports that “staff ICT competence was critical to the success of the whole school improvement initiative” (p. 5) in the case studies of these English schools, was independent of their different levels or backgrounds.

One of the participant schools, the Littlejohn School (pseudonym), was a community school at primary level. The researchers were greatly appreciative of the headteacher of that school and called him an “innovator” because “he had the support of a core group of teachers who could be categorised early adopters” (Leask and Kington, 2001, p. 10). Moreover, he adopted a strategy to implement ICT gradually, “so that in time all teachers would be brought on board, through training and collaboration with more experienced colleagues” (p. 10).

The headteacher of Littlejohn was so innovative that he developed a “laptop scheme,” which successfully created collaboration among the staff, pupils, and parents. The researchers found that the scheme had been so successful that “at the time the data were collected no staff could be categorised as resisters although there was evidence that some may have been so when the strategy was first proposed” (Leask and Kington, 2001, p. 10).

Moreover, the headteacher helped his staff realize their personal and professional benefits, so that “those teachers who were resisters at first, seemed to move rapidly to embracing the innovation” (p. 10). Leask and Kington also point out that ICT innovation looks “different to other forms of innovation e.g. innovations such as introducing new ways of teaching literacy or introducing new elements of a curriculum may not have the same personal and professional outcomes for teachers that using ICT has” (p. 10). The headteacher seemed to have successfully convinced his teachers to believe this unique benefit for themselves.

Another contribution of the headteacher was that he successfully created a supportive learning community, which even involved the participation of the husbands of two teachers and the local Further Education (FE) college. In addition, “the headteacher had adopted a strategy of pairing teachers so that there was ICT expertise in the year teams” (Leask and Kington, 2001, p. 11). There was at least one person with laptop (computer) expertise in each team. Under all these measures, “the staff ICT capacity had been steadily and strategically built up over a number of years” (p. 11).

Leask and Kington also report that the ICT strategy implemented by Littlejohn had contributions in three areas, namely (a) raising pupil achievement; (b) involving parents and children in learning together; and (c) supporting community regeneration (Leask and Kington, 2001, p. 5).
The second and third contributions were achieved through a portable computer loan scheme. This helped pupils' families who could not afford to buy computers to borrow portables from the school and use them at home for learning or other purposes. As reported by Leask and Kington (2001, p. 14), "the headteacher would like to see the laptops used as a family resource rather than just for the children, which he said would improve the motivation of everyone in the household. The aim was to achieve this through expanding the training for adults provided by the school, enabling them to gain qualifications in ICT". This kind of commitment of a school to the community was rarely, if ever, reported in Hong Kong. This point will be further elaborated later in this chapter.

To determine whether ICT appeared as a catalyst in the school, the authors has summarized the findings as follows:

ICT was not the catalyst for change but was an additional resource [in this school]. The headteacher's goals for change in:
- community attitudes to education
- parents' relationships with the school
- pupils' attitudes to themselves and their work
- the way teachers work and plan together

were not dependent [merely] on the availability of ICT. ICT provided tools ("additional resources") to help achieve these goals.

(Leask and Kington, 2001, p. 10)

In other words, these desirable effects could not be achieved unless careful planning and implementation was in place in the school; therefore, ICT was non-catalytic in this case.

Various reports from both the UK government and independent researchers indicate that the proficiency of staff is necessary, though insufficient by itself, factor affecting the quality of implementation. Having competent teachers is advantageous. However, Godison's (2003) findings should not be forgotten, i.e. less ICT-competent teachers could provide equally good or even better lessons with well-designed teaching methods and material. What could make the difference? Appropriate training is an instrumental factor. The willingness of teachers to use ICT is also essential. Bringing ICT into classroom is a simple process but using it in meaningful ways is difficult. Merely changing from using "chalk and talk" to "PowerPoint and talk" (Pearson, 2001, p. 282) is meaningless.

6 PowerPoint: a computerized presentation software
Review of ICT Implementation in Hong Kong Primary Schools

Having learnt the outcomes of the educational use of ICT in the UK, focus of this section is the context of the Hong Kong SAR. What is the scenario in primary schools in Hong Kong? Are there any similarities and differences?

Government Reports

A few years after the mass implementation of ICT at the school level, the Education and Manpower Bureau (EMB) (2004a) published a consultation document which also served the purpose of reviewing the “achievements” of ICT in education in its five-year strategy between 1998/99 and 2002/03. (EMB 2004b). It also “proposed the way forward to canvass public opinions” (EMB, 2004b). In the press release, the five-year strategy was claimed to be successful:

The five-year strategy has succeeded in laying a solid foundation for IT in education in Hong Kong. The government is committed to sustaining IT development in education, making enhanced efforts to equip our students for the information age, and fostering collaboration among schools, parents and the community.

(EMB, 2004b)

The EMB (2004a) policy document provides impressive data, as shown in the following example:

A survey conducted early this year found that on average, each primary school now has 91 computers while secondary school has 247. These are well above the original targets of 40 in primary schools and 82 in secondary schools now in the Five-year Strategy. All schools have broadband connection to the Internet, with over 60% of them having fibre access and enjoying 10 to 100 Mbps bandwidth.

(EMB, 2004a, para 3)

The government, like many school administrators, has tended to install computer hardware before having the matching manpower, e.g. competent teachers. It was believed to be the simplest way to “gain visibility” for the public (Bork 1993). However, these kinds of attractive figures are meaningless if there is nobody to make appropriate use of the hardware. As Loveless (1995) emphasizes, children do not automatically gain benefits in learning just by placing a computer in front of them.

According to the EMB (1998) policy document, ICT has been regarded as so powerful that it could “play a catalyst role in the transformation of school education” (EMB, 1998, para 1.3). However, the term “catalyst”
does not appear anywhere in the later document (EMB 2004). Instead, the word “lever” has been used in the 2004 document in the following context:

... using IT as a lever to support and advance the Education Reform initiatives...

(EMB, 2004, p. 8, emphasis added)

... Building Leadership Capacities for Using IT as Lever for Curriculum Innovation

(EMB, 2004, p. 17, emphasis added)

... IT can be used as a lever for innovation...

(EMB, 2004, p. 17, emphasis added)

... embedding IT as a lever for change in the school strategic development plan should be a key element in the professional development agenda for school heads.

(EMB, 2004, p. 18, emphasis added)

It is unknown whether EMB understood that “catalyst” could be difficult, if not impossible, to achieve and, therefore, did not use this word any more in the EMB (2004) policy paper. “Lever,” as Venezky and Davis (2002) defined, was more likely to happen and, therefore, was used in the EMB (2004) policy paper. However, this is merely a guess because the EMB did not make any explicit explanation for the change in wording. Another guess is that EMB knew nothing about the distinct differences between catalytic and lever behaviours of ICT in education and used these terms arbitrarily in their documents.

The EMB (1998) consultation paper set a target to achieve a transformation “from a largely textbook-based teacher-centred approach to a more interactive and learner-centred approach” (EMB, 1998, para 1.2). Relating to this target, its “quintessence” was later reviewed in the EMB (2004) document as follows:

The quintessence of the Strategy is to transform school education from a largely teacher-centred approach to a more interactive and learner-centred approach. This “paradigm shift” is also being promoted under the curriculum reform. Five years on, we have seen tremendous changes to schools as a learning institution: all schools are connected to the Internet; teachers have acquired at least basic skills and embracing IT as a teaching tool; students are using IT and the Internet in project-based learning.

(EMB, 2004a, Foreword)

The strategy was “promoted” to schools. Other than listing the indicators noted above, the rest of the document makes no mention of whether the “paradigm shift” or transform was successfully achieved.
However, the Hong Kong SAR government has not shown great concern in conducting rigorous research to review the quality or effectiveness of implementation of ICT since its large-scale introduction to primary schools in 1997. The EMB (2004) document has been the only formal document published by the Hong Kong SAR reviewing the implementation of ICT since 1997. This is a great difference between the Hong Kong government and the UK government, which has generated many reviewing documents published by the various education-related bodies, for example, DEES (2001), OFSTED (2002), and OFSTED (2004), etc.

**Independent Studies**

Some researchers such as Li and Chow (2000) and Ki (2000a; 2000b), etc., received grants from the Hong Kong government through the Quality Education Fund to conduct studies related to ICT. These studies were supposed to be "independent" because they were carried out by university researchers. However, most, if not all, of these researchers firmly believed that ICT must be, in principle, "good" for education. If there is any problem, it must be due to operational or practical deficiencies.

Few, if any, people have asked whether ICT is good for education. Instead, people merely have asked how to make ICT good for education. This kind of pre-judgement is a hindrance to unbiased research in the "true" effectiveness of ICT in education. From an interview with teachers in the study by Li and Chow (2000), the interviewee questioned the usefulness of ICT in teaching:

> I'm a bit uncertain that ICT can really help students learn better. Most of the learning experience and learning outcomes being quoted as exemplars can also be achieved without using ICT.

*(Li and Chow, 2000, p. 149)*

Presented in the same paper, another interviewed teacher expressed her helplessness during the implementation of ICT:

> I think psychological readiness is the most important. Teachers must be willing to change, otherwise nothing can be done in the development of ICT in education. As I come from an arts background, I know little about computer. Therefore I have to equip myself with computer skills first... then I have to find ways, on my own, to integrate ICT into my teaching...

*(Li and Chow, 2000, pp. 149)*

However, the researchers of the study have not attempted to find out, what made the first teacher "uncertain about ICT" and how the second teacher had to "find ways, on [his/her] own, to integrate ICT" in the lessons. It has been a general practice for policymakers, or even academic researchers, in Hong Kong to dismiss the complaints made by teachers. Those teachers have often been labelled as "reluctant to change" (Li and
Chow, 2000, p. 149). The authors of that paper have commented on the teachers having problems in their summary as follows:

In the change process, teachers are required to learn new technological skills and applications, to explore new pedagogical approaches to the planning and delivery of content knowledge within a new context. This challenges teachers to reconsider personal attitudes and beliefs held about their roles as educators and re-examine their conception of technology's role in the school, in society and in their lives.

(Li and Chow, 2000, p. 150, emphasis added)

From Li and Chow's point of view, ICT must be good. Any questioning of technology must be unreasonable. Teachers must "reconsider [their] personal attitudes and beliefs...and re-examine their conception of technology's role...."

Moreover, "in order to enhance teachers' susceptibility to change," Li and Chow further suggest requiring headteachers "to have strong awareness and strategic commitment to foster a culture that values student empowerment as the crux of ICT implementation, encourages professional development, appreciates and embraces innovation and quality of education" (Li and Chow, 2000, p. 150).

In another research study of the use of a computer-aided platform called Knowledge Forum in primary schools, Yuen (2003) concludes a positive outcome with this platform. Among many other benefits, such a platform establishes "a collaborative learning network with abundant information resources (p. 160)." However, he also points out that its effectiveness had been limited by insufficient technical supports and the skills of teachers. In the view of teachers, he adds:

As a general observation, teachers in primary schools incline to conventional view of teaching and learning which would minimize the possibility of building learning communities in classrooms.

(Yuen, 2003, 160, emphasis added)

The depth of many research studies in the Hong Kong context has usually not been sufficient to identify the particular problems of teachers. Li and Chow (2000) and Yuen (2003), among many other researchers in Hong Kong, blame teachers implicitly or explicitly for problems with implementation Teachers have been said to be "reluctant to change" (Li and Chow, 2000, p. 149) or "inclining to conventional view" (Yuen, 2003, p. 160). This kind of unfair or biased attitude towards teachers has been typical in Hong Kong's education community. With this kind of ignorance, the helplessness of teachers could not be solved or even released. As time went on, teachers have treated ICT as a burden, instead of a helpful instrument, in their teaching. In chapter 5 of this thesis, the real problems facing teachers will be revisited.
In addition, overly general proposals have frequently been found in these papers, such as encouraging professional development and innovation. However, these generic proposals could fit any study on implementing educational change and did not provide any substantive information to the reader.

In contrast, a very great difference has been found in the research in the UK and elsewhere in the world. Studies, such as DfES (2001), Gimbert and Cristol (2004), Sandholtz (2001) and Williams et al (2000), have been carried out to address the problems with and concerns of teachers. One of the aims of these research studies has been to find out the "true" situation of teachers, instead of merely putting blame on them.

However, this is not to say that teachers have been free from blame in the other part of the world. Stallard with Cocker (2001, p. 49), for example, does not believe that training of teachers has been a great obstacle to ICT utilisation. Instead, he supposes that some "explanations" have actually been "handy excuses." as in the following:

*Beyond these things [hardware and support-related], which some like to use as handy excuses for their lack of use of IT resources, many educators really prefer not to bother with it... Teaching, they say, is more of an art than a science. It is a transaction between a teacher and the class. Computers and other machines create "noise" in that communication process...*

*Teachers insisting on freedom to be "artistic" in the classroom present a major obstacle to the effective use of IT. Art happens or it does not. Real artistic talent is rare in any field, and many times what is intended as art is more craft. To assume that our society [US] can produce one million or more teachers who can effectively practice teaching as an art is absurd, even if it were desirable.*

*(Stallard with Cocker, 2001, p. 49)*

This kind of view matches the views of the policymakers and many researchers in Hong Kong.

**Human Resources**

As in many studies already mentioned, teachers are a key factor to the success of ICT implementation. Teachers without appropriate knowledge and skills only make the lesson "worse off" when putting technology in it, as in the following opinion from a headteacher in Liverpool:

*I think if you put a lot of technology into the classroom, and the teacher who's not organised, who doesn't plan well, who's not clear about learning outcomes, then that class is going to be worse off.*

*(Elliot, 2001, no page)*
However, caution should be taken to avoid unnecessary blame on teachers because this might not improve the situation. Carefully designed professional development or training, must be provided to teachers.

**Professional Development**

Professional development is also known by other names, such as continuing professional development (CPD) staff development, or in-service training. Ideally, teachers at different levels and with different characteristics should get training in different focuses, as pointed out by Snoeyink and Ertmer (2001), because “different teachers comprise different types of learners who could not be treated the same” (p. 104). In their case study of three veteran teachers, Snoeyink and Ertmer (2001) recommend three different sets of practice to help them according to their levels and characteristics.

About training programmes, Snoeyink and Ertmer (2001) also note the following opinions from teachers:

*When the participating teachers in this study were learning computer skills, they valued being able to ask their peers for help, especially while they were working. They also disliked trying to learn in large groups (from 12 to 18 participants) because some would race ahead while others were left behind. Additionally, the instructor could not adequately address all of their individual concerns and questions.*

*(Snoeyink and Ertmer, 2001, p. 107)*

Teachers themselves also prefer receiving training in small groups or direct help from their peers, instead of large group training. Gimbert and Cristol (2004, p. 214) also criticize the “one-size-for-all” approach toward technological proficiency because it can not best meet the needs of individual teachers. Similar opinions have also been reported in other studies, such as Kariuki et al (2001), in which a small group mentoring process was welcomed by school teachers. Some mentees have been found to go through an “observers to co-learners to leader” transition and finally have gained the confidence in using ICT for their teaching. (Kariuki et al, 2001, p. 416)

The leaders of a school are often referred to as the headteacher, which is the equivalent of principal or headmaster/headmistress in different educational systems of the world. In the discussion of technology in schools, technology leaders have an important place. Technology leaders should be well equipped with not only technical but also pedagogical competency. There were many models which identify different levels of technology competency required for teachers or as steps of a ladder in the Continuing Professional Development (CPD) for teachers. For instance, Wood (2003) emphasized the importance of CPD in education, particularly educational ICT. He built a four-level ICT proficiency model for pedagogical purposes, starting from the awareness level to the highest fluency level, as shown in Table 2-2.
Table 2-2 Four Levels of ICT Proficiency Levels for Pedagogical Needs

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raising awareness of, and initial familiarization with, the educational potential of ICT</td>
</tr>
<tr>
<td>2</td>
<td>Basic ICT literacy and establish sufficient confidence to work with ICT in the classroom</td>
</tr>
<tr>
<td>3</td>
<td>Advanced ICT literacy including strategies for integrating uses of ICT into the curricula and confidence in one's ability to assess when, how, and what ICT tools to use for different pedagogical purposes</td>
</tr>
<tr>
<td>4</td>
<td>ICT fluency where teachers and able to author and create their own ICT learning environments, perhaps with a specific goal of wider dissemination</td>
</tr>
</tbody>
</table>

Adapted with modifications from Wood (2003, p. 23)

European Schoolnet is "an international partnership of more than 26 European Ministries of Education developing learning for schools, teachers and pupils across Europe" (European Schoolnet, 2005). It supports various research studies in educational ICT. Wood (2003) is a cross-country research study supported by the European SchoolNet.

Although Wood (2003) has defined an ICT proficiency model as shown in Table 2-2, there appears to be "no generally accepted and proven models of how to evaluate the impact of training and development on teaching practices and impacts on learners" (p. 24). The author asserts that such evaluation would be "an extremely complex issue to investigate empirically" (p. 24). However, "some agreed methodologies that could help us to document and learn from training interventions" are in urgent need (p. 24). The issue is so complex that "it is unlikely that any firm connections will be made between approaches to training/CPD and direct impacts on practice and learner experience." (p. 24)

Leadership

Similar to the four-level model shown in Table 2-2, Moursund (1997b, p. 4-5) defines an eight-level ICT knowledge or "Stages of Concern" model, as shown in the following table.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Knowledge</th>
<th>Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Awareness</td>
<td>started to be aware of educational use of computers but yet techno-phobic</td>
<td>how to get familiar with hardware and software</td>
</tr>
<tr>
<td>2. Informational</td>
<td>gained novice level of ICT skills and knowledge but have insufficient confidence</td>
<td>how to use ICT in instructional work</td>
</tr>
<tr>
<td>3. Personal</td>
<td>started to use ICT in profession</td>
<td>the effect of ICT to personal and certain professional life</td>
</tr>
<tr>
<td>4. Time</td>
<td>spending some time in using ICT professionally</td>
<td>time needed to learn and update changing computer knowledge</td>
</tr>
<tr>
<td>5. Consequences</td>
<td>making certain use of ICT in profession</td>
<td>the effects if various ICT tools on students and own profession</td>
</tr>
<tr>
<td>6. Collaboration</td>
<td>occasionally help colleague solving ICT problem</td>
<td>doing more extensive work with peers for the benefits of both</td>
</tr>
<tr>
<td>7. Refocusing</td>
<td>making routine use of ICT in profession and help colleagues learn ICT</td>
<td>learn new ways to use and expand the horizon in ICT</td>
</tr>
<tr>
<td>8. Leadership</td>
<td>being the technology leader among the peers</td>
<td>maintain and improve leadership and professional development skills in school, district and beyond</td>
</tr>
</tbody>
</table>

Compiled with information from Moursund (1997b, p. 4-5)

Stages 1 to 8 of the model represent a continuous spectrum of the development of computer knowledge and attitude with teachers. Teachers who fall in stage 8 of this knowledge model are called technology leaders. They have the characteristics of leadership in technology mentioned in Table 2-3. They are “faster” catchers of ICT in their teaching profession. It is an advantage to have certain technology leaders in a group of teachers. Moursund (1997a, p. 4) encourages teachers to take professional development and then become “high-level leaders (p. 4).” Those leaders are able to help other “slower” colleagues make optimal use of ICT in their profession.

In many other countries or regions, the ICT coordinator is considered a leadership role in schools. Its “leadership” and “administrative” roles were indicated as follows:

... technology support programs are more effective when directed by well-trained technology coordinators... technology coordinators must be trained to bridge technical ability with classroom teaching experience; their leadership and administrative capacities should be nurtured; and their aptitude for instructional design should be developed.

(Ronkvist et al, 2000, p. 26)
According to Ronnkvist et al (2000), ICT coordinators should have the aptitude for instructional design. In the UK, ICT coordinators are generally regarded as leaders in their schools. Statements with this kind of implications have been widely found in independent research papers, as well as governmental documents.

Where the use of NGfL funding and NOF-funded training is effective, it is almost exclusively due to the strong leadership of the headteacher and ICT co-ordinator. A strong lead from the headteacher is vital and in many cases, the ICT co-ordinator is the driving force behind improvements in the school's ICT teaching and learning...

(OFSETD, 2002, para 13)

It should be noted that both the headteacher and the ICT coordinator assume a joint leadership status in the school in the implementation of ICT, although they have different roles in the implementation.

In Hong Kong, the ICT coordinator is usually not regarded as a leadership role in most, if not all, schools. Although the EMB (2004) mentions leadership of technology in schools many times, it does not mention its association with the ICT coordinator as a leadership role. This is an interesting difference in the mindsets of the policymakers in Hong Kong and the UK – whether ICT coordinators are considered as leaders in schools. Interviews with teachers and headteachers do not show any evidence of a leadership role for ICT coordinators. Even worse, ICT coordinators are frequently treated as technical support staff in many schools in Hong Kong, such as Yuen and Lee (2000). This will be discussed further in chapter 5.

Wahl (2000) suggests in a study of the value of technology that 70% of the budget should be spent on "human infrastructure" (p. 7) while only the remaining 30% should be spent on equipment. The human infrastructure should include staff development, i.e. CPD, as a basic ingredient. Unfortunately, schools and authorities have preferred purchasing tangible goods, such as hardware and software, with their limited budgets; staff development has often been ignored (Ringstaff and Kelley, 2002).

**Questioning the Benefits of ICT**

So far in the previous sections, discussions have focused on the issues of implementation of ICT in Hong Kong and the UK. It should be emphasized that the success of implementation is not necessarily equivalent to getting successful results or improved effectiveness. The former is more notable or detectable through observations or interviews. However, the latter is more difficult to measure. It takes much longer to determine whether ICT produces a successful result. Some empirical studies, such as Olkimuora et al (2004), have attempted to find out the supportiveness of multimedia learning material, which is a major component of ICT in education. However, most of these studies are far from providing a prefect answer.
Too Many Assumptions with Too Little Evidence

Some researchers, such as Lee (2002), have drawn over-simplified conclusions that ICT must be unquestionably good for teaching and learning, as in the following statement:

All in all, ICT offers new and innovative modes of learning for all students at all educational levels.

(Lee, 2002, 41)

In a study by Yuen and Lee (2000), teachers were interviewed and asked about their opinions of the benefits of ICT in schools. An interviewed teacher had the following opinion:

Students need to know about ICT. Asking them to draw (by hand) is already outdated as computer can do that already, so I see ICT in education is a must and the whole process is positive...

(Yuen and Lee, 2000, p. 98, emphasis added)

It is interesting to note that the teacher believed that ICT was a "must" just because drawing by hand was "outdated." More interestingly, the researchers who reported this interview did not make any comments on that. Perhaps they did not think that it was illogical. Another teacher in Hong Kong reported such an "advantage" of ICT:

Students can make changes at any time and this is one advantage. They are interested in handling this kind of task. They experience that if they enter the data, they will easily get the results.

(Yuen and Lee, 2000, p. 100, emphasis added)

This teacher noted that the "interest" of students was another advantage of ICT. The teacher also assumed that the computer could promote "active learning," as follows:

I think computer can help promote students' initiatives, or we call it active learning. That is, students are very willing to learn something new. If you are passive, then there is no way you can get any data from the computer or anything at all.

(Yuen and Lee, 2000, p. 99, emphasis added)

Many teachers, even researchers, take for granted that ICT must be good for education. However, that assumption should be distinguished from facts that are well-supported by evidence. Bruce (2004) criticizes those great promises having been made on behalf of technology without any concrete research evidence, as follows:
This is a linear model in which technology is assumed to be a good that should be incorporated more fully into teaching, that technology skills are on the critical path to success, and that resistance to technology needs to be overcome. Despite the widespread acceptance of these assumptions, none of them are supported by the research literature on the subject.

(Bruce, 2004, emphasis added)

In spite of this kind of insufficient evidence in proving the effectiveness of ICT in education, policymakers, as in the Hong Kong government (EMB, 2004), have often asserted that the success of ICT in a school setting would build a learner-centred environment and help constructive learning. Ringstaff and Kelley (2002), for instance, start their study from the following “perspective”:

...compared to more didactic approaches, constructivist or student-centred approaches are better suited to fully realizing the potential of computer-based technology. Our review of the research is guided by this perspective.

(Ringstaff and Kelley, 2002, p. 2)

This kind of “perspective,” or assumption, has formed the basis of many recent research studies in ICT. It should be noted that any research based on unproven assumptions can easily go wrong if the assumptions are invalid. Based on this argument, some researchers have not agreed that the use of ICT always produces positive results. The effectiveness of ICT is still in doubt because “many of these promises [of digital learning material] have no clear unequivocal evidence from scientific research” (Olkiniuora et al, 2004).

Temporary Versus Persistent Effects

One of greatest debates of the effectiveness of ICT in education is whether multimedia learning material would produce permanent, or persistent, effects to learning, in addition to the triggering effects. These two effects were also known as the “catch” and the “hold” factors, respectively (Veermans and Tapola, 2004). It has generally been agreed that digital materials are attractive to learners (Ki, 2000a; Hsu et al, 2000; and Wong and Cheung, 2000). Children may be “triggered” by multimedia learning material to learn much more readily than with textual material. However, it has not yet been proven whether these triggered learning interests can be maintained. (Veermans and Tapola, 2004).

Besides the short-term novelty effect to pupils, “the duration of multimedia use is a critical issue, because it is only when the treatment has lasted for a longer period that the true impact of it is revealed” (Nurmi, 2004). This kind of triggering or motivational effect could be explained, to some extent, by “the novelty charm of these computer-based materials” (Olkiniuora et al, 2004, p. 1). Veermans and Tapola, (2004) also point out that ICT has been losing its attractiveness to pupils because the novelty effect is over. It is time to find a “pedagogically meaningful way” to implement ICT (Veermans and Tapola, 2004):
The added value of technology could increase — and in particular, maintain students — interest in and motivation for learning, but only if it is implemented in a pedagogically meaningful way. This is especially true now that students are more familiar with computers; the novelty effect is gone.

(Veermans and Tapola, 2004, no page)

Pupils at Different Levels

Many students could benefit from a learner-centred environment enriched by ICT. However, many students have found changing from a teacher-led environment difficult, as Verbeeten (2002) indicates;

Yet, many students have been socialized in traditional education, however, and they believe that they cannot learn course materials unless those have been predigested by an instructor.

(Verbeeten, 2002, p. 161)

In the research by Olkinuora et al (2004), thirty-six (36) pupils at age 11 were selected for experimental studies on the effects of multimedia on learning. All pupils were from an urban Finnish comprehensive school. They were grouped randomly into 2 groups, each group consisting of 9 pairs of pupils. The pairs of pupils were treated with textual and multimedia material alternately. Pupils in the first group were treated with multimedia first and then textual material. In the second round, the two types of material were swapped for both groups of pupils.

Olkinuora et al (2004, p. 17) have found that “multimedia material seems to support some pairs, but not all, to achieve meaningful learning.” Moreover, the multimedia material seemed to “facilitate deeper cognitive processing” in more advanced pupils. This did not happen with less advanced pupils in the study. Olkinuora et al (2004) has given the reason that “the open and interactive tools of multimedia might be too challenging or require too much self-regulation for less advanced students” (p. 17). It is likely that “only more advanced students are ready for these new challenges” (p. 17).

The findings by Olkinuora et al (2004) indicate that common multimedia material should not be applied to all children in a setting. Because of individual diversity, different versions of the teaching material, multimedia or textual, should be tailored for pupils at different levels. Other researchers, such as Ellis (2003), have been interested in how individual personality affects participation in networked environments. She has proposed different ways to enhance learning environments for learners with different personalities.

As discussed earlier, Luckin (2001) holds a positive view towards the use of ICT in learning, based on Vygotsky’s ZPD theory. However, she also emphasizes the complexity in “creating the most effective
collaborative interactions (p. 59)." The interactions are also individual to each learner. "To be successful each software therefore needs to embody flexible scaffolding and either maintain or expect as input, sufficient information about the individual learner to offer them appropriately challenge activities" (p. 59). This shows that even an optimist, such as Luckin, realizes that individual differences of children must be considered when applying ICT in teaching and learning.

**Distraction to Learning**

Another common worry about the incorporation of ICT has been the distraction of the learner from the course content to the media itself, as these observations below note:

*It is not uncommon that students often spend time on improving the presentation rather than the content of their work. They may also waste time in endless trial and error on trivial technical matters.*

(Ki, 2000, p. 91)

Digital learning material might be so attractive that children could easily forget what they should aim to learn. This problem could become more serious in the Internet world, as in an interview with a headteacher in Liverpool reported by Elliott (2001):

*They're going to be wandering aimlessly around the Internet or using Word to do silly things with, rather than concentrating on the learning.*

(Elliott, 2001)

In addition, the “layering effects” of technology might diminish the quality of social interaction between teachers and students (Femeding, 2003, pp. 248). Eventually, the use of technology could “dilute or act to distract rather than enhance the learning process” (Ferneding, 2003, p. 226).

Another criticism of technology noted by Ferneding (2003, p. 191) has been its “dehumanising” effects to the users. Over-dependency on technology could lead to the ignoring of many other meaningful learning activities, such as “visiting museums or parks.”

Although many researchers, such as (Luckin, 2001), hold the views that ICT in the form of computers could raise the social interaction in Vygotsky’s theory, there are other researchers who hold the opposite views. Armstrong and Casement (2000) question this kind of improvement in interaction, as noted in the following excerpt of an interview with teacher:
Increasingly, I feel students are alienated from themselves. Students have too little time to read or read or reflect on their own. They have too little time for conversations that allow them to understand themselves and their world.

(Armstrong and Casement (2000, p. 200)

The interviewed teacher supposed that money spent on computers could be better spent on reducing class size and providing financial aids to students. Overall, she insisted that computers “[did not] help students to think better, read better, or write better” (Armstrong and Casement, 2000, p. 200).

Summary

1. Many researchers believe that ICT can help bridging the gap between the actual and potential development levels of a child according to the Vygotsky’s ZPD model. However, there is not yet any strong and unarguable evidence to support this theory. Optimists and pessimists keep on debating for their own views. Many more studies are needed in order to establish a clearer picture.

2. The definitions of ICT as a catalyst and its subsequent catalytic role were emphasized in the early part of this chapter. The distinctions between catalyst and lever were also stressed. Literature showed that the catalytic reaction of ICT rarely happened in schools. In many cases, effective use of ICT in education, at most, could merely produce a lever-like reaction.

3. During the literature search for this research study, many high standard research papers and reports in the educational use of ICT in the UK were found. Even the government-funded studies provided very deep investigation of past experience, current situation, and proposed actions. For instance, the DfES/PwC report (DfES 2001) conducted a rigorous and detailed study of issues, such as teachers’ workload and support, and their relationship to the success or failure of ICT implementation. Some measures were suggested to improve those areas.

In contrast, very few good research papers and reports were found in the study of the educational use of ICT in Hong Kong. Reports released by the government, such as EMB (2004), did not touch the root cause that made the implementation of ICT far from successful. The report did not even identify that some parts, such as the original ICT coordinator scheme, in the entire initiative seemed to be failing. This will be discussed in forthcoming chapters. In other papers, some failing points were mentioned, but they were superficial compared with those studies from the UK.

4. Different ICT strategies at the school level could lead to very different outcomes. For instance, strategies in some schools were so successful that “those teachers who were resisters at first, seemed to move rapidly to embracing the innovation” (Leask and Kington, 2001, p. 11). Unfortunately,
inappropriate strategies in some observed cases could drive teachers the opposite way, so that “the original enthusiasm [of teachers] waned and teachers became resistant to training...” (OFSTED, 2004, p. 12).

5. Headteachers are deterministic and they can make an ICT strategy successful or unsuccessful at school level. In Leask and Kington’s (2001) report, for example, the headteacher has been very successful in helping those initially resisting teachers rapidly become loving to use computers.

6. Many studies showed that the pedagogical, instead of technological, performance of the teacher was a determining factor in the success or failure of the use of ICT in a lesson. A less ICT-competent teacher could deliver the same, or even better, quality ICT-enriched lesson as a more ICT-competent teacher, as shown in the study of Goodison (2003).

7. In some, if not most, research papers and reports in Hong Kong, teachers were often the party being blamed the most. They were frequently described as “reluctant” or “susceptible to changes.” Besides additional requirements in ICT, many of the traditional professional and administrative demands were still on the shoulders of teachers, but unfortunately, the workload was rarely understood by policymakers or academic researchers.

Rather than blame, some of the research found good practices to help slower adapting teachers to be comfortable with technology. For instance, a staged approach (Tearle, 2003) was reported to provide a helpful environment for professional development to teachers within a school. Other studies, such as (Snoeyink and Ertmer, 2001) reported that teachers could find peer-to-peer learning a preferable way to get familiar with technology. Such a mentoring atmosphere should be encouraged.

8. It was interesting to note that both primary teachers and primary pupils had different levels of adaptability towards technology. Snoeyink and Ertmer (2001) suggested different ICT strategies be applied for teachers at different levels. On the other hand, Olkinuora et al (2004) suggested different learning materials be used for pupils at different levels.

9. Research found that professional development or training for teachers are essential to improve the quality of implementation of ICT at school level. Ideally, training should be tailor-made to fit teachers’ individual levels and needs. Moreover, some researchers asserted that training programmes should be focused more on pedagogical, instead of technological, contents.

10. In England, DfES (2001) pointed out that a lack of central direction was an important obstacle against a successful implementation of ICT. It was very likely that this statement was also valid for many schools, or even the entire educational system, in Hong Kong. For instance, EMB, being the highest educational authority in Hong Kong, did not even have clear positioning for ICT in her policy
documents. ICT was considered as a "catalyst" in her 1998 paper (EMB, 1998) but it was "changed" to "lever" in her review document (EMB, 2004) without any explanation. Nobody knew whether it was changed intentionally or unintentionally.

The implementation of the ICT coordinator scheme was also in a mess. Before carrying out the scheme, it seemed that this position had not been planned carefully. Its requirements and job specifications were contradictory. It was originally designed as a teacher position with a technology-coordinating role (Education Department, 2000a). However, due to the ambiguity, ICT coordinators were eventually considered technicians in many schools. When this happened, their roles overlapped with the technicians under the Technical Services Support (TSS) Scheme, which was also funded by the EMB simultaneously. It seemed that the EMB had been doing a large-scale "trial and error" experiment. This will be further discussed in Chapter 5.

11. There are still many unanswered questions about the use of ICT in education, especially primary education. More people, including the policymakers, researchers, and the public, are standing on the positive side. However, arguments on the negative side should not be ignored. It may be too late if no movement is made until all uncertainties are answered. Integrating ICT into education should be planned and carried out carefully. Over-ambitious movement does not necessarily make a quick success. More research has to be done to find out the optimal way to integrate ICT into education. If any negative result is found, there should be no reservation in looking for a replacement. ICT should be seen as a road, not a destination, in education.

In this chapter, a number of preliminary findings have been discovered from published research papers, governments' reports and related documents. The findings in this chapter will be compared with the findings from quantitative and qualitative methods to be described in the next few chapters.
Chapter 3  Research Design

It doesn't matter if a cat is black or white, as long as it catches mice. (English translation)
Deng, Xiaoping (1904 - 1997)

Overview

As defined in Chapter 1, the scope of current study is to determine the success or failure of the implementation of ICT in Hong Kong's primary school. It is a study executed primarily from the perspective of teachers and headteachers. The study focuses on the period from 1997 to 2002, but includes some literature material up to 2005. Wherever possible, the situations in the UK were also investigated as a comparison. The major research questions were:

1. As perceived by primary teachers and headteachers, what are the benefits and pitfalls of ICT for teaching?
2. What are the difficulties experienced by teachers and headteachers during the implementation of ICT in primary schools?
3. Have the resources spent in ICT actually improved teaching and learning?

To investigate these main research questions, a mixed-method approach was adopted (Onwuegbuzie and Leech, 2004; Creswell, Fetters and Ivankova, 2004). The advantages of both quantitative and qualitative data collection and analysis will be applied in this study. Since these are two extremely different paradigms, the justifications of combining them will be discussed.

