THE INTRODUCTION OF EDUCATIONAL TECHNOLOGY INTO ELEMENTARY SCHOOLS IN CYPRUS: A CRITICAL ANALYSIS OF THE IMPLEMENTATION OF AN INNOVATION

by
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ABSTRACT

This thesis researches the implementation of educational computing in Cypriot elementary schools. In the past, educational broadcasting, another innovation in educational technology, failed to be institutionalised. An experimental programme for computer introduction has been running since 1994 in twenty seven pilot schools. The similarities in the implementation process of the two initiatives suggest that computing is likely to follow the fate of broadcasting. To avoid this, the factors key to the process, Cypriots' perceptions and implementation conditions, need to be explored.

Examination of Cypriots' perceptions resulted in several findings, indicating that although individuals favour introduction of the innovation in theory, implementation is problematic at the practical level. First, most Cypriot parents, children and teachers support the introduction of new technologies in schools but they lack consensus as to the educational use of computers. Second, although actors hold favourable attitudes towards computing, several dimensions of these attitudes that emerge as a result of my research - personal, educational, general - are not found to be different between pilot and non - pilot populations. Third, the average pilot teacher is shown to be at an early stage of implementation with high "self" concerns, rather than "task" or "impact" ones. Interesting differences in the views, attitudes and concerns show the heterogeneity of actors, likely to lead to different reactions to implementation.

Exploration of implementation conditions shows that some aspects of the innovation such as introduction of resources into schools have succeeded but others such as access to hardware, software and supplementary material are problematic. This centralised initiative with its considerable flexibility at the school level enabled the emergence of different groups of teachers in terms of involvement. As such involvement is minimal, computing at the moment is not integrated successfully into existing learning and teaching practices. However, different practices, shaped by individual teachers, were developed in pilot schools. The profile of teachers in terms of views, attitudes and concerns and the conditions available were shown to have an important effect on the extent and quality of their involvement.

This thesis suggests that in the absence of appropriate action, the experimental programme would fail to reach institutionalisation. For educational computing to be successful in Cyprus as a tool, there is a need for improved institutional infrastructure to support teacher involvement. In the light of my research, I make recommendations for provision of training based on consideration of teachers' perceptions, clear goals for computer introduction and favourable local conditions such as hardware and software to support implementation practices.

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Πάντα στον νου σου να' χεις την Ιθάκη
Το φθάσιμον εκεί είν' ο προορισμός σου.
Αλλά μη βιάζεις το ταξίδι διόλου.
Καλύτερα χρόνια πολλά να διαρκέσει
και γέρος πια ν' αράξεις στο νησί,
πλούσιος με όσα κέρδισες στον δρόμο,
μη προσδοκώντας πλούτη να σε δώσει η Ιθάκη.

Η Ιθάκη σ' έδωσε τ' ωραίο ταξίδι
Χωρίς αυτήν δεν θα 'βγαινες στον δρόμο.
'Αλλα δεν έχει να σε δώσει πια
Κι αν πτωχική την βρεις, η Ιθάκη δεν σε γέλασε.
Έτσι σοφός που έγινες, με τόση πείρα,
ήδη θα το κατάλαβες οι Ιθάκες τι σημαίνουν.
(Κωνσταντίνου Καβάφη, "Ιθάκη")

Your mind should ever be on Ithaca
Your reaching there is your prime goal.
But do not rush your journey anywise.
Better that it should last for many years,
and that, now old, you moor at Ithaca at last,
a man enriched by all you gained upon the way,
and not expecting Ithaca to give you further wealth

For Ithaca has given you the lovely trip.
Without her you would not have set your course.
There is no more that she can give.
If Ithaca seems then too lean, you have not been deceived.
As wise as you are now become, of such experience
you will have understood what Ithaca stands for.
(Konstantinos Kavafis, "Ithaca")

The journey to my *Ithaca* has been long and stressful, lovely and rewarding at the same time. Reaching my destination is important. However, the experiences I have gained during these last years "on my way" have been really valuable. I could not have survived without the support of many wonderful people, to whom I feel the need to express my gratitude and appreciation.

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ABBREVIATIONS USED

ACICES: Advisory Committee for the Introduction of Computers in Elementary Schools

ANOVA: Analysis of Variance

CBAM: Concerns-Based Adoption Model

CBC: Cyprus Broadcasting Corporation

CD Rom: Compact Disc Read Only Memory

CD: Compact Disc

CDU: Curriculum Development Unit

CETO: Council for Educational Television Overseas

CPA: Cyprus Pedagogical Academy

DEE: Director of Elementary Education

EBS: Educational Broadcasting Service

EU: European Union

Fig: Figure

IT: Information Technology

M.Ed: Ministry of Education

PB: Planning Bureau

PI: Pedagogical Institute

SD: Standard Deviation

SoC: Stages of Concern

SoCQ: Stages of Concern Questionnaire

SPSS: Statistical Package for the Social Sciences

TV: television

UK: United Kingdom

US: United States (of America)

CHAPTER 1: INTRODUCTION

> Educational innovation is not what it seems--if it ever were! It is not a magic short cut to an educational wonderland. It is difficult, time-consuming, energy-exhausting, and often costly. (p. 104, Dalin, 1978 in Shaeffer, 1990)

1.1. BACKGROUND TO THE STUDY

My interest in educational innovation began with the introduction of educational broadcasting in Cyprus. As an elementary school student, I remember radio programmes and television broadcasts invading my classroom and then disappearing without an explanation. Later on, as a student teacher, I questioned the reasons for this. I discovered that people believed that the innovation "failed" to survive the first years of enthusiasm mainly because of the teachers' inability to adapt.

Some years ago, as a school teacher this time, I was pleasantly surprised to find out that the Ministry of Education planned the introduction of information technology in elementary schools. My colleagues and students were excited about the potential impact of computers on teachers' practice and pupils' learning. However, I feared that this process could follow the same path as educational broadcasting. I assumed that despite the different contexts, factors affecting the innovations could be similar. So, I decided to explore the implementation of broadcasting and computing in Cyprus to obtain information about these factors. I decided to review broadcasting briefly and concentrate mainly on computing, currently implemented to indicate if computing is likely to be successful.

Before I proceed to explain my aims and research questions, there is a need to set the context of the study, by referring to Cyprus and its educational system.

1.2. THE CONTEXT OF THE STUDY

A brief overview

The context for this thesis is Cyprus (Fig. 1.1), the third largest island in the Eastern Mediterranean. The population is 741,000 (1996) with Greek (78%), Turkish (18%) and others (4%).

The island has a relatively short post-Independence period since 1960 characterised by various political problems on one hand and by an impressive rate of growth on the other. In terms of development, Cyprus is classified as a "high income economy" (World Development Indicators, 1997; World Development Report, 1998), ranked 29th out of 156 countries for 1996 and a "high human development" country, as 23rd out of 174 (Human Development Report, 1996 in World Guide 1997-98). However, Unesco (1997) does not include Cyprus in the list of "developed" countries. So, we could specify the island as a country with a strong economic potential that lies between the developed and developing world.

Since 1974, as a result of the Turkish invasion and the division of Cyprus into two separate communities - Greek and Turkish - there are two autonomous educational systems. In this thesis, any reference to Cyprus relies on statistics and data provided by the official government (Greek) of the island.

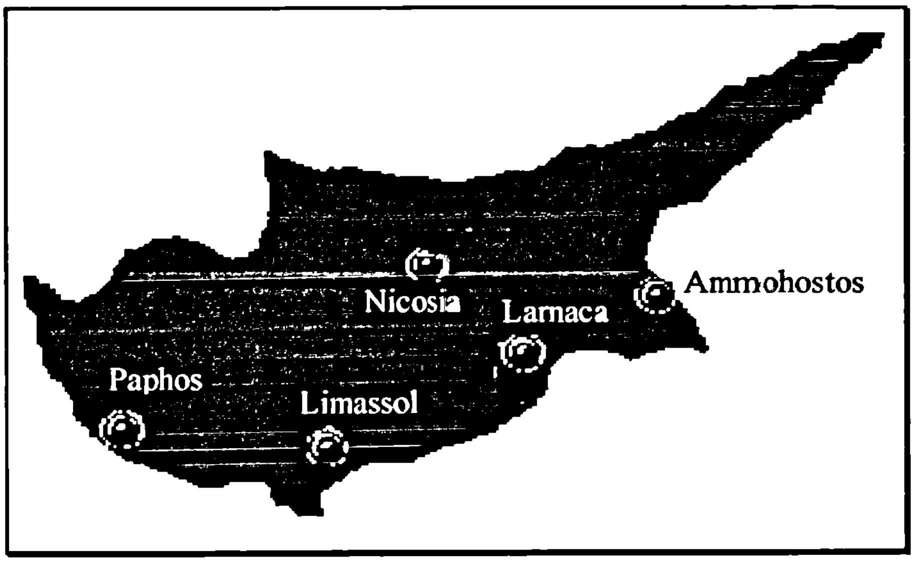

Figure 1.1 MAP OF CYPRUS (Districts)

The educational system of Cyprus

The educational system is highly centralised (Persianis, 1991). The Ministry of Education is responsible for all private and public institutions and has four departments: Elementary Education; Secondary Education; Technical, Vocational and Agricultural Education; Higher Education. The Council of Ministers approves educational policy and prepares the budget for education. The Educational Service Commission decides on matters of appointment, promotion and transfer of teachers. School committees cover for maintenance and equipment. Funding is provided through government grants, special allowances and taxes. Expenditure on education stood in 1992 at 11.4% of the country's budget and 3.5% of the Gross National Product. Elementary education absorbed 22.9% of the total expenditure.

Education either public or private, is compulsory through to age 15. Public education is free through to age 18. There are six years of elementary education for ages 6-12. Secondary education extends over six years for ages 12-18 and is divided into two cycles: the lower (gymnasium) and the upper (lyceum or technical school). After secondary school, students can attend post-graduate institutions at home - the University of Cyprus was founded in 1992 - or overseas. The general aims of the Cyprus educational system are as follows:

> The creation and the development of a freely thinking democratic individual characterised by an equilibrium of morals and cognitive capacities, healthy in body, actively and creatively involved in life. Such individuals are expected to contribute to the social, scientific, economic and cultural progress of the state and to promote co-operation, mutual understanding and love among all fellow human beings whether or not they belong to the same community/country, and the prevalence of freedom, justice and peace. (p. 15, Marcou, 1997)

Higher education is particularly valued by people on the island. Schatzman (1990) supports that there is a great desire for education since families tend to send children abroad and students attend special classes to prepare for university admission exams. Dallman (1986) stresses that Cyprus differs from the rest of Europe in the belief that education is the country's greatest capital asset. In 1986, Cyprus was third in the world in proportion of university students to the population. In 1992, 58% of students continued studies beyond the secondary level with 25% studying abroad (Statistics Report on Education). Bradshaw (1993) mentions that the system produces highly qualified graduates.

Elementary teachers are mainly trained at the University of Cyprus, which has replaced the Cyprus Pedagogical Academy (CPA) that offered a three-year course. Students must sit for the fiercely competitive entrance examination to enter the university four-year teachers' training program. The profession is popular for a variety of reasons; all graduates so far are guaranteed a post; teachers get good salaries, paid directly by the government; the work schedule is very convenient; the teacher status is quite high. The teacher-pupil ratio was 15.9 in 1992. Newly appointed teachers start off with thirty teaching periods per week which are reduced after a certain number of years. Teachers begin to be evaluated by inspectors first through reports and after thirteen years of service through marks. Except from this evaluation, teachers' promotion is also based on post-graduate qualifications and years of service. The next step up the ladder is for a teacher to be promoted to assistant principal and then to principal. The principal has a minimal teaching load and the responsibility of administrating the school. In-service training is mostly optional and provided by the Pedagogical Institute (PI) which holds afternoon seminars on various topics. Teachers' culture is characterised by lack of motivation for self-initiated action. As Pantelides (1982) suggests, teachers have to set free from their servility to the educational bureaucracy to contribute to the educational development of their country.

Innovations in Cyprus

The introduction of innovations is shaped by conditions of the specific local context. Cyprus is a good place to study innovation for several reasons.

First, in its effort for development the country has been struggling with change in all aspects of life: political, economic and social. Therefore, educational authorities tend to adopt new ideas at the macro and micro level, aiming at the quantitative and qualitative improvement of education (Karagiorges, 1986). For example, in 1995, the interest of Cyprus to join the EU began to put pressure on the educational system to place Europe in a central position in the curricula. As a result of constant changes and revisions, Cypriot education is characterised by a dynamism, that is not usual in other educational systems (Maratheftis, 1992). Innovations are valued in Cyprus and Cypriots are oriented to progress and hold positive attitudes about new ideas (Persianis, 1991).

Second, the need for change has been a result of conflicting ideologies and debates at all levels. Over time, a double system of values, reflected in the goals of education, reinforced the need of schooling to adopt change. On one hand, there is an emphasis on practical needs for economic development, supported in the past by the British and now by the EU. On the other hand, the educational paradigm of the island supports the national ideologies of "encyclopaedism", "humanism" and the "Christian Orthodox epistemology", promoted by the Church and Greece. These dominant epistemological traditions often prevent the production and application of new knowledge. "Encyclopaedism" is based on the premise that education should include all human knowledge, so educational content is mostly academic. "Humanism" supports that the ultimate goal of education is knowledge, independent of the personal experience. The "Christian Orthodox epistemology", in a similar way, promotes religious respect to theory rather than action. According to Persianis (1991), all these ideologies are obvious in certain characteristics of the Cyprus system: there is a centrally planned, detailed, nationwide curriculum; teaching periods are uniform for all schools to establish equal opportunity of access to education; specific textbooks for every subject for each grade are provided by the Ministry of Education, so their content is controlled; theoretical subjects such as Greek or History are considered of higher status compared to more technical ones as knowledge is superior to skills; there is little opportunity for independent or practical work; evaluation approaches are traditional as students are expected to reproduce the content of their textbooks; emphasis is on individualism rather than group work.

Of interest are also the structure and decision making processes of the educational system. As I have already mentioned, the education system of Cyprus is highly centralised and decisions and formulations of policy are controlled by the Ministry of Education. The Ministry of Education often initiates ideas for change, which are then disseminated to the schools. On the other hand, education is the joint concern of other actors as well such as the public in general, and the teachers and parents in particular, that influence implementation. As Theofilides (1986) suggests, elementary schools are semi-autonomous institutions and teachers can develop initiatives within the special general guidelines provided by the Ministry. The curriculum development model is therefore integrated: from centre (Ministry) to periphery (schools) and from periphery (schools) to centre (Ministry).

In the past, the absence of a university or serious research centre has resulted in importing educational knowledge from other countries. This knowledge has taken the form of a series of innovations that have bombarded the educational system of the island since 1960. These innovations concern mainly the content, the methods, the teaching materials and the methods of evaluation and are intended to make the educational system more flexible and effective. Some of them such as the introduction of technical and vocational education in 1960, the introduction of the Lyceum of Optional Subjects in 1980, the restructuring of the National Curriculum in 1981 and 1994 have been institutionalised. Others, mainly those concerning methods are not. This thesis focuses on an innovation currently implemented in Cyprus elementary schools: educational computing. In the next section I provide an overview of this particular innovation.

1.3. THE EXPERIMENTAL PROGRAMME FOR COMPUTER INTRODUCTION

After its initial experimental introduction during 1986-88 in some pilot schools, computer science acquired the status of a compulsory subject in the first grade of the secondary education lyceum and an optional supplementary subject in the second and third grade. So, educational computing was first introduced in Cyprus as a subject per se and as a field of specialisation in lyceums.

In 1991 a committee was set up to prepare an implementation plan for the introduction of computers as tools in elementary schools. This plan referred to five phases of experimental introduction from 1991 until 1995 (Table 4.3). Following this, the experimental programme for computing introduction, directed by the Ministry of Education began in a number of elementary pilot schools at the national level. In 1993-94 there were eight pilot schools, which increased by sixteen during the following year. Later on, the pilot schools became twenty-seven, with the addition of another three schools.

Several steps were taken towards implementation of the innovation, described in detail in section 4.1.2. Limited resources - software, hardware - were delivered to all pilot schools. Some teachers received training in computers from the Pedagogical Institute. One of the teachers in these schools undertook the role of the computer coordinator; later one of the computer coordinators in each district became the district coordinator. The Curriculum Development Unit for educational computing was established to visit schools and provide help.

However, the policy was open- ended. As I discuss in Chapter 4, the Advisory Committee for the Introduction of Computers in Elementary Schools outlined that computers should be used for "the enrichment and support of existing curricula subjects". Other than this general aim, no further specialised goals were given. Pilot schools received an innovation package comprising financial support, physical facilities and teaching material along with brief implementation guidelines. Schools used their discretion in putting the package into practice. In general, this approach to educational computing involved a combination of centralised initiative and largely decentralised implementation responsibility.

Since the launching of this initiative, a number of years have elapsed but the level of implementation, that is actual use in pilot schools, remains low. The change is not yet institutionalised, that is established in all Cyprus elementary schools. Therefore, it is worth examining the implementation processes to reveal what is happening in schools and identify which factors influence existing practices.

1.4. THE AIMS AND RESEARCH QUESTIONS

This thesis examines the phenomenon of innovation in educational technology in Cyprus elementary schools. The reader should keep in mind that this research is not intended to be an evaluation study. The main purpose is not to judge the effectiveness of the innovation itself. Rather I demonstrate how schools and the public in general respond to the introduction of new technologies, how they adapt to the experimental programme described above and what the products so far are. My aim is to highlight the conditions under which a sustainable innovation process can be achieved. In the light of this, the broad research problem is framed as **"What are the factors key to implementation and in what ways do these factors influence implementation practices?"**

To approach the first part of this problem thoroughly, I decided to research into educational broadcasting since its development in Cyprus could highlight the various factors, required for an innovation to succeed. So, initially I attempted to answer the following question, guided by two sub-questions:

1. What can be learned by the comparison between educational broadcasting and educational computing?

- How does the implementation process of the two innovations evolve?
- What are the factors key to this process?

My findings indicated close similarity between the computing and the educational broadcasting initiative (section 4.1.3). This comparison showed that actors' perceptions as well as implementation conditions were critical in the process. This pointed me to study existing literature on actors and implementation, outlined in Chapter 2 (section 2.4). In light of my findings and the literature search, I decided to focus on different groups of actors - parents, teachers and children - and find out about their views, attitudes and concerns about computers in general and the experimental programme in particular. The understanding of the trends in people's views, attitudes and concerns about educational computing could not be possible without also examining the nature of these constructs. Therefore, a new research question along with three specific sub-questions emerged:

2. What are the general trends and nature of actors' views, attitudes and concerns about educational computing?

- What are the general trends and nature of actors' views on implementation aspects?
- What are the general trends and nature of actors' attitudes towards the innovation?
- What are the general trends and nature of involved teachers' concerns about the innovation?

Finally, taking into consideration the findings of the first two research questions, I decided to approach the second part of my research problem and investigate the ways in which factors influence implementation practices. Since information on existing practices in pilot schools was limited, I aimed to describe implementation patterns, revealing the extent and the content of educational computing. Then, I aimed to focus on the factors which prevent individuals from adopting the innovation by addressing the following question:

3. In what ways do several key factors influence integration of computing into school practices?

- What is the extent and the content of the current implementation practices?

- What is the role of actors and their views, attitudes and concerns in implementation practices?
- What is the role of practical conditions in implementation practices?

A variety of quantitative and qualitative methods were used to answer these research questions; these are described in detail in Chapter 3.

1.5. SIGNIFICANCE OF THIS STUDY

This thesis has several important dimensions which add to its uniqueness and signify the importance of the research questions above: focus on Cyprus; educational broadcasting; actors' views, attitudes, concerns; the implementation process.

The Cyprus context

One of the originalities of this study is the fact that it deals with the Cyprus context. I will, therefore, highlight the implementation process as it is shaped by the characteristics of Cyprus, such as the centralised organisational structure, the conflicting ideologies and the orientation towards development. The focus on Cyprus has two important implications.

First, I provide significant insight into existing educational practices, often overlooked in Cyprus. The educational system lacks the mechanisms or personnel for systematic evaluation of the results and processes of curricula implementation and school activities. As educational research is scarce, judgements on practices are often based on superficial "observations". So, my findings can contribute to the future educational development of the island.

Second, the fact that Cyprus is a small country enables the researcher to obtain data from all districts and illustrate the whole implementation process. So, there is potential to use this "holistic" overview picture and provide significant insight into an innovation, very popular on the international educational scene. Experience in one place should not be treated as universally applicable to all cases. However, even though the environment in which educational computing was initiated and developed in Cyprus is not the same as that in other places, these findings can be useful for other studies, conducted elsewhere. As I will mention in Chapter 2, although national practices vary, trends are similar; whatever the extent of official plans, the general level of computer implementation is reported as low with an overriding emphasis on hardware; educational institutions face similar problems such as software or training to promote the real integration of the innovation in the classroom. So, this study could illuminate the innovation process to all those concerned with educational computing in other parts of the world.

Lessons from the past

The overview of educational broadcasting illuminates and deepens our understanding of implementation and gives a "time" perspective on the analysis of key factors. A thorough description of what happened creates a historical record, of value when implementing something similar, particularly when the program no longer exists (King et al, 1987). This is significant, considering that there is still a need at the international level for a better consciousness of the implicit ideologies and the pedagogical philosophy (Hayter, 1974; Dieuzeide, 1997) underlying technology applications to education. The lessons learned from implementation of broadcasting, as examined by this study, could apply to the initiation of other innovations, which will surely continue in the future.

Focus on actors' views, attitudes, concerns

Considerable literature focuses on the area of actors and implementation (section 2.4). Some theorists such as Olson (1988) blame under-users and non-users of innovations for inadequate confidence or competence, reluctance or fears. Others, such as Cuban (1986) refute the attribution of innovation failure to teachers' inability to maximise the potential of new technologies.

In this study, more light is thrown on the area of actors and the nature of their attitudes and concerns that are likely to impact on implementation. This study shows that attitudes are multi-faceted, highly complex constructs with various factors. Concerns, on the other hand, are examined as stages on a developmental continuum, useful to indicate the current level of innovation adoption.

Emphasis on the process

Finally, although this is one of many implementation studies on the introduction of new technologies, conducted in various parts of the world, it adopts a different perspective. Most of these studies measure final outcomes against predetermined goals, so they provide a summative evaluation. They do not clearly explain how failure comes about since what happens between the input and the output - the throughout stage - remains a "black box".

In contrast, this study depicts and analyses the process of implementation, concentrating on how it occurs. Such research generates new knowledge and tests old, not only about how innovations operate but also why (Young, 1965; Ely, 1987). In my case, findings could not only outline implementation processes of innovations but also explain the rationales behind the introduction of new practices in Cyprus.

1.6. THEORETICAL ASSUMPTIONS

The aspect of success: qualitative and quantitative

Literature suggests that educational technology, from an integrated perspective, involves not only resources but also processes and people. Innovation is "a planned and deliberate idea, object or practice, perceived as new by individuals" (Nicholls, 1983). Successful institutionalisation is characterised by the integration of the innovation into regular practices - here, the process of putting an innovation into practice in classrooms. In educational technology, success means incorporation of innovations to the educational system as integral to the teaching-learning function, not just as marginal, enrichment activities.

Success of educational computing, within the context of this thesis, does not imply revolutionary effects on education. It means including the best applications into daily schooling practice along with high degrees of teacher involvement. Of interest to this study is not only the quantitative aspect of success, but also a qualitative view in terms of "what is implemented". Unfortunately, internationally, despite enthusiasm for computing, we cannot as yet describe successful integration into the teaching and learning processes. Some outstanding efforts remain isolated pockets of excellence. Computers tend to be used mainly as add-ons to the existing curriculum. As a result, practices are merely at a superficial level of change or even non-change.

Perspectives adopted: implementation; phenomenological; problems as friends

Most programs falter during implementation, while the interaction between the innovation and its setting is maximised. Implementation is concerned with the nature and extent of actual change as well as the processes involved. This "implementation perspective" is central to this thesis (section 2.1.5.1).

This study also adopts the "political/cultural" (phenomenological) approach to change emphasising responses discernible by participants at different levels (section 2.1.5.2). I assume that examining people's views closely provides a satisfactory explanation for implementation. Individuals with their "meaning of change" (Fullan, 1982) are the most critical of the factors, so their perceptions take centre stage. Teachers are the "gatekeepers" of successful implementation (Brownell and Brownell, 1991; Tarrago, 1994) so investigation of their concerns is vital.

The assumption that computer introduction is complex and fraught with problems right from its inception underpins this research. However, as Fullan (1993) points out, change is "a journey in uncertainty" while excitement and problems are often "our friends". This thesis helps us to understand this process so as to improve education.

1.7. ORGANISATION OF THE THESIS

Chapter 2 provides a literature review focusing on innovation, educational technology and the concept of success as well as people's attitudes about and concerns towards change along with practical aspects and conditions. In Chapter 3, the methodological framework is outlined, highlighting the strategies for data collection. Results are presented in Chapters 4, 5 and 6. In Chapter 4, there is a background analysis of the introduction of broadcasting in elementary education. The story is provided along with some critical remarks on the factors involved in the process. I then describe the experimental plan for computer introduction in Cyprus elementary schools through relevant government documents and draw comparisons between broadcasting and computing. An analysis of parents', teachers' and children's views and attitudes towards computing follows in Chapter 5. Pilot teachers' levels of concerns about educational computing are also outlined. In Chapter 6, I discuss implementation issues through statistics on all pilot schools and interview data on four selected pilot schools so as to illustrate reflections on existing practices. Finally, I summarise the main findings of this thesis and discuss implications for Cyprus in Chapter 7. In this last chapter I also proceed to recommendations for the successful introduction of computing in Cyprus schools, focusing on higher teacher involvement, clarification of goals for educational computing and provision of favourable conditions.

Chapter 2 is devoted to the review of selected topics related to this thesis. This journey into literature is rather long and embraces a variety of issues but as the poet Kavafis points: *"When setting out upon your way... wish always that your course be long, full of adventure, full of lore..."*

CHAPTER 2: LITERATURE REVIEW

There is nothing as practical as good theory.
There is nothing as theoretical as good practice. (Kurt Lewin in Fullan, 1982)

This chapter explores important concepts from theoretical and practical perspectives. I clarify terms basic to this study, including "innovation" and "educational technology" to minimise possible misunderstandings. The literature reviewed draws heavily on the Anglo-American experience enabling research findings to be related to the UK and the US. This helps to provide the international perspective to my work.