This chapter begins with a brief review of the scope of this study. Two main research paradigms are introduced—positivism and interpretivism. The methodologies associated with these paradigms are then reviewed along with the ongoing debate over mixed-methods. After this theoretical overview, the research methods chosen for the current study are examined. The development of respective instruments is considered in the later part of this chapter.

Research Paradigms

In their book Fourth Generation Evaluation, Guba and Lincoln (1989) define paradigm as “a basic set of beliefs, a set of assumptions we are willing to make, which serve as touchstones in guiding our activities” (p.
A paradigm also represents "the nature of the world" and all entities and relations in connection with this world (Guba and Lincoln, 1994, p. 107). In this chapter, two major research paradigms will be considered. The research methods and techniques derived from these paradigms will also be outlined.

**Positivism or Interpretivism**

There are two main paradigms in social science research and these two paradigms are philosophically different (Guba and Lincoln, 1994, p. 109, in a list of four paradigms). In the first paradigm, "truth is out there and it is the job of the researcher to use objective research methods to uncover that truth" (Muijs, 2004, p. 4, emphasis added). This paradigm is often called positivism and researchers inclining to this side are often known as positivists.

In the opposite paradigm, "there is no pre-existing objective reality that can be observed" (Muijs, 2004, p. 4, emphasis added). Reality or truth is "at least in part constructed by us and by our observations" (Muijs, 2004, p. 4). In such frameworks, reality does not exist prior to the activity of investigation. This paradigm is often known as interpretivism, constructivism or anti-positivism. Researchers inclining to this side are known as interpretivists or constructivists.

The descriptions or distinctions among these research paradigms are not only technical but also philosophical. The scholarly literature on the topic is vast, and a more complete discussion of related topics could be detailed enough to be covered in a journal paper (e.g. Sale, Lohfeld and Brazil, 2002), a book chapter (e.g. Cohen and Manion, 1994, Chapter 1), or even as an entire book (e.g. Howe, 2003).

As summarized by Denzin and Lincoln (1994b), there are three components in a paradigm: ontology, epistemology and methodology:

*Epistemology asks, How do we know the world? What is the relationship between the inquirer and the known? Ontology raises basic questions about the nature of reality. Methodology focuses on how we gain knowledge about the world*  
*(Denzin and Lincoln, 1994b, p. 99)*

Historically, the discrepancy between these two different paradigms was so large that it became a "paradigm war" (Muijs, 2001, p. 3; Kelle, 2001, p. 1). Others have described the great methodological divide associated with these two paradigms as "methodological warfare" (Kelle, 2001, para 43). In the "paradigm war" there are, of course, so-called "paradigm warriors" (Kelle, 2001, Para 3) fighting for their beliefs.

In the interpretivist paradigm, researchers "seek insight rather than statistical analysis. They doubt whether social 'facts' exist and question whether a 'scientific' approach can be used when dealing with human being
(Bell, 1999, p. 8, quotes in original). "There are multiple realities or truths based on one's construction of reality" (Sale et al., 2002, p. 45). Gall, Gall and Borg (1999) illustrate the interpretivist paradigm with an interesting analogue:

*Any social phenomenon, such as a high school football game, does not have any independent existence apart from its participants; rather, it will have different meanings for the individuals who participate in the phenomenon or who subsequently learn about it.*

(Gall et al, 1999, p. 289)

In research associated with this paradigm, the researcher (e.g. interviewer) interacts closely with the participants (e.g. interviewees) for the purpose of constructing truth. Researchers may become "part of the instrumentation of the research by the acts of observing, interpreting, planning and analysing..." (Mason and Bramble, p. 347). This is an essential element in the interpretivist paradigm. The essential properties of the two main research paradigms are shown in Table 3-1.

<table>
<thead>
<tr>
<th>Component</th>
<th>Paradigm</th>
<th>Positivism</th>
<th>Interpretivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontology</td>
<td></td>
<td>Truth is unique. Reality exists before any investigation</td>
<td>Multiple truths may be constructed, depending on the perspective of study. Reality emerges during investigation</td>
</tr>
<tr>
<td>Epistemology</td>
<td>Focuses on decision. Events are reduced into smaller sub-units. Distance between investigated and the investigated is maintained.</td>
<td>Focuses on interpretation. Events are studied as a whole. Keeps interactivity between investigator and the investigated</td>
<td></td>
</tr>
<tr>
<td>Methodology</td>
<td>Inductive verification of hypothesis. Quantitative methods often employed.</td>
<td>Deductive creation of knowledge. Qualitative methods often employed.</td>
<td></td>
</tr>
</tbody>
</table>

In the positivist paradigm, "all phenomena can be reduced to empirical indicators which represent the truth" (Sale et al. 2002, p.44). Since the truth is assumed to be unique and independent of human perception, collection of data must be achieved by certain "objective" instruments.
Quantitative methods often facilitate positivism for the purpose of statistical generalization, whilst qualitative methods often facilitate interpretivism for the in-depth study of particular case(s). The paradigms have their own strengths and weaknesses, but selecting the appropriate paradigm for one's research is not a right or wrong issue, as pointed out by Babbie (2001):

> Ultimately, paradigms are not true or false; as ways of looking, they are only more or less useful. Each of the paradigms we are about to examine offers a different way of looking at human social life. Each makes certain assumptions about the nature of social reality. As we shall see, each can open up new understandings, suggest different kinds of theories, and inspire different kinds of researches.

_(Babbie, 2001, p. 43-44)_

In spite of the sharp discrepancy between the paradigms, debates between these opposing paradigms become less extreme in today's research community. Muijs (2001) suggested that "very few quantitative researchers nowadays are radical positivists" (p. 5), and vice versa. That is, this kind of paradigm fundamentalists, or purists, is rare. The author of this paper, like many other researchers, is neither a radical positivist nor a radical interpretivist, and would like to take the best from both paradigms by using appropriate methods. This is a key principle for the research design in the current study.
Quantitative and Qualitative Methods

Positivists often make use of quantitative research methods. Nevertheless, there are exceptional cases when positivists employ qualitative methods, and vice versa, as pointed out by Brannen (2004) (see, for example, the dotted lines in Figure 3-1).

However, there is no necessary linkage between assumptions on the one hand, and methodological approaches on the other. One ontological/epistemological stance may lead to very different kinds of methods; for example, researchers who adopt a realist stance may adopt either qualitative or quantitative methods, or both (Brannen, 2004, p. 313).

However, this kind of crossing methods between different paradigms is not agreed by certain researchers, such as Fielding and Fielding (1986); and Sale et al. (2002).

Usually, “quantitative researchers collect facts and study the relationship of one set of facts to another. They use the techniques that are likely to produce quantified and, if possible, generalizable conclusions.” (Bell, 1999, p. 8). Quantitative methods are thus frequently employed as an essential means for data collection. Survey and statistical techniques are the most common combination to collect and analyse quantitative data.

In the current study, survey will be used to capture the perceptions of teachers or headteachers from a wide variety of locations or backgrounds.

Inherent to its quantitative approach, “the uniqueness of individual contexts is generally not revealed by quantitative research” (Libarkin and Kurdziel, 2002, p. 80). Basit described the limitations of quantitative methods as follows:

While it may be interesting to know how many people feel positively or negatively about something, this is not the intention of qualitative inquiry. The idea is to ascertain ‘what’ they feel, and ‘why’ they feel that way. This will also incorporate ‘who’ feel they way they do, and ‘where’, ‘when’ and ‘how’. Such a detailed scrutiny clearly cannot be carried out by using numbers, percentages and statistics.

(Basit, 2003, p. 151)

The use of qualitative methods serves thus helps fill the gaps left by quantitative research that focuses exclusively on “numbers, percentages and statistics.”

In contrast with quantitative methods, qualitative studies are less interested in quantifying data but more interested in understanding “individuals’ perceptions of the world” (Bell, 1999, p. 8). “The object of analysing qualitative data is to determine the categories, relationships and assumptions that inform the
respondents' view of the world in general, and the topic in particular" (Basit, 2003, p. 143). However, there are some rare circumstances that “qualitative researchers draw on quantitative techniques, and vice versa.” (Bell, 1999, p. 8). However, these cases are not typical, and will not be further discussed in this chapter.

Quantitative data are usually analysed mathematically through “the use of procedures, formulas, and techniques that are rule bound” (Sprinthall et al., 1990, p. 238). The analysis of data is usually performed after all (or a sufficient amount of) data have been collected.

In contrast, qualitative data can be analysed “as soon as the first bit of data is collected” (Langenbach et al., 1994, p. 241). Using interviews as an example, Langenbach et al. also claimed that the first person being interviewed might provide additional ideas and questions to be pursued in subsequent interviews. This is a kind of iterative technique. A precise point, at which data collection ends and analysis begins, is typically not defined in qualitative research. (Patton, 2002). In other words, data collection and data analysis overlap to some degree. Such fluidity is one of the main contrasts between qualitative and quantitative methods.

Basit (2003) asserted that “the analysis of qualitative data is rigorous and is not a separate self-contained phase in the research process” (p. 152). In addition, “the researchers may also reformulate their research questions as they go along, in the light of the data that they have collected” (p. 152). This kind of mutual interaction between data collection and analysis is able to improve the overall quality of both processes involved. In this sense, the sampling stage could be quite different from that of qualitative research, in which the samples of study are well defined before data collection begins.

Using interviewing as an example, Pring (2000) emphasises the potential strength of qualitative methods over quantitative methods:

*The good interviewer is able to draw out from the person interviewed the deeper significance of the event, so that it seems ever more difficult to generalize – to see this or that individual as simply an instance of a generalization.*

*(Pring, 2000, p. 39)*

Thus, to be a “good” interviewer will be vital to the success of any interview study.

**Mixed-method Approach**

Traditionally, both qualitative and quantitative researchers emphasize their own strengths in capturing the views of the studied subjects. As pointed out by Denzin and Lincoln (1994a), qualitative researchers frequently criticise quantitative researchers who use “more remote, inferential empirical materials” (p. 5) which are seldom able to capture the views of individuals. Qualitative researchers believe that “they can get
closer to the actor's perspective through detailed interviewing and observation" (p. 5). However, the quantitative researchers regard these softer, qualitative materials as "unreliable, impressionistic, and not objective" (p. 5). In the subsequent sections, there will be more detailed descriptions of the positive and negative sides of the debate. Finally, a choice between different approaches will be proposed for the current study.

Friends or Enemies

In addition to the debate over the appropriate research methods in social science, many researchers disagree about whether different research paradigms can be mixed. Sales et al. (2002), for example, argue that "qualitative and quantitative research methods have grown out of, and still represent different paradigms" (p. 50), hence they are considered incompatible. Sale et al. (2002) further argue that "quantitative and qualitative methods cannot be combined for cross-validation or triangulation purposes" (p. 43) because, again, they belong to different paradigms and study different phenomena.

Based on the principles of positivist paradigm, quantitative studies require that "what is studied be independent of the inquirer and be described without distortion by her [inquirer's] interests, values, or purposes" (Sales et al., 2002, p. 49, citing Smith and Heshuisius, 1986). In contrast, qualitative studies "are based on the minimum distance between the investigator and the investigated, and seek multiple definitions of reality embedded in various respondents' experiences" (p. 49).

Sale et al. (2002) also criticise strongly an arbitrary mixing of quantitative and qualitative data, as well as the treatment of qualitative data in a quantitative way — "they [qualitative researchers] also increasingly use computer programs specifically designed for analysing qualitative data, such as NUD.IST or Ethnography, in quantitative (counting) ways. These practices seriously violate the assumptions of qualitative paradigm(s)" (p. 49).

On the other hand, many researchers praise the mixed-method approach. Johnson and Turner (2003), for example, defined their "fundamental principle of mixed methods research" (p. 299), in which "methods should be mixed in a way that has complementary strengths and nonoverlapping weaknesses" (p. 299). The advantages of mixed method were summarized by Teddlie and Tashakkori (2003) (see Table 3-2):

<table>
<thead>
<tr>
<th>Table 3-2 Major advantages of mixed-method approach over single-method approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mixed-methods research can answer research questions that the other methodologies cannot</td>
</tr>
<tr>
<td>2. Mixed-methods research provides better (stronger) inferences</td>
</tr>
<tr>
<td>3. Mixed-methods provide the opportunity for presenting a greater diversity of divergent views</td>
</tr>
</tbody>
</table>

Adapted from Teddlie and Tashakkori (2003, p. 14-15)
Jackson and Mead Niblo (1999) also suggest that carefully combining the quantitative and qualitative approaches can capture the strengths of both. However, "combining qualitative and quantitative methods without a clear understanding of these differences [between underlying paradigms] would indeed be a futile and risky business" (Jackson and Mead Niblo, 1999, no page). To provide a clearer understanding of their position, the key justifications for combining differences methods will be covered in the next few sections.

**Triangulation**

In Hammersley’s (1996) methodological eclectic view, there are three ways to interpret different types of data in a mixed-method research, namely "triangulation", "facilitation" and "complementarity" (p. 167). In short, triangulation refers to the mutual corroboration between different types of data. Facilitation refers to the collection of one type of data with the help from the other. Complementarity refers to the address of different and complementary aspects of an investigation of different types of data.

Triangulation is one of the most commonly used terms under the umbrella of mixed-method research. The contemporary meanings of triangulation mainly come from Webb et al. (1966). Unfortunately, "triangulation has come to so many meanings" (Morgan, 1998, p. 365, italic in original). Moreover, the meaning of triangulation is so implicit that Kelle (2001, Para 6) even called it a “metaphor”. Arguments from both supporters and opponents of triangulation were found in Kelle’s paper. For example, on one side, "the collection of data from different sources and their analysis with different strategies would improve the validity of results" (Kelle, 2001, Para 6). On the opposite side, "using several different methods can actually increase the chance of error" (Kelle, 2001, Para 6 quoting Fielding and Fielding, 1986, p. 31).

Despite many conflicting interpretations and ongoing debates over the meaning of triangulation, one of its meanings is the “goal of seeking cross-validation between methods” (Morgan, 1998, p. 365). This definition of triangulation will be adopted for this paper. For this particular purpose, “triangulation” is equivalent to the test of “convergence” or “confirmation” of findings between methods. To avoid ambiguity, Morgan (1998) even suggested replacing “triangulation” with “convergence” or “confirmation” (p. 365).

In order to cross-validate and enhance the plausibility of findings, triangulation is usually emphasized in other aspects in addition to methods, such as time, space, investigators and theory. (Cohen and Manion, 1994, Chapter 11). For the study in this paper, triangulation will only be emphasized with regard to methods, an approach which is called methodological triangulation (Cohen and Manion, 1994, p. 238-239)

The relationship between the definitions of triangulation (Cohen Manion, 1994) and various mixed-method approaches (Hammersley, 1996) is shown in Figure 3-2.
More aspects of mixed-method research, particularly triangulation, will be discussed in next few sections. The use of the triangulation model in this study will also be revisited.

Priority-Sequence Model

The priority-sequence model (Morgan, 1998; Jackson and Mead Niblo, 1999) categorises different combinations of priorities and sequences in mixing quantitative and qualitative methods. In this model, it is assumed that a principal or main method, either quantitative or qualitative, would be sufficient for a research project. In addition, another research method could be employed to support the principal method. In designing a research program using the priority-sequence model, the priority of the research methods, either quantitative or qualitative, should be determined first. Only then is their sequence in the research project determined. There are four (4) possible combinations of sequences and priorities, as summarised by Jackson and Mead Niblo (1999) in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. qual-QUANT</td>
<td>Smaller qualitative study helps guide the formation of questions in the larger (principal) quantitative data collection</td>
</tr>
<tr>
<td>2 quant-QUAL</td>
<td>Smaller quantitative study helps determine sites for more extensive qualitative data collection</td>
</tr>
<tr>
<td>3 QUANT-qual</td>
<td>In-depth qualitative study helps explain poorly understood quantitative results</td>
</tr>
<tr>
<td>4 QUAL-quant</td>
<td>Small quantitative study helps generalise results from a large qualitative survey</td>
</tr>
</tbody>
</table>

Adapted with modifications from Jackson and Mead Niblo (1999, no page)

At first glance, this model seems to be “fair” to both quantitative and qualitative methods, since either of them can be the principal method in a research project while the other serves as the supporting role. However, Sale et al. (2002) argue that “the most frequently used mixed-method designs start with a qualitative pilot study followed by quantitative research” (p. 49). Such an approach is captured in item (1) in Table 3-3, in which the quantitative method takes the leading role. With this kind of research program,
people will simply get an impression that quantitative methods are more "scientific" and qualitative studies are "only exploratory, cannot stand on its own, and must be validated by quantitative work" (Sale et al., p. 49). Again, it is another point which is frequently criticised by the advocates of qualitative methods.

It should be noted that this model focuses only on the sequential mode of application of quantitative and qualitative methods. It does not address other modes that will be discussed in subsequent sections.

**Sequential-Concurrent-Parallel Model**

Apart from the sequential mode described above, Gallivan (1997), for instance, studied other patterns of combination of quantitative and qualitative methods. Other than the sequential mode, he suggested that these two methods could be employed independently. It meant that quantitative and qualitative methods could be applied simultaneously in a research project. Onwuegbuzie and Leech (2004) further expanded mixed-method research into three main categories: the parallel, concurrent, and sequential approaches, as shown in Figure 3-3.

![Figure 3-3 Three approaches in mixed-methods research](image_url)
In the sequential mixed-method, "data analysis always begins before all the data are collected" (Onwuegbuzie and Leech, 2004, p. 780, italic in original). In this approach, data collection, analysis and interpretation happen in sequence, as shown in Part (a) of Figure 3-3. In this model, the preliminary findings from the first stage (e.g. qualitative results) are used to prepare for the second stage of data collection (e.g. quantitative). Obviously, this approach is similar to the sequential approach in Gallivan's (1997) sequential-independent model mentioned in the previous section. Such a sequential approach can be further subcategorised under the Morgan's (1988) priority-sequence model, as in Table 3-3.

In the concurrent mixed-method, collections of quantitative and qualitative data are conducted roughly simultaneously, and "integration [of data from different methods] usually occurs at the data analysis stage" (Onwuegbuzie and Leech, 2004, p. 780). The use of teaching evaluation forms was considered by Onwuegbuzie and Leech as an example of this kind of mixed-method approach because the forms "extract both quantitative and qualitative information concurrently" (p. 780). The quantitative data are often collected in the Likert-formatted items and the qualitative data are collected in the open-ended items. Data collected is analysed later in the analysis stage. This approach was shown in Part (b) of Figure 3-3.

Another form of concurrent mixed methods is the "quantitative studies of qualitizing data" (Onwuegbuzie and Leech, 2004, p. 780). In this process, quantitative data are transformed into data that can be analysed qualitatively (p. 780). Conversely, qualitative data can also be transformed into a numerical form through a process called quantitizing, and then analysed quantitatively. On the other hand, this kind of data transformation is strongly opposed by researchers such as Sale et al. (2002).

In the parallel mixed-method, the interaction between the qualitative and quantitative stages in data collection is minimal. "The results from each type of analysis are neither compared nor consolidated until both sets of data analysis have been completed" (Onwuegbuzie and Leech, 2004, p. 779, italic in original). This approach is illustrated in Part (c) of Figure 3-3.

It should be noted that this model focuses only on the sequence of the data collection, analysis and integration stages. It does not address the relative importance, that is, the priority of each stage, as in the priority-sequence model as mentioned before. In the next section, an integrated model will be introduced.

**Triangulation-Instrument-Transformation Design Model**

For all kinds of mixed-method research, such as those mentioned in previous sections, Creswell et al. (2004) describe three main models: the Triangulation Design Model, the Instrument Design Model and the Transformation Design Model. In order to determine to which model a particular mixed-method research
plan belongs, Creswell et al. (2004) define several criteria, (a) priority, (b) implementation, and (c) integration:

Priority is determined by the researchers, who place an emphasis on quantitative data, qualitative data or an equal priority shared between the 2 forms of data...
Implementation refers to whether the quantitative and qualitative data are collected in sequential phases or gathered concurrently at roughly the same time during the study...
Integration refers to the points in the process of research procedures at which the investigator mixes or integrates the quantitative and qualitative data collection...

(Creswell et al., 2004, p. 10, emphasis added)

With these three criteria, Creswell et al. classifies between the Triangulation Design Model, Instrument Design Model and Transformation Design Model, as shown in the following matrix:

<table>
<thead>
<tr>
<th>Table 3-4 Properties of different mixed-method models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangulation Design Model</td>
</tr>
<tr>
<td>Priority – weight between qualitative and quantitative studies</td>
</tr>
<tr>
<td>Implementation – sequence of collection of qualitative and quantitative data</td>
</tr>
<tr>
<td>Integration – relating the findings from qualitative and quantitative data</td>
</tr>
</tbody>
</table>

Complied from definitions in Creswell et al. (2004)

As defined by Creswell, et al. (2004), triangulation is intended “to triangulate or gather both quantitative and qualitative data at the same time, and to integrate the two forms of data to best understand a research problem” (p. 11) Creswell et al. further defined a “typical” structure for a paper or report using the Triangulation Design Model:

A typical structure for a triangulation study is to have separate sections on quantitative data collection and quantitative data collection, as well as separate section on qualitative data analysis and qualitative data analysis. The investigators then provide a results, discussion, or conclusion section in which they discuss the results of both analyses.

(Creswell et al., 2004, p. 11)
In short, the quantitative and qualitative data typically are given the same importance in this approach. The integration of quantitative and qualitative data does not happen until the results or conclusion phase.

The Triangulation Design Model for data collection, analysis and interpretation defined by Creswell et al. (2004) will be the main research structure in the current study. The following key factors are re-emphasized:

<table>
<thead>
<tr>
<th>Table 3-5</th>
<th>The priority, implementation and integration factors in current study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Priority</td>
<td>Qualitative and quantitative studies will carry approximately equal weight.</td>
</tr>
<tr>
<td>2. Implementation</td>
<td>Qualitative and quantitative data will be collected independently, and at roughly the same time.</td>
</tr>
<tr>
<td>3. Integration</td>
<td>The findings from qualitative and quantitative research will integrated in the concluding chapter.</td>
</tr>
</tbody>
</table>

The report of findings of this paper will also be presented in similar style, that is, the findings in quantitative and qualitative methods will be reported separately. The findings of the two approaches will be integrated in the study's conclusion.

**Selection of Research Methods**

In the current research as mentioned before, an attempt has been made to take advantages of both positivist and interpretivist paradigms. In the proposed study, the method best suited for each paradigm will be used. In other words, quantitative methods will be used for the positivist side of the study and qualitative methods will be used for the interpretivist side of the study.

As listed in Table 3-5, the current study will be a mixed-method approach using quantitative and qualitative components in roughly equal weights. The choice of instrument for each method is rather restricted, given the limitations of time, distance, and resources faced by the researcher. Eventually, self-completion questionnaires and semi-structured interviews were chosen as the studying instruments for quantitative and qualitative methods, respectively, in part because they help to overcome the resource-limitations in the project.

In the quantitative part of the study, a general view of the use ICT in primary education was sought through the use of "cross-sectional survey" (Burns, 2000, p. 568-569). Under the positivist paradigm, the interaction of the researcher and participants was minimized, except for some occasions when the investigator tried to convince the respondents to reply to the questionnaires.

"Self-completion" (Cohen and Manion, 1994, p. 92-94), or "self-administered" (Gorard, 2004, p. 83) questionnaires are suitable for collecting opinions from relatively large amount of samples over a number of
geographically dispersed locations. They are thus ideal for this study because responses can be collected from both Hong Kong and the UK through appropriate delivery and collection channels, to be discussed in later sections of this chapter.

Data collected from returned questionnaires were entered into statistical software. Numerical figures were derived from descriptive and inferential statistics for the determination of direction, magnitudes or significance in certain hypotheses. Further details regarding the development of the instrument will be discussed in the next sections. The findings in the study will be covered in Chapter 4.

To extract the most information out of the topic, the same issues in ICT will be viewed from a different angle through the lens of the interpretivist paradigm. The investigator, being a "part of the instrumentation of the research" (Mason and Bramble, p. 347), will interact with participants to construct a truth in the implementation of ICT in primary education.

Semi-structured interviews have been chosen as the qualitative instrument because they minimize interruptions to the participant and the school. For instance, a participating teacher or headteacher may need to spend around one hour for the interview but no additional time or preparatory work is required for him/her. Other qualitative instruments, such as observation and action research, are much more complicated to conduct. They require more involvement of headteachers, teachers and pupils during preparation and participation. Using these approaches would cause more interruptions to classes and the related personnel. Being an outsider at the primary school settings, the author did not have the confidence to get access through the "gatekeeper" (usually the headteachers) (Troman, 1996, p. 71) of a school in order to conduct a more elaborate and potentially disruptive research study. In the "No Entry Sign" paper by Torman (1996), there are good discussions on various difficulties encountered by external researchers attempting get entry to educational settings. Many difficulties mentioned in Torman's paper have also been experienced by the author of the current study.

The interviewing questions are in a "semi-structured yet flexible" style (Jones and Hayes, 1991, 212). Details in the development of interview schedule and other issues will be described in next few sections. The analysis and findings will be covered in Chapter 5.

Based on the research design discussed so far in this chapter, Figure 3-4, evolved from part (c) of Figure 3-3, summarises the proposed study from the stage of developing instruments to reaching results and conclusions.
Collection of Quantitative Data

As discussed in the previous section, the choice of research instruments was limited by various resources and the accessibility of schools and individual participants. Surveys are employed frequently in quantitative research. In turn, questionnaires are a common instrument in surveys. Questionnaires can be quantitative or qualitative in nature. The questionnaire employed in this research is quantitative. Finally, cross-sectional self-completion questionnaires have been selected to serve as the research instrument in the quantitative part of the study.

All respondents in this survey fall into the following categories: (a) Headteachers in Hong Kong (HK Heads), (b) Teachers in Hong Kong (HK Teachers), (c) Headteachers in England (UK Heads), and (d) Teachers in England (UK Teachers) (see Table 3-6):

<table>
<thead>
<tr>
<th>Headteachers</th>
<th>Teachers *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hong Kong (HK Heads)</td>
</tr>
<tr>
<td>Source of Quantitative Data</td>
<td>✓</td>
</tr>
<tr>
<td>Source of Qualitative Data</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Note: ICT coordinators are generally counted as Teachers

Headteachers and teachers in England will be studied in the quantitative part of the research. Teachers in other countries in the UK will not be covered. To avoid ambiguity, it should be noted that “UK Heads” and “UK Teachers” simply mean the headteachers and teachers (including ICT coordinators) to be studied in
England. Headteachers and teachers in other countries of the UK, namely Wales, Scotland, and Northern Ireland, will not be covered. Their educational systems are considerably different.

Pre-studies and Pilot Studies

Questionnaires in the current study belonged to the “self-completion” (Cohen and Manion, 1994, p. 92-94) or “self-administered” (Gorard, 2004, p. 83) category. The development of the instrument was based on an iterative approach from the relevant literature, pre-studies, and pilot studies.

As Gorard (2001) noted, “all research designs need to be piloted or pre-tested,” (p. 102) and this research design is no exception. Pre-studies and pilot studies will be carried out iteratively until “the pilot leads [only] to a few changes…. [and the research] will proceed to the main study” (p. 103).

There have been 3 major revisions of the questionnaire. The first revision of the questionnaire was precipitated by the author's coursework assignment. The second pre-study was originally prepared as the main study of this project. However, the main study had to be postponed because of the extremely low response rate from the first survey. The final version (third revision) of the questionnaire was developed by revising the earlier iterations. Table 3-7 captures these revisions:

Table 3-7 The profiles of several versions of the questionnaires

<table>
<thead>
<tr>
<th>Survey No</th>
<th>Pre-study</th>
<th>Pre-study</th>
<th>Pilot</th>
<th>Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>1.0</td>
<td>2.01</td>
<td>3.0</td>
<td>3.01c / 3.02c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.02e</td>
</tr>
<tr>
<td>No. of close-ended items</td>
<td>192</td>
<td>97</td>
<td>37</td>
<td>37 / 39</td>
</tr>
<tr>
<td>No. of open-ended items</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>No. of pages</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sampling *</td>
<td>Opportunistic</td>
<td>Random</td>
<td>Opportunistic</td>
<td>Systematic / Cluster</td>
</tr>
<tr>
<td>Delivery mode</td>
<td>via middle-person</td>
<td>by post</td>
<td>by hand</td>
<td>by fax, by hand</td>
</tr>
<tr>
<td>Collecting mode</td>
<td>via middle-person</td>
<td>by post</td>
<td>by hand</td>
<td>by fax, by hand</td>
</tr>
<tr>
<td>Questionnaires sent out</td>
<td>unknown</td>
<td>403</td>
<td>15</td>
<td>about 1100</td>
</tr>
<tr>
<td>Questionnaires collected</td>
<td>53</td>
<td>52</td>
<td>13</td>
<td>681</td>
</tr>
<tr>
<td>Response rate</td>
<td>unknown</td>
<td>≈ 13%</td>
<td>86.7%</td>
<td>≈ 62%</td>
</tr>
</tbody>
</table>

* Note: the details of sampling strategies will be covered later in this chapter
A major revision occurred from version 1 to version 2. The most important change over the course of these revisions was a reduction in the number of items, from 192 to 97 to 39. The number of pages was also reduced substantially, from 6 to 4 to 2. Figure 3-5 shows the evolution of the questionnaire:

![Diagram of questionnaires]

Figure 3-5  Revisions of the questionnaires

Some respondents suggested that the large numbers of items and pages were intimidating. Their concerns are supported by the findings by Smith, Olah, Handen and Cumbo (2003), whose work examined the affects of questionnaire lengths. It was found that the response rate of the final 2-paged version is much improved. It was believed that the reduced length had been one of the factors that improved response rates, along with face-to-face distribution and collection of the HK Teachers’ questionnaires by the investigator or his representatives. Such personal attention may impress the intended respondents and hence improve the response rate.

Based on the pilot questionnaire version 3.0, some wording was amended to produce version 3.01c. The main survey was started with version 3.01c of the questionnaire. Afterwards, two questions asking for the opinions of ICT coordinators were found to be useful and therefore inserted into version 3.02c. With the re-coding of question numbers, the data collected with version 3.01c could be combined with versions 3.02c and 3.02e and used in the analysis.
Contents of Questionnaire

There are five (5) sections in the final version of the questionnaire. The English version of the questionnaire is shown in Appendix E.

Section A consists of items 1 to 19 using the Likert scale. It is intended to collect from the respondents various experiences or attitudes regarding their ICT usage.

Section B consists of 2 items that ask for a ranking of perceived importance and degree of shortage in seven types of resources. Compared with Section A, this section adopts a less common style for a self-completion questionnaire. Although a complicated style should be avoided in questionnaires, it is also argued that a change in answering format will reduce the response set pattern from respondents (Hui and Triandis, 1985). Therefore a different format is adopted in Section B. Fortunately, in the pilot this section was found to be manageable for the respondents.

Section C consists of four (4) items which asked for the current and projected usage of ICT in various subjects. The Chinese language is being taught as a primary language, while the English language is being taught as a second language in most of Hong Kong’s primary schools. In questionnaires for Hong Kong respondents, Chinese language was therefore given as option A and English language was given as option B. In contrast, in the questionnaires for English respondents, English language was given as option A while “foreign language” was given as option B.

Section D is intended to collect some demographic data about the respondents and their school. The location of this section will be discussed shortly. The respondents will be asked about their positions in schools (question 30). This question is needed because an addressed respondent may simply pass the questionnaire on to a colleague. This item is therefore useful to identify the position of the actual respondent, as opposed to the addressed recipient, who may or may not be the respondent.

Section E is an open-ended item which is intended to collect any relevant issues not addressed in the previous close-ended items. This section is critical to the survey, since it asks for suggestions for improvement of the design or format of the questionnaire itself during the pre-study stage. It has proven to be very useful in providing ideas for improvement, e.g. the reduction of length and pages.

Language of Medium

In the first pre-study, questionnaires (ver. 1.0) were presented in English. There was extensive feedback from the respondents, who requested that it be presented in Chinese. Translating the questionnaire into Chinese increased the response rate, since most Hong Kong residents, including teachers, are more familiar
with their mother language. Finally, the questionnaires for the second pre-study (ver. 2.01) were presented in Chinese. The questionnaires for the main survey (ver. 3.01c, 3.02c and 3.02e) were prepared in two versions – one in Chinese for target respondents in Hong Kong, the other in English for target respondents in England. Despite the difference in the language of medium, both versions have been prepared to convey the same information.

**Starting Questions**

Czaja and Blair (1996, p. 83) suggested that a questionnaire should begin with “relevant,” “easy” and “interesting” questions. The final version of the questionnaire was started with the following questions:

Q1 Your school provides convenient access to computers and the Internet for pupils.
Q2 Your school provides convenient access to computers and the Internet for teachers.
Q3 Teachers have easy access to good teaching software.

These questions are relatively factual and are supposed to be simple to answer.

Demographic questions, such as the respondents’ ages or years of service, may be easy for some to answer but can be embarrassing for other respondents. Some respondents may be threatened by these sensitive questions, especially in the very early stage, and will therefore not answer the remaining items in the questionnaire. This argument was proven to be true when some missing items were found in the responses to this section. According to this argument, the demographic data should be collected at the end of a survey (e.g., Czaja and Blair, 1996, p. 88). In this survey, demographic information was collected later in the questionnaire, in Section D.

**Rating Scale**

The use of a Likert rating scale was chosen for the first section of the questionnaire. “A rating scale is a continuum of response choices that participants are told to use in indicating their responses” (Johnson and Christensen 2000, p. 133). This scale is useful, since it is a simple-to-answer format relative to others.

Nunally (1978) has conducted a variety of evaluations regarding presentation and other design considerations when using the Likert scale in a questionnaire. Nunally discusses the numbers of steps (categories), the use of numerical or graphic scales, and other formatting issues of the scale. Nunally presented views from both sides, that is, he discussed the positions supporting either odd or even numbers of steps. The presence of a neutral (middle) category on the scale was supposed to make the potential respondents feel more “comfortable” (p. 596). This opinion is supported by other researchers, who argued
that "not having such a possible response [middle position] forces people to make a decision in a particular
direction, when they may be undecided, and this can produce an unreliable measure" (Clark-Carter, 2004, p.
88).

On the other hand, some respondents might tend to make "all their marks in the neutral step" (Nunally,
1978, p. 596). This introduces ambiguity regarding whether their responses actually represented "a truly
neutral attitude" or simply unwillingness to participate (Nunally, 1978, p. 596). Using odd or even numbers
of steps have their own advantages, therefore. In his conclusion, Nunally left the decision "largely to the
judgement of the experimenter in the particular situation in which rating scale are employed" (p. 596)

Mckelvie (1978) studied the affects of the numbers of categories on a Likert scale in questionnaires. He
suggested that "a smaller number of categories (five or six) should be used" (p. 198). Mckelvie also argued
that "validity were [sic] adversely affected when the number of scale categories falls below five" (p. 198).
Finally, recalling the advice from Matell and Jacoby (1972, cited in Mckelvie, 2002), "if it is desirable to
minimize the number of 'uncertain' response, an even number of categories should be employed"

Considering the arguments discussed so far, a six-step rating scale was employed for questions 1 to 19:

You are knowledgeable and skillful enough to implement ICT in school

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolutely Disagree</td>
<td>Fairly Disagree</td>
<td>Slightly Disagree</td>
<td>Slightly Agree</td>
<td>Fairly Agree</td>
<td>Absolutely Agree</td>
</tr>
</tbody>
</table>

The same scale will be used for all questions in Section A. It is believed that respondents will find it easier
to reply to a set of questions using the same scale (Czaja and Blair, 1996, p. 86)

Avoidance of Response Sets

A response set is "the tendency to respond in a manner that is unrelated to the content of the instrument"
(Hui and Triandis, 1985, p. 253) or "[to] respond to a series of items in a specific direction" (Johnson and
Christensen, 2000, p. 138). Sub-categories of response set include acquiescence response set and social
desirability response set. Hui and Triandis (1985) suggested researchers should avoid using "a lengthy set of
questions with the same response format" (p. 259). To minimize the "tendency by a given person to use one
side of the range of response," Clark-Carter (2004, p. 89) suggested the use of reverse questions in part of
the questionnaire. Johnson and Christensen (2000, p. 129 and p. 138) also encouraged this kind of reverse
wording to reduce the chance of response set in a survey study.
In the main survey, items 8, 12, 16 and 19 in Section A of the questionnaire were carefully worded to avoid the pitfall of a response set. Each section in the questionnaire was also intentionally prepared in a different format, following Hui and Triandis's suggestion.