I begin by addressing the issue of innovation from the "implementation" and "phenomenological" perspectives. Section 2.1 illustrates the developmental nature of innovation over time, the various phases encountered, the factors affecting change and the strategies or models employed. Various approaches for reflecting on change processes are presented. Then, I discuss Fullan's work, that is fundamental for this study because I adopt several of his perspectives.

Second, I review the state of the art of educational technology and define the concept from an "integrated" perspective, involving products, processes and people in section 2.2.

Next, in section 2.3 I describe success in educational computing in both quantitative and qualitative terms. An overview of international figures demonstrates minimal integration of new technologies in existing practices and points to the significant role of actors, especially teachers, in implementation.

Actors' views are believed to play an important part in implementation. So, in section 2.4 I discuss individuals' attitudes and concerns about educational change in general and educational computing in particular. While attitudes about the innovation are mostly reported as positive, they are multi-faceted with different dimensions. I also review the area of teachers' concerns which develop on a continuum and are believed to be consistent with the level of adoption.

Finally, in section 2.5, I provide an overview of practical aspects and conditions, important for consideration in reflecting on actors' reactions to implementation.

2.1. INNOVATION

2.1.1. The concept of innovation

The terms "change", "reform" and "innovation" are often used interchangeably in this thesis. However, I consider the first two as too generic and vague for this context-specific study, so "innovation" is probably a more appropriate term.

Bolam (1975) defines "change" as a family of concepts, including accidental or unintentional movements and shifts. Educational change, in particular, is vague in regard to scope and precise in regard to importance. "Reform" is considered as embracing a cluster of innovations (Vandenberghe, 1988), usually meant to affect the system as a whole, or an important part of it. Both "change" and "reform" may signify dramatic alternation in the status quo (Havelock, 1970) or just a continuous reappraisal of existing practices (Nicholls, 1983). Change and reform aim to achieve quality in teaching, resources, structure or organisation.

Innovation, is distinguished from change and reform by being more discrete in nature, limited to particular subjects or practices (Shaeffer, 1990) and intentional (Bolam, 1975). Huberman (1973) defines innovation as "an improvement which is measurable, deliberate, durable and unlikely to occur frequently". The Organisation for Economic Cooperation and Development (OECD) classifies four types of innovation: those concerned with objectives and functions; with organisation and administration of an educational system; with role definitions and relationships; with the curriculum, its aims, content, methods and evaluation (Verspoor, 1989). Innovations in educational technology are multi-faceted, so can be placed in more than one of these categories. For this study, I adopt the comprehensive definition of Nicholls (1983) which captures all relevant aspects of the concept:

> ... an innovation is an idea, object or practice perceived as new by an individual or individuals, which is intended to bring about improvement in relation to desired objectives, which is fundamental in nature, planned and deliberate. (p. 4)

In this definition, the key word is "improvement". The focus is not on "innovation for the sake of innovation" but on "innovation for improvement". However, this thesis does not examine the quality and efficiency of specific innovations but assumes that implementation is desired, so emphasis is shifted towards the process rather than the product itself.

2.1.2. The study of educational change

This thesis reflects on the problem of educational change, so here I set the study of innovation practices in a historical and international framework.

The necessity for educational change is often prompted by the interdependence of education and social, political and economic realities (Shaeffer, 1990). Additionally, the scope of educational change is determined by cultural and technological influences (Tobin and Sharon, 1984). The interaction of these forces continuously differentiates educational goals, so educators must become skilled experts in managing the dynamics of change (Lewis, 1991; Fullan, 1993).

Hawkridge (1987) points out that in each decade or so something "new" arrives on the educational scene. Numerous efforts and projects to introduce educational innovations in both industrialised and developing countries have occurred (Green, 1972; Nisbet, 1975). For example, in the US during the period 1959-1969 billions of dollars were spent on "all manner of educational innovation" (Snider, 1992).

The process of educational change was investigated later (Fullan, 1992). The 1960s were called the "adoption era" because educators were preoccupied with how many innovations were being taken on. Around 1970, innovation got a bad name since programs were introduced for the sake of change leading to the first implementation studies. Results were dramatic and discouraging. Confusion derived from mistakes in practice led to easy "failure" theories such as that of educational "conservatism". Educational systems were regarded as likely to retain their status quo and maintain existing goals (Baker and O' Neil, 1989; Blenkin et al, 1992; Stoddard and Niederhauser, 1993). Educators were blamed for preserving their own security. The inefficiency of "failure" rationales resulted in the emergence of various approaches in viewing innovation, discussed in section 2.1.4.1.

Here, two points of concern in this study are important. First educational change as such is not different from change in other fields but its study should take into account the peculiarities of schools as settings. Education is not unique in manifesting the phenomenon of change. But, it is important to consider the organisational context of educational institutions (Kingsley, 1993). For example, the fact that schools are at the end of a chain of command makes the success of top-down reforms such as most innovations in Cyprus particularly problematic.

The second concern is relevant to the theoretical background provided on the study of change. This framework refers to the developed countries and has a strong empirical base. However, the reader should remember that there is a gap between the developed and developing world. Systematic research is lacking in the developing world so the level of understanding of educational change suffers accordingly (Verspoor, 1989; Rust and Dalin, 1990). Although I make much reference to the developed world in this thesis, my aim is not to regard the developed world as a role model. Useful conclusions are drawn from linking research findings to countries such as the UK or the US. However, the uniqueness of Cyprus, as the setting that lies between the developed and developing world, is seriously taken into consideration while setting the context in section 1.2 and discussing the findings of the study in section 7.2.

2.1.3. The context of educational change: the process, its development, factors involved and strategies/models applied

Drawing upon English and American experience, the failure of planned change led researchers to a closer look at the practical aspects of school innovation (Holt, 1987; Cohen, 1988). This resulted in extended research and theory formation on the process of change and its development. Several studies examined the major factors involved: the system, the actors, the innovation and the process. Theorists have also investigated and classified the strategies for implementation. All these aspects are presented here to highlight the complexity of educational change and suggest the need for understanding effective implementation.

2.1.3.1 The process of change: various schemes

Educational change is viewed differently by the three theorists, whose work I discuss in this section. However, a common characteristic is that they all view change as based on a network of "relationships".

The "systems theory" (Chapman, 1990) provides a useful conceptual scheme for thinking about educational change. This theory indicates that change should be studied on several levels: individuals, institution, community and the wider environment. Therefore, focus is on the relationships among system components, presented by Huberman (1973) as follows:

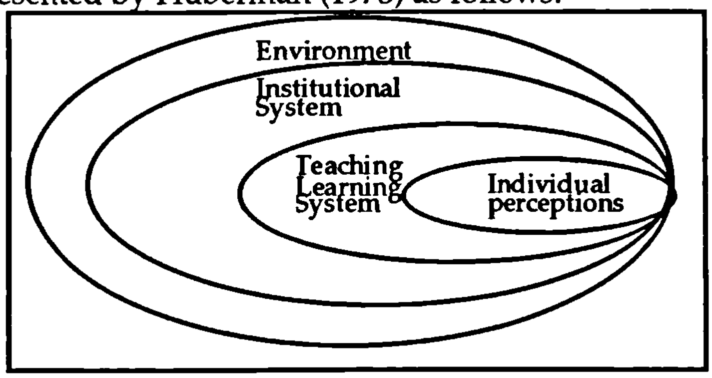

Figure 2.1 HUBERMAN'S "SYSTEMS IN CHANGE"

This theory proposes that while innovation is vital to growth and survival, new programs threaten the equilibrium of relationships among subsystems. As the new program perseveres, new relationships form between subsystems which later become regularised.

Bolam (1975) provides a useful heuristic framework (Fig. 2.2) for examining the process or "cycle" of educational change involving four major factors; the change agent, the innovation, the user system and the process of innovation over time.

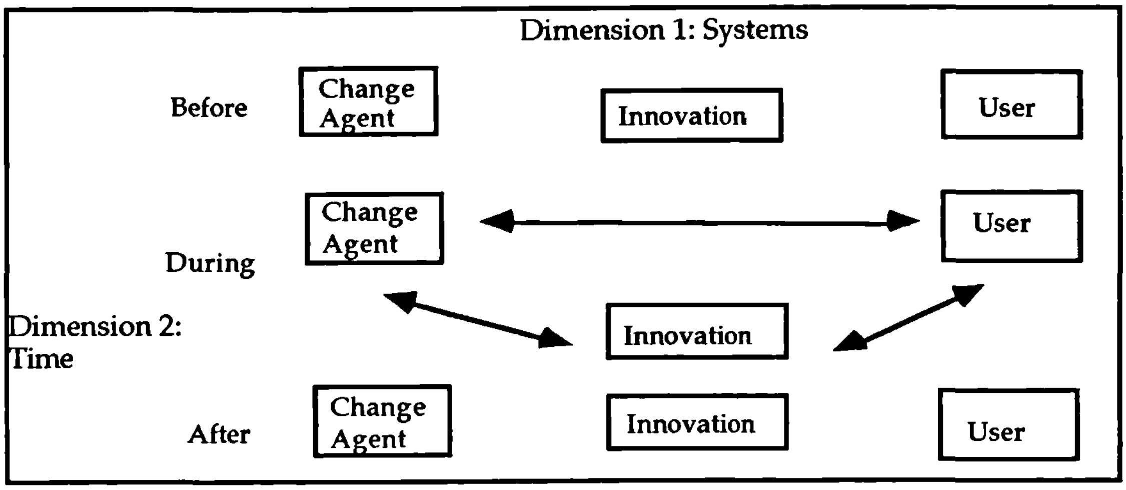

Figure 2.2 BOLAM'S FRAMEWORK

The first dimension includes the change agent, innovation and user. The change agent may be a teacher, a centre, a local authority or the national government. The key characteristic is an authority relationship with the user and possible access to the strategies described later in section 2.1.3.4. The innovation is the second system. This is constantly defined, changed and redefined as a result of experience and the differing perceptions of the people involved. Factors which bear directly upon the success of an innovation are relevance and magnitude, compatibility of the innovation with existing values and practices, costs and benefits. The user is targeted by the change agent. Individuals and organisations respond differently to innovations according to their personal or professional characteristics, contextual environment and structure.

The second dimension is the process of introducing the innovation over time. There are three major stages: before, during and after. In the "before" stage, the three systems exist separately. Interaction begins "during" the trial and implementation stages. In the "after" stage, the systems separate again and assessment of the impact on all three systems takes place. Movement from one stage to the other takes considerable time since change can not be made overnight (Khan, 1995). Pennell and Alexander (1990) state that we often assume that change must be achieved with the minimum passage of time, since administrators are anxious for rapid results.

Havelock (1970) also adopts this notion of a "cycle of innovations" and suggests the following scheme:

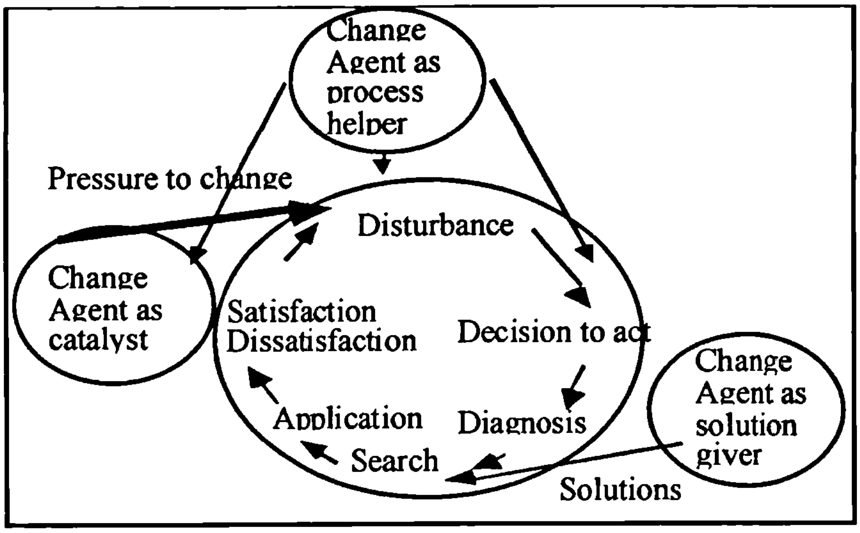

Figure 2.3 HAVELOCK'S "CYCLE OF INNOVATIONS"

Fig. 2.3 suggests a problem-solving model in this "cycle". The user has the problem to resolve so guidance from outside sources is needed during a process of reaction to the innovation. This model is further explained in section 2.1.3.4 since users are critical to this thesis.

So, we see that change involves different systems and is a "cycle" that is a process that develops along the time dimension. The users are problem-solvers and they are at the very "heart" of innovation. In this context, I proceed to the stages or phases involved in educational change.

2.1.3.2. The development of change: different phases

A number of writers including Shaeffer (1990) suggest that innovations move from initial conception to full functioning: from design to adoption and maturation. The phases encountered are: initiation, planning, implementation, evaluation and institutionalisation. In section 4.1 I provide an insight to these phases for the introduction of educational broadcasting and computing. Here I give a brief overview of these five stages.

The first stage is initiation. This embraces the decision to test an innovation, usually in an experimental way. Two factors are often important here: the different levels, for example centre to periphery, international to local; the complex pattern of roles played out by parents, teachers, bureaucrats, researchers, policy-makers or foreign consultants.

The second stage is planning. This phase involves preparation of strategies and sometimes, experimentation. Here the approach used by planners along with their understanding of educational change is important. Planners need to consider the contextual factors and constraints operating in specific innovations.

Third is implementation, that is putting an innovation into practice in classrooms. Chapman (1990) defines implementation as "the extent to which a program is actually used" (p. 195). During this process, there are some critical points for success such as the inputs and resources needed, the procedures established and the management of the innovation plan. Efforts to conceptualise implementation generally take one of two forms. The "fidelity" perspective is the exploration of the extent to which actual use of the innovation corresponds to intended use. Alternatively, the "organisational change" perspective, adopted by this study, involves consideration of implementation as a mutually adaptive process.

The fourth stage, evaluation, is the systematic application of research procedures in assessing the design, implementation and utility of a project. Evaluation reflects the relevance, effectiveness and impact of an intervention, in the light of its objectives (Nevo, 1986). This stage is integral to educational policy-making (Chinapah, 1990) and can be also viewed as a political activity (Kinnaman, 1992). Evaluation potentially indicates parental and teacher concerns in order to involve them in an experiment. However, certain dangers are involved. First, measuring the success of change is difficult (Stephens, 1990). Second, since education itself has a lengthy internal cycle, the impact of particular inputs is often visible only after a long process of complicated cause-effect relationships. Third, as Flores (1981) points out, early evaluation produces pressures that distort project development and undermine users' confidence. Innovation, therefore, requires certain protection from inspection to be established successfully.

The final stage is institutionalisation. This is the extent to which a programme is routinely applied and can be sustained as a part of normal administrative and classroom practice. When integration of the innovation into regular practices is achieved, the programme disappears as an innovation. Institutionalisation often requires prior implementation success and involves specific methods: innovations can be spread either naturally through informal channels ("laissez-faire" approach) or via formal regulations ("directive legislative" approach).

Some innovations never reach this stage and so they are considered "failures". Certain barriers to innovations are mentioned repeatedly in the literature as responsible for lack of success. Huberman (1973) distinguishes factors that inhibit the process of change in the "input", the "output" and the "throughput". Such factors are of particular interest to this study, so I refer to them more extensively in the following section.

2.1.3.3. Factors affecting change

Reviewing literature in this area indicates that the factors involved in educational change comprise four categories: system, actors, innovation and process.

First consideration is the "system". Shaeffer (1990) refers to this as the context in which the innovation is located and its adaptive capability at the macro-level and the school-level. Educational institutions are unique because they often carry their own socio-cultural norms and ability to implement change. Bassett (1970) focuses on the structure of a system which can be centralised or decentralised and the function which can be formal or informal. Miles (1964) refers to the particular characteristics of educational systems: diffusion rates are slow while ideological beliefs may block effective innovation. Nisbet (1975) and Chapman (1990) consider factors such as community support and cultural issues as well as infrastructure aspects including funds, equipment, buildings and personnel.

Second are the "actors". Shaeffer (1990) suggests that the greatest barrier to change is altering people's beliefs and values. Persons or groups, external to or within the system have the power to stimulate or nurture innovations (Miles, 1964). The interdependence of innovators and other groups involved is critical. Implementers' personal characteristics, adequacy of training and prior experience are also important (Chapman, 1990). Teachers in particular are considered responsible for making innovations effective at a practical level.

Third are the characteristics of the "innovation" itself. Miles (1964) and Shaeffer (1990) mention a wider range of properties including complexity, cost, technical validity and scientific credibility. Associated materials, implementation support and innovation/system congruence are reported as likely to affect adoption. Chapman (1990) describes programme factors such as clarity of characteristics, specificity of intended outcomes, adequacy of resources and supervision.

Finally, the "process" of change also has to be examined. Shaeffer (1990) refers to organisation and management of this process through conflicting styles in terms of ownership, control, adaptability. Bassett (1970) outlines the importance of teacher training, national bodies and educational publications in assisting newer practices. Miles (1964) also considers the planning and execution of change, often influenced by strategies, optimal conditions and linkage problems. The design of educational change programmes is of interest to Verspoor (1989) who describes five basic aspects of the process: implementation, effective administrative infrastructures, flexible strategies, arrangements for systematic learning from experience and eventual early institutionalisation. Nisbet (1975) further points to the need for evaluation feedback to the innovating team.

All these factors are carefully considered in this thesis during examination of both innovations. Information is provided on the "system", so the specifications of Cyprus as a setting have been highlighted in Chapter 1 (section 1.2). Because of the phenomenological approach adopted, the "actors" are surveyed extensively through questionnaires so as to reveal their views, concerns and attitudes (Chapter 5). Although focus is not on the quality of the "innovation" itself, the innovation's characteristics as perceived by the actors in their interviews are outlined (Chapter 6). Finally, the implementation "process" described by documents and interviews reveals certain problems and deepens our understanding of individuals' reluctance to adopt (Chapter 4). For the purposes of this thesis, factors are categorised into two groups: the "actors" on one hand and the "conditions" which include the "process", the "setting" and the "innovation" on the other.

2.1.3.4. Strategies and models of implementation

Strategies of implementation are the means intended to facilitate an optimum level of adoption. As Kingsley (1993) points out, strategic management is concerned with helping change processes in effective ways. However, these strategies do not provide solutions to the practical problem of implementation.

A number of writers including Chin, 1967 (in Bassett, 1970), Bennis et al, 1969 (in Bolam, 1974, 1975; Chin and Benne, 1972) and Sieber, 1972 (in Whiteside, 1978) refer to three basic strategies: the empirical-rational, the normative - re-educative and the power-coercive.

The "empirical-rational" strategy suggests that educational practice changes as more valid ideas displace less valid ones. This theory affirms a belief in a science of education. The underlying assumption is that people are reasonable and will respond best to rational examination and demonstration. The focus is, therefore, on "research, development and dissemination" (RDD model). Productive research centres, training and publications are emphasised.

Second is the "normative - re-educative" strategy which proposes a concentrated effort to create new educational knowledge by mounting a massive national research program. The actual nature of the re-educative process remains unclear but the strategy is most effective when people collaborate. This strategy assumes that the innovation is like a manufactured object which passes unchanged from developer to user. Effective innovation in this model requires a change of attitudes, values and skills as well as activation of forces within the user system.

Third is the "power-coercive" strategy and refers to forms that the exercise of power takes in effecting educational change. Such forms are legislation, court decisions, provision of funds and use of authority. This strategy depends upon access to political, legal, administrative and economic resources.

All three approaches may feature in a country's plans but the balance between them varies. Cyprus seems to employ all strategies in the implementation of both educational broadcasting and computing. The first strategy is promoted through top-down guidelines. The second strategy of changing people's attitudes through extensive training is often discussed but unlikely to apply because of limitations. Finally, the third strategy appears in the usual allocation of administrative and economic resources in an effort to implement changes. However, proper legalisation of innovations related to new methods through establishment in the National Curriculum is often neglected.

In terms of models, except from the RDD model mentioned above, three more are discussed in the literature. According to Havelock (1969, 1971 in Nicholls, 1983), one is the "social interaction" model (SI). This approach involves individuals working in informal networks in unsystematic ways. This model emphasises diffusion and movement of messages from person to person and system to system. In the "problem solving" (PS) model the user is seen as an active participant. The stages form a cycle, beginning with a "felt need" which is articulated as a problem followed by a search for solutions, one of which is selected and applied. Finally, the "linkage" model unifies the three preceding paradigms (RDD, SI, PS) by highlighting the need for linkage procedures. This model is probably the most accurate representation of the real situation in many countries (Stokking, 1995) including Cyprus.

This section has deepened our understanding of innovation by reference to the process of change and its development, factors, strategies and models. This understanding will be inadequate unless we proceed to a sound theoretical exploration of the causes for adoption and rejection of innovations.

2.1.4. Reaction to educational change: different theories and perspectives

This section outlines the basic approaches to change to explore the dynamics underlying innovation adoption and rejection. I demonstrate that the technological approach in studying change is often not satisfactory, so other perspectives are needed, namely the political and cultural perspectives.

2.1.4.1. Adoption and rejection of innovations

Five types of hypotheses about the conditions in which innovations are accepted, rejected or modified are apparent (Hurst, 1983). "Endemic conservatism" suggests that human beings naturally resist change preferring stability and continuity. "Variable conservatism" asserts that individuals, organisations and societies vary in their innovativeness, some being more receptive to change than others. "Properties of innovations" refers to the characteristics of the innovation which can determine its reception. "Communication hypotheses" assume that various transmission variables affect responses to innovation. Finally, "situational or decision analysis" models the process of change, said to determine acceptance behaviour.

This thesis does not test any of the hypotheses mentioned above. Instead, I seek to reveal the factors in implementation and concentrate on reactions of individuals. Hurst (1974) suggests that the conservatism of teachers is often blamed for failure. As we will see, a good deal of this conservatism is no more than a quite justifiable reluctance to have one's time wasted and one's labour increased for diminished returns.

To avoid such "simplistic" failure theories a more comprehensive framework of innovation adoption and rejection is needed. So, I refer to the two perspectives, discussed by Hurst (1983): "control" and "change". These paradigms are two coherent and internally consistent alternative approaches for examining social phenomena. The choice between them depends on value and belief systems as well as prevailing power structures.

2.1.4.2. The inadequacy of the technological perspective

The "control" paradigm sees innovation as a process of adaptation and adjustment by which the social system seeks to maintain control in order to survive. This is also known as the "dominant" perspective.

Within the "control" paradigm, there are two approaches: "systemic" or "structural" analysis and "diffusionism". "Systemic" analysis views change as a response to external variation in the environment. Systems initially resist change and they only innovate to maintain identity and restore equilibrium. Similarly, "diffusionism" analyses change in terms of communication processes by which knowledge is disseminated through networks. Reception to change is determined by the manner in which it is conveyed to a target audience. So, failure is due to improper communication of the innovation to users.

In education, the "control" paradigm seems related to the so-called "technological paradigm" which dominated studies of change from the fifties to the early seventies. This perspective is associated with terms such as "logistic", "technocratic", "infrastructural" or "centre-periphery" (Shaeffer, 1990). Here, the teaching process and particular innovations are based on scientific principles and explicit knowledge which can be improved rationally and empirically through a systematic process. So, emphasis is on specific inputs such as new materials, media or methods. The underlying assumption is that users are rationalists who will accept and implement change without objection, provided that it is explained to them. Studies adopting this perspective often centre on exploring the statistical relationship between factors and change outcomes.

This thesis does not accept this paradigm. I explain the grounds on which this perspective is considered inadequate in discussing innovation success.

First, this perspective underestimates the importance of power differences in society. This approach views the social system in the same way as an anatomist views an organism or an engineer views a machine (Hurst, 1983). So, change processes are pictured as a part of the normal function of this system, which essentially remains the same since the tendency is toward equilibrium. As Papagiannis et al (1982) suggest, society is seen as stable and enduring; it organises collective action, maintains and transmits a shared belief system, and coordinates various subsystems. In education, this approach assumes considerable non-existent social consensus and common values among people, especially developers and teachers, and ignores the impact of political influence.

Second, the "control" paradigm offers the key to devising successful and efficient strategies of implementation. However, although the technocratic nature of this perspective emphasises curriculum development, it neglects the school environment (Verspoor, 1989). This ideology argues that innovations develop "naturally" and therefore, most attention should be paid to removing any barriers to getting the "good" ones adopted (Hurst, 1978). Unfortunately, in reality nobody can exercise that degree of control. So, in practice, the results of most innovations are hardly congruent with the objectives set. Educational practices are not necessarily systematic, policy decisions concerning them are not necessarily rational, nor are actors within them necessarily predictable.

Third, this approach discusses the characteristics of individuals and institutions and their interactions in terms of simple behavioural and institutional assumptions. Emphasis is placed on the characteristics of individuals rather than the structural properties of the social system. So, understanding adoption is seen as based on individual-level psychological reductionism.

Therefore, this perspective fails to provide a satisfactory explanation of the outcomes. So, there is a need to adopt other perspectives in studying change. The emerging alternatives place emphasis on the interaction between various interest groups involved in the process, as we will see in the analysis of the "change" paradigm that follows. As this thesis adopts this second paradigm, we will view the related approaches in greater depth.

2.1.4.3. The alternatives: political and cultural approaches

The "change" paradigm assumes no underlying stability and views change as a normal feature and a political process. Contradictions of viewpoints between groups or individuals are resolved through conflict or negotiation, in which it is possible to intervene but scarcely to control.

Within the "change" paradigm, there are two approaches: the "conflict/dependency" models (political perspective) and the "phenomenological" or "situational" analysis (cultural perspective).

The "conflict/dependency" approach is a social theory that derives mainly from Marx and Lenin. Response to innovations is viewed in terms of class conflict or of dependency relations between capitalism and the underdeveloped societies. This approach is also known as the "political perspective", which sees educational change as involving conflicts and compromise between groups, such as the teachers, the parents and the government. The inevitability of competition for educational goals and resources is recognised. Since differences in viewpoints are usual, changes are negotiated in a process of mutual adaptation.

Within the political perspective, there are two divisions. One is the "macro-political" approach towards change. This is the Marxist and neo-Marxist school, called the "radical" paradigm by supporters including Papagiannis et al (1982). This approach stresses the importance of class conflict and ideology in explaining success and failure of educational change. However, conflict theorists, adopting this broad socio-political theory of understanding, fail to provide practical advice to curriculum developers. The second approach is the "micro-political" theory which focuses on political activities at the meso-level that is the school organisational level. Therefore, emphasis is on implementation work in school and the interaction among groups which influence outcomes.