**Length of Questionnaire**

In the study by Smith et al. (2003), the results show that “a shorter questionnaire can increase response rate” (p. 36). Gay (1996) also suggest that “lengthy questionnaires turn people off” (p. 256). However, Czaja and Blair (1996, p. 90) purpose that 6 to 8 pages are optimal for a questionnaire. In the second pre-study, the questionnaire was 4 pages. The response rate was very disappointing. Moreover, many respondents of the pilot questionnaires noted that this number of pages was still too long. The length of the questionnaires might be a factor leading to some refusal of participation in the second pre-study. This distinction may be a result of the typically faster pace of life in Hong Kong than elsewhere in the world.

The final version of questionnaire was reduced to two pages and finally self-proven by a much better response rate than the pre-study. The reduction of pages was difficult, since it is hard to strike a balance between the coverage of the questionnaire and its acceptance by the potential participants.

**Covering Letters**

With the faxed version of questionnaires, a covering letter giving a brief background of the survey was sent (faxed) to each potential participant (see Appendix D for the English version). The covering letter was generated by the fax software with the merge of participants' titles and names. The cover was started with a personal salutation like “Dear Mrs. X.” This is a kind of “quasi-personalisation” or “personalisation through technology,” as described by Gendall (2005, p. 379). However, Gendall (2005) argued that the personalisation effect in a covering letter “is varied and sometimes contradictory” (p. 368). From his study of 2000 mailed questionnaires, he demonstrated that “personalisation of an otherwise appropriate covering letter has little or no affect on response rate” (p. 380).

Nevertheless, Gendall (2005) suggested that, “from a practical point of view, unless there is a good reason to avoid personalisation, survey researchers should use it. At worst, it will have no effect, but it might have a positive effect” (p. 380). Keeping this in mind, personalisation has been used in the fax mode of the current survey, although there is no strong evidence of positive effects on response rate.

In the face-to-face delivery of questionnaires to HK teachers, a less formal covering note was used. The English translation is shown in Appendix C. The covering note was prepared with a few cartoon figures on it. It was observed that because of the cartoons the participants were intrigued to read through the note and
the questionnaire. In this delivery mode, there was no need (and no way) to know the participants in advance and personalisation of the note was therefore irrelevant.

Probability Sampling and its Approximation

As pointed out by Kemper, Stringfield and Teddlie (2003, p. 277), "purely quantitative studies typically use larger samples selected through probability techniques." Probability sampling can produce results characterised by their generalisability or external validity (Kemper et al., 2003). However, on many occasions perfect probability sampling is unavailable or infeasible. So-called "second best" techniques have to be used as alternatives.

"In very large surveys, like census, [probability] sampling techniques will be employed in order to produce a sample which is, as far as possible, representative of the population as a whole. Generalization can then be made from the findings" (Bell, 1999, p. 126). For government or other authoritative organisations, drawing perfect probability samples are not difficult. For instance, a census is held in the UK every 10 years and all the households "are legally obliged" to participate in the survey (Clark-Carter, 2004, p. 77). A census is similarly carried out in Hong Kong every 10 years. Mandatory participation is also legislated.

In contrast, individual researchers are not usually supported by this kind of legal obligation, and they are particularly "dependent on the goodwill and availability of subjects [i.e. participants]" (Bell, 1999, p. 126). Such researchers will probably encounter difficulties when they try to achieve "a true random [i.e. probability] sample" (p. 126). In such cases, Bell (1999) agrees that opportunity samples "are generally acceptable as long as the make-up of the sample is clearly stated and the limitations of such data are realized" (p. 126).

It is the author's view that sampling should not be treated in such a dichotomous way, that is, simply as probability or opportunity. There is in fact a continuum between complete probability and complete opportunity sampling. The author has chosen an ideal probability sampling in one subgroup, and a "less ideal" probability sampling in other subgroups (for example, where logistical limitations exist).

In this survey study, sampling strategies for different target-groups of respondents (e.g., HK Heads, HK Teachers, UK Heads) are different due to the different characteristics of the subgroups as well as different levels of restrictions and available resources. Table 3-8 shows a summary of various sampling strategies on these subgroups:
Table 3-8  Different sampling strategies for different subgroups in the proposed survey study

<table>
<thead>
<tr>
<th></th>
<th>HK Heads</th>
<th>HK Teachers</th>
<th>UK Heads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population</strong></td>
<td>Headteachers serving primary schools in HK</td>
<td>Teachers serving primary schools in HK</td>
<td>Headteachers serving primary schools in England</td>
</tr>
<tr>
<td><strong>Sampling Frame</strong></td>
<td>List of primary schools available online</td>
<td>Online available advertisements, memos and notices of public seminars open for teachers between May 2002 and Aug 2002.</td>
<td>Lists of primary schools available online from councils in Leicester, Leicestershire, Northampton, and Manchester</td>
</tr>
<tr>
<td><strong>Samples</strong></td>
<td>Systematic</td>
<td>Cluster, followed by Random</td>
<td>Cluster, followed by Systematic</td>
</tr>
<tr>
<td><strong>Assumption</strong></td>
<td>-</td>
<td>The distribution of participants of these seminars closely approximated that of all in-service teachers</td>
<td>The distribution of headteachers in these regions closely approximated that of all in-service headteachers in England</td>
</tr>
</tbody>
</table>

In the parts of the study focusing on HK Heads and UK Heads, it is possible to draw probability samples because the lists of schools and their headteachers are readily available to independent researchers. In another part of the study focusing on the teachers, probability sampling is not feasible and an alternative solution should be sought.

According to the official figures released by the Hong Kong SAR government, there were 715 primary schools in the academic year 2001-2002 (Financial Services and the Treasury Bureau, 2003, Head 156). There are currently three types of primary schools in Hong Kong: whole-day schools, half-day morning schools and half-day afternoon schools. A morning school and an afternoon school sharing the same campus are usually financial independent; they are served by different crews of headteachers and teachers, and therefore are considered separate school settings in the list.

For headteachers in Hong Kong (HK Heads), a probability sampling technique was employed. Probability sampling was possible in this subgroup because a complete list of all primary schools was available on the website of the Committee on Home-School Co-operation. This committee maintains the lists of all primary and secondary schools in Hong Kong (see Committee on Home-School Co-operation, 2005, for a current list of schools). Finally, a list of 698 primary schools was successfully retrieved. The fax numbers, names of headteachers, and other details came with the list. The list is therefore suitable to construct a sampling frame for this study.

Assuming a one-to-one mapping between headteachers and primary schools, there should be approximately the same number of headteachers as the number of schools. However, there were certain exceptional cases
where a morning school and an afternoon school were being served by the same headteachers. By manually reducing duplicated names of headteachers in such exceptional cases, as well as eliminating a few schools that lacked up-to-date contact information, 672 of headteachers eventually fell in this sampling frame. By applying a systematic initial sampling followed by a 1-in-5 selection in the sampling frame, a final sample of 135 headteachers was selected.

For teachers in Hong Kong (HK Teachers) the situation was different, since the names of individual teachers were not listed in the school details retrieved from the Internet. A full list of teachers was not obtainable using the method employed in the previous section (for HK Heads). After trying a few other approaches, such as negotiating with the Education Department, it remains impossible for the author to obtain this information.

Drawing random or systematic samples from the entire population is thus infeasible. As an alternative, a cluster sampling technique, which selects a specific number of schools and surveys all teachers in those schools, should be an acceptable alternative provided the researcher is able to gain access through the "gatekeepers" (Homan, 2002, p. 23), who are usually the school's headteachers. The author found that it would also be quite difficult, if not impossible, to get access to randomly selected schools for doing surveys with their teachers. Therefore, this kind of cluster sampling was also infeasible. More discussion on "gatekeepers" will be offered later in the Qualitative Data Collection section.

As an approximation of probability cluster sampling, the author decided to approach the potential respondents face-to-face, by "dropping in" on occasions when a lot of teachers gathered. Public lectures, seminars and workshops would be good occasions to meet the attending teachers from different schools and with different backgrounds. It was therefore believed to be a close approximation of probability samples of the entire population of teachers.

The author has tried to look for different channels, such as printed and online media – including notices, memos and advertisements from the government, universities, not-for-profit and commercial educational organisations. All potential events were collected, and then carefully filtered to ensure an even mix of events with different topics that would attract different target groups of audiences. Invitation letters (see Appendix B) and "follow-ups" were sent to the organisers to request access to these events. In these cases, the in-charge officers served as "gatekeepers" of the events. Again, the author had to deal with these gatekeepers in order to gain access to these events.

However, "going through the formal procedures that some bureaucratic systems require can be a long, frustrating process. Typically, there will be weeks, if not months, between initiating the request and gaining approval" (Bogdan and Biklen, 2003, p. 77). The author of this paper has experienced similar, if not worse, bureaucratic treatment when requesting approvals.
Some non-responses and "turn-downs" were expected and occurred. After collecting all permissions for access to the events, a second filtering was carried out to ensure that the final list of events still comprised a mix of different topics and teachers of different backgrounds. This was a necessary step to ensure a homogeneous set of samples. It is believed that the homogeneity of a public event, such as a seminar for teachers, would be much higher than that in a particular school. Although this technique does not guarantee a set of completely homogeneous samples, it is a good approximation of a true probability sampling.

With the approval from organisers, the author, and sometimes his helper(s), "dropped in" on these events, and passed on the questionnaires with covering notes to the attending teachers, occasionally after briefings. The participants were often willing to fill in the questionnaires at the beginning, during the tea breaks or at the end of the events. A kind instructor of a workshop even allocated a 5-minutes time slot in her session for the attendants to fill in the questionnaires. From the observations, the participants seemed to be interested in participating in the survey, particularly when the investigator was available to explain the questions upon request. The response rates reached as high as 70 or 80% in many cases, and even over 90% in a couple of cases! Although face-to-face interaction is time consuming for the investigator, these high response rates have been proven to be a great reward.

For headteachers in England (UK Heads) a single list of all primary headteachers was also unavailable to the author. Instead, separate lists of primary schools with headteachers in certain counties, boroughs and cities were available online from their regional councils. These were a good source for approximating a "multi-stage cluster" (Clark-Carter, 2004, p. 156-157) sampling strategy. Finally, lists of primary schools in Leicester, Leicestershire, Northampton and Manchester were defined as the sampling frame and retrieved. Headteachers within the sampling frame were selected systematically. Questionnaires with covering letters were than faxed to the selected schools marked for the attention of the named headteachers.

Issues in Technology-based Delivery

The questionnaire can be delivered to the hands of respondents in a number of ways, such as by post, by hand, and so on. Delivery by hand, or face-to-face delivery, was found to be an effective way to get a high response rate, since the respondents have direct contact with the researcher or the researcher's representative. However, in many circumstances, some modes of distribution are not feasible. For instance, if the researcher and respondents are from different geographical locations, it is not possible to distribute the questionnaire face-to-face. In this research, UK Heads belong to this category of target of respondents.

There have been many papers discussing the use of some alternative channels for conducting surveys. Babbie (2001, p. 265-266), for example, discussed some technologies for doing survey research, namely Computer Assisted Telephone Interview (CATI), Computer Assisted Telephone Personal Interview (CAPI), Computer Assisted Self-Interview (CASI), Computer Assisted Self-administered Questionnaire (CASQ),
Touchtone Data Entry (TDE) and Voice Recognition (VR). However, these technologies require significant resources to develop and implement and are usually beyond the means of independent researchers.

On the other hand, as a consequence of the growing penetration of the Internet, "web-based surveying is becoming widely used in social science and educational research" (Solomon, 2001, no page). Unlike other technology-based techniques, such as those mentioned in the previous section, web-based and email techniques usually require much fewer resources to implement. An ordinary personal computer and access to the Internet are often all that is needed. However, there are several potential weaknesses with this kind of technique, such as weak coverage, biased sampling, non-response and difficulties in measurement (Groves, 1989, cited in Grandcolas, Rettie and Marusenko, 2003). Similar potential errors are also discussed by some other researchers, such as Couper (2001). If web-based surveys are used, "researchers should use this technique with caution in carefully chosen populations and with an eye to learning as much as possible about how to do it better" (Solomon, 2001, no page). Due to these kinds of uncertainties, web-based techniques have not been chosen for the proposed survey. Fax-delivery mode, instead, has been selected for the study.

Using fax machines to conduct surveys has been widely discussed in the literature. For instance, Walker (1994, cited in Babbie, 2001, p. 266) reports that fax surveys “produce higher response rates than do mail or telephone surveys”. This argument is also supported by Dickson and MacLachlan (1992; 1996). Their studies show that “fax surveys can provide faster and higher response rates without reducing data quality” (Dickson and MacLachlan, 1996, p. 112). The low cost of fax surveys is another advantage over traditional mail surveys. Dickson and MacLachlan (1996) estimate that “costs per returned questionnaire in the fax condition were less than one-fourth of the comparable costs for the mail condition” (p. 112). Advantages like these are extremely beneficial for the proposed survey study.

In the current survey, a computerized fax was employed to distribute questionnaires to the HK Heads and UK Heads. The completed questionnaires were faxed back to the researcher via a local fax number printed on the questionnaires. A fax was automatically converted and attached to an email and finally reached investigator’s email address. The procedure was as follows:

1. Lists of primary schools were retrieved from the World Wide Web (WWW). School information, such as the addresses, names of school heads, phone and fax numbers were extracted from the lists and imported to the fax software.
2. Incorporating the contacts, questionnaires and covering letters were faxed to the offices of invited respondents using the fax software.
3. The addressees were asked to fill in the questionnaires and to fax them back to a local telephone number mentioned in the covering letter.
4. The returned faxes were converted to emails via a fax-to-email service and the investigator then received the returned fax through email.

A more complete workflow is presented in Appendix A.
Collection of Qualitative Data

Qualitative data will be collected from HK Heads and HK Teachers (see Table 3-1). As mentioned earlier, in-depth interviews have been chosen as the instrument for the collection of qualitative data.

A major advantage of the interview is its adaptability. A skilful interviewer can follow up ideas, probe responses and investigate motives and feelings, which the questionnaire can never do. The way in which a response is made (the tone of voice, facial expression, hesitation, etc) can provide information that a written response would conceal.

(Bell, 1999, p. 135)

Pilot Interviews

In this research, two pilot interviews have been conducted with two in-service primary teachers who are known by the author. These two pilot interviews were conducted in May 2000. Both interviewees are Hong Kong Chinese and teach in primary schools in Hong Kong. The interviews were conducted in Cantonese, which is a dialect in southern China. It is also the most common dialect in Hong Kong.

Powney and Watts (1987) highlight three functions of pilot interviews:

1. a check that the structure, or organisation, of the interview meets the requirements of the research project
2. a practical test of the logistics of the interview
3. an opportunity to practise the social interactive skills necessary for this kind of interview chosen

(Powney and Watts, 1987, p. 127)

The pilot interviews demonstrated great variations between the two interviewed teachers. The first interviewee, Teacher A, showed high competence in ICT and its use in classrooms. In the interview, the interviewer was impressed by the description of many ICT activities in his school; he organised some of the ICT activities. In general, he was optimistic about the use of ICT in primary education.

In contrast, the second interviewee, Teacher B, was much less knowledgeable about the educational use of ICT. She was also much more passive in the interview. Sometimes Teacher B could not understand the questions of the interviewer, but this did not happen with Teacher A. Occasionally, Teacher A replied with a very detailed response, which was beyond the interviewer's expectation. Teacher B, on the other hand,
tended to reply in short responses. Her brief responses may be a result of insufficient knowledge of and confidence in ICT and its use in education.

From these pilot interviews, it could be expected that there are also great variations in the attitudes, knowledge and enthusiasm among individual teachers in Hong Kong. As suggested by Powney and Watts (1987), the pilot interviews have served the functions of capturing the logistics, styles, structures and essential points to be raised in the main interviews.

**Interview Schedule**

In the research by Wheeler, et al. (2002), interviews were guided by a number of “primer” questions, but the interviewees were allowed, and actually encouraged, to discuss anything they wished. This kind of style is very similar to what is called “semi-structured yet flexible” interviews (Jones and Hayes, 1991, p. 212). A similar approach was also adopted for interviews in the current study. The collection of these primer questions is usually called an “interview schedule” or “interview guidelines.” Such a schedule is developed iteratively, based on the processes and preliminary findings in pre-studies, pilot interviews and pilot surveys.

For qualitative research, the researchers themselves are actually part of the instrument (Mason and Bramble, p. 347). Therefore, good training and familiarity with the interview topic, procedures and skills is mandatory to produce successful interviews.

A set of “primer questions” or “interview schedule” was prepared as an instrument for the interview. The interview schedule has been built upon the secondary literature, and findings in pilot surveys and pilot interviews. The final version of the interview schedule is shown in Appendix H.

Before the interview with a particular school head or teacher, the background knowledge, such as geographical location, number of pupils, and number of teachers, was retrieved from the Internet and reviewed. The website of the Committee on Home-School Co-operation (2005) is a good source of factual details for most primary schools in Hong Kong. In addition, most primary schools operate their own websites, in which rich details of the schools can be found, including their organisational structure, pupils’ activities and the curriculum. A few of the schools even published the qualifications and experiences of their school heads and teachers. Some schools operate electronic forums on their website.

There were several reasons to learn the background of schools before the interviews. Doing so helps (a) to know exactly what to ask or not to ask; (b) to save precious interview time from asking factual questions which were already available on the web; and (c) to impress the interviewees with knowledge of their schools. Some interviewees, for instance, were greatly surprised by the interviewer’s in-depth knowledge of
their schools. On a few occasions, issues raised by the interviewer helped jog the fading memory of the participants themselves.

During the warm-up period in an interview, the purpose of the study, its confidentiality and the flow of the interview are summarized by the interviewer. Some easy-to-answer, factual, and ice-breaking questions are raised first. Some factual questions, such as the school’s number of teachers and pupils, are superfluous since the information is usually available from other sources. However, it is a good opportunity to let both parties become familiar. Afterward, the interviewer gradually guides the interviewee to the main topic. There are some optional questions in the schedule, if time and circumstances allow.

**Recording, Storage and Retrieval of Raw Data**

An important point to address during the initial stage in an interview is permission for voice recording. The use of recording devices in interviews has been discussed by many researchers. For instance, Rapley (2004) strongly recommended taping interviews given the benefits offered:

> I always try and use a tape-recorder, for some very pragmatic reasons: I want to interact with the interviewee, and I don’t want to spend a lot of my time head-down and writing. Also, the tape provides me with a much more detailed record of our verbal interaction than any amount of note-taking or reflection could offer.

*(Rapley, 2004, p. 18)*

Corbetta (2003) also opposes taking detailed notes during interviews, because doing so may lead to “incomplete, dull, or even incomprehensible” results (Corbetta, 2003, p. 280).

The author of this paper shares the opinions of Corbetta (2003) and Rapley (2004) regarding the benefits of recording interview sessions. Ethically, of course, approval of interviewees is certainly sought before recording starts. Fortunately, all the interviewees, both pilot and main, were amenable and they allowed the interviewer to undertake recording throughout the interviews. On a few occasions during interview sessions, the interviewees requested to suspend the recording when getting into certain sensitive conversations. The interviewer suspended the recording until the participants felt comfortable to begin recording again.

All interviews were recorded with the permission of participants. Due to the advance in technology, a Mini-disc (MD) recorder was used instead of traditional cassette recorder. The interviews were recorded and finally converted (digitised) into the MP3 format, and were permanently stored as computer files. This is a digital compressed format for voice signals that does not introduce much distortion to the original sound quality. Compared with traditional cassette tapes, it saves money and physical storage space. Moreover, it provides very simple and easy playback with quick fast-forward and rewinding functions using computer software, which provides a very convenient way for listening to the interviews repeatedly during
transcription. Therefore all pilot and main interviews are kept in this kind of computer file. The applications of digital audio recording techniques in qualitative research have been studied. For example, Stockdale (2002) provided a very interesting discussion in this topic. Although some described technology has already been somewhat outdated from today’s point of view, the basics covered inside are still informative for interested researchers.

All the interviews were conducted in the participants’ mother language, i.e. Cantonese, which is the most popular Chinese dialect being used in Hong Kong. Transcription was also done in Chinese. Afterwards, the Chinese transcriptions were translated into English, which is the medium of language of this paper. Although the author of this paper is not a professional translator, he has attempted to make sure that the translations precisely reflect the views of the interviewees. The ideal way is to send the translated copies back to the respective interviewees for review or verification. However, it was not possible since it would lead to great trouble for the interviewees because all of them were very busy, as mentioned in the interviews. Instead, the author himself listened to the recordings and made the verification at least twice for every piece of work. To better assure the accuracy, the author also sought peer reviews on a few, but, again, impossible for all, segments selected from the translated work. These procedures were believed to be the second best way under the constraint that the best was not available.

Concerns regarding Neutrality

It is traditionally noted that an interviewer “listens more than speaks” (Powney and Watts, 1987, p. 128). Interviewing has been typically treated as a “neutral means of extracting information” (Holstein and Gubrium, 2004, p. 140) where “the interviewer is supposed to be neutral, inconspicuous, little more than a ‘fly on the wall,’ so to speak” (p. 140, quotes in original). However, Holstein and Gubrium (2004) also introduce the concept of active Interviewing which “highlight[s] the fact that interactional interpretive activity is a hallmark of all interviews” (p. 140). Their views agree with Rapley’s description of the modern interview (2004), in which “the narrative of non-neutral interviewing is dominant in contemporary methodology texts on interviewing” (p. 19).

‘Being neutral’ in any conventional sense is actually impossible — interviewers are always active. Interviewers have overarching control, they guide the talk, they promote it through questions, silence and response tokens (e.g. “okay”) and chiefly they decide which particular part of the answer to follow up. From this perspective, the binary of “neutrality/mutual self-disclosure” no longer holds.

(Rapley, 2004, p. 20, quotes and parentheses in original)

Recalling that a multi-truth ontology is assumed under the interpretivist paradigm, the interviewer is thus part of the instrument to construct the reality. The arguments of Holstein and Gubrium (2004) and Rapley (2004) describe the approach to be applied in the proposed in-depth interview study. In sum:
interviewing itself is a meaning-making project. The imagined subject behind the participant emerges as part of the project; it is not presumed to exist before or independently of the interview conversation. Within the interview itself, the subject is fleshed out – rationally, [or] emotionally,... The interview and its participants are constantly developing.

(Holstein and Gubrium, 2004, p. 150, emphasis in original)

In this sense, an interview is “more like a two-way informational street than a one-way data pipeline... interviewing is always unavoidably interactional and constructive – in a word, the interview is active” (Holstein and Gubrium, 2004, p. 143, italics in original).

In the “semi-structured yet flexible” style adopted in current study, the interviews were closer to a discussion than a “question and answer session.” In the early interviews, it was encouraging to note that at the beginning of an interview, the interviewee was usually more conservative and protective. After the a trusting relationship had been built up between the interviewer and the interviewee through ice-breaking questions, the interviewee felt more comfortable to throw out more deeply buried points of view. Some of these viewpoints will be discussed later in Chapter 5. Overall, the “in-depth” interviews match the original purpose of this study. Moreover, the interviews also well illustrated the epistemology under the constructivist or interpretative paradigm, as highlighted in the following statement:

*The investigator [i.e. interviewer] and the object of investigation [i.e. interviewee] are assumed to be interactively linked so that the “findings” are literally created as the investigation proceeds.*

(Guba and Lincoln, 1994, p. 111, quotes and emphasis in original)

**Sampling**

The sampling strategies for qualitative methods, such as an in-depth interview, are remarkably different from quantitative methods, such as surveys.

*Purely quantitative studies typically use larger samples selected through probability techniques, while qualitative studies typically use smaller sample selected through purposive techniques...*  
(Kemper, Stringfield and Teddlie, 2003, p. 277)

Purposive sampling technique, which is less favourable in quantitative research, is often accepted in qualitative research. For instance, in an in-depth conversation study conducted by Jones and Hayes (1991), the interviewed headteachers “known personally to one of [the researchers]” (p. 212). The researchers also acknowledged that that it was an “opportunistic” rather than a “systematic sampling technique” (p. 212).
In the current study, potential participants of the interviews were invited through a reply slip attached with the questionnaires in the second pre-study. Ten (10) voluntary replies were received which indicated that the respondents were interested in either receiving a survey report or participating in a follow-up interview. All of them were contacted by phone. The investigator began the conversations by saying “thank you” to their participation in the survey and briefed them about the survey findings. Then they were invited to participate in interviews. After a great deal of convincing, nine (9) interviewees were successfully invited in this way. The interviewees in this batch were called the first “layer” participants in the interview study.

When the interview with each first layer participant was finishing, the participant was verbally asked for referral(s) to some other participants, among school heads or teachers whom they knew. Although it was difficult in the initial moment of a request, most interviewees were successfully convinced by the sincerity of the investigator to introduce one or more participants in the next “layer.” These were known as the second layer of participants. A total of 33 interviewees were successfully invited through this kind of iterative snowball sampling technique.

**Convincing the Gatekeepers**

Many researchers, such as Bogdan and Biklen (2003), recognize that “the first problem to face in fieldwork is getting permission to conduct your study” (p. 75). This is a common problem encountered by both quantitative and qualitative researchers. “Gatekeepers are those who give access to a research field” (Homan, 2002, p. 23). Headteachers are usually the gatekeepers of the school settings (Homan, 2002; Troman, 1996). It is even more challenging for an outside researcher to gain access to a school setting, as pointed out by Troman (1996):

> the researcher, in order to gain access to participants, develop field relations, collect and analyse data, must first successfully negotiate entry to the culture. This process typically involves the fieldworker negotiating with a group, and who, acting as “gatekeeper”, has the power to grant or deny entry to the researcher... Gaining entry, however, is a stage in research which is not without its difficulties.

*(Troman, 1996, p. 71)*

> As headteachers are the likely gatekeeper that the researcher will encounter, headteacher stress, illness and burn-out may impact on negotiating entry.

*(Troman, 1996, p. 82)*

As discussed in earlier sections, the proposed study has avoided highly interruptive methods, such as observation and any longitudinal technique. Interviews with school heads and teachers were supposed to be a relatively less interruptive method in a qualitative study. Even so, however, there have been great
difficulties in recruiting voluntary participants. Being the gatekeepers themselves, most, if not all, headteachers initially avoided being interviewed. However, the author of this paper often tried to phone the headteachers, again and again, explaining the purpose of the study. Eventually, most headteachers were convinced to accept the invitation to interview.

Due to the difficulty in gaining access to a school, no potential access to a school has been "wasted." Whenever an opportunity to interview was offered, an interview was conducted. The selection of "suitable" cases was done afterward. In Goodson's (2003) study, for example, only two out of twenty observed lessons were selected for analysis. The purpose of selection is to: (a) maximise the variation of schools and participants and (b) include special or interesting cases. This strategy is not acceptable for probability sampling, but it is acceptable, and sometimes necessary, for purposive sampling.

Eventually, thirty-three (33) participants were interviewed. Fifteen (15) of them were headteachers, sixteen (16) were non-head teachers and two were ICT coordinators. They were teaching in eighteen (18) local primary schools. A full list is in Appendix F. A point to note is that one of these two interviewed ICT coordinators was employed externally, while the other was transferred to this post from a teaching position. In the interview, great differences between these two ICT coordinators were shown and will be discussed in Chapter 5.

At the end of each interview, some books suitable for primary children were presented to the school library as a souvenir. The interviewees were often impressed, although the souvenir was not very expensive. Finally, the interviewee was asked to refer other school heads or teachers whom they knew for further interviews. Often the interviewees initially declined to do so. However, after some explanation, some headteachers were convinced, and sometimes delighted, to introduce their teachers (or ICT coordinators in a couple of cases) or headteachers in other schools. The thirty-three (33) headteachers and teachers were recruited through such a snowball referral mechanism.

Ethical Issues

The British Educational Research Association adopted a set of ethical guidelines in 1992 (BERA, 1992). This set of guidelines consists of 34 paragraphs in 7 sections regarding the responsibilities to or relationship with the following: (a) research profession, (b) participants, (c) public, (d) funding agencies, (e) publication, (f) intellectual ownership, and (g) host institution.

Every effort has been made to ensure the current study conforms to these guidelines, including but not limited to the following issues:

- All findings are as accurate as possible.
- All participants have been notified about the purpose of the study in the covering letter, covering
note, initial conversation and/or through other means.

- The survey has been conducted and reported anonymously. No personal information is disclosed.
- Permissions have been sought for the recording of interview sessions.
- Similarly, all participants in the interviews were treated in strict confidentiality. Interviewees and schools are represented in symbols (i.e., school and interviewee codes) in all reports. Identities of individuals and schools will never be disclosed.
- All participants are adults and there is no issue of children participants.

Quality Indicators

There are many criteria that indicate the quality, or plausibility, of quantitative and qualitative research, such as validity (internal and external), applicability, generalisability, consistency, reliability, neutrality, objectivity, credibility, transferability, dependability and confirmability (see Seale, 1999, p. 45). Some terms are overlapping while others are synonyms. Detailed explanations of each term will not be covered in the current context. Interested readers may refer to Seale (1999).

Reliability, internal and external validity are often used as the quality indicators for quantitative methods. Based on a different paradigm, the quality of qualitative methods is based on a different set of criteria. Some researchers, such as Creswell (2003), also use the same names (reliability and validity) to represent the quality for both quantitative and qualitative studies. To avoid ambiguity, some other researchers, such as Seale (1999), prefer to use another set of terms as the quality indicators for qualitative studies. These terms include credibility, transferability and dependability, which are the counterparts of internal validity, external validity and reliability, respectively, in quantitative studies (Seale, 1999, p. 45).

In quantitative studies, under unchanged conditions and procedures, reliability is "the extent to which measurements are repeatable across occasions and internally consistent" (Cherulnik, 2001, p. 462). As a counter-example, "a clock which runs ten minutes slow some days and fast on other days is unreliable" (Bell, 1999, p. 103).

Validity refers to "the degree to which the results of a research study provide trustworthy information about the truth or falsity of the hypothesis" (Cherulnik, 2001, p. 466). For example, another clock which runs exactly ten minutes slow every day is reliable but not valid. An unreliable item must be invalid and a reliable item is not necessary valid. From a quantitative perspective, the observed or measured value can be considered the sum of the following components:

\[
\text{Observed Value} = \text{True Value} + \text{Systematic Error} + \text{Random Error}
\]

(Corbetta, 2003, p. 79)

In general, reliability is related to random error whilst validity is related to systematic error. For quantitative studies in the social sciences, there are two main forms of reliability, namely the "repeated measurement"
and the “internal consistency” (Muijs, 2004, p. 72). For a perfectly reliable instrument, the same value will be obtained when it is used to measure the same item or participant. As a counter-example, “an individual gets a score of 110 on an aptitude test and, the following day, gets a score of 80 on the same test or on any equivalent test” (Corbetta, 2003, p. 81). The test is not reliable because, simply, it does not fulfil repeated measurement criteria.

The threat to validity of any research broadly falls in two types, namely the internal validity and the external validity. “External validity refers to the generalisability of the findings” (Clark-Carter, 2004, p. 39). Internal validity refers to “the degree to which a design successfully demonstrates that changes in a dependent variable are caused by the changes in an independent variable” (Clark-Carter, 2004, p. 41). Internal validity is emphasised in experimental studies due to the difficulty in isolating independent variables among many other attributes in the subject being studied.

In a survey study, the independent variables are mainly the responses on the questionnaires and the dependent variables are the actual attributes of the respondents. A perfect set of questionnaires should exactly reflect what the respondents think. In this study, the questionnaires have been reviewed and piloted repeatedly to ensure their reliability. Some questions have been designed to avoid the possibility of a response set as well. We will return to this issue later in this chapter.

Because of the ontology of multi-truth assumptions under the positivist paradigm, in qualitative research validity and reliability will have different implications. Creswell (2003) realized the equal importance of validity in qualitative research compared to quantitative research. However, the “connotations” are different:

Validit[y in qualitative research] does not carry the same connotations as it does in quantitative research, nor is it a companion of reliability or generalizability... Overall, however, reliability and generalizability play a minor role in qualitative inquiry.

(Creswell, 2003, p. 195)

From the perspective of qualitative research, validity determines “whether the findings are accurate from the standpoint of the researcher, the participant, or the readers of account” (Creswell and Miller, 2000, cited in Creswell, 2003, p. 195-196). This is a “standpoint-focused” validity, which is different from the validity that emerges from the ontology of “unique truth” adopted by quantitative methods, in which validity is also known as “trustworthiness,” “authenticity,” and “credibility” (p. 196).

As discussed earlier, the current study has adopted a mixed-method approach. In spite of the ongoing debate on mixed-method approaches discussed in early part of this chapter, the advantages of triangulation, being a mode of mixed-method, have been accepted for this study. In this sense, “triangulation, then, if used with due caution, can enhance the credibility of a research account by providing an additional way of generating
evidence in support of key claims” (Seale, 1999, p. 61, emphasis added). According to Seale (1999, p. 44-45), in qualitative research credibility is an equivalent indicator to internal validity in quantitative methods.

As strong supporters of mixed-method research, Brewer and Hunter (1989) believe that the mixed-method approach is much more powerful than each of its component methods. That is, the methods work together to improve synergistically the quality of the research findings.

For if our various methods have weakness that are truly different, then their convergent findings may be accepted with far greater confidence than any single method’s findings would warrant. Each new set of data increases our confidence that the research results reflect reality rather than methodological error. (p. 17)

In this case, a converging result in a mixed-method study automatically helps confirm the validity and reliability of the study because it is assumed that the probability of having consistent but invalid results from two independent results is very low. On the other hand, if any contradictory finding is generated in a mixed-method study, it will be a strong indicator of the need for further investigation.

And divergent findings are equally important, but for another reason. They signal the need to analyze a research problem further and to be cautious in interpreting the significance of any one set of data. (p. 17)

The benefits of a mixed-method approach (methodological triangulation) are further asserted by Brewer and Hunter as follows.

Triangulated measurement tries to pinpoint the values of a phenomenon more accurately by sighting in on it from different methodological viewpoints. To be useful, a measuring instrument must both give consistent results [for reliability] and measure the phenomenon that it purports to measure [for validity]. When two instruments yield conflicting results, then the validity of each is cast into doubt. When the findings of different methods agree, we are more confident [in the reliability and validity of findings].

(Brewer and Hunter, 1989, p. 17, author's interpretations added in square brackets)

Based on Brewer and Hunter’s ideas, if consistent or convergent results are obtained from this mixed-method study, more confidence can be claimed for the reliability and validity of both the surveys and interviews being used in the study. The results will be discussed in the concluding chapter, where further discussions regarding the validity or credibility of the study will be considered.

Cresswell (2003, p. 196) recommended implementing one or more of the following eight “primary strategies” to ensure the validity or “accuracy” of findings in a research study, namely: (a) triangulation, (b)
member checking, (c) use of “rich” and “thick” description, (d) self-reflection, (e) presentation of negative information, (f) researcher’s prolonged time in the field, (g) peer debriefing, and (h) external auditing.