The "phenomenological" perspective is more individualistic. It starts from the premise that behaviour is determined by people's varied models of the world or definitions of reality. The key elements are the individual's or social group's definition of its own situation, values and knowledge as well as the logic and politics of its decisions for action. This is also known as the "cultural perspective". This assumes that society is fragmented and each group has a strong subculture. Conflict still exists but is based on shared values of different groups and on what the processes of change and education mean to each group. The belief system of the groups involved and the cultural context are emphasised. Several theorists including Fullan (discussed in detail in section 2.1.5) favour this perspective which views change as an evolutionary process that comes about through interaction and compromise at the school level rather than through technological planning or political conflict at the system level.

This study adopts the "change" paradigm, considering change as a matter of historical, political and logical conflict between competing and contradictory values, interests, ideologies and conceptions of the world. Conflict, as I have stressed in section 1.2 is an important characteristic of the Cypriot context. So, this perspective is appropriate because it analyses innovations as generated through the interaction of individuals not only with a structural system of incentives but also with societal structures. This is clearest in the development of new educational technologies such as computers, television and radio, of interest to this thesis. The weakness perhaps lies in the difficulty of turning more plausible descriptions into useful prescriptive and diagnostic tools since the degree to which social change can be controlled is very slight.

Researchers adopting both political (with the exception of the Marxists) and cultural approaches place more emphasis on the study of implementation. This indicates a shift from the "technological" paradigm to the "implementation" paradigm, badly neglected in the past, which now becomes the key to understanding innovation failure or success.

2.1.5. A recent study on change: Fullan's work

So far, I have shown that this thesis adopts the "change" paradigm and the "political/cultural" approach to change that leads to the "implementation" perspective. Since all these dimensions are present in Fullan's work, I will next refer to his theories. Application of Fullan's strategies is also suggested by other studies on the introduction of computing such as that of Plomp et al (1989) for the Netherlands. Fullan's work draws upon experience and literature from the US, Canada and the UK.

Fullan (1993) proposes a new paradigm on change through eight basic lessons:

> You can't mandate what matters; change is a journey, not a blueprint; problems are our friends; vision and strategic planning come later; individualism and collectivism must have equal power; neither centralization or decentralization works; connection with the wider environment is critical for success; every person is a change agent (p. 21).

Of special importance to this study is Fullan's view of change as a process, where problems are likely to arise: "problems are inevitable, but the good news is that you can't learn or be successful without them" (section 1.6). This is also consistent with the "change" paradigm, involving conflict. This study refers extensively to problems arising, while examining the innovations of interest later on since awareness of such problems can lead to improvement.

Now, we will discuss three of Fullan's assumptions adopted by this study: the implementation perspective, the phenomenological approach and the factors of change.

2.1.5.1. The implementation perspective

The problem of implementation is that of translating ideas into action. Thinking up what seems to be a good idea is one thing; putting this into practice is another. Most efforts to implement educational innovations prove unsuccessful while most studies do not explain how "failure" comes about. As I have mentioned in section 1.5, what happens between the input and output - the throughout stage - remains a mystery and that could lead to a superficial level of change or even non-change (Rahman, 1987; Lam, 1991; Mgijima, 1991).

A growing interest in the implementation of innovations in schools (Bergman, 1981 in Grunberg and Summers, 1992) led to Fullan's "implementation perspective" (1995). As already mentioned in section 2.1.3.2 implementation is concerned with the nature and extent of actual change, as well as the processes influencing how and what changes are achieved. There are two main reasons why it is important to focus on implementation (Fullan, 1992). First, it is impossible to know what has changed without attempting to conceptualise and measure this directly; we cannot interpret the outcomes or their absence if we do not know what is in the "black box" of implementation. Second, we need to understand the reasons why many educational innovations fail. The implementation perspective can be a powerful resource for accomplishing real improvements in schools. This approach leads us into the domain of both individual and institutional development allowing us to put innovations themselves into perspective.

Fullan insists that not all change is progress, or even meant to be. Failure to implement an ill-conceived or a poorly-developed policy or a bad idea is obviously a good thing. This is relevant to the "pathos of implementation": faithful implementation is sometimes undesirable, because the idea is bad; sometimes impossible because power won't permit it; and often unforeseeable because it depends on people's contributions as well as content. This thesis does not explore whether the particular innovations are "good" or "bad". I assume that the products are promising new ideas and are worth implementing.

2.1.5.2. The phenomenological approach

Fullan's approach is explicitly phenomenological providing an examination of innovation as it impinges on various actors involved in the process (Huberman, 1992 in Fullan, 1992). Significant changes have no reality beside local actors' views since actions or inactions are determined by people's perceptions. Implementation rides heavily on enlightened mixtures of users' charisma, knowledgeability, power, competence and needs.

So, the problem of meaning is central to making sense of educational change (Fullan, 1982). People usually lack a clear sense of understanding about the content and theory of educational practice and change. Results are faddism, confusion, failure and resistance. Development of meaning involves a political and cultural process, so is difficult. Individuals are parts of a gigantic, loosely organised, complex social system containing many subjective worlds. Perceptions are a function of each group's phenomenal world: objectives important to one group are incidental to another. So, proposed changes are usually not construed in the same way. Also, many changes are introduced as a result of external political pressures and are passed down the chain to the school administration, teachers, pupils and finally parents. Certain negotiations between all sides are handled implicitly since a "shared vision" is often needed.

So, focus is on both the individual and collective pictures. The individual picture concerns the subjective meaning for individuals at all levels of the system. Neglect of the phenomenology of change, that is how people actually experience change, is often at the heart of innovation failure. The collective picture is also needed because educational change is a socio-political process. So, investigation of the relationships between new programs or policies and the thousands of subjective realities embedded in people's individual and organisational contexts is required. How these subjective realities are addressed determines whether potential changes become meaningful at the level of individual use.

The implementation process is complex and embraces four important aspects. First, participation, initiative-taking and empowerment are key factors. Second, both pressure and support are necessary for success. Third, the relationship between changes in behaviour and changes in beliefs requires careful consideration: most people do not discover new meanings unless they are involved. The role of ownership is the fourth aspect. True ownership in the sense of clarity and commitment is a progressive process that does not occur magically. Teachers especially develop ownership as they undergo cycles of experimentation and begin to master change in the classroom.

2.1.5.3. The factors of change

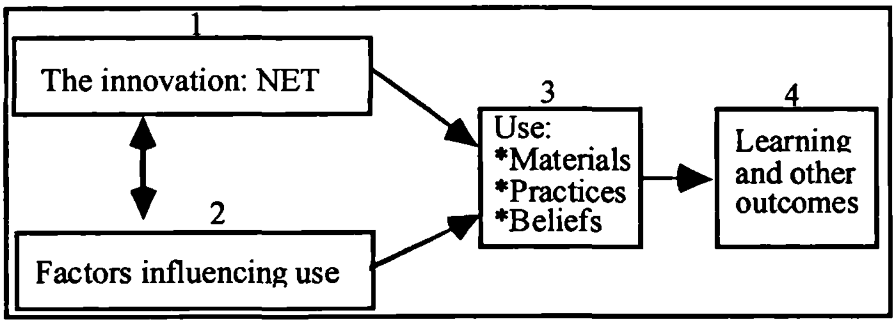

Figure 2.4 FULLAN'S OVERVIEW OF IMPLEMENTATION

Figure 2.4 shows that the "factors influencing use" are important in the process of change. Fullan (1982) underlines that the number and dynamics of such factors are too overwhelming. However, he proposes a comprehensive list of variables affective adoption, derived from recent literature (Table 2.1).

Fullan supports that effective implementation depends on a combination of factors that reinforce or undercut each other as an interrelated system. Single-factor theories of change are doomed to failure. Arguments that product quality is more important than teacher attitude or that external factors are more important than internal ones or that teachers are more central than administrators are pointless. The characteristics of the change (innovation), the make-up of the local district (system), the character of individual schools and teachers (actors) and the existence of relationships (process) interact to produce conditions for change. A fortunate combination of the right factors is needed to make change happen. Location of specific factors, to observe and explain how they function, and with what consequences is also required. Fullan (1992) proposes his own list of factors contributing to successful implementation, used for data analysis in Chapter 6 (section 6.2.2).

SUMMARY OF LITERATURE IMPLEMENTATION FACTORS	*FULLAN'S FACTORS OF IMPLEMENTATION*
1. Existence and quality of innovations 2. Access to information 3. Advocacy from central administrators 4. Teacher pressure, support 5. Consultants and change agents 6. Community pressure, support, apathy, opposition 7. Availability of federal or other funds 8. New central legislation or policy 9. Problem-solving incentives for adoption 10. Bureaucratic incentives for adoption	*Characteristics of the innovation*: 1. Clarity and complexity 2. Consensus and conflict about the change 3. Quality and practicality of the change *Local conditions*: 4. Central office direction, commitment and support 5. Process for implementation and institutionalization 6. Professional development and assistance 7. Implementation monitoring and problem-solving 8. Principal's leadership 9. Community support 10. Environment stability

Table 2.1 IMPLEMENTATION FACTORS

Generally, Fullan proposes that the change process is based on an evolutionary model. The resources, training, strategies and timelines are all forms of liquidity, which are better spent on the way.

Summary

This literature review on educational innovation leads us to some important points that underpin this study.

First, "improvement" is a key word in our definition of innovation. The aim is not to innovate for the innovation's sake, but for the sake of improvement. Innovations are a means to an end, and not an end in themselves (Hurst, 1983).

Second, change is complex as full understanding of all possible dimensions is impossible. The study of educational change has evolved during the last few decades and generated several theories. A basic assumption in all theories is that change is a developmental process within time limits. Different phases are encountered while the phase of implementation is particularly crucial. Several critical implementation factors refer to the system, the actors, the innovation and the process. A variety of strategies and models are applied to promote change.

Third, there are two paradigms in the study of educational change. The "control" paradigm is rejected because of its inefficiency in explaining implementation. The alternative "change" perspective is adopted, placing emphasis on mostly the "political-cultural" approaches. Of interest are individuals and groups within the broader societal context.

Fourth, Fullan's views on the "implementation" perspective, the "phenomenological" approach and the factors of change are all important for this thesis. The implementation perspective places emphasis on the context in which changes function in practice. The phenomenological approach proposes that the change process involves a combination of individuals and societal agencies. Individuals' and especially teachers' "meaning of change" is crucial. Finally, Fullan proposes a list of factors, divided into "characteristics of the innovation" and "local conditions".

Next, I proceed to discuss the concept of educational technology.

2.2. EDUCATIONAL TECHNOLOGY

This thesis focuses on the implementation of educational innovations in the field of educational technology, so here I provide an insight into this area.

There is no universally agreed-upon-definition of educational technology. Koetting and Januszewski (1991) suggest that within the field there are words, phrases or ideas that are referred to as problematic since they are open to debate. Indeed, discourse is impeded by the multiple meanings held by people (Molenda, 1995). According to Thomas (1987) and Hoban (1968), educational technology usually brings to mind film projectors, tape recorders, television sets, and computers as teaching tools; some people add such non electrical materials as books, photographs, and charts while others subscribe to a definition including items used in teaching and administration.

Historically, the concept "educational technology" has simply emerged. The roots of educational technology extend back through the years since the field developed as a series of movements. The principles that shaped its transformations come from diverse streams of influences including media research, systems analysis, educational psychology, progressive educational theory, communications theory and programmed learning. In this century, educational technology has undergone three distinct scientific and intellectual revolutions which have affected both its theory and practice.

2.2.1. Physicalist approach

The "physicalist" view was developed around 1940 and dominated the field until the 1950s. Today, this view remains in many educational and training establishments, especially with the contemporary computer revolution. This approach relies on the application of physical science to an education system (Davis, 1970) and may be described as a "product oriented", "technology in education", "audio-visual" or "tools" viewpoint.

In this physicalist approach the process of teaching is mechanised through the utilisation of a variety of aids including language laboratories, closed-circuit television and other audio-visual media. These present stimuli materials generating an increase in teacher impact and the number of students one teacher can instruct. Technology is synonymous with the machines (Hlynka, 1984). So, emphasis is on the creation, improvement and implementation of aids and the tendency is towards bigger and better machines.

Some people consider this approach a failure since they consider the nature of the instruction delivered more important than the equipment delivering it (Robinson and Embling, 1975; Rominzowski, 1988).

2.2.2. Systems approach

After the Second World War, the "systems" approach developed in consequence to the rise of behaviourism and learner-centred, programmed instruction. This is sometimes described as a "software", "behavioural science" or "technology of education" approach. This view originated in the application of behavioural principles to the learning process which is considered as a change in performance (Davis, 1970). The purpose of educational technology becomes "telesis", that is the attainment of desired ends by the application of human efforts to the means.

Although the emphasis is still on product aspects, process becomes increasingly important. So, educational technology extends beyond physical materials to "non-hardware" dimensions including methods of performing tasks that require no special equipment. Practically, this means that the orientation to "hardware" such as film projectors and tape-recorders developed outside education is substituted by an emphasis on "software" such as films or tapes, designed specifically to meet educational needs. Development of learning materials is based on contemporary theories of learning and perception (Ellington, 1993).

2.2.3. Integrated approach

A third, more systemic, holistic approach developed in the 1980s. This "integrated" approach resulted from the shift to learners' active participation on instructional design processes and the emergence of learning strategies. This definition adds an individual, human dimension.