Due to resource and time constraints, the author of this paper was unable to implement all of these strategies in the current research. However, some of the strategies have been implemented to improve the plausibility of the study:

- The author has spent as much time as possible in the field, as suggested by Creswell (2003).
- A great deal of secondary literature was used to design the questionnaire. For example, a six-point scale was used in Section A, as it was generally agreed that a five- or six-point scale would produce the optimal validity (Nunally, 1978; McKelvie, 1978).
- The questionnaires have been refined by pre-study and pilot surveys.
- The questionnaire and interview schedule were reviewed by peer colleagues and an academic supervisor.
- The pilot respondents were asked whether there was any ambiguity in the questions items or the questionnaires on the whole.
- The author conducted all interviews. This helped maintain consistency between interviews.
- When conducting the first two main interviews, the author was accompanied by an experienced interviewer, who had served as a peer-reviewer and given valuable ideas, assistance and advice before, during and after the interviews.
- The use of the triangulation mode in a mixed-method approach is expected to produce strong evidence when the findings from both methods coincide.
- As suggested by Creswell (2003), the use of rich and thick description for reporting the interview data in Chapter 5 will help “transport readers to the setting and give the discussion an element of shared experiences” (p. 196).

Difficulties and Limitations

It should be remembered that “no proposed research project is without limitations; there is no such thing as a perfectly designed study” (Marshall and Rossman, 1999, p. 42). This study is no exception, though it has been planned and implemented to be as good as it can be, given various logistical constraints. Nonetheless, the following limitations are presumed in the current research design:

1. Only the perceptions of headteachers, teachers and ICT coordinators were studied in the current research. Views from other parties, such as pupils and parents, may be equally important but have not been covered in the scope of study. Other non-mainstream educational settings, such as “international” schools (those applying non-local curriculum) and schools for special educational needs have not been covered.

2. Due to resource constraints, the survey has only covered headteachers, but not teachers, working in certain regions in England. The coverage of a wider area and the involvement of teachers in a future
study would provide a more complete comparison with school heads and teachers in Hong Kong and England.

3. Due to privacy and other reasons, a complete list of in-service Hong Kong teachers was not available for independent researchers, such as the author of this paper. This increased the challenge of drawing perfect probability samples. However, great efforts have been made to obtain approximated probability samples. This should ensure the external validity, or generalisability, of the survey findings.

4. Data collection was mainly undertaken in the first half of 2002. It has been a few years between the period of data collection and this report. The delay was mainly due to the time required to do data analysis, especially with qualitative data, because the analysis of qualitative data was “a lengthy, complex and sometimes frustrating process” (Basit, 2003, p. 147), particularly for a part-time researcher.

However, the literature review is up-to-date. All efforts have been made to search for the latest literature. ICT has changed tremendously in recent years and readers may find some gaps between the data collection and the literature. Nonetheless, many findings in 2002 still hold today, such as the discrepancy of attitudes between headteachers and teachers, and teachers’ frustrated feelings with ICT implementation.

5. Great efforts have been made by the author to seek expert advice in developing the questionnaires and interviews, both from peers and academic advisors. With the absorption of different ideas, the final version of the instrument should be adequate. Iterative refinement through several pre-studies and pilot studies also further improved the truthworthiness of the instruments.

6. The issue of non-response in “traditional” surveys has been raised by many researchers, such as Roslow, Nicholls and Comer (1993). They suggested ways to adjust the data from surveys with some weighting of responding and non-responding “participants.” However, as they concluded, it is not yet well known “whether there are appropriate items to use in weighting; they need to be investigated through empirical research” (p. 31). In other words, if any adjustment by uncertain weighting is applied, there will be a risk of degraded results.

The overall response rate in the main survey is about 62%. As Babbie (2001) notes, “a 50% response rate is adequate... 60% is good... 70% is very good” (p. 256). The response rate for this survey is thus good. The high response rate was mostly a result of face-to-face delivery, in which the response rate was as high as 80%, and sometimes 90%. Weighting of non-response cases is therefore not considered necessary for the current survey study.
Summary

In this chapter, two major research paradigms, the positivist and the interpretivist paradigms, have been introduced. Essential elements of ontology, epistemology and methodology associated with these two research paradigms have been covered. Quantitative and qualitative research methods apply under the positivist and interpretivist paradigms, respectively. Despite the on-going debates on combining the use of quantitative and qualitative methods, an optimistic view on this approach has been adopted. In the current research, self-completion questionnaires and in-depth qualitative interviews have been proposed as the major quantitative and qualitative research instruments, respectively.

A number of important issues related to quantitative and qualitative data collecting techniques have also been discussed in this chapter. Procedures in sampling, with different emphases on quantitative and qualitative techniques have been discussed in detail. Finally, concerns in quality and ethics of research, and technology-assisted delivery and collecting techniques for questionnaires, have been introduced. Detailed analysis with the collected quantitative and qualitative data will be covered in the next two chapters.
Chapter 4  Analysis of Survey Data

Irrationally held truths may be more harmful than reasoned errors.

Huxley, Thomas H. (1825 - 1895), *The Coming Age of the Origin of Species*

Overview

This chapter begins by reviewing the descriptive statistics of the data obtained through surveys. Inferential statistics will be discussed later. Responses in the open-ended section will be presented at the end of the chapter. The findings obtained in this chapter will be carried forward to Chapter 6, forming part of the data triangulation with the material from Chapter 5.

Sub-grouping of Respondents

In the following detailed analysis, respondents are divided into four (4) subgroups according to their background, namely Hong Kong Headteachers (HK Heads), Hong Kong Teachers (HK Teachers), UK Headteachers (UK Heads) and UK Teachers. In the current categorisation, "Heads" mean the headteachers, also known as principals, of primary schools. "Teachers" implies all other teaching staff in the schools, including but not limited to deputy heads, subject leaders, "ordinary" teachers and ICT coordinators.

HK Heads, HK Teachers and UK Heads were the intentional target groups of respondents in the current survey (as defined in the scope of study). However, the inclusion of UK Teachers was "accidental" because no questionnaire was addressed to teachers in this subgroup. It turned out that some questionnaires (18) were actually returned by UK Teachers, as shown in Table 4-4. It seems likely that some UK Heads passed on to their teacher colleagues the received questionnaire. As mentioned, this subgroup of respondents was out of the pre-defined scope of study and is therefore not included in the analysis.

Analytical tools have been employed in this chapter, including descriptive analysis and inferential statistics, such as Analysis of Variance (ANOVA) and its extension, Tukey's Honestly Significant Difference Test (HSD).
Descriptive statistics are frequently used to “organize and summarize data so the data are more readily comprehended” (Coladarci, Cobb, Minium and Clarke, 2004, p. 2). Inferential statistics, on the other hand, “permit conclusions about a population, based on the characteristics of a sample of the population” (p. 3). Inferential statistics asks, “are the two averages so different that sampling variation alone cannot account for the difference?” (p. 4). Tukey HSD tests are introduced and employed in the inferential statistic section. This is a kind of post hoc comparison, in contrast to “planned comparison” (Beins, 2004, p. 169).

In this study, several software tools have been employed to analyse the data, mainly SPSS (Brace, Kemp and Snelgar, 2003; Hinton, Brownlow, McMurray and Cozens, 2004; Muijs, 2004; SPSS, 2004) and Statistica (StatSoft, 2004). These tools have also been used to generate some charts in this chapter.

Descriptive Statistics

In the final version of the questionnaire, there were 39 closed-ended questions and 1 open-ended question under 5 sections (see Appendix E for the English version). Each returned questionnaire was assigned a unique “questionnaire number” that serves as the index for subsequent reference to the questionnaire itself.

In the following section demographic data will surveyed, since it is important to have an overall picture of the profile of all respondents. The experiences and feelings of the respondents collected from other sections will be investigated at a later point.

Demographic Information

Some demographic information was obtained intuitively, while other data were obtained through questions in Section D of the questionnaire. A total of 681 questionnaires were collected in this survey. Out of these completed and returned questionnaires, 574 sets were collected from participants in Hong Kong and 107 were collected from respondents from several cities and counties in the UK, including Leicester, Leicestershire, Manchester and Northamptonshire. The “selection” of these samples was discussed in the research design chapter.

Most questionnaires in Hong Kong were delivered and collected by means of “face-to-face” mode (448 out of 574 collected), while the rest (126 out of 574) were done by Fax. On the other hand, all questionnaires collected from the UK were delivered and collected by Fax, as discussed in the previous chapter. Moreover, the respondents invited in Hong Kong were provided with the Chinese version of the questionnaire (ver. 3.02c), as shown in Appendix M. The respondents invited in the UK were given the English version (ver. 3.02e) of the questionnaires, as displayed in Appendix E. A positive side effect of this arrangement was the easy distinguishing of replies from Hong Kong and UK.
Table 4-1 represented the distribution of delivery modes and the locations of survey. Since the delivery mode of a questionnaire is one of its intrinsic properties, there was no missing value with this parameter.

Table 4-1 Number of respondents reached by fax and hand

<table>
<thead>
<tr>
<th></th>
<th>Hong Kong</th>
<th>UK</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery by hand</td>
<td>448</td>
<td>0</td>
<td>448</td>
</tr>
<tr>
<td>Delivery by fax</td>
<td>126</td>
<td>107</td>
<td>233</td>
</tr>
<tr>
<td>Total</td>
<td>574</td>
<td>107</td>
<td>681</td>
</tr>
</tbody>
</table>

Table 4-1 and Figure 4-1 show that 574 questionnaires were collected from respondents in Hong Kong and 107 questionnaires were collected from the UK. The distribution of delivery methods is also shown in Table 4-1.

Respondents were requested to enter their demographic data in section D. These questions provided useful information for the analysis of answers from participants in different categories.

From the results in Question 26, the number of male and female respondents in Hong Kong and the UK was listed (Table 4-2).

Table 4-2 Number of female and male respondents in HK and UK

<table>
<thead>
<tr>
<th></th>
<th>Hong Kong</th>
<th>UK</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (Missing)</td>
<td>16</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>395</td>
<td>58</td>
<td>453</td>
</tr>
<tr>
<td>Male</td>
<td>163</td>
<td>45</td>
<td>208</td>
</tr>
<tr>
<td>Total</td>
<td>574</td>
<td>107</td>
<td>681</td>
</tr>
</tbody>
</table>
Among the total of 681 respondents to the questionnaires, there were 453 females and 208 males. Another 20 respondents did not reply to Q26, which asked the gender of respondents. This led to the missing value shown in Table 4-2 and Figure 4-2.

![Figure 4-2 Gender distribution of respondents](image)

Summarized from Question 30 in Section D, Table 4-3 shows the number of respondents in different roles or duties in their schools.

<table>
<thead>
<tr>
<th>Duty</th>
<th>Hong Kong</th>
<th>UK</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Missing)</td>
<td>18</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td>Head</td>
<td>72</td>
<td>78</td>
<td>150</td>
</tr>
<tr>
<td>Deputy Head</td>
<td>9</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Discipline Head</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Subject Leader</td>
<td>132</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>Teacher</td>
<td>283</td>
<td>4</td>
<td>287</td>
</tr>
<tr>
<td>ICT Coordinator</td>
<td>29</td>
<td>9</td>
<td>38</td>
</tr>
<tr>
<td>Other</td>
<td>19</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>574</strong></td>
<td><strong>107</strong></td>
<td><strong>681</strong></td>
</tr>
</tbody>
</table>

All respondents were then categorized into HK Heads, HK Teachers, UK Heads and UK Teachers. The distribution of questionnaires within different subgroups is shown in Table 4-4 below. The missing values are the results of non-responses to this question.
Table 4-4 Respondents summarized as Headteachers and Teachers

<table>
<thead>
<tr>
<th></th>
<th>Hong Kong</th>
<th>UK</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duty (Missing)</td>
<td>18</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td>Headteacher</td>
<td>72</td>
<td>78</td>
<td>150</td>
</tr>
<tr>
<td>Teacher</td>
<td>484</td>
<td>18</td>
<td>502</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>574</strong></td>
<td><strong>107</strong></td>
<td><strong>681</strong></td>
</tr>
</tbody>
</table>

In the following analysis, the differences and similarities between headteachers (HK Heads and UK Heads) and teachers (HK Teachers) will be revisited.

Question 27 asked respondents to list their years of teaching experience. From the 654 valid responses to this question, most of the respondents fell in the range of 0 to 10 years of experience, as shown in the histogram in Figure 4-3. The mean teaching experience was 15.08 years with a standard deviation of 10.44. It was noted that the survey comprised more young respondents than experienced respondents.

When a histogram was plotted with an interval of 5 years, it produced the results shown in Figure 4-4. Viewed at this level of detail, most teachers had 0-5 years of teaching experience.
Questions 28 and 29 asked the respondents about the time they spent with computers in school and at home, respectively. The results were plotted in Figure 4-5 and Figure 4-6, respectively. Twenty (20) respondents said that they did not spend any time (0 hours) with computer in school and 26 respondents said that they did not spent any time with computer at home.

Figure 4-5 and Figure 4-6 also demonstrate that most other respondents spent 1 hour or less with computers, both in school and at home. Moreover, the mean computer time for all respondents in school is 1.70 hours and the standard deviation is 1.54. The mean computer time spent at home is 1.76 hours with a standard deviation of 1.26.
General Perceptions (Q1 - Q19)

Questions 1 to 19 probed general perceptions of the respondents. These questions make up Section A in the questionnaire. In this section, questions were mainly focused on the respondents' experiences and feelings regarding the daily use of ICT in schools. There were 19 questions in this section (Table 4-5).

Table 4-5  All questions in Section A of the questionnaire

<table>
<thead>
<tr>
<th>Q1</th>
<th>Your school provides convenient access to computers and the Internet for pupils.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2</td>
<td>Your school provides convenient access to computers and the Internet for teachers.</td>
</tr>
<tr>
<td>Q3</td>
<td>Teachers have easy access to good teaching software.</td>
</tr>
<tr>
<td>Q4</td>
<td>Good training in ICT is easily available for teachers.</td>
</tr>
<tr>
<td>Q5</td>
<td>Technical support, such as a hotline and reference material, etc., is easily available for teachers.</td>
</tr>
<tr>
<td>Q6</td>
<td>There is sufficient space in your school for setting up computer facilities.</td>
</tr>
<tr>
<td>Q7</td>
<td>You are knowledgeable and skilful enough to implement ICT in school.</td>
</tr>
<tr>
<td>Q8*</td>
<td>The implementation of ICT in school is a heavy burden for you.</td>
</tr>
<tr>
<td>Q9</td>
<td>You enjoy the process of ICT implementation in school.</td>
</tr>
<tr>
<td>Q10</td>
<td>You are very eager to implement ICT for teaching.</td>
</tr>
<tr>
<td>Q11</td>
<td>It is a simple and easy task for you to help implement ICT in your school.</td>
</tr>
<tr>
<td>Q12*</td>
<td>Implementing ICT in school retards your daily teaching and administrative duties.</td>
</tr>
<tr>
<td>Q13</td>
<td>Your colleagues are very eager to implement ICT in school.</td>
</tr>
<tr>
<td>Q14</td>
<td>The headteacher in your school is very eager to implement ICT.</td>
</tr>
<tr>
<td>Q15</td>
<td>ICT plays an essential role in modern teaching and learning.</td>
</tr>
</tbody>
</table>

Figure 4-6  Hours per day using computers at home
Q16* For the time being, there is still strong resistance against the implementation of ICT in your school.

Q17 In the past 3 years, your school has obtained plenty of financial and other resources from the state/government for the implementation of ICT.

Q18 In the past 3 years, input of resources from the state/government has significantly contributed to the use of ICT in your school.

Q19* Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning.

* Note: Q8, Q12, Q16 and Q19 are questions whose word order was reversed

Figure 4-7 shows summaries of responses in this section. The mean response of most questions fell on the scale around “4” or “slightly agree.”

Table 4-6 extracted questions in which the mean rating was closer to “slightly agree” on the scale. It is noted that most questions (13 out of 19) belong to this category.

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 Your school provides convenient access to computers and Internet for pupils.</td>
</tr>
<tr>
<td>Q3 Teachers have easy access to good teaching software.</td>
</tr>
<tr>
<td>Q4 Good training in ICT is easily available for teachers.</td>
</tr>
<tr>
<td>Q5 Technical support, such as a hotline and reference material, etc., is easily available for teachers.</td>
</tr>
<tr>
<td>Q6 There is sufficient space in your school for setting up computer facilities.</td>
</tr>
<tr>
<td>Q7 You are knowledgeable and skilful enough to implement ICT in school.</td>
</tr>
<tr>
<td>Q8 The implementation of ICT in school is a heavy burden for you. (reverse wording)</td>
</tr>
<tr>
<td>Q9 You enjoy the process of ICT implementation in school.</td>
</tr>
<tr>
<td>Q10 You are very eager to implement ICT for teaching.</td>
</tr>
</tbody>
</table>
Q12 Implementing ICT in school retards your daily teaching and administrative duties. (reverse wording)
Q13 Your colleagues are very eager to implement ICT in school.
Q17 In the past 3 years, your school has obtained plenty of financial and other resources from the state/government for the implementation of ICT.
Q18 In the past 3 years, input of resources from the state/government has significantly contributed to the use of ICT in your school.

In Questions 2, 14 and 15, the mean rating on the scale approached “5” or “fairly agree” (see Table 4-7).

Table 4-7 Questions with rating closer to “fairly agree”

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2 Your school provides convenient access to computers and Internet for teachers.</td>
</tr>
<tr>
<td>Q14 The headteacher in your school is very eager to implement ICT.</td>
</tr>
<tr>
<td>Q15 ICT plays an essential role in modern teaching and learning.</td>
</tr>
</tbody>
</table>

In Questions 11, 16 and 19, the mean rating on the scale approached “3” or “slightly disagree” (see ≠).

Table 4-8 Questions with rating closer to “slightly disagree”

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11 It is a simple and easy task for you to help implement ICT in your school</td>
</tr>
<tr>
<td>Q16 For the time being, there is still strong resistance against the implementation of ICT in your school. (reverse wording)</td>
</tr>
<tr>
<td>Q19 Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning. (reverse wording)</td>
</tr>
</tbody>
</table>

In Figure 4-7, the mean responses are presented graphically for all respondents without any sub-grouping. The graph offers an overall picture of the respondents, but it is unable to indicate any differences between subgroups. In the following figures, charts will be presented for different subgroups (i.e., HK Heads, HK Teachers and UK Heads). In all the subsequent analysis, HK Heads, where applicable, serve as the base-line for inter-group comparison.

With sub-grouping, the ratings from HK Heads and HK Teachers were presented as two separate lines in the graph in Figure 4-8. A comparison can be easily obtained by reading the figure.
In Figure 4-8, HK Heads show a tendency toward higher ratings than HK Teachers, with the exceptions of the reversed-wording questions. For instance, in Question 1 HK Teachers' mean response was approximately 4.0 while HK Heads' mean response was approximately 4.4. In this and many other questions, it was shown that HK Heads generally carried more optimistic attitudes towards the use of ICT while HK Teachers generally gave less positive opinions. These apparent differences will be further verified in the inferential statistics section.

This general attitude was confirmed in the results of questions 8, 12, 16, and 19, which were intentionally written in reversed wording to minimize, if not eliminate, any potential "response set" (Hui and Triandis, 1985), a data distortion explained in the previous chapter. As a result, HK Teachers agreed to those questions more strongly than HK Heads. The outcome also proved that a "response set" was not present in this survey.

Figure 4-8  Questions 1 to 19 rated by HK Heads and HK Teachers

Figure 4-9  Questions 1 to 19 rated by HK Heads and UK Heads
In Figure 4-9, the similarities and differences between HK Heads and UK Heads are illustrated. It is observed that the attitudes of these regions were similar, with the exception of several questions, such as questions 3, 4, 5, 8 and 16, in which great inter-group differences were observed. The differences will be quantified and further analysed in later sections.

Perceptions of Effectiveness of ICT (Q17 - Q19)

It is especially interesting to study Questions 17 through 19, since these questions ask how the respondents perceive the resource inputs and outcomes of ICT in teaching and learning:

Q17 In the past 3 years, your school has obtained plenty of financial and other resources from the state/government for the implementation of ICT.

Q18 In the past 3 years, input of resources from the state/government has significantly contributed to the use of ICT in your school.

Q19 Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning.

Table 4-9 shows the mean responses and standard deviations of the subgroups HK Heads, HK Teachers and UK Heads obtained from questions Q17, Q18 and Q19. Figure 4-10 compares the mean responses of these subgroups.

Table 4-9 Mean ratings in Q17 through Q19 by HK Heads, HK Teachers and UK Heads

<table>
<thead>
<tr>
<th></th>
<th>HK Head</th>
<th>HK Teacher</th>
<th>UK Head</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>mean</td>
<td>SD</td>
</tr>
<tr>
<td>Q17</td>
<td>72</td>
<td>4.17</td>
<td>1.28</td>
</tr>
<tr>
<td>Q18</td>
<td>72</td>
<td>4.44</td>
<td>1.22</td>
</tr>
<tr>
<td>Q19</td>
<td>72</td>
<td>2.76</td>
<td>1.05</td>
</tr>
</tbody>
</table>
On the left of Figure 4-10, it is shown that HK Heads and HK Teachers have similar rating in Q17. However, HK Teachers are less positive in Q18 and more positive in Q19. This implies that HK Heads perceived more positively the contribution of educational funds on ICT (in Q18) and the contribution of ICT in teaching and learning. In contrast, HK Teachers are less optimistic regarding these two issues.

On the right of Figure 4-10, it is interesting to observe that the graphs of the HK Heads almost overlap with the UK Heads. This suggests that school heads in both regions have very similar ratings regarding these three issues, although they are engaged with different educational systems. These similarities and differences will be treated quantitatively in the section on inferential statistics.

**Perceptions of Different Resources (Q20 - Q21)**

In Questions 20, the respondents were asked to describe the availability of the following resources:

A. Good Computing and Networking Facilities
B. Sufficient Time for Preparing Lessons
C. Good Teaching Software
D. Adequate In-service Training
E. Sufficient Space on Campus
F. Sufficient Supporting Staff on Campus
G. Immediate Technical Support (e.g. Hotline)

To better illustrate the differences in ranking by the HK Heads and HK Teachers, Figure 4-11 offers the mean rankings by the corresponding subgroups of respondents.
Table 4-10 presents the perceived importance of various resources. It shows that the attitudes towards different resources by the HK Heads and HK Teachers were very similar. Some slight differences were found in (A) "good computing and networking facilities," (B) sufficient time for preparing lessons" and (C) "good teaching software." HK Heads considered (A) "computing and networking facilities" to be the most important (mean=5.48, n=69, sd=1.57) but the HK Teachers ranked these resources somewhat lower (mean=4.71, n=478, sd=1.83). HK Teachers, on the other hand, considered (B) "sufficient time for preparing lessons" to be the most important (mean=4.84, n=477, sd=1.92) of all resources. This indicates that time is the most important factor to the HK Teachers.

<table>
<thead>
<tr>
<th>Ranking by HK Heads</th>
<th>Ranking by HK Teachers</th>
<th>Ranking by UK Heads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Item</td>
<td>Mean</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------</td>
<td>------</td>
</tr>
<tr>
<td>5.48</td>
<td>(A) Computing &amp; Networking Facilities</td>
<td>4.84</td>
</tr>
<tr>
<td>4.66</td>
<td>(D) In-service Training</td>
<td>4.71</td>
</tr>
<tr>
<td>4.37</td>
<td>(F) Supporting Staff on campus</td>
<td>4.60</td>
</tr>
<tr>
<td>4.35</td>
<td>(B) Time for Preparing Lessons</td>
<td>4.32</td>
</tr>
<tr>
<td>3.84</td>
<td>(C) Teaching Software</td>
<td>4.26</td>
</tr>
<tr>
<td>2.99</td>
<td>(E) Space on campus</td>
<td>2.85</td>
</tr>
<tr>
<td>2.34</td>
<td>(G) Technical Support, e.g. Hotline</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Note: a higher figure in mean implies a higher priority
Table 4.10 shows that (G) "technical support" is ranked at the bottom of the list by both the HK Heads (mean=2.34, n=70, sd=1.77) and the HK Teachers (mean=2.50, n=476, sd=1.77). It is important to note that (D) "in-service training" is highly regarded by both HK Heads (mean=4.66, n=71, sd=1.78) and HK Teachers (mean=4.60, n=472, sd=1.74).

The pattern of the HK Heads is very similar to that of the UK Heads, other than the resources (F) "supporting staff on campus" and (G) "technical support." HK Heads rated (F) "supporting staff on campus" (mean=4.37, n=71, sd=1.57) much higher than (G) "external technical support" (mean=2.34, n=70, sd=1.77). In contrast, the UK Heads rated (G) "external technical support" (mean=4.12, n=69, sd=2.00) more important than (F) "support staff on campus" (mean=3.58, n=66, sd=1.82).

For comparison, perceived importance towards different resources by HK Heads and UK Heads is plotted in Figure 4-12.

![Figure 4-12 Importance of resources perceived by HK Heads and UK Heads](image)

In Question 21, respondents were requested to report shortages in the same resources, according to the experience in their schools. Figure 4-13 and Figure 4-14 show this kind of experience from the perspectives of different subgroups of respondents.
In Figure 4-13, shortage of resources experienced by HK Heads and HK Teachers are presented. It is shown that both HK Heads and HK Teachers have very similar feelings other than (D) “in-service training”, (E) “space on campus” and (F) “supporting staff.” HK Heads rated (E) “space on campus” (mean=4.64, n=69, sd=2.36) higher than the other two resources, i.e. (D) “in-service training” (mean=3.28, n=68, sd=1.48) and (F) “supporting staff” (mean=2.83, n=68, sd=1.63). HK Teachers, on the other hand, rated these three resources, i.e. (D) “in-service training” (mean=3.76, n=483, sd=1.70), (E) “space in campus” (mean=3.85, n=483, sd=2.28) and (F) “supporting staff” (mean=3.5, n=483, sd=1.89) at very close levels.

In Figure 4-13, both HK Heads and HK Teachers placed (B) “time for preparing lessons” at the top of the scale. This means that both subgroups regard “time” as the scarcest resource among this group.

In Figure 4-14, the responses of HK Heads and UK Heads are plotted in a similar way. These two subgroups of respondents gave very different answers, except for (B) “time,” for which both HK Heads and UK Heads perceived a high degree of scarcity.
Table 4-11 illustrates the shortages of resources in numerical figures. "Time" was highly rated, at the values of 5.38, 5.31 and 5.52 by HK Heads, HK Teachers and UK Heads, respectively. This is very strong evidence that time is strongly needed by all heads and teachers, irrespective of the positions and educational systems of the respondents.

Perceptions of Different Subjects (Q22 - Q25)

In Question 22, the respondents were asked whether they were currently teaching or have taught in the following subjects:

A. (in UK version) English Language
   (in HK version) Chinese Language
B. (in UK version) Foreign Language(s)
   (in HK version) English Language
C. Math
D. ICT
E. (in UK version) Science / D&T / Geography / History
   (in HK version) General Studies / Science / Social Studies / Health Studies
F. Art / Music / PE / RE
G. Others subjects

In options A, B and E, subjects in the UK and HK versions are adjusted according to the culture and curricular variations. Figure 4-15 shows that the percentage of HK Heads and HK Teachers who teach or
have taught individual subjects. The patterns of both categories are similar to each other except "ICT." More HK Teachers (32.9%) have teaching experiences in ICT than HK Heads (7.0%).

Figure 4-15  Subjects taught by HK Heads and HK Teachers

Figure 4-16 illustrates the teaching experience of HK Heads and UK Heads in different subjects. Great differences between the categories are shown in the graph. It seems that UK Heads generally have more teaching experience than HK Heads in virtually all subjects except foreign languages. This may indicate that HK Heads usually carry heavier administrative duties than teaching duties, compared with their UK counterparts.

Figure 4-16  Subjects taught by HK Heads and UK Heads

In Question 23, respondents were asked about which subjects are making use of ICT. Figure 4-17 shows the pattern of HK Heads and HK Teachers. Both HK Heads and HK Teachers showed very similar intra-group patterns in this question. The subject (D) "ICT" is naturally rated with the highest percentage of ICT usage. Subjects like and (C) "Mathematics" and (E) "Social Studies and Science subjects" are relatively highly rated regarding the use of ICT. Art and Music are rated at a relatively low percentage of ICT usage. It is clearly shown on the chart that the line of HK Teachers is running below that of HK Heads. This implies that HK Heads generally perceive more extensive use of ICT in various subjects. Again, they have a more optimistic view of ICT.
Q23. Subjects utilising ICT

100%
80%
60%
40%
20%
0%

A B C D E F G

Figure 4-17 Use of ICT in different subjects perceived by HK Heads and HK Teachers

Figure 4-18 illustrates the differences between the patterns of HK Heads and UK Heads in the same question. It is interesting to note the high percentage (86.8%) of UK Heads who reported ICT being used extensively in English language, alongside a very low percentage (5.3%) who rated ICT being used extensively in foreign languages. In Hong Kong, about similar percentage (55.6%) of HK Heads rated ICT being used extensively in both Chinese Language and English language (the primary and second languages, respectively, being taught for most Hong Kong pupils).

In Question 24, the respondents were asked about which subjects they would use ICT more intensively with in the future. Similar to last question, the responses of HK Heads and HK Teachers generated very similar intra-group patterns. However, in inter-group comparison, HK Heads generally gave higher ratings than HK Teachers (Figure 4-19).
In Question 24, the respondents were asked which subjects they thought ICT would benefit. Again, the intragroup pattern within both the HK Heads and HK Teachers is very similar, as shown in Figure 4-21. For inter-group comparison, HK Heads generally showed a more optimistic view towards the benefit of ICT in various subjects.
In Figure 4-22, the opinions of UK Heads were compared with those of HK Heads. More UK Heads felt ICT provided benefits to their native-language lessons (i.e., English, 86.7%) than foreign language lessons (38.7%). On the other hand, similar proportion of HK Heads felt ICT provided benefits to their Chinese-language instruction (the mother language, 62.5%) and English-language instruction (68.1%).

Perceptions of ICT Coordinators (Q37)

In the final version of the questionnaire, the contribution of ICT Coordinators (ICTC) was queried in Q37 of Section D. The responses from different subgroups are presented in Figure 4-23. The greatest proportion of UK Heads (45 of 72, or 62.5%) described ICTC as having “very much” contribution to improve teaching at school level. In contrast, only a low proportion of HK Teachers (33 of 189, or 17.4%) rated ICTC as having “very much” contribution. A fair proportion of HK Heads (22 of 56, or 39.2%) rated ICTC as having “very much” contribution.
On the other hand, a relatively high proportion of HK Teachers (60 of 189, or 31.8%) rated ICTC as having only "very little" contribution and one HK Teacher rated ICTC having no contribution ("none"). On the other hand, few HK Heads (only 6 of 56, or 10.7%) rated ICTC as having "very little" contribution. Also very few UK Heads (only 7 of 72, or 9.7%) rated ICTC in this category.

Figure 4-23  Raw figures of perceived contribution of ICT Coordinators

Figure 4-24  Mean ratings of contribution of ICT Coordinators with 95% confidence levels
Figure 4-24 also compares the ratings of contribution of ICTC from different subgroups of respondents. The chart indicates the mean ratings at 95% confidence levels. From the data collected so far, it is clear that UK Heads held the most positive attitude towards ICT Coordinators while HK Teachers held the most negative attitude. HK Heads' opinions were in-between these two groups. It seems that the mean difference between HK Heads and HK Teachers is greater than that between HK Heads and UK Heads. These preliminary findings will be verified with inferential statistics in the following section.

**Inferential Statistics**

As discussed in the previous section, all respondents were divided into 4 groups, namely: the HK Heads, the HK Teachers, the UK Heads and UK Teachers. Three of these groups (HK Heads, HK Teachers and UK Heads) were selected for the following analysis. As explained earlier in this chapter, some questionnaires from the UK Teachers were received unexpectedly and therefore will not be processed in this analysis. In this section, inferential statistics will be employed to study the inter-group differences. To preface this discussion, it is important to differentiate dependent and independent samples when conducting inferential statistics.

> *Two samples are said to be independent when none of the observations in one group is in any way related to observations in the other group... In contrast, the research design in which an investigator uses the same individuals in both groups, as in a before-after comparison, provides a common example of dependent samples.*

*(Coladarci et al., 2004, p. 283, emphasis added)*

By definition, all subgroups are mutually exclusive in this survey. That is, any group of HK Heads, HK Teacher and UK Heads does not overlap with any other group. In other words, a HK Head cannot be a UK Head at the same time. Dependence does not exist among these subgroups. Hence, these subgroups fulfil the criteria for doing ANOVA between independent groups of samples.

The differences between groups of respondents have been discussed in the previous section, and the charts have presented a rough idea of the existence of unique perceptions of headteachers and teachers in different regions. However, the magnitudes and the significance of the differences have not been determined. They will be presented in the coming section.

**One-way ANOVA with Tukey HSD Test**

The means of responses by different groups of participants in Q1 through Q19 were analysed by a one-way ANOVA F-test. ANOVA may be viewed as an extension of the independent t-test when there are more than...
two groups (Peers, 1996, p. 313) or the t-test can be conversely regarded as a special case of one-way ANOVA.

In comparative designs the impact on a metric response variable of categorical independent variables, representing naturally occurring groups, is assessed. The researcher is looking for the effect of membership of a particular group (independent variable) on the response variable. Variables used to define groups are called factors, for example, sex, and the various treatment within a factor are called levels, for example, male or female.

(Peers, 1996, p. 313, emphasis added)

In the current survey, the position, or duty, of respondents is the factor to classify independent groups (or subgroups). “HK Heads,” “HK Teachers,” “UK Heads” and “UK Teachers” are the different levels of subgroups.

The null hypothesis of an ANOVA process is that the mean responses among subgroups are equal.

\[
H_0 : \mu_{\text{HKHead}} = \mu_{\text{HKTeacher}} = \mu_{\text{UKHead}}
\]

The test result will determine whether this hypothesis holds. As pointed out previously, samples across different subgroups are independent and the ANOVA of independent groups will be applied.

The ANOVA results in Appendix I show that virtually all questions, except Q6 and Q17, display evidence of different response patterns among these three independent groups of respondents. However, the table only addresses those differences existing among the means of three independent subgroups of respondents. It does not detail the nature of the differences, such as whether differences happen only between HK Heads and HK Teachers, or between HK Heads and UK Heads, or between HK Teachers and UK Heads, or all three of these groups. Another statistical method, the Tukey HSD test, allows one to find out the differences between the responses of subgroups.

Peers suggested that “a plot of subgroup means could be very informative as well as modified t-test on post hoc pairwise comparisons of subgroup means” (1996, p. 320, italics in original). The plots of subgroup means have been illustrated in Figure 4-8 and Figure 4-9. Post hoc pairwise comparison is then used to provide stronger evidence of the differences among subgroups. The simple use of “multiple t-test on a set of means should be discouraged because this will lead to a high experiment-wise error rate” (Peers 1996, p. 329). On the other hand, “most post hoc multiple comparison procedures incorporate adjustment for experimental error” (Peers, 1996, p. 330, italics in original). The Tukey test is a “good all round [post hoc] test” among many others (Hinton, et al., 2004, p. 159) and therefore selected to apply for the forthcoming analysis.
As shown in Table 4-12, the Tukey HSD analysis was used as a multiple comparison between HK Heads and HK Teachers. The null hypothesis was that HK Heads and HK Teachers gave the same mean rating to a question.

\[ H_0: \mu_{HK\text{Head}} = \mu_{HK\text{Teacher}} \]

Table 4-12 Tukey HSD Test in ANOVA with HK Heads and HK Teachers

<table>
<thead>
<tr>
<th>Question</th>
<th>Value of Difference</th>
<th>Significance</th>
<th>Significant at 0.01 level</th>
<th>Significant at 0.05 level</th>
<th>Insignificant at both levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>.518</td>
<td>0.005</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>.312</td>
<td>0.026</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>.293</td>
<td>0.058</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>.760</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>.560</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>-.120</td>
<td>0.802</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>.123</td>
<td>0.645</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q8</td>
<td>-.736</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>.133</td>
<td>0.536</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>.565</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q11</td>
<td>.161</td>
<td>0.439</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q12</td>
<td>-.930</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q13</td>
<td>.746</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q14</td>
<td>.230</td>
<td>0.183</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q15</td>
<td>.536</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q16</td>
<td>-.642</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q17</td>
<td>.052</td>
<td>0.927</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q18</td>
<td>.403</td>
<td>0.008</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q19</td>
<td>-.686</td>
<td>0.000</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-12 shows that significant differences exist in Q1, Q4, Q5, Q8, Q10, Q12, Q13, Q15, Q16 and Q19 at 0.01 level, and Q2 at 0.05 level. There is no significant difference in other questions. The inter-group comparisons between HK Heads and HK Teachers are described as in the following procedures.

First, it is determined whether each question is significant at .01 or .05 levels. If not, this question is classified as “no significant difference between subgroups.” In other words, \( H_0 \) holds. In contrast, if the questions are significant at .01 or .05 levels, then the sign of the mean difference value is checked. The HK
Heads' mean response is said to be more positive than HK Teachers' when the sign is positive. Conversely, the HK Heads' mean response is said to be less positive than HK Teachers' when the sign is negative. Three types of scenarios are established as follows:

1. \(H_0\) holds in questions Q3, Q6, Q7, Q9, Q11, Q14, Q17, i.e. there is no significant mean difference between HK Heads and HK Teachers in these questions.

2. In Q1, Q2, Q4, Q5, Q10, Q13, Q15 and Q18, the mean differences are positive and the mean differences are significant at the .01 or .05 levels. This implies that HK Heads have more positive ratings than the HK Teachers in these items.

3. In Q8, Q12, Q16 and Q19, HK Heads give more negative mean ratings. It should be noted that these questions are in reversed wording.

With these findings, individual questions are grouped and displayed in Table 4-13.

<table>
<thead>
<tr>
<th>HK Heads and HK Teachers gave similar rating</th>
<th>Q3</th>
<th>Teachers have easy access to good teaching software.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q6</td>
<td>There is sufficient space in your school for setting up computer facilities.</td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>You are knowledgeable and skilful enough to implement ICT in school.</td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>You enjoy the process of ICT implementation in school.</td>
<td></td>
</tr>
<tr>
<td>Q11</td>
<td>It is a simple and easy task for you to help implement ICT in your school.</td>
<td></td>
</tr>
<tr>
<td>Q14</td>
<td>The headteacher in your school is very eager to implement ICT.</td>
<td></td>
</tr>
<tr>
<td>Q17</td>
<td>In the past 3 years, your school has obtained plenty of financial and other resources from the state/government for the implementation of ICT.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HK Heads gave more positive rating</th>
<th>Q1.</th>
<th>Your school provides convenient access to computers and Internet for pupils.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2.</td>
<td>Your school provides convenient access to computers and Internet for teachers.</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>Good training in ICT is easily available for teachers.</td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>Technical support, such as a hotline and reference material, etc., is easily available for teachers.</td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>You are very eager to implement ICT for teaching.</td>
<td></td>
</tr>
<tr>
<td>Q13</td>
<td>Your colleagues are very eager to implement ICT in school.</td>
<td></td>
</tr>
<tr>
<td>Q15</td>
<td>ICT plays an essential role in modern teaching and learning.</td>
<td></td>
</tr>
<tr>
<td>Q18</td>
<td>In the past 3 years, input of resources from the state/government has significantly contributed to the use of ICT in your school.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HK Heads gave more negative rating</th>
<th>Q8</th>
<th>The implementation of ICT in school is a heavy burden for you.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q12</td>
<td>Implementing ICT in school retards your daily teaching and administrative duties.</td>
<td></td>
</tr>
<tr>
<td>Q16</td>
<td>For the time being, there is still strong resistance against the implementation of ICT in your school.</td>
<td></td>
</tr>
<tr>
<td>Q19</td>
<td>Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning.</td>
<td></td>
</tr>
</tbody>
</table>

It is desirable to know in which questions the HK Heads and HK Teachers display the greatest discrepancy. In principle, the analysis suggests that a higher magnitude in the mean difference implies greater
discrepancy between the respondent groups. The inter-group discrepancy between HK Heads and HK Teachers can be detected by looking up the numerical values of significance in Table 4-12.

The 5 questions with the greatest magnitudes in mean differences in Table 4-12 were extracted and placed in Table 4-14. Q12, Q4, Q13, Q8 and Q19 are the questions with the greatest discrepancy, in descending order.

Table 4-14  Top 5 differences in the magnitude of ratings responded by HK Heads and HK Teachers

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementing ICT in school retards your daily teaching and administrative duties. (Q12 reversed)</td>
<td>-0.930</td>
</tr>
<tr>
<td>Good training in ICT is easily available for teachers. (Q4)</td>
<td>+0.760</td>
</tr>
<tr>
<td>Your colleagues are very eager to implement ICT in school. (Q13)</td>
<td>+0.746</td>
</tr>
<tr>
<td>The implementation of ICT in school is a heavy burden for you. (Q8 reversed)</td>
<td>-0.736</td>
</tr>
<tr>
<td>Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning. (Q19 reversed)</td>
<td>-0.686</td>
</tr>
</tbody>
</table>

Table 4-14 also shows that the sign of the mean differences in Q12, Q8 and Q19 are negative while it is positive in Q4 and Q13. In order to get a clearer picture of the actual differences between headteachers and teachers, the wordings of questions Q12, Q8 and Q9 were reversed, as shown in Table 4-15. In order for all the selected questions to have the same “direction” of meaning, the questions with negative mean difference were given a “negative” wording, as shown in the 1st, 4th and 5th questions in Table 4-15.

Table 4-15  Top 5 issues agreed to more by HK Heads than by HK Teachers

<table>
<thead>
<tr>
<th>Rank</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Implementing ICT in school does not retard your daily teaching and administrative duties. (Q12 reversed)</td>
</tr>
<tr>
<td>2nd</td>
<td>Good training in ICT is easily available for teachers. (Q4)</td>
</tr>
<tr>
<td>3rd</td>
<td>Your colleagues are very eager to implement ICT in school. (Q13)</td>
</tr>
<tr>
<td>4th</td>
<td>The implementation of ICT in school is not a heavy burden for you. (Q8 reversed)</td>
</tr>
<tr>
<td>5th</td>
<td>Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning. (Q19 reversed)</td>
</tr>
</tbody>
</table>

Table 4-15 shows the 5 issues which HK Heads agreed with more than HK Teachers. The topmost issue, for example, indicates that HK Heads perceive less hindrance in ICT implementation than do HK Teachers. The other four issues are closely related to the difficulties in the implementation of ICT in school. The significant differences between the perceptions of HK Heads and HK Teachers reflect that the HK Heads do not perceive these problems to be as serious as do the HK Teachers. It may also imply that HK Heads generally underestimate the difficulties of ICT implementation. Headteachers are supposed to bridge the gap between
teachers and policy makers. However, these findings suggest that may not always be the case. This issue will addressed further in the concluding chapter.

Table 4-12 also demonstrates that there is no significant mean difference in Q17. That is, HK Heads and HK Teachers do not exhibit different opinions regarding the government's role in ICT implementation. However, there are significant differences in Q18 and Q19. These responses strongly suggest that HK Heads are more optimistic regarding the effects of ICT in teaching and learning (see Figure 4-10).

HK Heads vs. UK Heads (Q1 – Q19)

Having analysed the differences in responses between HK Heads and HK Teachers, it was also desirable to know if there was any discrepancy between HK Heads and UK Heads. The procedures are similar to that in previous section. Again, a Tukey HSD Test was done “on top” of the ANOVA test. Then the differences of means of ratings are grouped according to the sign or direction of the differences. Finally, the top 5 differences between HK Heads and UK Heads are extracted.

Again, the null hypothesis of no difference between the rating from HK Heads and UK Heads is assumed:  

$$H_0 : \mu_{HK\text{Head}} = \mu_{UK\text{Head}}$$

A Tukey HSD test is done on top of ANOVA and the results are presented in Table 4-16. It is shown that significant differences exist in roughly half of the questions from Q1 to Q19. Responses to Q1, Q3, Q4, Q5, Q8, Q10, Q11, Q12, Q14 and Q16 are significantly different between HK Heads and UK Heads. It confirms the observable discrepancy in Figure 4-9. Other questions do not contain significant differences between the means of both groups. For these questions, the null hypothesis holds.

Table 4-16  Tukey HSD Test in ANOVA with HK Heads and UK Heads

<table>
<thead>
<tr>
<th>Question</th>
<th>Value of Difference</th>
<th>Significance</th>
<th>Significant at 0.01 level</th>
<th>Significant at 0.05 level</th>
<th>Insignificant at both levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>-.612</td>
<td>.011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>.194</td>
<td>.427</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>-.811</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>.837</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>.889</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>-.242</td>
<td>.589</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>-.334</td>
<td>.148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q8</td>
<td>-1.051</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>-.253</td>
<td>.262</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
With the findings in Table 4-16, the directions (signs) of mean differences are grouped together and the following summary is drawn:

1. First, $H_0$ holds in Q2, Q6, Q7, Q9, Q13, Q15, Q17, Q18 and Q19. It can thus be inferred that HK Heads and UK Heads do not have significantly different attitudes regarding these questions.
2. In Q4, Q5, Q11 and Q16, HK Heads give more positive mean ratings than do UK Heads.
3. In Q1, Q3, Q8, Q10, Q12 and Q14, HK Heads give more negative mean ratings than do UK Heads.

Similar to Table 4-13, the detailed comparison of rating is presented in Table 4-17.

<table>
<thead>
<tr>
<th>Q10</th>
<th>-.404</th>
<th>.031</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11</td>
<td>.585</td>
<td>.002</td>
</tr>
<tr>
<td>Q12</td>
<td>-.571</td>
<td>.007</td>
</tr>
<tr>
<td>Q13</td>
<td>.035</td>
<td>.974</td>
</tr>
<tr>
<td>Q14</td>
<td>-.505</td>
<td>.008</td>
</tr>
<tr>
<td>Q15</td>
<td>.032</td>
<td>.979</td>
</tr>
<tr>
<td>Q16</td>
<td>.849</td>
<td>.000</td>
</tr>
<tr>
<td>Q17</td>
<td>.154</td>
<td>.676</td>
</tr>
<tr>
<td>Q18</td>
<td>.016</td>
<td>.995</td>
</tr>
<tr>
<td>Q19</td>
<td>.102</td>
<td>.844</td>
</tr>
</tbody>
</table>

**Table 4-17** Comparison of the mean ratings given by HK Heads and UK Heads from Q1 to Q19

<table>
<thead>
<tr>
<th>HK Heads and UK Heads gave similar rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2. Your school provides convenient access to computers and Internet for teachers.</td>
</tr>
<tr>
<td>Q6. There is sufficient space in your school for setting up computer facilities.</td>
</tr>
<tr>
<td>Q7. You are knowledgeable and skilful enough to implement ICT in school.</td>
</tr>
<tr>
<td>Q9. You enjoy the process of ICT implementation in school.</td>
</tr>
<tr>
<td>Q10. You are very eager to implement ICT for teaching.</td>
</tr>
<tr>
<td>Q13. Your colleagues are very eager to implement ICT in school.</td>
</tr>
<tr>
<td>Q15. ICT plays an essential role in modern teaching and learning.</td>
</tr>
<tr>
<td>Q17. In the past 3 years, your school has obtained plenty of financial and other resources from the state/government for the implementation of ICT.</td>
</tr>
<tr>
<td>Q18. In the past 3 years, input of resources from the state/government has significantly contributed to the use of ICT in your school.</td>
</tr>
<tr>
<td>Q19. Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HK Heads gave more positive rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4. Good training in ICT is easily available for teachers.</td>
</tr>
<tr>
<td>Q5. Technical support, such as a hotline and reference material, etc., is easily available for teachers.</td>
</tr>
<tr>
<td>Q11. It is a simple and easy task for you to help implement ICT in your school.</td>
</tr>
<tr>
<td>Q16. For the time being, there is still strong resistance against the implementation of ICT in your school.</td>
</tr>
</tbody>
</table>
Table 4-18 ranks the magnitudes of the mean differences obtained in Table 4-16 and extracts the top five questions with the highest mean differences.

Table 4-18  Top 5 differences in the magnitude of ratings responded by HK Heads and UK Heads

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q8  The implementation of ICT in school is a heavy burden for you.</td>
<td>-1.051</td>
</tr>
<tr>
<td>Q5  Technical support, such as a hotline and reference material, etc., is easily available for teachers.</td>
<td>.889</td>
</tr>
<tr>
<td>Q16 For the time being, there is still strong resistance against the implementation of ICT in your school.</td>
<td>.849</td>
</tr>
<tr>
<td>Q4  Good training in ICT is easily available for teachers.</td>
<td>.837</td>
</tr>
<tr>
<td>Q3  Teachers have easy access to good teaching software.</td>
<td>-.811</td>
</tr>
</tbody>
</table>

As explained previously, the tone of all questions was aligned and Table 4-19 was produced.

Table 4-19  Top 5 issues agreed more by HK Heads than by UK Heads

<table>
<thead>
<tr>
<th>Rank</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>The implementation of ICT in school is not a heavy burden for you. (Q8 reversed)</td>
</tr>
<tr>
<td>2nd</td>
<td>Technical support, such as a hotline and reference material, etc., is easily available for teachers. (Q5)</td>
</tr>
<tr>
<td>3rd</td>
<td>For the time being, there is still strong resistance against the implementation of ICT in your school. (Q16)</td>
</tr>
<tr>
<td>4th</td>
<td>Good training in ICT is easily available for teachers. (Q4)</td>
</tr>
<tr>
<td>5th</td>
<td>Teachers do not have easy access to good teaching software. (Q3 reversed)</td>
</tr>
</tbody>
</table>

The issue in which great discrepancy exists between HK Heads and UK Heads, is whether ICT is a burden instead of (or in addition to) a tool. HK Heads perceive that ICT implementation is less of a burden than their UK counterparts.

In Table 4-16, it is also shown that no significant mean difference exists between HK Heads and UK Heads in Q17, Q18 and Q19. This finding confirms the observation in Figure 4-10, namely, HK Heads and UK
Heads do not have significantly different opinions on the improvement of teaching and learning due to the use of ICT.

**Mean Differences in the Perceptions of ICT Coordinators (Q37)**

With reference to the raw ANOVA results in Appendix I, the between-group difference in Question 37 was significant. Appendix J further shows the results of the Tukey HSD comparisons on Q37. The values are extracted and displayed in Table 4-20.

<table>
<thead>
<tr>
<th>Related Subgroups</th>
<th>Mean Difference</th>
<th>Significance Value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>HK Head vs. HK Teacher</td>
<td>.439</td>
<td>.000</td>
<td>Significant at 0.01 level</td>
</tr>
<tr>
<td>HK Head vs. UK Head</td>
<td>-.242</td>
<td>.119</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>

The mean difference between HK Heads and HK Teachers is 0.439, which is significant at the 0.01 level. This finding strengthens the observation in the left portion of Figure 4-10, in which HK Heads feel more positive about the contributions of ICT coordinators in schools.

On the other hand, the mean difference between HK Heads and UK Heads is -0.242, i.e. HK Heads are less positive than UK Heads, but it is not significant enough to confirm the existence of a difference, which is apparently detected in the right portion of Figure 4-10. In other words, HK Heads and UK Heads do not demonstrate significant differences of opinion regarding the contributions of ICT coordinators in schools.

**Implications from Open-ended Section**

About sixty returned questionnaires completed the open-ended section. They account for about 9% of all 681 respondents. These forms contain not only the opinions or feelings of respondents about the implementations of ICT, but also the respondents' ideas about administrative issues of the survey, suggestions for improving survey results, and so on. Having eliminated all responses irrelevant to the implementation of ICT, 26 responses from Hong Kong and 13 responses from the UK were extracted from this section. All those responses are presented in the table in Appendix K. Illegible handwriting is noted in the table. Replies from the UK respondents, which were originally written in English, are directly copied to the table. On the other hand, opinions by HK respondents were originally offered in Chinese, as shown in Appendix N. These responses were translated into English and also presented as part of Appendix K.

Table 4-21 divides respondents' opinions obtained from the open-ended questions into several categories. The table is interpreted with an example in the first column of "HK Heads": a respondent no. 464 (belonging
to "HK Heads") raised issues in "insufficient time/over-workload," "insufficient support," and "insufficient skills/training."

In a further interpretation of other responses, it is found that a relatively high proportion of responses (8 in all) have pointed out that limited time and excess-workload are serious hindrances to the implementation of ICT in schools. These issues are believed to be the major obstacles against a successful implementation of ICT in schools. "Insufficient support" is also pointed out to be another major obstacle. "Insufficient skill or training" is the third important issue extracted from the open-ended section.

Table 4-21  Issues raised in the open-ended questions

<table>
<thead>
<tr>
<th>Issues</th>
<th>Subgroup</th>
<th>HK Head</th>
<th>HK Teacher</th>
<th>UK Head</th>
<th>UK Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient Hardware/Software</td>
<td></td>
<td>026, 137, 241, 527</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient Time / Over workload</td>
<td>464</td>
<td>026, 089, 099, 213, 253, 306, 397</td>
<td></td>
<td></td>
<td>628</td>
</tr>
<tr>
<td>Insufficient Support</td>
<td>464</td>
<td>097, 149, 155, 213, 403, 524</td>
<td></td>
<td></td>
<td>673</td>
</tr>
<tr>
<td>Insufficient Funding/other resources</td>
<td></td>
<td>003, 494</td>
<td></td>
<td>578, 598</td>
<td></td>
</tr>
<tr>
<td>Insufficient Space</td>
<td></td>
<td></td>
<td></td>
<td>583</td>
<td>628</td>
</tr>
<tr>
<td>Positive feeling regarding the</td>
<td>532, 566</td>
<td>151</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>effectiveness of ICT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative feeling regarding the</td>
<td></td>
<td></td>
<td></td>
<td>565</td>
<td>612</td>
</tr>
<tr>
<td>effectiveness of ICT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>628</td>
</tr>
<tr>
<td>Insufficient skills/training</td>
<td>464</td>
<td>026, 195, 350</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It was also shown in Table 4-21 that HK Teachers made plenty of complaints in the implementation of ICT. Comparatively, HK Heads expressed far fewer complaints in those open-ended questions.

Summary

1. In this survey, 681 sets of questionnaires were collected. The response rate was around 62%. Out of these questionnaires, 574 sets were collected from respondents in Hong Kong and 107 were collected from respondents in the UK. Other demographic information was presented in the early part of this chapter. Descriptive statistics and inferential statistics were covered in later points in this chapter.

2. In the data collected in Questions 1 through 19 and presented in Figure 4-8, Table 4-15 and other charts, HK Heads usually expressed more optimistic responses towards the use of educational ICT when compared with HK Teachers. This issue has been identified in both the descriptive statistics section and the inferential statistics section.
3. For general perception questions in Q1 through Q19, ANOVA has been applied. It is noted that the inter-group discrepancy between HK Heads and HK Teachers is usually greater than that between HK Heads and UK Heads. This can be seen by comparing Table 4-12 and Table 4-16. Significant mean differences between HK Heads and HK Teachers occur in 12 questions (as in Table 4-12), while significant mean differences between HK Heads and UK Heads occur only in 10 questions (as in Table 4-16).

4. In Q17, which asked participants about the effectiveness of financial resources in ICT, the mean ratings of respondents were close to “slightly agreed,” with little difference between subgroups (see Figure 4-10).

On the other hand, the responses to Q18 and Q19 caught the researcher’s interest. As illustrated in Figure 4-10, HK Heads and UK Heads gave very similar ratings in these questions. They are relatively optimistic about the utility of ICT in teaching and learning. In contrast, the HK Teachers are significantly less optimistic on these issues. These observations are confirmed by the Tukey HSD comparisons in Table 4-12 and Table 4-16.

5. In questions that asked about individual subjects (Q22- Q25), some intra-group patterns of HK Heads and HK Teachers are quite similar, as reflected in the shapes of lines in Figure 4-17, Figure 4-19, and Figure 4-21. On the other hand, the HK Heads generally have more optimistic views of ICT than do HK Teachers. This is clearly shown in the gaps between individual lines representing these subgroups in Figure 4-17, Figure 4-19, and Figure 4-21.

This means that the HK Heads have more positive views regarding the current use, future use and potential benefits of ICT in various teaching subjects. All this evidence shows that the HK Heads and HK Teachers do not have consistent opinions towards the use of ICT in education. This is an important fact for the policy maker.

What are the reasons that led to the discrepancy? Can these less optimistic opinions of teachers be addressed effectively in policy? These issues will be revisited in the concluding chapter.

6. The data collected from the UK Heads regarding individual subjects suggested that they do not have similar opinions to HK Heads in certain subjects, as shown in Figure 4-16, Figure 4-18, and Figure 4-20. A major difference exists in the UK Heads’ low rating on the use of ICT in foreign languages. This may be a result of the limited availability of teaching software in this subject.

7. Referring to Table 4-10, Figure 4-11 and Figure 4-12, computing and networking facilities are regarded as important resources by HK Head, HK Teachers and UK Heads. Nevertheless, the respondents do not
consider there to be serious shortages in these resources (see Table 4-11, Figure 4-13 and Figure 4-14). On the other hand, time for lesson preparation is placed on top of the list by all the subgroups of HK Heads, HK Teachers and UK Heads. In other words, teachers are overloaded with different tasks and do not have sufficient time to do something meaningful. The workload issues being faced by teachers in the UK have also been addressed in DiSE (2001c), as discussed in Chapter 2.

8. In Figure 4-24, HK Heads gave ICT coordinators a mean rating close to "fairly much" in their contributions. Comparatively, HK Teachers have a less positive opinion regarding the contributions of ICT coordinators in schools. This is detected in Figure 4-24 and confirmed with Tukey HSD test as shown in Table 4-20. HK Heads and UK Heads do exhibit a mean difference in the rating of ICT coordinators. However, the difference is not confirmed by the HSD test.

9. Based on the feedback in the open-ended section of the questionnaire, time is a key issue raised by the respondents. This finding is consistent with the response to Question 21 in the questionnaires, as presented in Figure 4-13 and Figure 4-14.

10. According to the mixed-method research model adopted in this research project, the validity of the above findings will be triangulated with the findings obtained in qualitative interviews to be discussed in the next chapter. Further discussions will be addressed in the concluding chapter.
Chapter 5 Analysis of Interview Data

"Do you suppose she'll interview me?"
"Never in the world. She'll not think you of enough importance."

James, Henry (1843-1916), The Portrait of a Lady

Overview

As mentioned in Chapter 3, the purpose of conducting semi-structured interviews with school heads and teachers, including ICT coordinators, was to uncover more details about ICT implementation at the school level from the participants' perspectives. As a part of the entire research project, the semi-structured interviews aimed to collect qualitative data that would facilitate data triangulation with the quantitative findings obtained in Chapter 4. As discussed in the previous chapter, combining quantitative and qualitative results is known as methodological triangulation (Cohen and Manion, 1994, pp. 238-239) under the parallel mixed-method model (see Figure 3-3). Data collected in previous and current chapters will be triangulated in Chapter 6, as illustrated in flow diagram in Figure 3-4.

In contrast to the analysis of quantitative data in the previous chapter, the interview data involved in this chapter are qualitative in nature. In this study the qualitative data are not intended to generate broad, generalizable insights, but to explore the quantitative findings in a specific institutional setting, a process described by Gay (1996).

In a qualitative study... generalizations are highly speculative or nonexistent... Since sampling is purposive and the sample size is small, no attempt is made to generalize findings to a larger population... Conclusions are highly tentative, and generalizations are minimal or nonexistent.

(Gay, 1996, p. 245)

In short, this qualitative study attempts to unlock the "particular" as a way to contextualize the "general."

The preparation and execution of the interview study followed the procedures summarised in Appendix G. The interview schedule, as shown in Appendix H, provided the interviewer with a set of provisional interview questions. Again, when conducting “semi-structured yet flexible” interviews (Jones and Hayes, 1991, p. 212) the interviewer is responsible for judging which questions should be asked and which ones should be skipped, depending on the flow of the interview. Because the interviewer was not tied to a rigid set of questions, this approach allowed interesting research threads to be followed through during the interview. The interviews could explore important "hidden issues" that might not be uncovered by other means, as pointed out by Gay:
In addition to serving triangulation objectives, interviews have a unique purpose, namely, to acquire data not obtainable in any other way.

(1996, p. 244)

Also mentioned in Chapter 3, a total of 33 participants were interviewed (see Appendix F for the full list). However, due to the limitation of time and other resources, it was not feasible to analyse all the interviews. Eventually, seventeen of the interviews were selected for analysis, as listed in the table in Table 5-1.

<table>
<thead>
<tr>
<th>School Code</th>
<th>Interviewee Code</th>
<th>Position</th>
<th>Gender</th>
<th>Interview Duration (hh:mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>01A</td>
<td>H</td>
<td>F</td>
<td>1:15</td>
</tr>
<tr>
<td>02</td>
<td>02A</td>
<td>H</td>
<td>M</td>
<td>1:08</td>
</tr>
<tr>
<td>07</td>
<td>07A</td>
<td>H</td>
<td>M</td>
<td>1:46</td>
</tr>
<tr>
<td>08</td>
<td>08A</td>
<td>H</td>
<td>M</td>
<td>2:01</td>
</tr>
<tr>
<td>09</td>
<td>09A</td>
<td>T</td>
<td>F</td>
<td>0:45</td>
</tr>
<tr>
<td>10</td>
<td>10A</td>
<td>H</td>
<td>M</td>
<td>1:12</td>
</tr>
<tr>
<td></td>
<td>10B</td>
<td>I</td>
<td>F</td>
<td>0:32</td>
</tr>
<tr>
<td>11</td>
<td>11A</td>
<td>H</td>
<td>F</td>
<td>1:17</td>
</tr>
<tr>
<td></td>
<td>11B</td>
<td>T</td>
<td>M</td>
<td>1:16</td>
</tr>
<tr>
<td>12</td>
<td>12A</td>
<td>H</td>
<td>M</td>
<td>1:33</td>
</tr>
<tr>
<td></td>
<td>12B</td>
<td>T</td>
<td>F</td>
<td>0:35</td>
</tr>
<tr>
<td></td>
<td>12C</td>
<td>I</td>
<td>M</td>
<td>0:33</td>
</tr>
<tr>
<td>13</td>
<td>13A</td>
<td>T</td>
<td>M</td>
<td>1:04</td>
</tr>
<tr>
<td></td>
<td>13B</td>
<td>T</td>
<td>F</td>
<td>0:42</td>
</tr>
<tr>
<td></td>
<td>13C</td>
<td>T</td>
<td>F</td>
<td>1:13</td>
</tr>
<tr>
<td>14</td>
<td>14A</td>
<td>H</td>
<td>F</td>
<td>0:42</td>
</tr>
<tr>
<td></td>
<td>14B</td>
<td>T</td>
<td>M</td>
<td>1:31</td>
</tr>
</tbody>
</table>

Note: * H: Headteacher, T: Teacher, I: ICT Coordinator

In contrast to quantitative studies, filtering of cases is frequently adopted in qualitative studies, as in the study by Goodson (2003). As in such studies, this project selected cases in order to (a) maximise the variation of schools and participants and (b) include special and interesting cases.

Before the analysis, all the recorded interviews were transcribed (in Chinese). Then they were translated into English. The coding and analysis were based on the "editing approaches" (see, for details, Robson, 2002, p.457-458). Due to resource limitation, qualitative software tool, such as NUD*IST (QSR, 2005), was not available to the author and manual coding, with the help of word processor, has been adopted. However, if
the analysis is done properly, the absence of this kind of software tool should have no effect to the quality of
the output, since "computer programs can facilitate the work of analysis, but they can't provide the creativity
and intelligence that make each qualitative analysis unique." (Patton, 2002, p. 442)

Interviews allow us to extract important details from the general issues identified in previous studies, as well
as exploring issues which are otherwise hidden. In this study, several important issues were identified during
the course of the study, namely: (a) the availability of physical resources; (b) time constraints or workload
on teachers; (c) the effectiveness of ICT in learning; (d) the training opportunities for teachers; and (e) the
influence of school organization. In the coming section, the least complicated issue, physical resources, will
be dealt with first. More complicated issues will be discussed as the chapter progresses.

Issues with Physical Resources

The interviews revealed that most ICT projects came from the Quality Education Fund (QEF), even though
the fund was not intended exclusively for ICT-related projects. (Government Information Centre Hong
Kong, 2005). In many schools QEF seemed to be an essential source of money for the development of ICT.
School-01, for example, developed a "Digital Library" as part of a project funded by the QEF.

Once we established our digital library, digital books were provided to pupils. They are excited
about the prospect and concentrate hard during the lessons related to the library. Children have
never behaved like that in the past... We applied for a grant from the QEF to undertake this
digital library project. After waiting a long time, we received a fifteen month grant to support
the project.

Excerpt 1, Interviewee 01A (Head of School-01)

Like the digital library project, QEF was also a frequent source of money for the delivery of ICT projects in
many other schools. For example, Multi-Media Learning Centres (MMLCs) were established in School-01,
School-08 and School-10. All these projects were supported by the QEF. Although such grants were non-
recurrent and allocated to individual projects, many schools utilized them as regular recurrent funding. On
the other hand, some teachers and headteachers complained that preparing project proposals and reports for
QEF grants increased their workload and took a lot of time from their teaching. School-08, for instance,
failed to secure funding through a recent application to the QEF. The headteacher, Interviewee 08A, had
some doubts about the evaluation process of the application, as noted below.

[ Question: Do you think that there is any problem with the evaluation of the QEF
applications?] [Question: Do you think that there is any problem with the evaluation of the QEF
applications?] There are a number of problems with it. For instance, nobody knows the criteria that are being
used to judge the applications. Since the educational field is very small, members of the
assessing committee may be familiar with some particular schools in the application. Nobody
knows whether this kind of special relationship exists because of the lack of transparency in the
evaluation process. It is natural for unsuccessful applicants to question the fairness of the
assessment when we know of another successful application that is very similar to ours!

[Question: Does this imply that the QEF won’t be a major source of funds in your school?]

Exactly, at least not this year!

[Question: Do you have any other financial source to replace this one (QEF)?]

This is not a major problem. Actually we don’t have special need [of money] for ICT in our school. The regular funding from the government is sufficient. Especially, the prices [of hardware] have been dropping in recent years. We have enough money for the development [of facilities] in the next two years. ...

[Question: What are the major resources that you will request?]

Hmm ... we have sufficient money ... teachers are fine ... I guess time is the most important resource. I have been a teacher myself and involved in ICT development. I can understand that picking up new material in very limited time is difficult and exhausting. Therefore I am worried about the time available to teachers.

Excerpt 2, Interviewee 08A (Head of School-08)

In this school, the use of QEF was not a “life or death” issue. It was surprising, moreover, that the headteacher believed his school had sufficient resources. According to the headteacher, the school could still perform well even if the application was not successful.

Many interviewees, including both headteachers and teachers, questioned the cost-effectiveness of procuring computer equipment through the government. Due to the bureaucratic structure in the government, the evaluation and tendering processes were slow and inflexible. This might be of little concern for non-ICT assets. However, since computer equipment evolves rapidly and prices change constantly, long delays in the acquisition cycle will lead to unnecessary purchases of outdated and overpriced equipment. Interviewee 08A offered the following comments on government procurement.

Therefore... [laughing]... I can say that we have never wasted as much money as the government. I don’t trust the government [to use money effectively]. Our bargaining position is much better than the government’s. For instance, when the government has to spend $1000 [HKD] to buy a computer display, we can buy similar item at just $500 because we can acquire it from retailers [at a much lower price].

Excerpt 3, Interviewee 08A (Head of School-08)

Most teachers and headteachers also expressed similar views on the acquisition of computer items. They agreed that decentralization of the acquisition of computer items would lead to more cost-effective procurement.

**Issues with Time Constraints**

From the reference material studied in Chapter 2, workload was identified as an important obstacle preventing the use of ICT in schools in the UK. Teachers just did not have sufficient time to use ICT
effectively. In this chapter, through interviews with Hong Kong participants, this point was also identified. As pointed out by Interviewee 12B, teachers were unable to prepare lessons with ICT due to time constraints, even though they might be willing to use it.

*How can I say it? We are actually very busy with our normal teaching activities. There is virtually no time to prepare additional teaching material. We teach more than 30 lessons in a week, and we have to deal with numerous inquiries from our pupils. We have to participate in many in-service training programmes as well... The problem is that we do not have sufficient time to prepare our lessons using ICT, even though we realize that ICT may be useful in teaching and learning.*

Excerpt 4, Interviewee 12B (Teacher of School-12)

Interviewee 12B was a veteran teacher with 20 years of teaching experience. She said that she had been using computers for a few years in her teaching, but did not have sufficient time to utilize ICT to its full potential. She believed that having more preparation time would help her to deliver more polished lessons. She ranked time as the scarcest resource, even scarcer than money.

*I have been using ICT for a few years. I found ICT very useful in preparing examination questions, for example. The questions are being kept in a data bank that helps me a great deal when I prepare examination papers. However, the real hindrance is work overload... [Question: What would you ask for if you could?] More free time for teachers... this would be the most useful thing to help us improve learning outcomes. It doesn’t help much when the government only gives more money to hire technical staff instead of teachers...*

Excerpt 5, Interviewee 12B (Teacher of School-12)

It was clearly shown that Teacher 12B was asking for additional teachers, instead of technicians, to offload her duties.

The head in School-14 agreed, finding current workloads to be much more onerous than those of the past. He also emphasized that the increasing demands on teachers must be offset by more preparation time.

* [Question: What problems exist that limit the implementation of ICT in your school?] Time! The workload of teachers is already very heavy. In the past, a teacher could go into the classroom and start to teach using a textbook. It was relatively simple. Teaching is more demanding today than ever before...*

Excerpt 6, Interviewee 14A (Head of School-14)

Teacher 12B also pointed out that demands upon teachers have increased because of educational reforms that have taken place in recent years. Some teachers are now required to attend various examinations and assessments, such as the Language Proficiency Assessment for Teachers (LPAT) (Education Department...
Hong Kong, 2002a), in order to fulfill professional advancement requirements. Many teachers feel threatened by these new requirements. Teacher 12B thought such assessments actually eroded teacher performance and wasted their time.

[Question: If you were giving suggestions to policy makers in education, what would you say?]

Give me more time – this is the most important thing I need. This is because we, the teachers, have to deal with a lot of trivial tasks in addition to teaching. For instance, the LPAT has a great impact on teachers. Teachers are spending a great deal of time to prepare for this assessment, but it is not helpful at all...

Moreover, education expenses have been increasing every year, but pupils receive fewer and fewer benefits. Teachers are required to attend training courses but do not learn much. This is clearly wasting money...

If I had more time I could finish all of my tasks much more successfully. If asked to use ICT, for example, I could go ahead and do it. However, currently I can only manage to prepare for the next lesson or the next day. I don’t have enough time to plan further ahead.

Excerpt 7, Interviewee 12B (Teacher of School-12)

It was clear that Interviewee 12B was very concerned about current educational policy. Her feeling of helplessness was apparent in her response to the next question:

[Question: Do you receive any help from the Education Department? Where can you find suitable teaching material?]