Here, we see a combination of both task and human relations orientations and an integration of research from both 'hard' and 'social' sciences. Emphasis is on processes such as needs analysis and instructional development as well as product components such as multimedia or interactive video, in order to develop solutions to learning problems. "Process" is the systematic application of scientific solutions to practical tasks and "products" are the hardware and software that result from technological processes (Harris, 1988). Focus is on the optimal allocation of human, material and financial resources to produce desired educational outcomes.

This new approach results from an overall philosophy that the only meaningful way of looking at an organisation is to study it as an open system (Hancock, 1977). So far, the two theories described are essentially concerned with closed systems, independent from their environment; things are examined as existing apart from what they actually do or accomplish; they are focused to the chalkboard or the language laboratory or the teacher as a separate entity. This integrated educational technology is largely concerned with a "whole" and involves the design and evaluation of curricula and learning experiences as well as the problems of implementing and renovating them (Rowntree, 1982).

Ravishankar (1982) and Budin (1991) suggest that educational technology is an integrated system rather than a package of instructional materials. Verhagen and Plomp (1988) describe educational technology as the methodology of educational problem solving. On the other hand, Unwin and McAllese (1978) define educational technology as "an area of study and practice within education concerned with all aspects of the organisation of educational systems and procedures whereby resources are allocated to achieve specified and potentially replicable educational outcomes" (p. 325). Defined either way, Engler (1972) argues that the concept is value-free, morally and philosophically neutral.

According to Molenda (1995) the field of educational technology is dynamic. The area has always been heavily influenced by new developments in communications and information technology. New tools have opened up pedagogical possibilities that generated interest in new or rediscovered philosophical positions. Postmodernism (Hlynka, 1991) and emerging transformational developments in educational paradigms (Kemp, 1991) can be critical for the future of the area. For instance, Ullmer (1994) talks about a shift from the conventional "tools and tasks" perspective to new models, called "platforms and processes" and "ecologies and enterprises" which emphasise the learner's interactive, constructive role. Friedman (1994) foresees the emergence of a fourth phase of educational technology focusing not on hardware, software or users - like the other three - but on the environment of organisation.

Several attempts have been made to come up with a comprehensive definition of educational technology. The definition adopted for this thesis is the one proposed by the largest professional body in the field, the Association for Educational Communications and Technology, US (1977) which specifies educational technology as:

> ...a complex, integrated process involving people, procedures, ideas, devices and organizations, for analysing problems and devising, implementing and evaluating, and managing solutions to those problems, involved in all aspects of learning...It includes, but is not limited to, the development of instructional systems, the identification of existing resources, the delivery of resources to learners and the management of these processes and the people who perform them (p. 310 in Unwin and McAllese, 1978)

Summary

This study adopts the notion of educational technology from the integrated approach. This approach suggests that educational computing is viewed not as a new "tool" technology but as a system, involving products, processes and people. The emphasis on users overlaps with Fullan's theory on the importance of individuals. With this in mind, I next turn to discuss educational computing in relation to implementation success and the role of people.

2.3. EDUCATIONAL COMPUTING: SUCCESS IN IMPLEMENTATION

Here, I proceed to review the various rationales for computer introduction. Next, I clarify the concept of "success" in implementation of educational computing. Then, I show that the present state of computer integration world-wide is minimal and that individuals - teachers in particular - play an important role for successful implementation.

2.3.1. Rationales for introduction of educational computing

There is no doubt that at some level of adaptation, computers will appear in the classrooms of most countries (Pelgrum and Plomp, 1993). There is a tendency, especially in developing countries to show imitative behaviour of practices in advanced countries (Ihebuzor, 1986). According to Hawkridge (1990), the national strategy on computer introduction in schools depends on the dominant rationale. The social and vocational rationales are gathering strength in developing countries. The first supports computer introduction in schools because computers are pervading societies (Boyd, 1988). The second holds that children should learn about computers so as to be prepared for jobs in the future market place. On the other hand, in richer industrial countries, the pedagogic rationale is stronger. This suggests use of computers for the improvement of the teaching and learning processes. Fisher et al (1994) mention two alternative pedagogies: using new technological means to reach either old or new ends. Of interest to this study are the dominant rationales, supported by people and reflected in current practices, in the case of Cyprus, as the country is between the developed and developing world (section 5.2.2.1).

Whatever rationale is adopted, politicians must consider that the computer is not simply a "tool" but rather a complex package (Tucker, 1988). Technology, as the "integrated" approach proposes, comprises a "bundle of innovations" with many components and persons involved (Plomp et al, 1990). Within this framework, an exploration of the concept "success" attempted next is complex.

2.3.2. The concept of success: qualitative and quantitative dimensions

Successful innovations can either be viewed as revolutionary or evolutionary. For the case of computers, some authors view the innovation within a methodological context as a powerful tool with certain "revolutionary" effect on education (Tucker, 1988). Other more conservative ones consider the potential for restructuring as a utopian fantasy. Technology is viewed as simply related to the materials and the teaching models used (Hepp et al, 1998), arising out of current pedagogical practices. In this "evolutionary" context, success means treatment of technology as a systemic issue integral to the teaching-learning function, rather than as a marginal "enrichment" activity (Bardo, 1994). Success also implies incorporating the best of technology applications into the daily schooling practice. For example, the potential for increasingly learner-centred approaches (Tobin and Sharon, 1984; Blease and Cohen, 1990) is utilised.

On the other hand, success in computer implementation could mean high degrees of teacher involvement in computer use across the curriculum (Rhodes and Cox, 1990). Van Den Akker et al (1992) propose two components of successful experiences: students attaining clear learning results and teachers executing effective lessons without major problems. Meiste (1984) suggests that integration is successful when the computers are used in a variety of subjects by a large proportion of students and parents (in Hativa, 1995). Success is related not only to the amount and type of equipment provided but also to the quality of learning promoted by the actual interaction and understanding between the people in a school (Loveless, 1995). Coming back to Fullan's theory, success comes when all teachers experience a sense of "ownership" and meaning in practices (Rhodes, 1989). That means responding to the innovation, absorbing it, and matching classroom management, organisation and children's learning styles with the facilities offered (Fields, 1993).

All these attempts to define success imply the existence of two dimensions. One is quantitative and refers to the extent to which technology is integrated into current classroom practices. The other is qualitative and is more related to the content of the practices implemented. In both dimensions people are critical during the implementation process, as the "implementation" and "phenomenological" perspectives and the "integrated" view of educational technology suggest. Therefore, any reference to success in this thesis should incorporate both dimensions, as I discuss in Chapter 6.

2.3.3. International implementation practices: minimal success

2.3.3.1 A general overview

During the last two decades, national plans for computer introduction have emerged and developed worldwide at different levels. Such plans existed in fifteen out of the nineteen countries surveyed, according to a Unesco report (1987) but nations were as much as ten years apart (Tucker, 1988). Disparities occurred not only between but also within countries with school sites often found at different implementation levels.

However, internationally, despite the increasing numbers of machines in schools, one can not yet speak of successful integration of technology into teaching and learning processes. Many studies in the US, Canada, the Netherlands and the UK indicate that although many schools have computers, within schools little progress is made on quantitative or qualitative aspects (Davis, 1993; Pelgrum and Plomp, 1993; Bardo et al, 1994). So, simply providing a technology-rich environment does not of itself imply success (Kingston and Wagstaff, 1992).

In practice, in quantitative terms, computers are being used minimally and without apparent focus or educational rationales (Hativa, 1995). Teacher use reported internationally is rather limited: 10% of teachers in developed nations and 1 teacher per school in economically developing countries employ computers in teaching (Molenda, 1995); in the US half secondary school teachers use computers (Pelgrum and Plomp, 1991 in Grunberg and Summers, 1992). There have been some outstanding efforts to introduce educational computing, but these remain isolated pockets of excellence, floating on the periphery of education and never entering the mainstream (Zappone, 1991). These efforts are usually dependent on individual teachers, as for example in Dutch schools (Brummelhuis and Plomp, 1993; 1994).

On the other hand, in qualitative terms, technology is treated as a reluctantly accepted "in-law" of the education family; its best applications are still at odds with existing practices. Implementation plans in schools are reactive rather than proactive that is technology arrived, then there was a struggle to find valid applications. The applications are input-based rather than output-based, focused on hardware rather than applications (See, 1992). Therefore, computers tend to be used most frequently as add-ons to curricula (Pelgrum and Plomp, 1993), often as symbols of modernity rather than tools of restructuring. Experiences suggest that computing applications will not, simply by existing, create educational change (Walker, 1995).

Some striking parallels are apparent between what schools are doing and thinking about computers today and what they did and thought about other media in the past. Writers such as Cuban (1986) and Roszak (1986) view computers not as momentous and transformative, but as the latest in a long line of important inventions which have little impact on education. Tobin and Sharon (1984) suggest that new technologies are like old technologies, incorporated primarily as teaching aids in a largely unchanged educational system. Harper (1987) warns that the computer is in danger of being treated as an " add on", the victim of "benign neglect" just like educational television. In general, the bold predictions about media improving learning and revolutionising education have remained unrealised (Hannafin and Savenye, 1993); very modest changes in practice have occurred without any clear demonstration that instruction is more effective. The majority of new technologies did not receive widespread use in schools and did not survive the initial years of enthusiasm.

2.3.3.2 Some innovative projects

Why has the impact of technological innovations on educational practice been minimal? The disappointment following each innovation has left researchers searching for an explanation. It would be interesting, at this point, to reflect on some specific initiatives to implement computing, the strategies they involved and their limitations in effectiveness.

In the UK since 1973 several programmes were supported by the Department of Education and Science to promote the use of IT in schools: the National Development Programme in Computer Assisted Learning (NDPCAL, 1973-1977); the Microelectronics Education Programme (MEP, 1981-86); the Microelectronics Education Support Unit (MESU, 1986-1989); the Education Support Grants (ESG) for the appointment of advisory teachers and the provision of hardware; funding for the training of teachers and advisory teachers; grants to the National Council of Educational Technology (NCET) for support to the Local Education Authorities and teacher training establishments (Watson, 1993). In Scotland, the Scottish Microelectronics Development Programme (SMDP) was developed to produce software, to act as an information centre and to conduct research and development.

However, research findings indicated that at the school level these ambitious programmes were not particularly successful, as the majority of teachers made insufficient effective use of IT. The IMPACT project and the STAC project showed that the level and nature of such use depended upon the resource provision, access and particular curriculum requirements and that most teachers lacked sufficient pedagogical skills to be able to use IT in their lessons (Cox, 1997). The IMPACT project, in particular, showed that the implementation of IT primarily depended on individual teachers' initiatives, impacted by aspects of organisation, management, teaching styles, philosophy, and pedagogical practice. The distribution and sharing of limited resources, the need for inservice training and on-going support were also critical factors in implementation.

I will now briefly refer to the basic aspects and limitations of two specific initiatives: the MEP project in the UK. and the ACOT project in the US.

The UK. Experience: the MEP project

An interesting initiative is the Microelectronics Education Programme (MEP), mentioned above, that was developed for England, Wales and Northern Ireland. The Programme was aimed primarily for the compulsory sector (ages 5-16) and had a strong regional emphasis for the use of the computer as an aid for teaching and learning as well as the injection of new topics into the school curriculum. The strategies employed, as Gwyn (1987) states, involved three areas: curriculum development, teacher training and organisation/support of resources.

The direct MEP influence on the classrooms was judged disappointing, so the main weaknesses were investigated (Boyd-Barrett, 1991). First, an initial absence of widespread teacher perception of need was indicated, despite the enthusiastic lobbying of special interest groups; teachers were not necessarily convinced and it was difficult to reach beyond the already converted. Second, available hardware and software were often rudimentary. Third, there were wide variations of resource and a need for a coherent and agreed educational philosophy. Finally, the general level of training provided was relatively low. McKay (1989) points to the lack of an integrated policy in IT in education, encompassing funding, software design, machine purchase and teacher training.

The US. Experience: The ACOT project

Another interesting example is the ACOT project (Apple Classrooms of Tomorrow) in the US., a research-and-development collaboration among public schools, universities, research agencies and Apple Computer, which began in 1985. This project set out to investigate how routine use of technology by teachers and students would affect teaching and learning. ACOT initially involved five schools, which were reduced to three in 1989. The strategy of the project involved provision of these sites with hardware, software, teacher training, technical and instructional support and laissez-faire experimentation, encouraging variation and change. In 1992, ACOT received a grant from the National Science Foundation to create a replicable model of staff development to help teachers integrate technology into their classrooms.

Research findings indicated that the addition of technology in the ACOT classrooms did not revolutionalise instruction or change student learning (Sandholtz et al, 1997). As the project progressed, teachers began to question their beliefs about teaching and felt the need to shift from instruction to construction. However, when training was provided, teachers leaving the teacher development centres and returning to their schools encountered barriers such as limited access to hardware and software, lack of technical support and insufficient time; limited support from colleagues and administrators.

The overview of these initiatives indicates that even when the political will is there and resources are provided to schools, classroom practice is not easy to change. As Ridgway (1997) points out, the introduction of new curriculum materials brings about only surface reforms; changes in the process of teaching depend upon human interactions and are therefore, expensive and demanding. Several strategies employed by policy makers do not lead to success, unless the individuals at the school level decide to get and remain involved. Therefore, focus should be on the actors and their reactions to the innovation programme.