It is very difficult. We teach six to seven lessons every day. In addition, we have to mark assignments, quizzes, and examinations. We still have to prepare lessons for tomorrow. Do you think that I have time to do anything more? Not unless I get more time so that I can devote one or two hours everyday to things like ICT preparation.

[Question: Do you think that other teachers have the same problem?]

Sure, I’m among those who use ICT the most...

Excerpt 8, Interviewee 12B (Teacher of School-12)

Interviewee 11A, a headteacher, already had implemented some measures to reduce teacher workloads in her school.

[Question: Do you have enough teachers or other staff to carry out the school’s mission?]

How do you measure whether or not something is sufficient? ... My view on the allocation of human resources is that “one must perform to one's strength and get what one needs.” I allocate tasks by taking into consideration each teacher's strengths. Our teachers are not required to service computers or other equipment in school. We have subscribed to receive ICT maintenance services from an external consulting firm. They look after our servers to make sure that everything is running well. Teachers just focus on their teaching responsibilities. If there is

7 The Education Department was merged into the Education & Manpower Bureau in 1 January 2003 (Education Department Hong Kong, 2002b)
any demand for additional ICT services, we deal with the consulting firm to see how these services can be provided. Of course, if our requirements are either unreasonable or unaffordable, we have to look for alternatives.

My goal is to shield teachers from work that should be done by ICT specialists. If they had to take on such tasks, their primary responsibilities would be almost impossible. A person who has expertise in ICT may not be capable of teaching. Suppose that we have a good teacher who is not competent in ICT; does this mean that he or she should not continue teaching? I believe that every teacher's major responsibility is to teach pupils well. Also, does he or she serve as a good role model for pupils? The computer is a tool which is better maintained by technicians. Therefore, I do not expect my teachers to manipulate them directly. We have found that this kind of arrangement is satisfactory in all aspects.

Excerpt 9, Interviewee 11A (Head of School-11)

Interviewee 11A thus allocated most administrative tasks for ICT to dedicated technicians. In her own view, this approach successfully shielded teachers from “unnecessary” non-teaching related tasks, and let them focus mainly upon teaching. Unfortunately, this view was rare and no other headteacher expressed the same idea in the interviews.

Interviewee 11B, a teacher in school-11, also felt that more time should be reserved for teachers to work directly with children to achieve better educational results, regardless of the teacher's use of ICT in the classroom.

There is not enough time [for children]. Even without ICT, the schedule already is extremely tight. Teachers do not have enough “contact time” with pupils. Unlike secondary students who can stay behind after school, parents usually pick up their primary school children immediately after school, so there is less time for one-on-one instruction.

Excerpt 10, Interviewee 11B (Teacher of School-11)

Issues with Effectiveness

The interviewee's opinions about ICT effectiveness fell in two radically different categories. Some teachers expressed concern that the effectiveness of ICT had been overstated. They also felt that ICT had a number of deleterious effects on educational outcomes. In contrast, other interviewees praised the theoretical and practical use of ICT in the classroom.

[Question: First, what do you think about the usefulness of ICT in teaching?]
To keep pace with the advancements in society, teaching with ICT is very useful and important in primary education ...

[Question: What has changed now that schools are implementing ICT?]
I think the programme is on the right track. Pupils now are able to search for information on diverse subjects over the web. In addition, there are online forums available for discussions of
Interviewees such as the following headteacher regard ICT as a modern educational tool that complements conventional ones. As such, they think that ICT will work just like traditional pedagogical techniques.

[Question: Do you think that ICT has a positive effect upon modern primary education?]
I think that ICT occupies an important place in the modern world. In schools, ICT is an important tool. It is similar to what chalk, blackboards, cassette recorders, and TV sets have been in the past...

Many conventional pieces of equipment, such as TV sets, fall under the jurisdiction of ICT. However, the term ICT frequently has a much narrower connotation. Most people regard ICT as a collection of computers and networking equipment, including the Intranet and Internet. We have found that these tools can help our teachers and pupils overcome traditional limitations of time and space. This is a very important breakthrough... The use of computers and networks can save a lot of time for both teachers and pupils. Therefore I think that ICT is a very powerful tool.

Audio and visual capabilities are important features that make ICT a key addition to more conventional tools in modern teaching and learning activities, which is what Alessi & Trollip (2001) proposed.

Modern multimedia programs make extensive use of pictures, illustrations, graphics, and animations, though they are not always designed or used well. When properly used, pictorial information enhances learning... Sound, especially speech, is increasing important for educational multimedia... Sound can and should be used much more than it is...

(Alessi & Trollip, 2001, p. 68 and 74)

Interviewee 01A and 12C support this view, based upon their experiences.

[Question: Do you feel that the introduction of ICT in schools is useful?]
It depends upon how the teachers use it. If it is utilized in the appropriate way, it may have a positive affect upon teaching. Pupils commonly find it more difficult to concentrate when teaching is restricted to verbal communication alone. Pupils usually receive visual in addition to auditory stimulation. Many find just listening to their teacher's voice boring. The use of multi-media instructional material, such as that provided by ICT, may be helpful for this kind of student. However, teachers must provide careful guidance to their pupils when they are using this kind of material. Otherwise, pupils may lose themselves in the visual effects and forget the actual knowledge being conveyed.
Interviewee 12C, the ICT coordinator at School-12, agreed that the audio and visual effects of ICT may lead to improved student concentration.

[Question: Do you think that ICT is useful for pupils? If so, in what areas?]
I think it is really useful! The audio and visual effects of computers can help students improve their concentration. Pupils especially are interested in game-like material.

Excerpt 14, Interviewee 12C (Teacher of School-12)

In School-01 the potential benefits of ICT were demonstrated in the “Digital Library” project. The head of that school strongly supported the use of ICT because their Digital Library had been such a success. Pupils appeared to take a great interest in reading electronic books with rich visual presentations. This had never happened before, as Interviewee 01A recalled.

[Question: Generally speaking, is ICT appealing to pupils?]
Yes, it is appealing—especially now that we have a digital library with electronic books. Whenever pupils have lessons in the library, they are excited and show improved concentration. Although its effectiveness in helping students learn language skills is not yet proven, the benefits of reading, whether conventional or electronic, are well known. I have found that pupils are happy to visit the library. They especially are drawn towards electronic books with eye-catching graphics.

Excerpt 15, Interviewee 01A (Head of School-01)

Despite the apparent improved concentration of students, Interviewee 01A did not give any facts to support her view of positive educational achievements. This was also a common confusion with other interviewees. Since there are so few data measuring the consequences of this improved concentration, additional research must be carried out on the correlation between improved concentration and the “eventual” effects on education. The distinction between such triggering and retentive effects is essential (Veermans and Tapola, 2004). It helps determine if the use of ICT actually improves students’ learning in primary education.

Interviewee 10A essentially supported the use of ICT. He pointed out that some difficulties may have arisen in the past but most had been overcome in recent years. He believed that ICT currently fit students’ educational needs, and he did not believe the effectiveness of ICT has been overstated in the educational community.

[Question: Do you think whether the importance of ICT has been overstated within the educational community?]
Not at all! However, it was a bit chaotic when ICT was first implemented. For example, teacher qualifications were not up to standard, and so on.

[Question: Was this a few years ago?]
Exactly! This all happened a few years ago. In the beginning, there were problems with hardware resources, teacher computer skills, etc. Those resources were not adequate to support...
the fast pace of ICT implementation.

[Question: What is the present situation?] It is on the track right now. At present, ICT is able to meet the needs of our school.

Excerpt 16, Interviewee 10A (Head of School-10)

Some participants, such as Interviewee 08A, generally held a positive view of educational ICT, but expressed some reservations about its long-term effectiveness. He perceived that current implementation of ICT has not been good enough.

I believe that the implementation [of ICT] in primary schools is essential. However, I have certain reservations with respect to how it is implemented and used, and I'm concerned that its effectiveness may be overstated. Various aspects of educational ICT, including implementation, have room for improvement.

Excerpt 17, Interviewee 08A (Head of School-08)

Some researchers also have urged caution as schools begin to implement ICT. They argue that ICT should be implemented "carefully," in order to achieve the best result. For instance, Drew & Ingram (2001) emphasized that World Wide Web (WWW), a typical ICT application, would demonstrate its advantages in students' learning only under well planned circumstances.

... there is little doubt that the Web can be a tremendous source of educational materials and experiences. But we all know that it is not enough for us merely to point students to a networked computer and tell them to find important information. Students deserve well-constructed lesson plans, engaging them in important tasks that could benefit from the use of Web resources.

(Drew and Ingram, 2001, p. 60)

On the other extreme, some teachers thoroughly question the effectiveness of ICT. For instance, teacher 12B had a “radical” objection against ICT. She argued that ICT's clear failures could not be solved by any amount of money or additional resources.

[Question: Do you mean that there will not be much improvement to the quality of teaching?] Yes, no matter how much money is spent in buying computers and other equipment, because it is not only a problem of money! ... Is this a “radical” view?

Excerpt 18, Interviewee 12B (Teacher of School-12)

In her response to the question of whether or not the effectiveness of ICT has been overstated, her answer was blunt and to the point.
[Question: Do you feel that the effectiveness of ICT has been overstated within the community?]
Yes, that is exactly how I feel.

Excerpt 19, Interviewee 12B (teacher of School-12)

Teacher 12B did not feel that computers were irreplaceable teaching tools. In her opinion, ICT is just one of many pedagogical tools. In many circumstances, she argued, other means of teaching can be just as effective as ICT.

[Question: Do you feel that computers have been over-emphasized?]
Definitely. Not all the time, but sometimes.
[Question: Do you mean that computers are not always needed in the classroom?]
I believe that teaching is flexible. The most important thing is how teachers conduct their lessons. ICT was not available many years ago but lessons could still be presented well. Don't you agree?
[Question: Do you mean that computers are not as essential as some claim?]
Yes, I rarely see students collect useful information on the computer.

Excerpt 20, Interviewee 12B (Teacher of School-12)

Interviewee 12B was not alone in her objections to the current ICT programme. Another interviewee, 02A, was also discouraged by the use of ICT in schools. ICT, he argued, did not lead to student learning, but merely produced attractive lessons. One advantage, he admitted, was that ICT fostered student creativity.

[Question: Do you think that ICT is useful in primary education?]
I cannot say that it is useless. However, I personally would not encourage ICT for younger students. First, it is unhealthy for the pupils' eyes. Second, if it is only used for getting on the Internet, it may not be very effective pedagogically. Searching over the Internet is certainly more convenient, but I believe that it is better for primary-school children to search for material in a conventional library... I believe that ICT does not enhance learning, but simply produces beautiful packaging for education.

Excerpt 21, Interviewee 02A (Head of School-02)

Interviewee 10A also noted that other pedagogical tools might be as important as ICT.

[Question: Has there been any improvement in the ability of students to communicate as a result of the introduction of ICT?]
ICT cannot be considered a panacea for all educational problems and ICT should not be the only tool used by educators. It should be considered one of many teaching techniques.

Excerpt 22, Interviewee 10A (Head of School-10)
In recent years, ICT has been a very "hot" topic in the educational community and the public at large. Many people falsely assume that ICT is beneficial for students without any hard evidence to support their position. The interviewees were divided on effectiveness of ICT. Given their "on the ground" experience, we should take their opinions seriously and use them to begin a critical dialog about the effectiveness of ICT in the classroom.

Issues with Professional Development

Professional development, or training, is a key element in the teaching profession. When teachers found it difficult to use ICT in their teaching, they often sought help from colleagues. Building teachers' knowledge was essential to implement ICT in schools, as Interviewee 10A noted.

[Question: If teachers encounter problems with ICT, how can they solve them?... For instance, should they seek solutions in books, consult colleagues, or use other government resources?]  

First, they need to get assistance from colleagues. Second, they need to seek out further training. Every teacher, for example, can now obtain a training grant from the government.  

Excerpt 23, Interviewee 10A (Teacher of School-10)

Like most professions, proper training was an essential component in the professional development of these teachers. As discussed in Chapter 2, there are a number of ways to conduct training, including external training, school-based training, and mentoring. In many schools, so-called mixed-mode training took place, that is, teachers received training in a combination of several ways. Individual schools, however, emphasized different modes. The most common modes being mixed are school-based training and external training. Interviewee 10B also pointed out that school-based and external training were employed in parallel in her school. She noted that each mode had its strengths and weaknesses. Overall, school-based training was preferred by her colleagues.

[Question: How do you compare school-based training and external training courses? Which is better?]  

We have tried both ways. In school-based training, our TSS (Technical Support Services Technician)* frequently conducts training courses. For example, a training session was held after school today. It saves teachers time and effort, since they don’t need to commute to a new another training site. We don’t spend any extra money. But some teachers think that the pace doesn’t suit them and prefer external training programmes. The government has allocated budgets for teachers’ training and we will not deny them this kind of training, if that is what they want. That’s why we have used both types of training.  

[Question: Which way is preferred by teachers?]  

They prefer school-based training.

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* TSS - the Technical Support Scheme, as discussed in Chapter 2
Excerpt 24, Interviewee 10B (Teacher of School-10)

It should be noted that the TSS was supposed to have technical or operational skills in ICT. Despite this mandate, the TSS usually did not have the skills to integrate ICT into the curriculum. Only rarely was the TSS able to train teachers in curriculum-related topics. In the following interviews, teachers noted that training resources were often focused on operational needs instead of curricular needs. People might suppose that teachers needed only training in operational techniques, instead of a holistic knowledge in the integration of curricular material with ICT environment. This kind of misunderstanding of teacher training is commonly found among policy-makers and even some educators.

In many cases, schools that trained in both school-based and external modes often used school-based training for introductory topics and external training for more advanced topics. School-13 was typical in this regard.

[Question: What is the proportion of school-based training to outside training?]
It isn't simple to measure. Training at the BIT [basic] level was entirely in school-based mode. At the IIT [intermediate] level, some ICT concepts and skills were beyond our in-house trainers, so we used some external trainers. Finally, most of the training at the UIT [upper] level was done by outsiders.

[Question: How about your own training? How do you acquire your knowledge of ICT?]
My colleagues and I frequently attend relevant seminars, workshops, and forums organized by external parties.

[Question: Do you think whether there are enough such seminars and workshops?]
Yes, there're enough.

Excerpt 25, Interviewee 13B (Teacher of School-13)

The following response was from teacher 12B, a veteran teacher with years of experience in the classroom. She offered a strong critique of the external training course. Again, those courses were not designed for the schools' current pedagogical or curricular needs. As such, the teacher preferred to teach herself rather than take the external courses.

[Question: Where did you acquire your ICT knowledge?]
I was self taught. Practice is the best way to learn.

[Question: What do you think of external training courses?]
They are not really useful. For instance, what can you learn in a three hour lesson of word processing, or a three hour course of web development? Nothing. You can't remember anything with such short lessons. I would rather learn through practicing on my own than take those courses.

Excerpt 26, Interviewee 12B (Teacher of School-12)

* It was a question whether teachers really needed to do web development by themselves.
In School-11, teacher training also followed the mixed-mode approach. Most teachers received school-based training at the basic level from other, more experienced teachers. On the other hand, competent teachers, such as Mr Chan (pseudonym)\(^\text{10}\), received training from external sources. The headteacher was satisfied by this style of training.

[Question: Are teachers in your school usually trained in external courses?]
No, training is usually school-based. However, Chan is an exception since he is so knowledgeable in ICT. He is so skilled, in fact, that no other teacher has anything to teach him. He can only benefit from external training courses... We also have study groups in which common topics are taught. Our technical consultant is the instructor for many such topics\(^\text{11}\). We are basically interested in introducing practical ICT tools instead of abstract concepts. For instance, we have found topics relating to basic networking and file systems to be very useful. At least nobody will lose documents just because of a misunderstanding of the file location!

[Question: Will you continue this kind of school-based training?]
Sure, and we will try to improve it a little bit every year.

Excerpt 27, Intervieewee 11A (Head of School-11)

The headteacher gave Chan such high praise because of his ICT competence. Chan was the teacher in charge of his school’s inter-school “Robotic Olympic” competition, which was a QEF-funded project.

Teacher 11B (Chan) also realized that sharing ideas among colleagues was an essential way to improve the staff’s knowledge. Discussion forums or ad hoc workgroups were also important. A short session known as “Mini-Encyclopaedia in ICT” was praised as a great way for teachers to share useful ideas.

[Question: Can you tell me how teachers in your school receive training? For instance, do they collect information in books, over the Internet, or from other sources?]
In the past, there was not much material available on the Internet. The suppliers did not provide appropriate training courses, either. Fortunately, I knew some colleagues in other schools and we could educate ourselves through exchanging ideas or through informal discussions.

[Question: Is it important to have peers so that one can seek help from them?]
Absolutely, we can improve our skills efficiently in this way.

[Question: Do you know how other teachers generally handle their ICT problems?]
We have school-based training courses. The Education Department offers training such as the programmes designed to bring teachers up to the BIT or IIT standard. They are part of our basic requirements. We have been allocating time for the “Mini-Encyclopaedia in ICT” session during our weekly staff meeting. Teachers are given some skill or practical knowledge each time and the results are quite positive. Generally speaking, our teachers are young and not resistant to new ideas and information. In contrast, some teachers are learning on their own.

[Question: Is this sharing session organized by you?]

\(^\text{10}\) “Channel” and all other names being used in this Chapter are pseudonyms.

\(^\text{11}\) It was unlikely to have any pedagogy-related topic offered by the ICT consultant.
I organize it with several colleagues in the ICT task group.

Excerpt 28, Interviewee 11B (Teacher of School-11)

It seemed that everything was working well at school-11. When the teacher was probed for more details about the overall implementation of ICT in Hong Kong, however, he offered some criticisms of ICT in the region.

[Question: In the last few years, is ICT developing rapidly in Hong Kong? Is it sufficient or inadequate?]

From my point of view, the overall hardware infrastructure is good enough. Sufficient hardware resources have been provided to both primary and secondary schools. As for teacher training, it is a mixed bag. The real problem is that teachers cannot get training or support that exactly matches their pedagogical needs.

[Question: Do you mean that training is inadequate?]

Exactly. I suppose that some material is not necessary or redundant. For instance, it is absolutely useless to ask teachers to learn video editing. Teachers seldom use such techniques in their lessons. Teachers have wasted a lot of time learning these techniques... On the other hand, there are insufficient opportunities for teachers to exchange their experiences or ideas.

[Question: Is there any training that matches the needs of curriculum designers?]

Training has been set up to cater to operational-level needs. For instance, learning to set up a hyperlink or create a video segment helps teachers pass assessments for ICT proficiency. However, teachers should be treated differently from technicians. The contents of this kind of courses are more suitable for technicians than teachers.

[Question: Is it the same now?]

Yes, basically the requirements for BIT and IIT have not changed. They are about the same since the first day it launched.

Excerpt 29, Interviewee 11B (Teacher of School-11)

In the discussion, it was clear that Teacher 11B was disappointed about the current training opportunities for teachers, although he was one of the most competent teachers in ICT in his school, as praised by his headteacher in Excerpt 27. Once started, he could not stop himself from criticizing the poor training policy.

[Question: What do you think about the training workshops?]

They are poorly organized. I think that they don't provide effective training for teachers. They are ad hoc ...

[Question: What about other primary teachers? How do they get hold of relevant knowledge?]

Our school has a session of "Mini-Encyclopaedia in ICT." At this session teachers share their techniques or other ideas about ICT. It is good to develop such a culture of knowledge sharing, instead of asking teachers to participate in other kinds of training courses, which are a total waste of resources ... [laughing] ...

[Question: Generally speaking, what do you think about support from the government for ICT?]
Again, we lack good in-service training or a culture of sharing.

Excerpt 30, Interviewee 11B (Teacher of School-11)

According to Teacher 11B, no fresh ideas had ever been offered by the organizers of workshops and seminars. It was a pity that the best training was the little sharing session in his own school, the “Mini-Encyclopaedia in ICT.” It was clear that he was very proud of this sharing session, since he mentioned it for several times in the interview.

Many interviewees also preferred training from colleagues. Interviewee 14B, for example, mentioned that school-based training was always preferable to external training.

[Question: What do you think about the quality of school-based training and external courses? Which kind do you prefer?]

Ideally, teachers could train one another. But if teachers cannot share knowledge with their colleagues, training from external sources is the only alternative. I heard from colleagues in other schools that the quality of courses from external parties is uneven. The courses are sometimes boring and not useful for teaching. They are usually very quick and short and little is learned...

The advantages of school-based training by internal teachers are obvious. Each school and each teacher may have unique requirements, of course. The pace can be adjusted to the ability of each teacher. The programme can be designed according to the needs of individual teachers. This is a definite advantage. It is more efficient because teachers are not forced to attend less relevant courses, especially those that focus on operational techniques.

Excerpt 31, Interviewee 14B (Teacher of School-14)

As Teacher 14B pointed out, external training courses were usually focused on transfer of technical or operational skills. However, these courses were not what teachers wanted because the links between technologies and curricular context were not covered.

[Question: Would you say that external training firms are not able to provide suitable training for teachers?]

We can’t say that either. I think that external training parties cannot tailor the course content to match the hardware environment, the school’s ICT infrastructure, its textbooks, and so on. School-based training is totally different. Teachers can share with other teachers everything that is going on inside the school, such as the differences among classes. School-based training can be adjusted to particular classes in the school. In contrast, external training sessions are mainly based on fixed course materials, which are not customized for individual schools or classes.

[Question: Is it because the trainers themselves are not primary teachers?]

That is part of the problem. Another reason is that they do not really understand the daily teaching activities inside a school...

[Question: Some argue that teachers are more attentive in external training programmes than in school-based programmes, because teachers can always reach the ICT instructors after the
school-based training sessions. Did you see this situation?
This is a cynical view of school-based training. It should be positive for most teachers. Those inattentive teachers are exceptional cases. However, it should be recognized that offering lessons for internal teachers is more difficult than for children, because you can't discipline teacher-learners! From my experience, external training courses do not necessarily provide a more focused atmosphere. Nevertheless, it is true that fewer teacher-learners chat with one another in external courses. Teachers are more relaxed when they attend training in their own schools. The opportunity to question the instructor after the training sessions is also a definite advantage of school-based training. These advantages should not be ignored.

Excerpt 32, Interviewee 14B (Teacher of School-14)

After further probing, Teacher 14B also expressed displeasure towards the government because of the lack of appropriate training for teachers.

[Question: What do you think about the seminars or workshops being held for ICT?]
They are not concrete enough. This kind of event is all that the government (Education Department) knows how to do. Before the Education Department invites somebody to share in a workshop, no one knows what is going to be on the agenda. The material is not necessarily positive and it is sometimes negative. However, the Education Department always holds this kind of event – asking people to share, but without knowing the contents before the meeting! Sometimes the material is garbage!

[Question: Do you mean that direction or a clear theme is missing in these kinds of workshops?]
Exactly. Organizing these events is inexpensive. The organizers only need to arrange a venue. Then the participants are free to “share” anything. However, the contents are repeated and repeated. Teachers become bored after attending a few times.

Excerpt 33, Interviewee 14B (Teacher of School-14)

Teacher 14B was just one of many teachers who complained about the government's ICT policies. Interviewee 12B was the angriest noting that the government had been wasting money with little to show for it. This was true not only in the training policy for ICT but also in the entire educational system.

[Question: Do you think that the government has a good ICT policy for schools?]
I think that the government is just wasting money, but our requirements are not met...

[Question: But a lot of resources have been spent ...]
Yes, money has been wasted, but it has not produced good results.

[Question: Is it true for the whole educational system?]
Absolutely!

Excerpt 34, Interviewee 12B (Teacher of School-12)

Some headteachers were aware of the resistance of teachers to ICT. Besides the demoralizing effects of insufficient hardware and software, inadequate training was again recognized as a major obstacle.
Frankly speaking, there are difficulties [in the implementation]. First, it is a psychological issue, because some teachers resist using ICT. Fortunately, such resistance is on the decline, in part because teachers have no choice but to use ICT. Besides the psychological issue, the availability of hardware is another issue. The hardware is sometimes outdated and unable to match the software requirements for teaching. Yet they are not the big factors.

The biggest problem is insufficient training. Many teachers are afraid to use ICT. Frankly speaking, some teachers copy the assignments from other teachers to meet the BIT assessment. Therefore, the BIT standard does not necessarily reflect the ICT skill level of a particular teacher. Moreover, the quality of external training is not guaranteed. All these factors undermine the implementation of ICT in the school.

Excerpt 35, Interviewee 08A (Head of School-08)

Support from the headteacher is an essential factor in ICT’s success or failure in schools. As noted by Interviewee 11B, a teacher at School-11, the headteacher in his school strongly supported the use of ICT but did not required teachers to execute ICT tasks at an operational level (Excerpt 9), as many other schools did. This arrangement saved teachers a great deal of time and let them focus mainly on curriculum-related ICT tasks. Teacher 11B, it seemed, strongly agreed with his headteacher on this issue. The role of headteachers, as well as other issues in school organisation, will be discussed in the next section.

Issues with School Organisation

Along with hardware resources, time constraints, and training, school organisation comprised a bundle of interesting issues that concerned the interviewees. Teacher 11B, for example, felt that a robust staff was an essential component for any school that employs ICT.

[Question: Which of the following factors is the most essential for the successful use of ICT? Headteachers, teachers, or ...]

Actually I believe that it’s a holistic view. Our headteacher has a strong mind because she clearly understands the benefits and importance of ICT. I felt that our headteacher supports ICT with school policy. Even she has learned to use ICT. The ICT consultant in our school is also very important...

In other words, human resources are very important. Good manpower helps support teachers. In turn, the teachers realize that ICT can help teaching, instead of merely increasing workload. There is a rumour that some schools require their teachers to prepare a certain number of Power Points [computerized presentations] per year. However, our school doesn’t put this kind of pressure on teachers... I believe that adequate manpower is very important.

Excerpt 36, Interviewee 11B (Teacher of School-11)

As mentioned in Chapter 2, the ICT coordinator was supposed to be a “teaching” position provided by the Hong Kong SAR Government to help the implementation of ICT in primary and secondary schools.
(Education Department, 2000a). However, other than its vague definitions, the recruitment of ICT coordinators was not clearly defined by the government. It was left open for schools to define the exact roles of ICT Coordinators in their schools. Overall speaking, the interviewees revealed that the appointment of ICT coordinators generally fell into three categories:

<table>
<thead>
<tr>
<th>Approach</th>
<th>Example</th>
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<tbody>
<tr>
<td>1. Staff teacher appointed as ICT coordinator</td>
<td>School-10</td>
</tr>
<tr>
<td>2. New ICT coordinator hired</td>
<td>School-12</td>
</tr>
<tr>
<td>3. No specific ICT coordinator, coordination of ICT shared by a group of existing teachers</td>
<td>School-14</td>
</tr>
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</table>

In School-10, for example, the position of ICT coordinator was given to a current teacher. Interviewee 10B was the teacher who took on the duty of ICT coordinator. In the interview with this teacher-ICT coordinator, she voiced her strong disapproval of appointing an ICT coordinator from outside the current staff.

[Question: Does your school have an ICT coordinator?]

No, but I knew that there was an ICT coordinator programme. More than 100 schools in Hong Kong received funds for appointing their ICT coordinators.

[Question: Which model do you prefer? Your school's or those with ICT externally-hired ICT coordinators?]

I prefer the model of our school. From my own teaching experience, I can determine which material is suitable for teaching.

[Question: Has your school ever have any externally-hired ICT coordinator?]

No, we haven't. According to what I have heard, the role of ICT coordinators is very similar to technicians in TSS.

[Question: Is it assumed that ICT coordinators are more active? ... ]

I suppose, but the TSS technician in our school is also very active. Since I am the coordinator of ICT activities, I know what is the most suitable for children. It will be more difficult for the externally-hired ICT coordinators, since they usually do not have any teaching experience.

[Question: If you have the chance, would you recommend your school's approach?]

Sure.

Excerpt 37, Interviewee 10B (Teacher of School-10)

Clearly, Teacher 10B's experience gave her a very negative opinion of fresh ICT coordinators who had no teaching experience. She believed that she was best able to coordinate educational use of ICT because of her own teaching experience.

12 That is, the school did not appoint an ICT coordinator from outside sources.
13 Interviewees commonly confused the role of ICT coordinators and the technicians in TSS.
In School-14, on the other hand, no ICT coordinator was specially appointed. Instead, a team of teachers who were knowledgeable in ICT shared the coordination of ICT activities. One member of the group, Teacher 14B, praised the model.

[Question: Do you know that other schools have dedicated ICT coordinators for all ICT activities?]

Yes, I know, but I believe that our model is better. I am not saying that our model is the best. However, ICT coordinators in other schools occasionally call us for advice on managing ICT activities. The ICT coordinator in each of these schools is responsible for all ICT activities in his/her school. But teachers often resist the work done by these coordinators because of the heavy workload imposed by the rapid implementation of ICT, a workload that they blame in part on the externally-hired ICT coordinators. Newly-employed coordinators cannot overcome this kind of resistance, but they are expected to carry all sorts of ICT related activities. You can imagine how difficult it is for them. Computer hardware can take two years to implement. Then the curriculum must be modified to enjoy the benefits of this new infrastructure. This is the most difficult part...

So how can an ICT coordinator handle this kind of change? The coordinator must work closely with the curriculum committee. But this new colleague is not in a position to ask senior teachers to change their attitudes and curricula unless the headteacher is completely supportive—and the headteachers are rarely so supportive of the ICT coordinator.

Excerpt 38, Interviewee 14B (Teacher of School-14)

As Teacher 14B pointed out, the major difficulty for any non-teacher ICT coordinator is a lack of authority. It is easy to imagine that a senior teacher with 20 years of experience might be reluctant to follow the recommendations made by a new ICT coordinator. If an externally-hired ICT coordinator does not gain the trust of the headteacher and teachers, his/her role would be little different than a technician.

[Question: Do you mean that experienced teachers usually reject the advice from a fresh ICT coordinator?]

That is part of the problem. Actually an ICT coordinator has very limited authority in his/her school. If the ICT coordinator is not fully supported by the headteacher, he/she is only allowed to set up the computers and networking. After the infrastructure is ready, he/she cannot direct and optimise the use of the new technology [in pedagogy]. In other words, the coordinator did little to improve the use of ICT within the school.

[Question: I have heard comments similar to yours. Do you mean that the ICT coordinator plan has actually failed?]

Exactly, this scheme cannot achieve the original objectives. In many schools, ICT coordinators are actually assuming the duties of a technical support staff. However, it is not worth spending a relatively high salary to hire an "ICT coordinator" to do the job of technical support. Therefore appointing an ICT coordinator from outside is not a good idea. Without a good understanding of the school politics, he/she cannot make any headway. He/she can only hide

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14 This teacher (14B) clearly distinguished the roles between ICT coordinators and technicians. Only a few interviewees were able to point out such a difference.
himself/herself inside computer labs and work with computer hardware or software, which are only superficial relationships...

Excerpt 39, Interviewee 14B (Teacher of School-14)

In the above interview, the teacher repeatedly pointed out that a fresh ICT coordinator would not support the school's use of ICT for teaching.

School-12, however, took the second approach in Table 5-2, that is, it hired a recent graduate without any teaching background for its ICT coordinator. Teacher 12B, a teacher in School-12, thought the hire was a mistake.

[Question: Your school has an ICT coordinator. Does he help?] Yes, I think that it would be better. The ICT coordinator in our school is very young. He does not have any teaching background and does not know what teachers really need.

Excerpt 40, Interviewee 12B (Teacher of School-12)

According to Teacher 12B, the duties of their ICT coordinator were very similar to technicians. They helped out with trivial jobs, such as picture scanning. An ICT coordinator who only performed these kinds of duties would fail to achieve the original objectives of the programme. This situation reinstated a previous statement that the role of ICT coordinators was always confused with that of ICT technicians.

The following conversation was with the ICT coordinator in School 12. This ICT coordinator was disappointed with teachers, and the teachers were disappointed with him. It was evident that the ICT coordinator was working in a difficult situation because of his lack of teaching experience. It seemed he was not respected at all by some of his colleagues.

[Question: As an ICT coordinator, did you experience any difficulties with teachers' cooperation?] It's pretty difficult. Teachers usually think of ideal situations. I disappoint them because I can't always achieve what they want.

[Question: What do you know about the ICT knowledge of most teachers?] To be honest, they are not very familiar with ICT. The more senior the teachers, the more reluctant they are to use computers.

[Question: Do you think that it's better to have an ICT coordinator with teaching experience?] Yes, it's essential. Teaching experience helps us understand the needs of pupils. I am unable to handle some situations because of lacking of teaching experience.

[Question: Do you find any important differences between ICT coordinators in other schools]
and yourself?]
I am different from other ICT coordinators because most of them have teaching experience.
Since I don’t have teaching experience, I have a hard time doing my job.
[Question: Will you continue in your current job?]
No, I am considering leaving this position because of my weak experience in teaching. I may go back to study.

Excerpt 41, Interviewee 12C (ICT Coordinator of School-12)

The ICT Coordinator was so upset that he was considering leaving the job. Moreover, he also agreed that the position of ICT coordinator was better filled by a person with teaching experience. This opinion was exactly the same as that of his colleague (Teacher 12B in Excerpt 40). School organisation like this would probably help the advancement of ICT in a school.

[Question: So, it seems the government did not carefully introduce this scheme because teaching experience was not set as a prerequisite for ICT coordinators. Do you agree?]
Exactly!
[Question: If the role of ICT was taken by a teacher, do you think that it would be a better arrangement? ]
It may cause another dilemma. Sometimes a decision has to be made between two persons, one with better subject knowledge and the other with better ICT knowledge.

Excerpt 42, Interviewee 12C (ICT Coordinator of School-12)

Later in the conversation with Interviewee 12C, he pointed out that the use of ICT by teachers was actually very limited. Some teachers in his school were still reluctant to ICT. On the other hand, no adequate support was available from the government when problems came up.

[Question: Do you think the requirements of BIT, IIT and UIT, etc. can reflect the ICT standards of teachers?] 
No, I don’t think that it is very helpful because it is all about the completion of assignments.
[Question: Do you mean that teachers may not be up to a certain standard even they were awarded the grade?] 
I think that they are doing assignments just to fulfil requirements. If they are not really interested, implementation will be difficult.
[Question: Is it true that teachers will avoid using ICT if they have the choice?] 
Definitely!
[Question: What do you think about the requirements of ICT competency level for teachers?] 
It isn’t very meaningful. Teachers can easily pass the assignment and inspection.
[Question: How should they change such attitudes?] 
For those who have substantial teaching experience, it is difficult, if not impossible, to change. New teachers could handle it much better.
[Question: How many teachers work well with you?]
Three or four.

[Question: Do you think that the online resources available from the Education Department are good enough?]

No, they are not sufficient. These things can only help a little bit, because every school has its own circumstances. The material has to be tailored according to individual situations.

Excerpt 43, Interviewee 12C (ICT Coordinator of School-12)

Interviewee 12C was the only new ICT coordinator who was willing to be interviewed. Given the nature of qualitative interviews, the views of this particular coordinator could not be generalized to all ICT coordinators. However, it set a good reference point for further research. Combined with the views of other teachers and headteachers, however, this ICT coordinator offered us a strong message—the ICT scheme was failing.

Headteacher in School-11 was also aware that a fresh ICT coordinator would not enhance ICT in her school. Therefore she chose not to appoint an ICT coordinator. On the other hand, the school received technical support services from an external vendor (Excerpt 9). Although teachers were not required to handle computing facilities directly, ICT competence was still a key consideration in the recruitment of new teachers in her school. The head considered it so important that she required new hires to pass a written test covering their ICT knowledge.

[Question: Are they [new teachers] knowledgeable of ICT?]

Starting from the year before last, all new teacher applicants coming to interview have to sit for a written paper in ICT. It covers the use of presentation software, word processing, and spreadsheets.

[Question: Is it true that those without a minimum level of ICT competency are rejected?]

Yes, unless we have no other choice. If there is no alternative, I tell the new teacher that he/she has to educate him/herself over the summer holidays, before coming to teach in our school. All current teachers in our school already possess a basic set of ICT skills. If a newcomer does not have the same level of skill, he/she must bring him/herself to the same level. Since we function as a team, it is impossible to ask other colleagues to adapt to his/her level.

[Question: Will preferences be given to people with ICT skills?]

Certainly, and the in-service teachers are also aware of this. Therefore they are eager to educate themselves in ICT tools and techniques.

Excerpt 44, Interviewee 11A (Head of School-11)

A number of other schools also required ICT competence. For instance, Interviewee 10A, the headteacher of School-10, also made it clear to his existing teachers that ICT knowledge was a fundamental requirement.

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15 In many cases ICT coordinator was confused with ICT technician.
16 It should be noted that this headteacher did not mention any requirement regarding the pedagogical use of ICT. This requirement was also overlooked by most interviewees.
[Question: You mentioned that the attitude of teachers has changed. Do you think that ... ?]
First, they know more about the contributions of ICT in teaching. Second, all teachers are required to meet the BIT standard and therefore each of them must be willing to use ICT. Excerpt 45, Interviewee 10A (Head of School-10)

Moreover, Interviewee 10A recalled the early difficulties in his school when they did not have sufficient preparation for the changes. The situation, however, has changed significantly in recent years.

[Question: In the early deployment of ICT, did you have a difficult time?]
Yes, our situation was very difficult a few years ago. At that time, our staff members had little preparation in ICT. It would be much better if our staff members understood ICT.
[Question: Do you have staff with this kind of capability?]
No, it has been difficult because we do not have this kind of staff. All of us are required to share the responsibility for ICT. At that time, we had very limited knowledge and we had difficulty just typing Chinese characters.
Excerpt 46, Interviewee 10A (Head of School-10)

After further probing, the headteacher related that a teacher had decided to leave the school because of the pressure of ICT.

[Question: Is there any complaint from your teachers today?]
The situation is much better now than ever before, because the teachers realize that ICT is useful and helpful... At the beginning, however, it was true that teachers felt great pressure, even though they rarely made any complaint. We had a teacher left our team a few years ago. She was worried about the difficulty of picking up ICT skills, such as Chinese keyboarding. In other words, her departure was due to the pressure of ICT. She might not able to catch up because of her age.
[Question: Really? She left because of ICT! When did it happen?]
It has been two years. She sometimes comes back to work as a supply teacher. However, she doesn’t want a permanent position now. She was intimidated by the requirements for BIT, etc. She did not have the confidence to tackle these requirements and decided to take early retirement...
Excerpt 47, Interviewee 10A (Head of School-10)

It was clear from the headmaster’s description that the situation had been so uncomfortable that the teacher chose to leave the school. According to the headteacher, however, the situation today is greatly improved.

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17 The interviewee assumed that “required to use” was equivalent to “willing to use”, which is not true.
18 The input of Chinese characters using an ordinary keyboard requires the learning of at least one kind of Chinese keyboarding skills.
In School-12, the headteacher also perceived that the "atmosphere" of using ICT had been significantly improved in recent years. In the report to the Education Department, he even mentioned that his teachers were already up to standard.

... The ICT culture in our school is pretty good. As I mentioned, 5 years ago teachers were scared to use ICT. At that time, teachers, including me, did not even get to touch the computers. Now, five years later, teachers have become proficient at using computers. Some teachers are still undertaking further study, in universities or elsewhere. All of the assignments were completed with computers. Their performance is excellent and I am probably the weakest at the school! [laughing] ...

Our teachers have finished BIT but we have not stopped. Somebody attained the upper-level certification last year. For those who have not yet reached the upper level, they are either at the intermediate or upper-intermediate level. When I complete the fulfillment form this year, I will report to the Education Department that all our teachers have reached a very good standard.

Excerpt 48, Interviewee 12A (Head of School-12)

However, a teacher in the same school (Interviewee 12B) held a radically different opinion. The interviewee pointed out that teachers were not yet ready for ICT activities in education. Everything, he argued, was geared towards demonstrations in front of the headteacher, inspectors, or guests. In practice, however, traditional techniques still predominate in daily teaching activities.

[Question: Is instructional material very important to you?]  
Yes, instructional materials are important, as well as other software tools such as word processors and spreadsheets. Computers are frequently used for activities like preparing examination papers but less frequently used in lessons. Frankly speaking, most of our colleagues are not using ICT extensively.

[Question: Really?]  
Yes, during observations or inspections of lessons, colleagues can make it all looking good but it is just for show. However, when the observers or inspectors have gone, teachers go back to the conventional way.

Excerpt 49, Interviewee 12B (Teacher of School-12)

In the previous interviews, the discrepancy between the opinions of teachers and the headteacher was clear. Head of School-12 assumed that everything had already been running smoothly, but the teachers experienced something quite different: the ICT programs were not producing the intended results.

School-13 had been a pilot school in the ICT implementation scheme. Well before non-pilot schools, School-13 received a lot of resources to prepare for the manpower, hardware, and software requirements of ICT. The interviews with teachers in this school captured their feelings. Interviewee 13A was a relatively ICT-competent teacher. He held a very satisfactory opinion towards every aspect of ICT, such as workload and computing facilities. Overhead projectors were the only insufficient items he mentioned.
[Question: Do you feel that the use of ICT has increased your workload, comparing today's situation with that three or four years ago?]
I have been here for many years. Actually the workload has not changed much in these last few years. I suppose that our workload would be more or less the same even assuming that ICT had not been implemented. Although it was very hard to implement ICT at the beginning, the outcomes are reusable in the years to come. So, all things considered, it is difficult to determine whether the time being spent has increased or decreased due to ICT implementation.

[Question: Are you willing to teach with ICT?]
Yes! I am.

[Question: Do you think that the [computer] facility in your school is sufficient? ]
It is good enough in comparison with other primary schools.

[Question: Your school is a pilot school. Now that the pilot scheme has finished, do you think your school still has an advantage over other schools?]
Yes, of course! Pilot schools have an earlier exposure to the environment of ICT. At the beginning, we were working very hard because there were no good references or other resources. We were doing it on our own, building up everything from scratch.

[Question: Is there any insufficient ICT facility in your school?]…Every facility is sufficient in our school. If something could better, it would be nice to have more projectors.

[Question: Do you find that teachers are forced to put their teaching material on computers even if it is not necessary? Has it taken away resources in other areas?] No, I have never seen any situation like this.

Excerpt 50, Interviewee 13A (Teacher of School-13)

Interviewee 13C was another teacher in the same school. She was a veteran teacher with over 17 years experience. Although she had been “forced” to adapt to the ICT movement, she could recall the early apprehension that she and other senior colleagues felt. For instance, the requirements from their headteacher were so strict that some teachers needed to spend money to ask for external help for the preparation of examination papers.

[Question: How did you acquire ICT knowledge a few years ago?]
It was multi-dimensional. First, it was forced…or, speaking candidly, it was a kind of pressure. For instance, our headteacher set a rule that all examination papers must be typeset with computers19. Handwriting was not acceptable. At that time, we had to get it finished in countless sleepless nights. Some teachers were really upset. Some of them who were really unable to master the skill had to pay external assistants to prepare the papers. I heard that it cost20 $100 for each set of papers. However, I'm not sure whether it was a fact or just a rumour. I believed that I was not too old to learn. I had no choice but to get hold of the skills in ICT if I wanted to continue with my teaching profession…

19 Chinese keyboarding skill is required.
20 Currency in Hong Kong Dollars.
After further probing, Teacher 13C described an “inferiority complex” at the very beginning of the school’s ICT implementation, which was due to her weak ICT skills compared with young colleagues. The situation was made even more difficult because she had no good way to vent her feelings.

[Question: When did you get hold of ICT skills?]
I still haven’t! In order to keep pace with ICT, I am learning and learning, without slowing down. I developed an inferiority complex in... about 1995. At that time, I knew very little in ICT. A new colleague with very good ICT knowledge came and helped us with daily teaching activities in ICT....The headteacher pushed us with the computerisation of the school library. We really wanted to cry because of the very tight schedule.... I was a senior member and the head of the resource allocation committee which also looked after the ICT resources...
Quite honestly, my inferiority complex was developed because I was a senior group leader but I had limited knowledge in ICT. I had to get assistance from members much younger and junior than me. Over time I became more tolerant to the reaction of other colleagues, but this kind of feeling was hidden deeply in my heart.

Excerpt 52, Interviewee 13C (Teacher of School-13)

Having listened to the uncomfortable feeling expressed by the Teacher 13C, it seemed critical to interview the headteacher in this school. However, the interview was eventually denied, even though invitation had been offered several times.

Among the headteachers being interviewed, most of them believed that the situation had improved in recent years, even if the ICT environment was problematic at the very beginning.

[Question: Is there any teacher who still resists ICT?]
No!
[Question: Was there any problem a few years ago?]
Yes! The senior teachers were refusing to use computers.
[Question: When did the situation begin to change?]
In 1997/98 teachers were resisting ICT. Beginning about 1999/2000, however, the government pushed ICT and teachers were forced to adapt. From BIT [basic] level to UIT [upper] level, you have to learn ICT and achieve the standard. Just like teaching English, teachers must obtain a certificate. Otherwise, you must “go home” [i.e. quit the job]. It is a requirement and there is no other choice.
[Question: Teachers are forced, but not willing to do it... ]
Yes, they are forced to do it. However, you will not find it hard when you get familiar with it.

21 This “new” teacher was probably Interviewee 13A.
To take the post of a headteacher also requires certain qualifications. The government will not promote a person to headteacher who doesn't have such qualifications. We must follow the rules set by the government. Many years ago, a headteacher could assume the position first and then learn the leadership skills through practice. It has totally changed. You won't be considered [for the post of headteacher without the qualification]. "Troubles" [requirements] are not only created for teachers, but also for headteachers.

Excerpt 53, Interviewee 07A (Head of School-07)

Interviewee 07A realized that there might be some pressure on the teachers who could not pick up the required skills quickly. They even faced dismissal if they did not adapt to the new ICT requirements. It was also interesting to note his comparison of the requirements for teachers with the special requirements for headteachers today.

The following interview was made with Interviewee 09A who believed that her teachers were not been forced to use ICT, but instead were encouraged to broaden their skill set.

[Question: Have you heard any complaint of increased workload from your teachers since the introduction of ICT to your school?]

Never! However, since the implementation of ICT in education, the government requires teachers to prepare themselves thoroughly and achieve the BIT [basic] and IIT [intermediate] standards. Teachers are therefore required to have proper training. Obviously, the new standards will place certain kinds of pressure on teachers.

In our school, however, we are encouraging teachers to develop these skills, rather than forcing them upon the staff. There is no strict requirement of percentage of teaching that must be prepared with ICT. We have the following directions: First, we get all equipment and facilities ready and convenient for teachers to use. Second, we encourage teachers to share among themselves. In so doing, we hope they will learn the benefits of ICT. In our case, teachers will not feel great pressure since we have never forced them to use ICT.

[Question: Are they willing to use ICT now?]

I suppose that teachers will use ICT to prepare their lessons. In the weekly lesson-preparation meeting for Chinese Language, English Language, and Mathematics, any software which is found to be useful is recommended to other teachers.

[Question: Do you think that your school has sufficient computing equipment?]

Sufficient! Very Sufficient! The network is ready and every classroom is networked. We have video projectors. All hardware facilities have been well prepared. We are not looking for a supplier to improve our Internet... Teachers can find all material they want when connecting to our servers.

Excerpt 54, Interviewee 09A (Head of School-09)

In the interview, head 09A repeatedly emphasized that the school possessed adequate ICT facilities and teachers were encouraged to use them. Like some other headteachers, she did not point out any current difficulties or pressure on teachers.
Discussion

The advantages of using of probes (Powney J. & Watts M., 1987, pp. 138, 139 & 173) had been proven in conducting these interviews. At the beginning, interviewees usually talked about commonly known “general” views but were reluctant to elaborate further “stories.” However, when the interviewees ran after twenty or thirty minutes, some interviewees started to show their unhappiness, complaint, or even anger, towards the policies in the ICT implementation. Resulting from proper probing, some interviewees exposed certain views or facts which were originally hidden.

For instance, Interviewee 10A disclosed that one of his colleagues took earlier “retirement” mainly due to the unaffordable pressure in ICT implementation (Excerpt 47). Another teacher told us, after some probes, that some teachers passed the ICT proficiency qualifications by preparing the required assignments by means of improper ways (Excerpt 35 & Excerpt 43). Another teacher heard that her colleagues chose to pay for external assistance in the preparation of question papers because of having inadequate computer techniques. (Excerpt 51). In some cases, interviewees changed their attitudes from a mild complaint to a vigorous criticism after probing by the interviewer. For instance, a change in the strength of complaint, or anger, could be observed between Excerpt 28 and Excerpt 29, both from Teacher 11B. A headteacher believed that pressure was put not only on teachers but also on headteachers because they had to fulfil special requirements for this rank (Excerpt 53). It was interesting to know that for some teachers, “teaching” their colleagues was more difficult than teaching pupils simply because punishment could not be used (Excerpt 32).

Other issues discussed earlier, such as the impact of LPAT on teachers (Excerpt 7), the opinions on QEF (Excerpt 1 and Excerpt 2), and the “mocked up” lessons for “show” in front of inspectors and observers (Excerpt 49) were “discovered” during the interviews. The discovery of all these interesting, exciting or critical points proved the strong potential of semi-structured interviews which were currently used throughout this chapter. These data could not be easily uncovered through survey, structured interviews, or any other structured data collecting methods. As mentioned earlier in this chapter, the current method was able to discover “hidden” information because the data collector, that is, the interviewer, was not tied to a rigid set of questions and it allowed interesting research threads to be followed during the process.

Summary

1. Overall, most interviewees considered ICT an important addition to the schools (as in Excerpt 11 and Excerpt 12, etc.) There were a few exceptions, however, such as Excerpt 21. On the other hand, many interviewees felt the implementation was problematic.
2. Many teachers and headteachers argued that school-based training is an economical, effective, and content-relevant way for teachers to acquire ICT skills and knowledge. It is clearly important to improve further this means of training. Moursund (1997b) also pointed out that a technology leader in each school would contribute to the overall effectiveness of ICT in technological applications. In our interviews, Teachers 11B and Teacher 13A were recognized as such technological leaders in their schools. They were found to be helpful to improve the culture of ICT usage in their own schools.

3. Training courses held by external parties were usually inadequate. Course contents or material being used in teacher training were usually focused on operational techniques, such as word processing, spreadsheets, video editing, and so on. Curricular or pedagogical materials were rarely covered. Many interviewees complained about these courses (see, for example, Excerpt 26, Excerpt 29, Excerpt 35 and Excerpt 43). Those courses were inflexible and not optimised for different situations in individual schools. Moreover, some interviewees complained about the informal sharing workshops or forums, which often lacked direction (Excerpt 33). All these points made school-based training more welcomed by teachers and headteachers.

4. It was interesting to learn that money was not a major concern in some schools (see, for example, School 08 in Excerpt 2). Some interviewees even mentioned that money would be wasted if other obstacles were not removed (Excerpt 5, Excerpt 7 and Excerpt 30). Other argued that money cannot improve the situation if the entire policy is failing (see Interviewee 12B in Excerpt 34). Similarly, neither hardware nor other physical resources had been reported as major obstacles.

5. Many teachers pointed to new and onerous time demands, such as the preparation of project proposals or reports for QEF-funded projects (see, among many others, Excerpt 4, Excerpt 5, Excerpt 6 and Excerpt 7). A teacher even complained about the LPAT which was also “wasting” teachers' time from doing other constructive teaching practice (Excerpt 7).

In certain schools, teachers were required to prepare examinations and assignment papers using computers (e.g., School-10 in Excerpt 46 and Excerpt 47). This applied great pressure on some teachers who were not able to pick up Chinese keyboarding skills. Again, it is common to observe the confusion between ICT-based pedagogical skills and this kind of ICT-based clerical work. It is hard to understand why such clerical tasks cannot be offloaded to teaching assistants or other support staff.

There have been rumours in some schools that teachers are required to prepare a certain number of computer presentations per year (Excerpt 36). We just hope that this kind of rumour is not true.

6. Some teachers were upset because a rapid introduction of ICT was not matched by good training and support (Excerpt 4). In one cases, a teachers was feeling so bad that she developed an "inferiority
complex" (Teacher-13C in Excerpt 52). In the worst cases, psychological disorders may develop in these teachers. Fortunately, this was not found in any interviewee. However, it was reported that an experienced teacher resigned from her position due to the stress imposed by ICT implementation (Interviewee 10A in Excerpt 47). The educational authority should be aware of this kind of pressure on teachers and should take some proactive measures to combat it. It should help teachers recognize that ICT is able to help them relieve certain job-related pressures, and not just create new ones.

7. On the other hand, it was interesting that some felt a new ICT coordinator might not have sufficient negotiating power or authority to request for any changes to old practices (Excerpt 38). Experienced teachers usually did not trust these colleagues (Excerpt 40). Some ICT coordinators, moreover, did not have confidence in themselves (12C in Excerpt 41).

8. Headteachers might be aware of the differences and resistance but they might not see how grave the problem is at the school level. The government also ignored the difficulty of carrying out ICT implementation. People in the community, government officials, and even educators were sometimes hoodwinked by the attractive presentation of ICT. The situation “on the ground” seems much less successful.

9. Teachers at different skill levels tended to approach ICT differently. Even in schools with a high level of computer usage, e.g. School-13 which was a pilot school in running ICT, the variety of ICT-competence levels for different teachers was also significant. Such differences were evident in Excerpt 50 and Excerpt 51. In these two interviews, the teachers served in the same school but held radically different opinions of ICT and its utility in the classroom.

10. Headteachers usually felt more optimistic about ICT than teachers. This happened even for teachers and headteachers in the same schools. For instance, the headteacher of School-12 mentioned that he would report to the Education Department that ICT was running smoothly in his school (Excerpt 48). In contrast, a teacher in his school complained mightily about the new movement (Excerpt 49). The ICT coordinator in this school also criticized the overall ICT programme (Excerpt 43). Clearly, there are great discrepancies between the perceptions of the headteacher and other staff members in this school. A similar divergence of opinion was found at School-11. Although there were some complaints from the headteacher about ICT implementation, they were mild (Excerpt 27). In contrast, Teacher-11B vigorously criticized the programme even though he was the most ICT-competent teacher in the school (Excerpt 28, Excerpt 29 and Excerpt 30).

11. We might deduce the following about knowledge flow regarding the ICT programme: First, the intermediate or top official in the educational authority might not be aware of such problems within primary schools, because the headteachers themselves were not aware of them and did not report them.

22 The Educational and Manpower Bureau (EMB) of the Hong Kong SAR government.
to their superiors. Second, the educational authority seems not to have received any complaints about the programme from those working at the school level. All ICT activities in classrooms have been well presented in front of inspectors or guests, a fact pointed out by some teachers (e.g. Interviewee 12B in Excerpt 49).

12. It seems obvious that ICT could help pupils who cannot concentrate when using conventional instructional materials. For instance, the headteacher in School-01 described its Digital Library Project as a success (Excerpt 1). This was merely a casual observation, and the Digital Library Project is not itself a product of ICT. Playing computer games — even if one is at full attention — does not necessarily improve one's learning. Whether ICT is able to improve the mathematical skills, problem solving skills, language proficiency, cooperation or other personal attributes has not been determined. As some interviewees pointed out, such as 02A, ICT often looks good on the surface, but it does not necessarily lead to the pupils' long-term personal development. More research should be done in these areas to determine the effects of ICT on specific educational outcomes.
Chapter 6  Conclusions and Recommendations

*I never did give anybody hell. I just told the truth, and they thought it was hell.*

_Truman, Harry S. (1884 - 1972)_

Overview

In Chapter 2, Table 2-1 illustrated several common motivations to deliver ICT in education. Half of these are more or less related to economic growth or competitiveness. These motivations are also observed by Selwyn:

... underpinning most if not all of the educational technology policies over the last twenty years has been a powerful rhetoric regarding the use of technology-based learning to re-skill and up-skill the workforce and increase the country's economic competitiveness.

_(Selwyn, 2002, p. 178)_

There is strong evidence that political or economical issues are the driving force of the ICT initiatives. In fact, many government leaders, such as the previous Chief Executive of the Hong Kong SAR government and the Prime Minister of the British government, have committed a large amount of resources to the use of ICT in education. One of the main goals of such efforts is to improve education and, in turn, to enhance economic competitiveness. Their views have been covered in the Introduction chapter. The next problem is to determine the outcomes of the “investments” in these domains.

In addition to summarizing the findings of earlier chapters, this Conclusion chapter attempts to correlate, or triangulate, the findings from the quantitative and qualitative techniques based on the triangulation model (see Table 3-4 and Figure 3-4). Under this principle, convergent findings from different parts of the study will strengthen each other. In contrast, contradictory findings in different parts of the study will weaken each other. The former scenario strongly supports the findings while the latter implies a need for further study. Let us begin with Table 6-1, which shows the triangulation of various preliminary findings:
Table 6-1 Summary of inferences from triangulation

<table>
<thead>
<tr>
<th>Finding</th>
<th>Data Source</th>
<th>Survey in HK</th>
<th>Interviews in HK</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>The use of ICT is good for teaching and learning</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>Convergent findings – Positive</td>
</tr>
<tr>
<td>Teachers are overloaded</td>
<td>✓</td>
<td>✓ ✓</td>
<td></td>
<td>Convergent findings – Positive</td>
</tr>
<tr>
<td>Training is a problem</td>
<td>?</td>
<td>✓ ✓</td>
<td></td>
<td>No convergent finding – Further study desirable</td>
</tr>
<tr>
<td>Physical resources are a problem</td>
<td>×</td>
<td>× × ×</td>
<td></td>
<td>Convergent findings – Negative</td>
</tr>
<tr>
<td>ICT resources are cost-effective</td>
<td>×</td>
<td>× × ×</td>
<td></td>
<td>Convergent findings – Negative</td>
</tr>
<tr>
<td>Schools heads are more optimistic than teachers</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓</td>
<td></td>
<td>Convergent findings – Positive</td>
</tr>
<tr>
<td>The ICT coordinator scheme has been successful</td>
<td>×</td>
<td>× × ×</td>
<td></td>
<td>Convergent findings – Negative</td>
</tr>
</tbody>
</table>

Legends: “✓” = positive findings; “×” = negative findings; “?” = no strong evidence on either side

Again, the summary in this chapter is drawn essentially from HK Heads and HK Teachers. Findings from UK Heads are included for comparison.

Overall Findings

Several main research questions defined in the scope of study are recapitulated in Table 6-2. Several key points matching these research questions are also listed. In this chapter, findings from different parts of this study are consolidated according to these key points.

Table 6-2 Mapping the main research questions to key points

<table>
<thead>
<tr>
<th>Main Research Question</th>
<th>Key Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>As perceived by primary school heads and teachers, what are the benefits and pitfalls of ICT for teaching?</td>
<td>Benefits and Pitfalls</td>
</tr>
<tr>
<td>What are the difficulties experienced by headteachers and teachers during the implementation of ICT in primary schools?</td>
<td>Major Obstacles</td>
</tr>
<tr>
<td>Have the resources spent in ICT actually improved teaching and learning?</td>
<td>Cost Effectiveness</td>
</tr>
</tbody>
</table>
Benefits and Pitfalls

The contributions of ICT in education have been discussed in Chapter 2. One of the main theoretical frameworks is Vygotsky's ZPD model. ICT is often assumed to help bridge the gap between the actual and potential development levels of children (Luckin, 2001).

In practical terms, ICT can take many different roles, such as simulations, tutors, drill-and-practise, and information facilitators. ICT is also supposed to support learning activities through improving communications, discussions, collaborations, and information searching and dissemination (Alessi and Trollip, 2001; Collis, 2002; Kwok and Eastham, 2002). These form part of a longstanding claim: computers can enhance learning and “technology is where the future is” (Ferneding, 2003, p. 226).

Other supposed benefits of ICT were introduced in Chapter 1. Many researchers believe that the use of technology must be a “good thing” in education (Selwyn, 2002, p. 3). Unfortunately, the educational effects of ICT are not as great as most people have assumed (Veermans and Tapola, 2004).

On the other hand, the effects of ICT in education are not one-sided. Besides some obvious benefits, certain researchers have pointed out the negative effects of ICT, such as the problems of supervision. In well-networked classrooms, teachers frequently face a dilemma in the supervision of their pupils, as noted by Lai:

If students are encouraged to surf the Internet freely, teachers are concerned that they may access materials considered to be inappropriate. Close supervision, [and] screening out materials by using a filtering software... may or may not solve the problem, and these strategies may revert the teacher's role to that of knowledge provider.

(Lai, 2002, p. 346)

Moreover, the dehumanising effect of technology and the problem of over-reliance on computers are two other issues. The dehumanising effect of technology has been discussed briefly in Chapter 2. Ferneding (2003) noted many educators who are greatly concerned about this issue. For example, a school head in her study “worried specifically about computer technology’s possible dehumanising effects and the inculcation of superficial and passive learning” (p. 225). Some other teachers also feared the “dehumanisation, increased isolation, and potential loss of socialization skills” induced by ICT (p. 225). One teacher even suspected that “ADD/ADHD was related to the effects of too much stimulation from an information and media-saturated culture” (pp. 225-6). Unfortunately, such worries were rarely addressed and “these fears were assuaged by the assumption that electronic technology would, somehow, generally improve the quality of education” (p. 226).
As pointed out in Chapter 2, over-reliance on technology, for example, on the use of simulation in replacement of "real" science labs, has been observed and can be a "huge pedagogical error" (Ferneding, 2003, p. 226).

As discussed in the summary of Chapter 5, most participants in the interview study agreed that ICT is important to current teaching practices (item 1). However, many interviewees did not have sufficient confidence to use ICT effectively in their lessons. In the survey study, it was also shown that most respondents believe ICT has an essential role in teaching and learning (see Question 15 in Figure 4-8). It was also observed that HK Heads are more convinced of the importance of ICT.

Regarding the utility of ICT in individual subjects, less than 50% of HK Teachers rated ICT as being useful in most subjects, while more than 50% of HK Heads gave positive ratings in these questions (see item 5 in the summary of Chapter 4).

The interview study also generated some findings similar to the survey study. For instance, most interviewees had positive overall perceptions regarding the use of ICT in their schools. However, they rarely pointed out the specific benefits of ICT. Some told the interviewer that ICT produced instantaneous appeal to the children, that is, the triggering effect.

For example, the "digital library" implemented in School-01 was claimed to be a successful project by the school head (Excerpt 1 and Excerpt 15), since it apparently attracted children who could not concentrate on conventional teaching material. Pupils, supposedly, were "happy to visit the library [which contained plenty of electronic media]" (Excerpt 15). However, no evidence reveals whether this "catch" effect will lead to improved educational outcomes (Veermans and Tapola, 2004).

Another school head had a different opinion regarding the digital library. He believed that children could benefit more from a "conventional" library than the digital library (Excerpt 21). He thought that the attractiveness of the digital library to pupils was merely an impression of "beautiful packaging."

Although none of the interviewees used the terms "triggering" or "catch" effect to describe the potentially false picture painted by ICT, a few of them were aware of these apparent effects (e.g., Excerpt 21). Other interviewees also noticed the possible "side-tracking" effect of digital media (e.g., Excerpt 13). Nevertheless, the majority who admired the "benefits" of ICT usually could not point out whether the triggering effect was associated with any persistent educational advantages to children.

Another issue identified in the interviews was the discrepancy between school heads and teachers. School heads usually felt more positive about the effects of ICT in teaching and learning. In contrast, teachers were frequently less positive (item 10, Summary in Chapter 5). It could even be said that some teachers were pessimistic about ICT (e.g., Teacher 12B in Excerpt 18, Excerpt 19 and Excerpt 20).
Such strongly contradictory perceptions indicate a remarkable gap between the heads and teachers. Some remedies will be discussed later in the recommendations.

According to the principle of triangulation adopted in this research project, convergent findings in both the quantitative and the qualitative parts of the study reinforce the strength of the findings. In this case, we have convergent evidence that (a) HK Heads and HK Teachers typically feel positive about the use of ICT at the school level; and (b) HK Heads feel significantly more optimistic than HK Teachers.

In practice, however, there has been insufficient evidence to indicate how ICT generates educational benefits. All benefits are thus imagined or “taken for granted” (Selwyn, 2002, p. 3), instead of proven empirically. This is clearly an area that needs further investigation.

Major Obstacles

There are many potential obstacles standing in the way of ICT implementation at schools. Several of them, namely, computer facilities, time, software, training, space, local supporting staff and remote support, were raised in questions 20 and 21 of the questionnaire. The responses to these questions showed that computer facilities (hardware) were regarded as an important factor by HK Teachers, HK Heads and UK Heads (see Table 4-10). However, these resources were not thought to be in serious shortage (see Table 4-11). In the interview study, none of the participants described hardware as a limiting factor in ICT implementation (see item 4 in the summary of Chapter 5). Some even mentioned that hardware facilities were already more than sufficient (Excerpt 2). These convergent results strongly suggest that hardware is not the most desired resource at the school level.

In contrast, “time” was considered the scarcest resource by all three groups of respondents in the survey (see item 7 in the summary of Chapter 4). In the interviews many teachers also complained about the heavy workload in various tasks and reported that there was not sufficient time to apply ICT meaningfully (see item 5 in the summary of Chapter 5). Again, since the findings from the quantitative and qualitative parts of the study were convergent, there is strong evidence that time is the most desired resource at the school level.

As reflected by the interviewees, insufficient or ineffective professional development is an essential problem that limits the outcomes of ICT in education (see items 3 and 5 in the summary of Chapter 5). However, this issue was not highly rated by HK Heads and HK Teachers in the survey (see Table 4-11 and Table 4-12). The cause of these inconsistent findings is not clear without further study. However, a possible reason may be the ambiguity of the definition of “in-service training.” For example, the survey respondents might have thought that “training” had a narrow meaning of formal training courses held by training organisations. School-based training and peer-to-peer learning might therefore have been excluded. This is definitely a
limitation of survey studies, that is to say, respondents may only get the "surface" meaning of the questionnaires. This is very different from an in-depth interview, where the interviewer and the participant can discuss interactively to get the most accurate data from the respondents.

In sum, although training was considered a very important factor in the interview study, this finding was not supported by the survey study. Further investigation on this topic is therefore highly desirable.

There were some cases in the interview study where teachers described feeling helpless when encountering difficulties at school. In one case the teacher was so upset that an inferiority complex was developed (see item 6 in the summary of Chapter 5). In another case it was reported that a veteran teacher resigned from the post because of the feelings of helplessness caused by ICT in teaching. These may be the result of existing communication problems and even poor relationships between different levels in the educational hierarchy. This kind of communication failure will be re-visited in the Recommendation section.

In the survey study, the contribution of ICT coordinators was recognized by some of the respondents. The mean responses and the differences between subgroups have been discussed in Item 8 in the summary of Chapter 4. In-depth perceptions which were not obtained in the survey study were collected in the interview study.

In the interviews, it was similarly found that the school teachers made more serious complaints about the ICT coordinators scheme than did the heads. Several approaches for the appointment of ICT coordinators were shown in Table 5-2. The teachers especially pointed out that externally-hired ICT coordinators who did not have teaching experience were not able to play this role effectively (Excerpt 40). However, school heads did not have such complaints. From the survey in the UK, it was found that UK Heads were probably even more satisfied with their ICT coordinators than were the HK Heads, although the difference is not statistically significant.

Cost Effectiveness

As discussed in Chapter 1, there have been claims that the incorporation of ICT in education will be a cost-saving alternative, replacement or supplement to traditional pedagogy. Unfortunately, it turns out that a vast amount of money and other resources have been spent to feed ICT-related demands. There has been no evidence of cost-saving up to the present moment.

As shown in Table 1-1, Figure 1-1, Figure 1-2 and other figures collected in Chapter 1, there has been a large amount of money spent on ICT in the educational systems of both Hong Kong and the UK. This means that money allocated to other areas has probably been "diluted", since educational funding is not a limitless
resource. ICT may even become a “black hole” that hungrily absorbs money in the education sector, if such expenses are not well controlled.

Questions 17, 18 and 19 in the questionnaire were related to the cost effectiveness of ICT resources covered by public money. HK Heads gave a mean rating of “slightly agree” to “fairly agree” in these questions. HK Teachers, however, gave a significantly lower rating regarding the cost effectiveness of ICT (see item 4 in the summary of Chapter 4).

The opinions in the interviews varied. Some interviewees had very positive opinions regarding the implementation of ICT (e.g., Excerpt 11, Excerpt 12 and Excerpt 14). They thought that the implementation of ICT had been cost-effective. Other interviewees, however, had concerns about this issue (e.g., Excerpt 17 and Excerpt 19). Some interviewees even thought that computer facilities had been over-deployed and that there was insufficient manpower to support them (see item 4 in the summary of Chapter 5). No interviewee complained about insufficient hardware investment, but there were lots of complaints about unmatched human resources and professional development. The quality and appropriateness of training courses for teachers were even described as “a waste of resources” (Excerpt 30). Such training courses, as well as the excess workload discussed previously, were also important factors that undermined any sense of ICT cost effectiveness.

Recommendations

As introduced in Chapter 2, the role of ICT being a supplement (but not replacement) for teachers should be emphasised, particularly in the area of improving pupil-to-pupil and pupil-to-teacher interaction. Nevertheless, in addition to its potentially beneficial effects, the following issues should be brought to attention.

To Use but not Abuse ICT

Most participants in the interview study, with a couple of exceptions, supported the use of ICT in teaching, although the actual advantages of ICT are not yet well understood. As Alessi and Trollip describe it:

*Although none of these situations guarantees that a computer will be beneficial as a vehicle for delivering instruction, they increase the probability of success.*

*(Alessi and Trollip, 2001, p. 6, emphasis added)*

Increase in probability implies a greater chance of success, but not necessarily a 100% guaranteed success. Even so, ICT should be encouraged in education, but used with great care.

It should be noted that ICT is sometimes, but not always, a good medium for teaching and learning. For example, computer simulations are good replacements of some experiments in the “conventional”
curriculum. However, in many situations real, “hands-on” science labs have distinct advantages and are not replaceable by simulation (Ferneding, 2003, p. 226).

Computers should be treated as a supplementary medium, but not necessarily the only or mandatory vehicle for all pedagogical purposes. In fact, there are plenty of instructional media, including ICT and many others. Alessi and Trollip (2001) argued that ICT is not always the best solution for teaching. In different situations, individual medium have their own advantages:

... we would sometimes find an advantage for books, sometimes teachers, sometimes film or video, sometimes peer-tutoring, sometimes hands-on field experience, sometimes listening to an audio tape, sometimes computers. Not surprisingly, across these many studies, which utilized a variety of topics, learners, and situations, little or no overall effect was found in favor of a single medium.

(Alessi and Trollip, 2001, p. 6, emphasis added)

An interviewee also expressed a similar view that ICT is only “one of many teaching techniques” (Excerpt 22). The computer is clearly not a one-size-fits-all jacket for education. In considering instructional media for a particular purpose, other media should not be excluded from the selection pool. As pointed out by Selwyn (2002), “ICT should not necessarily be seen as providing better educational contexts, but different contexts for learning” (p. 177).

Teachers should be able to select the most suitable teaching medium for particular subjects because “not all subjects fit to all instructional forms” (Rindermann, 2002, p. 325). In this sense, teachers should not be biased in favor of ICT-based medium. They should be able to differentiate the suitability of different media and judge the most “adequate use of media and programs for selected subjects” (p. 325). In order to achieve this purpose, any professional development programme should aim to equip teachers with this kind of capability.