2.3.4. The key to success: focus on actors

Groups of people such as administrators, principals, teachers and pupils are of critical importance to change. Rowntree (1982) suggests that the implementation of innovations in education needs to "win the goodwill and active involvement of people to succeed" (Williams and Moss, 1993). Classroom teachers, in particular, are often regarded as key actors in the success of any innovation (Becker, 1993; Hativa, 1995). Regardless of administration patterns, in both centralised and decentralised systems, it is largely left to individual teachers to act (Wells, 1976). Without teacher support, Ministerial policies on application of classroom technology are certain to fail; computers presently in schools will not be used (Reed, 1986, Hawkridge and Jawaorski, 1990; Van Den Akker et al, 1992).

So, since implementation depends on individuals, then innovation failure is often attributed to their reluctance to get involved. Implementation practices are shaped by individuals' actions which often reflect their views and attitudes. So, several theories developed have linked people's reluctance to their views and attitudes, discussed in section 2.4. Literature suggests that success comes when the actors involved are positive and willing to change (Hawkridge and Jawaorski, 1990). However, as we will see in section 2.5, conditions should also be carefully considered in interpreting people's reactions to innovations.

Summary

Success of computing is seen in qualitative and quantitative terms as shown in section 2.3.2. Real integration into existing practices and the extent of usage are minimal worldwide (section 2.3.3). This failure has been attributed to individuals in general and teachers in particular (section 2.3.4).

Therefore, to explore educational computing in Cyprus elementary schools, I focus on individuals - especially teachers - in a process of mutual adaptation while they negotiate implementation. Individuals' views are believed to influence implementation. So in the next section I concentrate on attitudes and concerns to reveal possible dimensions of such views.

2.4. ACTORS IN IMPLEMENTATION: ATTITUDES AND CONCERNS

In the past, implementation failure has often been attributed to individuals' beliefs. Reference has been made to animosity of teachers as a reason for failure of educational broadcasting (Woeflel and Tyler, 1945; Murray, 1981). Teachers were cited as fearful, resisting and threatened by change, adopting defensive strategies to protect their traditional roles (Thomas, 1987; Olson, 1988; Campoy, 1992). Woodhouse and McDougall (1986) as well as Riedesel and Clements (1985) suggested teachers' widespread fear of technical things. Under-users and non-users of innovations were often blamed for inadequate confidence, competence or reluctance. In his review of classroom use of technology since 1920s, Cuban (1986) characterises this tendency to lay failure at the feet of teachers as unfair (section 1.5).

Until 1986, according to Wedman et al (1986) limited attention was given to the "people" aspect as related to computer implementation. As Fasano (1986) states, quantitative estimates of individuals involved in IT in education were very scarce. Since then, considerable research has explored reactions of various groups to innovations in general and computing in particular in terms of views, attitudes and concerns.

Research findings on teachers', students' and parents' attitudes and concerns reported here show that these groups hold positive feelings about change in general. Even in the case of IT with a complex and demanding nature (Harper, 1987), the trends are the same. So, implementation failure should be sought in the people's meanings for change, as influenced by the practical conditions in which the process develops.

Except from general trends (sections 2.4.1.2; 2.4.2.2), of interest is also the nature of concerns and attitudes. Attitudes are multi-faceted, highly complex constructs with different dimensions, usually referred as sub-scales or factors in section 2.4.1.1. Concerns, on the other hand, are described as different stages, on a developmental continuum in section 2.4.2.1.

2.4.1. People's attitudes

2.4.1.1. The nature of attitudes

Allport (1966) specifies the concept "attitude" as a mental and neural state of readiness organised through experience, exerting a direct and dynamic influence upon the individual's response to all objects and situations with which it is related (in Mullan, 1982). Attitudes would seem to be internal states, tied to psychological constructs such as beliefs and values, which share common attributes and are introspective in their operation (Mullan, 1982). Oppenheim (1992) points out that attitudes may lead to particular behavioural intents.

There are a number of reliable and stable instruments measuring attitudes of adults. Such are the Computer Anxiety Index (Simonson et al, 1987), the Computer Attitude Scale (Rainer and Miller, 1996) and the Computer Attitude Scale (Kim, 1994). Gardner et al (1993) in their study established the reliability and validity of four computer attitude measures: ATC (Attitudes Towards Computers, Raub, 1981), CAIN (Computer Anxiety Index, Maurer, 1983), BELCAT (Blomberg-Erickson-Lowery Computer Attitude Task, Erickson, 1987) and CAS (Computer Attitude Scale, Loyd and Gressard, 1984). In the area of instrument design, Daud (1995) as well as Christensen and Knezek (1996) tried to develop their own specialised instruments to measure teachers' attitudes.

These attitude instruments include various factors as subscales, suggesting that there are various dimensions for consideration. Anxiety is one of these aspects.

For example the Computer Attitude Scale by Loyd and Loyd (1985) refers to computer anxiety, confidence, liking and usefulness. The Minnesota Educational Computing Consortium (Chen, 1986) refers to computer interest, confidence, anxiety, gender equality in use, and respect through computers. The Minnesota Computer Literacy Test (Mahmood and Medewitz, 1989) measures enjoyment, anxiety, confidence and attitudes towards computers. Another Computer Attitude Scale (Kim, 1994) refers to computer dislike, anxiety and confidence. McInerney and Sinclair (1994) used their Computer Anxiety Rating Scale to measure learning about computers anxiety, computer equipment anxiety, computer message anxiety and observing computers anxiety.

Several instruments have been developed for assessment of student computer attitudes as well: the Young Children's Computer Inventory (YCCI) by Miyashita and Knezek (1992), the Bath County Computer Attitudes Scale (BCCAS) by Bear et al (1987) and Francis and Evans (1995), a Computer Anxiety Scale by Bandalos and Benson (1990). Semantic differential instruments were also used by other researchers (Williams et al 1983; Harvey and Wilson, 1985; Nelson, 1989).

There were again different factors as subscales. Todman and Dick (1993) refer to fun, ease of use and usefulness. The Computer Attitudes Scale by Richards et al (1986) includes liking, self-confidence, belief in the necessity of computers for career success, and belief that computers are a male domain. Another scale, proposed by Shashaani (1993) refers to interest in computers, stereotypes about computer users, concept of computers, confidence in ability to learn computers as well as perceptions of parents and teachers attitudes towards computers.

As we see, this recent review of the literature reveals descriptions of several instruments, designed to measure computer attitudes, most of which propose different factors believed to underlie that construct. So, results indicate some inconsistency in the hypothesised dimensionality of the construct as the underlying dimensions of computer attitudes have been explicated in multiple ways.

2.4.1.2. The role of attitudes in implementation: general trends

Teachers

Regardless of the power and organisational structure of an educational system, there is limited control of what happens in the classroom. Most pedagogical activities are carried out entirely by teachers (Schostak, 1988). Not surprisingly then, many theorists like Galbraith et al (1990) and Sandholtzt et al (1997) have repeatedly regarded teachers as the gateway to the success of any innovation.

Existing literature implies that the extent to which computer use is effective depends on how valuable the teacher perceives the computer to be as an instructional device (Wright and Campbell, 1987; Becker, 1990; Van Den Akker et al, 1992). Stevens (1980) and Podemski (1981) assert that teachers' attitudes are significant to successful implementation (in Wedman et al, 1986).

So, the underlying assumption is that attitudes are important in the implementation process. Research in the area is either exploratory or experimental. Exploratory research describes attitudes within specific settings while experimental relates attitudes to variables such as age or gender.

Such research has been undertaken extensively on an international level. Sponder and Hilgenfeld (1993) investigated preservice teachers' attitudes towards computers in Singapore. Meimaris (1993) focused on Greek teachers' views about new technologies and their hypothetical future integration into classrooms. Kristiansen (1992) found attitudes of the teacher population quite stable over a 20 year period. Beishuizen and Moonen (1993) discussed the Dutch Technology Enriched School project in terms of teacher attitudes. Sudzina (1993) focused on teacher beliefs in school restructuring, reform and training. Reference to teacher attitudes is also made in the report of the US Office of Technology Assessment (1995) which seeks to underscore the connection between teachers and technology implementation in schools. Keeler (1996) investigated attitudes in an evaluation study of an elementary computer implementation project.

Most exploratory research suggests that teachers theoretically favour use of the computers in their teaching practices. The US Office of Technology Assessment (1988) reported that 70% of American teachers believed that computers had a positive effect on student motivation, subject interest, attention span and cognitive learning. Landerholm (1995) found that over 90% of teachers surveyed in Chicago, US had positive personal and professional attitudes towards computers. Reed (1986) indicated that teachers who used computers favoured technology as an integral part of instruction. Sullivan et al (1993) revealed that educational technology professionals had a positive outlook toward the future of the field. Williams and Moss (1993) in a survey of staff attitudes in a UK school concluded that all teachers felt technology was important within the whole school curriculum, while 73% believed this for their subject area. In their survey, Underwood and Underwood (1990) pointed that "positive attitudes were received four times as often as negative responses" (Loveless, 1995). Other studies such as those of Johnson (1987), Okinaka (1991), Jo (1995) and Lowther and Sullivan (1994) indicated positive teachers' computer attitudes.

A few other researchers reported reluctance. Lumsden and Norris (1985) found that educators surveyed were not highly positive in their attitudes towards educational computing. Beach and Vacca (1985) investigated perceptions on the implementation of computers and indicated that success varied directly with the adaptability of the administrator. Menis (1987) stated that some Mathematics teachers in Israel feared that computers might replace them in the future.

Attitudes have been found to change as a result of training or implementation practices. Some researchers explored the relationship between attitudes and other variables. A few researchers concentrated on training and teachers' attitudes. Kluever et al (1994) investigated attitudes of teachers who participated in training on classroom applications of computing; results indicated significant differences in most items between pre and post test means. McCormack (1995) administered pre and post implementation questionnaires to test teacher attitudes towards technology use in the elementary classroom; findings showed that all participants recognised advantages of such use. Others explored attitudes in relation to computer ownership. For example, Moonen and Collis (1992) investigated Dutch teachers and showed a positive relationship between owning a computer and holding a favorable attitude towards using one at school.

In general, although attitudes are mostly reported as favourable, there is little evidence of effective computing implementation. The majority of teachers remain untouched by the introduction of IT in schools and show reluctance to utilise it (Blease and Cohen, 1990). The only exception is often a group of educators acting with energy and enthusiasm in purely empirical and pragmatic ways (Fothergill, 1988; Underwood and Underwood, 1990; Fields, 1993). As Rhodes and Cox (1990) point out, British teachers' acceptance of the value of computer use in the classrooms does not necessarily lead to regular integrated use.

Students

According to Smith (1987) students' views about technology have been an area of continuing concern. Implementation of computers in schools is also to be related to students' attitudes and confidence about using the machines (Sewell, 1989; Straker, 1993).

Most research has concentrated mainly on exploring trends in students' attitudes. Within the context of implementation of technology programmes, children's attitudes were reported as positive by several studies such as that of Mullan (1982); Colbourne and Light (1987); Beyer and Dusewicz (1991); Wilson et al

(1993); Salehi et al (1989) in Davidson and Ritchie (1994). Williams et al (1983), Harvey and Wilson (1985) and Nelson (1989) conducted similar surveys on children in the US, the UK and West Australia respectively and indicated their computer attitudes as positive.

Another interesting pattern in attitude research is related to gender. The issue of gender has been constantly raised since, as Loveless (1995) states, the popular image of new technology has historically been designed and marketed for males. Clements et al (1993) refer to the study of Scott et al, 1992 who found the boys to be predominant computer users compared to girls. Gender differences were indicated by Kirkman (1993) and Martin (1991) in the UK. Boys were found to have more positive computer attitudes than girls on the subscales for fun and usefulness by Todman and Dick (1993); interest in and confidence about computers by Chen (1986); confidence and interest by Siann et al (1990); stereotyping and confidence by Gardner et al (1986); interest, confidence and stereotyping by Shashaani (1993). However, a few other studies revealed no substantial gender differences in attitudes: Harvey and Wilson (1985) and Nelson (1989) in the UK and Australia respectively; Knezek et al (1993) in parallel studies of Japan, Mexico and the US.

As far as age is concerned, Harvey and Wilson (1985) found fewer attitude differences between primary and secondary school children in the UK than Nelson (1989) who stated that younger Australian children had generally more positive attitudes. Todman and Dick (1993) found no overall age effect, except on the fun sub-scale on which attitudes decreased as children were getting older.

Other researchers have concentrated on the relationship between student attitudes and experience. Harvey and Wilson (1985) as well as Nelson (1989) reported that children owners in the UK and West Australia respectively had significantly more positive responses than non-owners. Kirkman (1993) and Martin (1991) in the UK also showed that the attitudes of children to computers were influenced by computer ownership. Levin and Gordon (1989) showed that in Israel owners were more motivated to become familiar with computers.

Finally, research has investigated attitudes related to the effect of educational environments: Knezek et al (1993) in a study of children's attitudes towards computers in Japan, Mexico and the US found that importance and enjoyment were positively influenced by the introduction of computer activities in primary schools; Moore (1987) showed that pupils' attitudes were influenced by the classroom activities. Other researchers such as Summers (1990), McInerney and Sinclair (1994) and Savenye (1993) indicated that participation in computer training produced positive attitudes reducing anxieties. Mahmood and Medewitz (1989) found that as college students became computer literate, they formed positive opinions toward technology applications but did not significantly change their attitudes and values. However, Offir et al (1991) discovered no significant development in attitudes before and after courses on innovations and information technologies. McEnerney et al (1992) found that the attitudes of preservice teachers, enrolled in noncomputer courses were more positive than those of their counterparts in computer education electives.