Studies show that some pupils are more suited to ICT-based materials while others are more suited to human-led instruction. When ICT is useful, it tends to serve high attaining students. In contrast, low achieving children were found to benefit less from ICT-based instruction. As pointed out by Rindermann (2002), “it is evident that students with higher intelligence benefit more from this technology [ICT]” (p. 324).

Nevertheless, it is very interesting that some interviewees appreciated that ICT helped children who found it difficult to concentrate using conventional means (see, for example, Excerpt 1). This seems to contradict the findings in Rindermann (2002), as well as Olkinuora et al. (2004). It was suggested that “the open and interactive tools of multimedia might be too challenging or require too much self-regulation for less advanced students” (Olkinuora et al., 2004, p. 17).
As suggested in Excerpt 1, the use of ICT-based media "successfully" helped children who had difficulty concentrating. However, such apparently positive "effects" may hide the need for treatments for these children with concentration or other problems. In-depth investigation of ICT for low attaining children is certainly an area for further research.

To Bridge the Communication Gap

In the survey study, HK Heads and HK Teachers expressed different opinions on many issues (see, for example, items 3, 4 and 5 in the summary of Chapter 4). It was surprising that stakeholders in the same educational system (Hong Kong) held such different opinions about fundamental issues. The difference was even greater than between school heads from different educational systems (HK and UK). Interestingly, it seems occupational position may influence stakeholder opinions. In the current situation, the position of a school head may block the way he/she can see or listen to external opinions and data. Such divergent opinions will become a communication gap between heads and teachers. Without effective communication between themselves and teachers, the schools heads may not see clearly what are the actual difficulties facing ICT implementation.

In addition to the survey, the interviews reveal that many teachers have complaints regarding ICT policy set by school heads and policymakers. Teachers keep on complaining but it seems they have not been heard. The school heads should digest the opinions from teachers and, if appropriate, pass them on to the educational officials. However, this does not seem to be happening at the school level in Hong Kong.

If a gap in attitudes between HK Teachers and HK Heads exists, it can lead to serious problems. School heads may think that everything is working fine, when in fact it is not (see item 10 in the summary of Chapter 5). In turn, the heads will report to the upper level in the bureaucratic structure what they believe to be true. Thus, teachers have many complaints, but no way to communicate to the policymakers. Nobody actually listens to the difficulties faced by teachers. Consequently, their views are not considered and no improvements are made to ICT implementation.

It is difficult to explain the great discrepancy in opinions between HK Heads and HK Teachers. However, there are some "clues" in the study. It is natural for most people to hear or see "good" things. Schools heads or officials in the upper levels of the bureaucracy probably think that teachers are trying to find excuses to escape from their "responsibilities." This kind of tangible or intangible pressure coming from the "top" of the educational bureaucracy will discourage teachers from communicating the truth.

Teachers are not trusted fully, as described above and in item 7 in the summary of Chapter 2. When ICT was not well implemented in schools, teachers were the first to be blamed, though it seems very unfair to them. Referring to previous findings, teachers are always described as "reluctant" or "susceptible to changes"
In order to “protect” themselves from criticism, professional “damage” to their image or even job loss, teachers tend to present good ICT-enriched lessons in front of school heads, guests, or inspectors (item 11, summary of Chapter 5). With this kind of false picture, the real situation can never be ascertained.

An effective communication channel should be established between schools heads and teachers, and between policymakers and teachers. Unless the problems encountered by teachers can be communicated to the policymakers, educational improvement will be difficult to achieve. In fact, the existence of a gap between the policy and implementation levels may also apply to other educational policies, aside from ICT applications.

School heads and policymakers should be forgiving; they should open their ears to listen to potentially uncomfortable information. Teachers should never be pre-judged as “reluctant” or “resistant” to change. Instead of doling out blame, officials should open an appropriate communication channel for teachers to tell their stories. Imposing pressure will likely force them to present a beautiful but misleading picture.

**To Define Clearly the Role of ICT Coordinators**

In Question 37 of the questionnaire, the respondents were asked about the contribution of ICT coordinators at the school level. As illustrated in Figure 4-23 and Figure 4-24, HK Teachers did not rate highly ICT coordinators' contributions, especially when compared with the ratings given by HK Heads and UK Heads.

During the interviews with participants in Hong Kong a lot of complaints were heard, from both teachers and ICT coordinators themselves (see item 7 in the summary of Chapter 5). The duties of ICT coordinators were sometimes ambiguous and overlapped with those of technical support technicians. From all available evidence, the introduction of ICT coordinators to Hong Kong primary schools has been an extremely ineffective, if not totally worthless, scheme. Refreshed from the discussion in Chapter 2, the launch of ICT coordinator plan has not been well-planned. The roles ICT coordinators have not been clearly defined (see item 11 in the summary). It is unclear, for example, whether ICT coordinators are meant to work on the operational side or the pedagogical side of the school’s mission.

In contrast, the role of ICT coordinators in UK primary schools has been clearly defined. They are mainly pedagogical leaders in ICT, with little or no duties in technical support. On the other hand, ICT coordinators in Hong Kong are rarely, if ever, treated like that. ICT coordinators should be regarded more like teachers. Routine tasks in technical support should never bother teachers, including ICT coordinators. In an observed school in the UK, “the ICT coordinator was established freedom to plan ICT activities and draw in staff as appropriate” (Lawson and Comber, 1999, p.48).
To Create Better Environments for Teachers

A teacher is also a learner. A good teaching and learning environment is necessary not only for students, but also for teachers.

The school heads, government officials and the public are happy to see “beautiful packaging” (Excerpt 21). Many observers of ICT in the education confuse good presentation skills with good pedagogical skills. Consequently, many external training courses for teachers have been focused on operational skills (see item 3 in the summary of Chapter 5). It seems to be a world-wide problem. In a study of ICT policies in New Zealand, Lai (2002) found a similar issue in their professional development programmes for teachers.

In this professional development program, the focus is still very much skill-based, and cognitively-oriented in nature, with inadequate attention given to the cultural, ethical, and social issues … To be sure, not all professional development programs are skill-based, some have surpassed the training phase and begin to focus on theory-based instruction and consideration on pedagogy of ICT as well as integration of technology into the school curriculum but overall, professional development is still very much oriented towards developing teacher confidence and competence in ICT.

(Lai, 2002, pp. 345-346, emphasis added)

Training programmes in Hong Kong are frequently designed and conducted in a similar “skill-based” mode. Teachers are also expected to produce attractive presentations using the “skills” learned in these “training” courses. In the interviews, many participants were dissatisfied with such training programmes; some respondents even labelled them “a total waste of resources” (Excerpt 30). Many teachers expressed their preference for school-based training or the internal peer-mentoring model. These models of professional development are believed to be more cost-effective and pedagogically relevant to teaching (see item 2 in the summary in Chapter 5). It is therefore strongly recommended that policymakers enhance this kind of internal-support in schools.

Training programmes should not only tell teachers how to use ICT, but also help them decide when to use ICT, since it is only one of many media for delivering lessons. In addition, earlier studies show that some electronic media are more suitable for some children while conventional media are more suitable for others (see, for example, Rindermann, 2002; Olkinuora et al., 2004). Teachers should be smart enough to determine which instructional tool is the best choice for a particular child. This is a main difference between a “teacher” and a “technician.”

Heavy workload or time limitations are also major obstacles against a successful implementation of ICT at the school level (see item 7 in the summary of Chapter 2; item 7 in the summary of Chapter 4; and item 5 in
The workload of teachers in Hong Kong seems to be a serious problem that has never been properly addressed.

As reflected by the interviewees, many trivial or administrative tasks were put on the shoulders of teachers. For instance, teachers are frequently required to prepare their examinations and assignment papers in a presentable format. Some teachers felt very strong pressure when they were unable to meet the "requirements" (see, for example, Excerpt 47). There is no reason to relate directly this kind of operational skill with pedagogical needs. It is therefore reasonable to offload such clerical or operational tasks to teaching assistants or other administrative staff. For certain mandatory ICT-based presentation skills, teachers should be given sufficient learning time to achieve effective results. It should be understood by administrators that, like pupils, teachers are also individuals with unique patterns of learning.

On the whole, the interviews show that teachers have been facing a lot of pressure to match the pace of ICT implementation. They had no other choice but to follow the policies, although some of them might seem like nonsense to "on-the-ground" educators. For them, schools can be "viewed as rigid bureaucracies that offer teachers little freedom and control over their work" (Ferneding, 2003, p. 63). Instead, teachers should be encouraged, instead of compelled, to participate in the game. Above all, as found in the interviews and survey, teachers need more time!

**To Conduct More Research Studies**

From the reference material and data analysed in this study, there is some, but insufficient, evidence to support the benefits of using ICT in education. Therefore, doing more research on the subject is strongly recommended.

Most, if not all, benefits of ICT in education are expected and assumed, instead of empirically well-proven. In certain cross-country studies of the effects of ICT in school environments (Venezky and Davis, 2002), the effects of ICT under a particular environment were classified as either "catalysts" or "levers." Disregarding the nomenclature, there was no study in Hong Kong to evaluate different effects of ICT in education at the level of detail achieved by, for example, Leask and Kington (2001) in the UK.

Evaluation is a large and important topic in educational research (Rindermann, 2002). High quality evaluation of ICT in education in the context of Hong Kong does not yet exist. It is therefore desirable as a future topic in educational research. To help formulate the most appropriate direction for ICT development at the school level, "high quality and creative instructional design coupled with careful evaluation and revision" are necessary (Alessi and Trollip, 2001, p. 6).
As pointed out by Veermans and Tapola (2004), the “catch” and “hold” effects of an instructional medium are fundamentally different and they must be identified before looking into the benefits of something like ICT, whether it is conventional or digital. This kind of differentiation is rarely found in the scholarly literature on Hong Kong. Again, research in this area is urgently needed.

Although the scope of this study was defined exclusively for school heads and teachers, the inclusion of the opinions from different stakeholders, such as legislators, government officials, parents and pupils themselves, will be desirable in any future study.

As discussed in the Research Design chapter, the formulation of a random sampling was limited by the lack of a comprehensive list of teachers in the educational system. In future research, it is therefore highly desirable to get close support from the government, not only for financial resources, but also for the availability of certain securely-maintained data, such as the contacts and schools of service for all teachers. Only the government possesses this kind of confidential data, which are very useful for drawing and reaching the most ideal samples.

Final Thoughts

Of course, the recommendations discussed above may not be completed immediately, but they should be considered seriously, and, if possible, implemented in stages.

In addition to positive thinking in ICT in education, all policymakers, schools heads and teachers should also realise the negative side effects of ICT, such as supervision problems, dehumanisation and over-reliance, as summarised in previous sections. Hereby the author would like to share Oppenheimer’s view in his book, “The Flickering Mind”, to conclude this paper:

... the campaign to put computers in schools was described as a crisis [i.e. “危機”] in the Chinese sense of the word, defined by two characters – one [i.e. “危”] standing for danger, the other [i.e. “機”] for opportunity.

(Oppenheimer, 2003, p. 412, emphasis and Chinese characters added)

ICT is truly a coin with two sides – danger and opportunity. The side on which it lands will depend largely on how the stakeholders handle ICT implementation. In practice, however, most people recognize only the “opportunity” of ICT but overlook its “danger.” It will be a real “danger” if researchers and other educational professionals do not recognize the inherent problems of ICT in education.
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Appendix A  Detailed Workflow of the Survey

1. Prepare questionnaires
2. Print out questionnaire
3. Pass on to intended respondents
4. Fill in questionnaires
5. Return to investigator
6. Label the questionnaires
7. Data processing and analysis
8. Prepare list of intended respondents
9. Merge recipients and questionnaires
10. Send out questionnaire using fax software
11. Fill in questionnaires by intended respondents
12. Fax back to investigator
13. Questionnaires reach investigator's email account
14. Fill in questionnaires by unintended respondents
Appendix B
Sample Letter Requesting for Permission to Conduct the Survey

To : Mr. W. C. Cheng  
Hong Kong Teacher Centre  
Education Department  
HKSAR Government

Date : 24 April 2002

Dear Mr. Cheng,

Request to Conduct a Survey at your Workshops

I am writing to ask you to consider providing me an opportunity to conduct a survey with questionnaires at your workshops being held between May and June 2002. This survey is a part of my graduate research at the University of Leicester under the topic of “The Use of ICT in Primary Schools”.

The participants of your workshop would be a set of ideal samples for my study. Consisting of only two (2) printed pages, the survey won’t take much time. All the collected data will be confidentially treated under professional research practices.

The research is being done entirely for academic purpose, without any commercial interest. A reference letter written by my research supervisor, Prof. Paul Cooper, is enclosed for your review. Should you have any questions, please feel free to contact me by email (research@kpwong.org) or phone (26036660 or 81030003) for further explanation.

Your approval of this survey is vital to the success of this research. Upon your request, a copy of the survey findings will be sent to you when it becomes available.

Thank you very much in advance for your kind assistance!

I look forward to hearing from you very soon.

Yours Sincerely,

Kit-pui Wong B.Sc., M.Phil.  
Researcher  
School of Education, University of Leicester
Appendix C
Covering Note of Invitation for Participation in the Survey (English Translation)

Dear Teachers / Headteachers,

You are cordially invited to participate in the enclosed survey regarding the use of ICT in primary schools. Kindly fill in and submit the questionnaire to us. All collected information will be treated in strict confidentiality, and will be used solely for academic research. You participation will greatly improve this study.

You will receive a souvenir upon the return of this questionnaire.

Thank you very much!
Dear Mrs. Smith,

I am a postgraduate student undertaking research for a doctoral degree under the supervision of Professor Paul Cooper of the University of Leicester. My research topic is "The Use of ICT in Primary Schools" across different countries.

In connection with this study, I would like to invite you to participate in a survey. Kindly fill in the attached questionnaire (2 pages) and fax it back to me at the following number:

0116 290 6300

The questionnaire is private and your answers will be treated in strict confidentiality. The overall findings of the research (which will not divulge any of the participants' details) may be published in academic journals and/or submitted to governments, their related authorities or advisory boards.

Your contribution will be most valuable for the future development of ICT in education.

Should you have any queries regarding this request, please feel free to contact my supervisor, Professor Paul Cooper (Tel: 0116 2523751, e-mail: pwc5@le.ac.uk), or preferably, myself (e-mail: research@kp Wong.org).

You participation will be greatly appreciated. We look forward to receiving your kind reply soon.

Thank you very much!

Sincerely yours,

Kit-pui Wong
Researcher
School of Education, University of Leicester
Appendix E  Final Questionnaire (English Version)

** The Use of ICT in Primary Schools **

Section A

Please make comments about the implementation of ICT in your school.

1. Absolutely Agree
2. Fairly Agree
3. Slightly Agree
4. Slightly Disagree
5. Fairly Disagree
6. Absolutely Disagree

please circle one choice between 1 and 6

1. Your school provides convenient access to computers and the Internet for pupils.
2. Your school provides convenient access to computers and the Internet for teachers.
3. Teachers have easy access to good teaching software.
4. Good training in ICT is easily available for teachers.
5. Technical support, such as a hotline and reference material, etc., is easily available for teachers.
6. There is sufficient space in your school for setting up computer facilities.
7. You are knowledgeable and skilful enough to implement ICT in school.
8. The implementation of ICT in school is a heavy burden for you.
9. You enjoy the process of ICT implementation in school.
10. You are very eager to implement ICT for teaching.
11. It is a simple and easy task for you to help implement ICT in your school.
12. Implementing ICT in school retards your daily teaching and administrative duties.
13. Your colleagues are very eager to implement ICT in school.
14. The headteacher in your school is very eager to implement ICT.
15. ICT plays an essential role in modern teaching and learning.
16. For the time being, there is still strong resistance against the implementation of ICT in your school.
17. In the past 3 years, your school has obtained plenty of financial and other resources from the state/government for the implementation of ICT.
18. In the past 3 years, input of resources from the state/government has significantly contributed to the use of ICT in your school.
19. Generally speaking, the input of resources in ICT has not improved the quality of teaching and learning.

Section B

How do you think about the following resources? (Please fill in the boxes with the resource codes 1-7)

1. Good Computing & Networking Facilities
2. Sufficient Time for Preparing Lessons
3. Good Teaching Software
4. Adequate In-service Training
5. Sufficient Space on Campus
6. Sufficient Supporting Staff on Campus
7. Immediate Technical Support (e.g. Hotline)

20. The level of importance of various resources? (Please fill in the resource codes 1-7)

 Least Essential

21. The level of shortage of various resources in your school? (Please fill in the resource codes 1-7)

 No Shortage

188
Section C

How do you rate the following subjects with the use of ICT?

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please circle one or more choice(s) between 1 and 7

22. Which subject(s) you are teaching or used to teach?

23. In which subject(s) is your school applying ICT extensively?

24. In which subject(s) will you plan to increase the use of ICT?

25. Which subject(s) can be benefited from the use of ICT?

Section D

More information about your school and yourself (strictly confidential)

26. Your gender Female / Male

27. How long have you been working in education? (including this and other schools) _______ years

28. How many hours per day on average do you use computers in school? _______ hours

29. How many hours per day on average do you use computers at home? _______ hours


32. How long has your school been established? _______ years


34. The curriculum in your school 1. Main-stream 2. Special-Ed 3. Foreign Syllabus 4. Other _______

35. Does your school have an ICT coordinator (or equivalent)? No / Yes (If "No", please jump to Q.38)

36. Teaching experience of the ICT coordinator in your school (1) 0 to 0.9 years (2) 1 to 1.9 years (3) 2 to 4.9 years (4) 5 years or above _______


Section E (Optional)

You're welcome to fill in any opinion about this survey, about the use of ICT in education.

Should you wish to obtain the statistical report when it's ready, please also fill in your contact information.

Thank you very much again for your kind participation in this survey

Please FAX it back to 0116 2906300 when finished
Appendix F  Summary of All Participants in the In-depth Interviews

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Note: * H: Headteacher, T: Teacher, I: ICT Coordinator
Appendix G  Preparation and Follow-up of Interviews

1. Extract the contact details from the reply slip in the second pre-study.

2. Phone the target headteachers until they respond (they often cannot be reached the first time).

3. Arrange a time for a meeting (ask them to suggest a meeting time first).

4. Phone again on the day before the actual interview.

5. Arrive 15 minutes ahead of the pre-scheduled interview.

6. Start the interview.

7. Ask the interviewee how much time is allocated for the interview.

8. Introduce the purpose of the interview and ask for permission to voice record.

9. Start the conversation with ice-breaking questions.

10. Go into more in-depth questions (see Appendix H for the Interview Schedule).

11. Continue with the discussions until time is up or there are no further issues.

12. Close the interview.

13. Present the souvenir to the respondents.

14. Ask the interviewee for referral (usually some convincing is needed).

15. Contact the newly referred teacher or headteacher and make invitation through similar steps.
Appendix H  Interview Schedule

**Ice-breaking questions**

- How long has your school been established?
- Has there been any change in pupil and teacher populations since the publication of this information (on the website)?
- The website of your school is very informative. Who is responsible for its design?

**Common questions**

- Do you think that computers are useful in primary education?
- Do you think the usefulness of computers in education has been overstated?
- Do you think there are sufficient ICT facilities, including hardware and software?
- Are you aware of the amount of resources spent by the SAR government for the promotion of IT in primary education? Is it sufficient? In which area(s)?
- How do you rate the “value-of-money” relative to the input of resources?
- What’s the reaction of pupils towards ICT?
- What do you think about the workload of teachers in your schools?
- What do you think about human resources? Sufficient or not? Appropriate or not?
- What about professional development for teachers?
- Do you notice any change in IT usage in your school in the past few (e.g., 3) years? Where?
- If you meet with government officials in education, what will you ask for?

**Conditional questions**

- How long have you been serving this school?
- Do you have any control over the usage of computers by pupils? In what way?
## Appendix I  ANOVA Results Generated by SPSS (Q1–19 and Q37)

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# Appendix J  Tukey HSD Comparisons Generated by SPSS (Q1–19 and Q37)

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* The mean difference is significant at the .05 level.
## Appendix K  Responses to the Open-ended Section (English Version)

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<tr>
<th>Questionnaire No.</th>
<th>HK Head</th>
<th>HK Teacher</th>
<th>UK Head</th>
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<tbody>
<tr>
<td>003</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>The government should increase the annual budget in ICT for the acquisition or replacement of software and hardware. The change in ICT is tremendous every year.</td>
</tr>
<tr>
<td>026</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>It is desirable to have suitable instructional software in the market. Teachers can make use of it with little amendment. In contrast, if teachers are required to prepare instructional software by themselves, they waste a lot of time and effort. Moreover, most teachers already have this kind of ability.</td>
</tr>
<tr>
<td>089</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>Reduce teachers’ administrative work to let them have sufficient time to prepare instructional material and ICT in lessons.</td>
</tr>
<tr>
<td>097</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>The Education Department should not force teachers to prepare instructional software by themselves, but outsource to external suppliers. It helps reduce the workload on teachers.</td>
</tr>
<tr>
<td>099</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>Teachers do not have sufficient time to apply ICT.</td>
</tr>
<tr>
<td>123</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>Computer workshops in schools should be opened for pupils during holidays.</td>
</tr>
<tr>
<td>137</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>More instructional software should be available.</td>
</tr>
<tr>
<td>149</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>More supporting staff should be stationed at schools.</td>
</tr>
<tr>
<td>151</td>
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<td>*</td>
<td></td>
<td></td>
<td>Computerised instructions can be used in Music lessons.</td>
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<tr>
<td>155</td>
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<td>*</td>
<td></td>
<td></td>
<td>Education Department did not provide sufficient support.</td>
</tr>
<tr>
<td>195</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>More training should be provided to teachers in order to raise the quality of ICT.</td>
</tr>
<tr>
<td>213</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>I really hope that more spare time should be available for teachers. There are only two teaching assistants in each school with 24 classes, unlike secondary schools, where teaching assistance is currently provided for each major subject.</td>
</tr>
<tr>
<td>241</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>Support on software and hardware should be evenly allocated.</td>
</tr>
<tr>
<td>253</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>Education Department aims to promote ICT in teaching but it has not provided sufficient resources. Definitely it will fail. It is not moral to increase the workload of teachers without any positive result.</td>
</tr>
<tr>
<td>306</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>More rooms of lesson preparation should be provided. Number of pupils per class should be reduced. The pressure of examination on pupils should be reduced. The administrative structure should be improved.</td>
</tr>
<tr>
<td>Questionnaire No.</td>
<td>Subgroup of respondent</td>
<td>Response (English translation for questionnaire no. 003-566, original English responses for questionnaire no. 578-673)</td>
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</tr>
<tr>
<td>350</td>
<td>*</td>
<td>Many training programmes are not effective, especially those subject-specific programmes. They are wasting participants' time. I suppose that ICT is a supplement, instead of substitute, of learning.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>397</td>
<td>*</td>
<td>Under a tight teaching schedule, teachers do not have any time to design/use instructional software.</td>
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</tr>
<tr>
<td>403</td>
<td>*</td>
<td>ICT support for teachers is not sufficient. Problems always happen on the computers. There are an awful amount of difficulties.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>431</td>
<td>*</td>
<td>Private-sector schools do not yet enjoy any government's funding. Please change the policy.</td>
<td></td>
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</tr>
<tr>
<td>464</td>
<td>*</td>
<td>Improve training for teachers. Provide teachers more rooms for [illegible handwriting] and lesson preparation. Reduce the pupil-to-teacher ratio. ICT can be more efficiently used with such improvements.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>494</td>
<td>*</td>
<td>Uneven distribution of resources does matter. &quot;Focused&quot; schools receive many more resources than &quot;ordinary&quot; schools. However, it is common to compare these two types of schools. Unfair pressure is established. Objectives which are set for the &quot;ordinary&quot; schools are unachievable.</td>
<td></td>
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<tr>
<td>524</td>
<td>*</td>
<td>Number of ICT supporting staff should be increased.</td>
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<tr>
<td>527</td>
<td>*</td>
<td>A projector, an object projector, and a set of computers should be installed in each classroom of all schools. The replacement of illuminating lamps for projectors should be charged to the government.</td>
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<tr>
<td>532</td>
<td>*</td>
<td>The government has spent plenty of resources in promoting educational ICT. I hope that ICT will continue to be emphasized and no budget will be cut.</td>
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<tr>
<td>565</td>
<td>*</td>
<td>I agree than pupils must be equipped with computer skills. ICT should be treated as a tool to help pupils in the collection and renewal of knowledge in order to achieve &quot;Learning to learn.&quot; However, I believe that traditional teaching methods are good at training pupils in thinking and composition.</td>
<td></td>
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<tr>
<td>566</td>
<td>*</td>
<td>The education-related authorities are eager to provide ICT support for schools. Teachers' knowledge in ICT has been raised in recent years. The most essential issue for teachers is to utilize effectively ICT under limited time constraints. The objective is to improve the interests of pupils in learning.</td>
<td></td>
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<tr>
<td>578</td>
<td>*</td>
<td>Our main source of funding has come from outside education. The funding from education is (awfully) small.</td>
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<tr>
<td>583</td>
<td>*</td>
<td>As a very small school, we have limited space. However, we do have an 11 station computer suite, the envy of many other schools!</td>
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<tr>
<td>586</td>
<td>*</td>
<td>Schools are desperate for an ICT technician, so the coordinator can teach ...</td>
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<td>Questionnaire No.</td>
<td>HK Head</td>
<td>HK Teacher</td>
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Response
(English translation for questionnaire no. 003-566, original English responses for questionnaire no. 578-673)

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<tr>
<td>673</td>
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Very costly and takes an unfair proportion of resources when compared with other core subjects.

ICT taught as discrete skills and other lessons where skills are used to enhance learning.

Good co-ordination and resourcing of ICT in schools needs 3 different people: head, ICTC (curriculum rep.) and ICT technician (tech. rep.)

Main problem: small school unable to buy the technical support. We need to sustain 16 mixed computers of varying age and temperament (as are the staff). No time to train staff, properly without detriment to teaching of current pupils – dependent on rapidly ... [illegible handwriting] of sons, husband, etc.

The policy is great! Perhaps we need to consider an audience and why a school has great input or not with ICT. This makes a vast difference!

We find ICT a hindrance rather than a valuable aid to learning.

I personally believe that too much emphasis is put on ICT in primary school – we have neither (time) nor space. Learn the basics now and ICT (later ??) at secondary schools. I know many colleagues share this view.

This was filled in by the ICT coordinator (not the headteacher).

Use of computers in the KSI dept is limited until ½ term when we will have a new computer suite! (2nd in the school)

Wonderful when everything is working ........ [but] too frequently we encounter problems, particularly with printers.
敬愛的老師/校長：

我們誠邀您參與上述研究 — 閣下只須填妥並交回問卷便可。所有資料，絕對保密，亦只會用作學術研究。您的熱心參與，必令此項研究更具代表性。

交回問卷時
可獲贈紀念品一份

謝謝！
Appendix M  Final Questionnaire (Chinese Version)

甲部

評估資訊科技在學校落實的狀況

<table>
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<td>絕不同意</td>
<td>頗不同意</td>
<td>稍不同意</td>
<td>稍為同意</td>
<td>頗為同意</td>
<td>絕對同意</td>
</tr>
</tbody>
</table>

1. 學生可以方便地在學校使用電腦及互聯網（Internet）
2. 教師可以方便地在學校使用電腦及互聯網
3. 教師可以容易地找到優質的教學軟件
4. 教師可以容易地獲得合適的資訊科技培訓
5. 教師可以方便地獲得技術支援，如熱線電話、參考資料庫等
6. 貴校舍內具備足以的空間來安放電腦設施
7. 閣下具備足夠知識和技巧以在學校運用及推動資訊科技
8. 在學校推行及運用資訊科技是閣下一項沉重的負擔
9. 在學校推行及運用資訊科技令閣下感到樂趣
10. 閣下對推行教學上應用資訊科技表現得十分積極
11. 在學校推行及運用資訊科技對閣下是一項輕而易舉之事
12. 推行及運用資訊科技阻礙閣下執行日常教學或行政等工作
13. 其他教師（不包括閣下）對推行教學上應用資訊科技表現得十分積極
14. 貴校校長對推行教學上應用資訊科技表現得十分積極
15. 資訊科技在現代化的學術中將扮演一個不可或缺的角色
16. 直至現在，在學校推行及運用資訊科技的阻力仍然很大
17. 在過去三年，貴校已從政府獲取大量金額及其它資源來推行資訊科技
18. 在過去三年，政府已投入的資源對貴校推行資訊科技有顯著的貢獻
19. 整體來說，已投入於資訊科技的資源並沒有顯著提升教與學的質素

乙部

請排列下列資源於應用資訊科技教學的重要性及其缺乏程度

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>優良的電腦及網絡設施</td>
<td>充分的備課時間（給教師）</td>
<td>優良的教學軟件</td>
<td>合適的在職培訓（給教師）</td>
<td>充裕的校舍空間</td>
<td>充足的駐校技術人員</td>
<td>即時的技術支援（如熱線電話）</td>
</tr>
</tbody>
</table>

20. 各項資源的重要程度（請將資源 1 - 7 按其重要程度填入格中）
    - a b c d e f g 無足夠

21. 各項資源在貴校的缺乏程度（請將資源 1 - 7 按其欠缺程度填入格中）
    - a b c d e f g 極之欠缺
請評價以下學科與資訊科技的關係

1. 中國語文
2. 英國語文
3. 數學
4. 電腦科
5. 常識/科學/社會/健教
6. 美勞/音樂/體育/宗教
7. 其它:

可圈出一個或多個選擇

22. 閣下現在或過往主要任教哪些學科？
1 2 3 4 5 6 7
23. 資訊科技正廣泛地應用於哪些學科？
1 2 3 4 5 6 7
24. 閣下將會在那些學科中加強資訊科技的應用？
1 2 3 4 5 6 7
25. 資訊科技可有效地提升那些學科教學與學的質量？
1 2 3 4 5 6 7

請提供一些個人及學校的背景資料（絕對保密）

26. 閣下的性別？
女 / 男
27. 閣下服務教育界多久（包括現職及其它學校）？
_______年
28. 閣下平均每天在校內花多少時間使用電腦？
_______小時
29. 閣下平均每天在家中花多少時間使用電腦？
_______小時
30. 閣下的職務？
1. 校長 2. 副校長 3. 訓導主任 4. 科目主任 5. 教師 6. 資訊科技總策員 7. 其它_______
31. 閣於校內推行資訊科技的參與程度？
1. 沒有參與 2. 閣中協助推行 3. 經常協助推行 4. 主要負責人
32. 貴校創校至今有多久？
_______年
33. 學校的運作模式？
1. 官立 2. 津貼 3. 私立 4. 直資 5. 其它_______
34. 學校的課程類型？
1. 主流課程 2. 特殊教育 3. 國際學校 4. 其它_______
35. 貴校聘有資訊科技總策員（ITC）嗎？
沒有 / 有 （如沒有，請跳往第38題）
36. 貴校的資訊科技總策員具備教學經驗嗎？
(1) 0-0.9年 (2) 1-1.9年 (3) 2-4.9年 (4) 5年或以上
37. 資訊科技總策員對貴校的貢獻如何？
1. 極大貢獻 2. 頗大貢獻 3. 有些貢獻 4. 毫無貢獻
38. 貴校學生的平均學業水平？
1. 高 2. 中上 3. 中下 4. 低
39. 貴校學生家庭的平均家庭收入？
1. 高 2. 中上 3. 中下 4. 低

戊部（可選擇性填寫）

歡迎閣下對是項調查、有關當局的政策、及至於任何有關資訊科技應用於小學教育提供寶貴的建議。
如想收到統計結果，亦請填上聯絡資料：

完成後 請傳真至 81052468

再次感謝 閣下參與這問卷調查及提供的協助
### Appendix N  Responses to the Open-ended Section (Chinese Version)

<table>
<thead>
<tr>
<th>Questionnaire No.</th>
<th>HK Head</th>
<th>HK Teacher</th>
<th>UK Head</th>
<th>UK Teacher</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>003</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>政府應增撥每年的IT經常費，用作購買或更換軟硬件，因IT每年的變化很大</td>
</tr>
<tr>
<td>026</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>如坊間有合適軟件，教師只需修改便能應用，如需教師親力親為製作軟件，十分需時及費力，而部分教師未有這種能力</td>
</tr>
<tr>
<td>089</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>減少教師的行政工作，讓教師有更充足的時間備課及IT於教學工作上</td>
</tr>
<tr>
<td>097</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>教育不應指令學校教師製作教學軟件，而是外聘負責，免增加教師教學負擔</td>
</tr>
<tr>
<td>099</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>教師沒有時間去應用資訊科技</td>
</tr>
<tr>
<td>123</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>學校的電腦室需於放假中開放給學生使用</td>
</tr>
<tr>
<td>137</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>多提供可供電腦用的教學軟件</td>
</tr>
<tr>
<td>149</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>可多派技術人員駐校</td>
</tr>
<tr>
<td>151</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>電腦教學可以應用在音樂科上</td>
</tr>
<tr>
<td>155</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>教署支援不足</td>
</tr>
<tr>
<td>195</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>應提供更多在職培訓給予老師以提高質素</td>
</tr>
<tr>
<td>213</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>真是希望能為教師提供多些空堂，每校有24班，但教學助理只有兩個，連校長也找他們做工作，不像中學，重要的科目可各有一個助理，這使教學助理沒有時間替我們籌備IT教學</td>
</tr>
<tr>
<td>241</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>宜平均地提供足夠軟、硬件支援</td>
</tr>
<tr>
<td>253</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>教署一方面想大力推行資訊科技教學，另一方面卻沒有相應足夠的資源配套，最終只會導致失敗，教師的工作量也大量增加了，實在沒有社會道德</td>
</tr>
<tr>
<td>306</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>爲老師創造大量備課空間，減少班級人數，減少考試對學生升學壓力，改善行政架構編制...等</td>
</tr>
<tr>
<td>350</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>很多培訓班的成效不大，由以那些「資訊科技應用於XX科」更參加浪費培訓班老師的時間，本人覺IT是輔助角色，不能喧賓奪主，因級主角是學習</td>
</tr>
<tr>
<td>397</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>在緊拙及密集的教學工作裡，老師沒有空間時間去設計/使用合適軟件</td>
</tr>
<tr>
<td>403</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>給老師於資訊科技的支援不足，供老師仗用的電腦常有問題出現時，困難重重</td>
</tr>
<tr>
<td>Questionnaire No.</td>
<td>Respondent's Role</td>
<td>Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>431</td>
<td>*</td>
<td>私校未受惠政府津貼發展 IT in teaching !！請更改政策！</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>464</td>
<td>*</td>
<td>教師的培訓，ITC的支援，給老師更多空間進修和備課，減少學生比例，才更能享用IT在小學教育中靈活有效地運用！</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>494</td>
<td>*</td>
<td>資源分配不平均，重點學校比普通學校的資源多得很。跟著又著重點學校跟普通學校比較，做成一些奇怪的壓力，而且彷彿在給予普通學校一些無法達成的指標。</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>524</td>
<td>*</td>
<td>增加資訊管理人員</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>527</td>
<td>*</td>
<td>所有學校，每個班房應有一部投射器，實物投映機，和一套電腦(政府提供)，及全校投射器的「燈泡」，應由政府出錢更換。</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>532</td>
<td>*</td>
<td>政府投放於推動資訊科技教育的資源很多，希望仍能重視資訊科技教育，不要削減資源。</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>565</td>
<td>*</td>
<td>我同意學生應具有電腦技能，但資訊科技應該是一個工具去幫助學生去尋找更多和更新資料和知識，從而做到「學會學習」。不過，在培養學生思考或寫作方面，我認為傳統教育有其好處。</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>566</td>
<td>*</td>
<td>當局對學校提供IT非常積極，近年老師對這方面的認識亦提升不少，目前老師最重要是利用有限的時間運用IT進行教學，藉此提高學生的學習興趣。</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>