All research has extensively outlined interesting relationships between variables and dimensions of the attitude constructs. Attitudes have been researched so as to indicate whether implementation works. However, it has failed to support clearly that when student attitudes are positive, implementation is successful.

Parents

Parents often become active participants in the planning and implementation of computing in the classroom. Little has been mentioned in the literature on parental attitudes towards technology. Usually researchers (Kristiansen, 1991; Davidson and Ritchie, 1994) investigated parents' attitudes in order to compare with attitudes of other groups such as teachers or students. Shashaani (1993) also found a strong relationship between students' computer attitudes and their perceptions of their parents' attitudes towards computers.

Investigation of parents' reactions towards an innovation is important as community support is often a condition for an innovation to survive (Fein, 1987). As Kristiansen (1991) stresses:

> We know something about teachers and students but parents are often an overlooked partner in the game. Even if the computers were not available in the home, the attitudes and expectations of parents are of vital interest. Conflict or consensus with the teachers is crucial (p. 201).

Parallel studies: various groups

Comparisons between different groups are of interest to several researchers. Smith (1987) investigated both teachers' and students' computer attitudes during the first years of implementation of an educational curriculum. Both studies, for schools that were at early and advanced stages of computer application, revealed significant differences in attitudes by grade level as well as in sex-typing attitudes of males and females.

Alifrangis (1991) described the implementation of a computer-based integrated learning system in an elementary setting. Teachers and students were very positive about their experiences of the Education System Corporation (ESC) lab as a supplement to their classrooms.

Lehman and Campbell (1991) focused on Microcomputer based laboratories (MBLs) in science classrooms of six high schools in Indiana, US. They collected data on student and teacher attitudes toward the use of MBLs and found both students' and participating teachers' attitudes overwhelmingly positive.

Kristiansen (1991) explored whether teachers, parents and pupils in Norway shared the same expectations about computers in order to indicate factors influencing effective use in secondary and primary education. Teachers, compared to parents were less motivated and enthusiastic about their own use of computers and tended to underestimate the necessity of computers in education.

Kimpston et al (1991) investigated teachers', students' and parents' views about a project entitled CAN (Computer Applications Now!) integrating computers in a rural Midwest school district in the US. Overall the project had no significant effects on student performance. However, a number of factors contributed to a negative impact of the project on the attitudes of some school staff.

Finally, Davidson and Ritchie (1994) conducted a survey to determine computer attitudes of teachers, students and parents in an elementary school in Texas, US. They found that students' and parents' positive attitudes increased significantly one year after the introduction of computers in the elementary school, although no statistical difference was indicated for teachers. The general outcomes showed that computers could be effectively implemented into the classroom when individuals' anxieties remained low.

Summary

Attitudes have been researched into as individuals' views are important for successful implementation. So far, we see that attitudes are reported as constructs with various dimensions (section 2.4.1.1). Therefore, instruments with different sub-scales have been developed and used in research.

Extensive research has focused on attitudes of different groups such as teachers, parents, principals and children in relation to implementation. This is consistent with the "change" political/cultural paradigm. Attitudes are mostly reported as positive and with interesting trends according to variables (section 2.4.1.2). For this study, it is worth wondering about the nature and trends in Cypriots' attitudes. In particular, it is worth considering the role of teachers' attitudes in the implementation process of educational computing in Cyprus pilot schools.

Now, I shift attention to another way of exploring actors' reactions, that is the implementers' concerns. A significant theoretical background is provided in the next section to support the importance of these constructs in the implementation of innovations over time. Like attitudes, concerns are multi-dimensional but represent a developmental continuum, useful for identifying the current level of adoption of individuals or groups. Therefore, concerns compared to attitudes seem to be more practical guides in exploring involved actors' feelings about implementation.

2.4.2. People's concerns

2.4.2.1. The nature of concerns

A concern is defined (Hall et al, 1986 in Bailey and Pulsha, 1992) to be "the composite representation of the feelings, preoccupations, thoughts and considerations given to a particular issue or task".

Fuller's (1969) early work in educational innovations concentrated on the area of teacher concerns. Fuller suggested a natural sequence of three concerns: nonconcern, concern with self, and concern with pupils. In 1973, Hall, Wallace and Dossett applied Fuller's model to teachers involved in implementation and evolved a "Stages of Concern" continuum. This continuum, describing the perceptions, feelings and motivations of innovation users over time, was validated by a series of longitudinal studies (Marsh and Penn, 1988).

Adopters go through seven progressive stages of concern (SoC) as they become innovation users: from "self" to "task" and "impact" (Table 2.2). The first three levels of concern are self-directed that is they focus on the effect of the innovation upon an individual, such as a teacher. The next two are task-directed and focus on concern over the innovation as related to a setting, such as a classroom. The last two levels are impact-directed and emphasise the consequences of the innovation across an environment, such as a school district. When encountering an innovation, behaviour is influenced by the highest concerns at the time. Individuals do not experience only one stage at a time. They rather have a concerns profile with some stages relatively more intense than others: stages 0, 1 and 2 at the beginning; then stage 3; finally, stages 4, 5 and 6.

Fuller's work influenced Hall and Loucks (1978) to develop the Concerns-Based Adoption Model (CBAM) related to the concerns of professionals about an innovation. The model suggests that learners pass through predictable stages from lack of awareness to concerns regarding collaboration. Change is regarded as an ongoing, personal experience, effectiveness being mediated by the extent to which training is matched to the needs of individual trainees (Hall & Loucks, 1978 in Bailey and Palsha, 1992).

(0) *Awareness*	The initial contact with an innovation in which there is little involvement. The professional has little awareness of the innovation and thus is not likely to be particularly concerned about it.
(1) *Informational*	A general awareness and desire to learn about the innovation, but the individual does not see its relationship to self. The primary concern is with knowing more about what the innovation is and what it does.
(2) *Personal*	Individual begins to worry about the impact and demands of the innovation upon his/her situation and about personal adequacy in dealing with new expectations; financial and status considerations for self and colleagues may also be of concern. Professionals may view the innovation as a personal threat if it is difficult or too demanding (Bailey and Palsha, 1992).
(3) *Management*	Attention is on the process and tasks involved in using the innovation in one's own environment; issues related to efficiency, organisation, management and time are most important. Concerns focus on the implementation of the intervention (how, when, and where).
(4) *Consequence*	Emphasis is on the impact of the innovation on the learning environment and on the students. Focus is on motivation, student performance, and changes in the classroom. The professional is concerned about the extent to which the innovation will have a positive impact.
(5) *Collaboration*	Focus is on coordination and cooperation with colleagues regarding the use of the innovation. Such concerns are usually expressed by administrators who are concerned about the cooperation among professionals in implementation.
(6) *Refocusing*	Attention is on exploring additional benefits of the innovation as well as refinement of current use to increase effectiveness. It may include alternatives to innovation that seem more effective. So, the professional evaluates the innovation so as to modify it or considers other options.

Table 2.2. THE SEVEN STAGES OF CONCERN (HALL ET AL, 1977)

Much discussion in the literature is about the importance of the CBAM and the SoC Questionnaire (SoCQ) in studying change as progress of individuals in the developmental stages of concern. Populations in each study differ.

Some studies over the past sixty years demonstrated the usefulness of investigating concerns in facilitating innovation adoption in schools. Hord and Hall (1984) referred to the CBAM as a useful empirically based conceptual framework and the SoCQ as a research based technique that principals can use when making decisions about teachers' development. Williamson and Hassan (1990) provided seventy studies of curriculum implementation in Australia, most of which involved use of the SoCQ.

Some research has concentrated on the applicability of the CBAM in other disciplines. For example, the studies of McCulloch and Thompson (1981), Hatton et al (1994) as well as Gardner and Tillman (1986) validated use of the model in the education of health professionals. Francq (1984) recommended use of the CBAM for library managers. Hall and Rutherford (1983) proposed the SoCQ as a diagnostic tool for counsellors, administrators and other change facilitators responsible for the delivery of staff development experience.

Research also suggests modifications to the original instrument. For instance, Bailey and Palsha (1992) proposed a 5-stage model, as a more consistent framework for conceptualising needs opposed to the original 7-stage model; Shotsberger and Crawford (1996) suggested a 27-item 5-stage model without the awareness and refocusing stages; O'Sullivan and Zielinski (1988) examined a modified version of the SoCQ intended for use with preservice teachers; Rutherford (1982), Hall et al (1993) and Matthews (1993) proposed the Change Facilitator Stages of Concern Questionnaire (CFSoCQ) as a procedure for studying leaders' concerns.

2.4.2.2. The role of concerns in implementation: general trends

The concerns of teachers determine institutionalisation of innovations in the curriculum (Heller and Martin, 1987). Research focused on concerns as related to implementation of educational innovations in general and technology innovations in particular. Researchers either investigated the development of concerns through use of the CBAM and the SoCQ or explored the relationship between concerns and other variables.

Educational innovations

Considerable research confirmed the developmental nature and described various trends in concerns while implementing different school and non-school educational innovation programs. Such research demonstrated the usefulness of using the SoCQ to indicate levels of innovation adoption and problem areas.

School innovations have been investigated to a great extent. Darr (1985) focused on the Ohio Vocational Home Economics teachers' concerns about adopting a new Practical Action Curriculum and found them high at the informational, personal and consequence levels. Kimpston (1986) indicated a progression from lower to higher stages of concern of principals and teachers involved in implementing benchmark testing in a school district; elementary teachers' concerns were of higher levels than those of secondary teachers; knowledge about the innovation raised the level of concern; English and Mathematics teachers' concerns were of higher levels than others. Knudson (1987) showed concerns in collaborating on the implementation of a writing program in a California middle school. Marsh and Penn (1988) examined the progression of concerns that 96 students experienced as they engaged in innovative reading improvement classes. Sevilla and Marsh (1992) found that elementary school teachers in California, involved in an inquiry-oriented science program, reached advanced concerns early in their implementation efforts. Griswold (1993) indicated the concerns related to the implementation of "Total Quality Schooling" and identified employees as nonusers. Bushrow and Turner (1994) tested administrators and teachers of a rural school district in the US and showed that they were still at the information stage on "Adaptive and Assistive Technology in Special Education". The SoCQ was also used for trade and industrial arts teachers in Nebraska and Idaho, US and showed failure to accept technology education (Rogers, 1991; Rogers, 1992; Rogers and Mahler, 1994; Rogers and Wilson, 1992). Linnell (1992) focused on the same population in North Carolina and indicated concerns about personal effects, allocation of resources and state requirements. Such informational, personal and management concerns should be addressed for curriculum transition to be successful (Linnell, 1994).

Other researchers focused on implementation of non-school innovations. Enochs (1985) indicated use of the instrument to document effectiveness of the "Kansas State Energy Curriculum Institute" program; participants became increasingly concerned about student outcomes and collaboration with other colleagues. Kuralt (1990) investigated the institutionalisation of a consultation-based ancillary service delivery model, multidisciplinary "Child Study Teams", and indicated users' concerns. Noad (1995) referred to the use of the CBAM in curriculum adoption for the "Certificate of General Education for Adults" in Australia and its contribution to identification of barriers to change.

Finally, significant amount of research has studied concerns as an indication of training effectiveness. Broyles and Tillman (1985) measured the effect of inservice training on teachers' concerns before and after the program. Stroble and Bratcher (1990) indicated a shift in concerns about writing process instruction from informational to collaboration after the training on the "National Writing Project" model. Cicchelli (1991) indicated significant differences in self, task and impact concerns between undergraduate and graduate students in a teacher education program. Scharmann and McLellan (1992) evaluated an inservice workshop intended to promote science technology society instructional themes and found a significant shift in concerns as trained teachers demonstrated higher levels of concern with respect to the innovative instructional approach. Moreover, Zielinski and Preston (1992) studied preservice secondary science teachers as they progressed through a 4-year teacher preparation program; concerns during the first years remained informational and became more student-centred by shifting to consequence, collaboration and refocusing later on. Gann (1993) described a concerns-based approach to professional development programs designed to implement current reforms in Mathematics education. Finally, Meyerson (1995) showed a change from "self" to "impact" concerns for 10 educators, enrolled in a 4-month graduate course, as they adopted naturalistic assessment procedures.

Educational technology

Extensive literature has concentrated on concerns in relation to the introduction of technologies in classroom environments, of special interest to this study. As Cicchelli and Baecher (1989) point out, unless the real concerns of teachers are systematically considered as a critical variable in the change process, application of computers will take on the usual "hit and miss" orientation.

Wedman and Heller (1984) found teachers' concerns about educational computing most intense in the areas of awareness, information and personal. Wedman (1986) conducted two studies using the CBAM: the first study rejected that concerns of innovation users are developmental and indicated that changes in concerns could be affected by the nature of the inservice activity and/or the characteristics of the innovation; the second showed that different educational uses of technology such as word processing and computer assisted instruction elicited different concerns. Heller and Martin (1987) investigated attitudes of teachers about "microcomputers in instruction" as a determinant of permanent institutionalisation of the innovation into the curriculum; teachers involved in the first year of computer use had high personal concerns, regardless of computer training, years of experience and computer use. Ellis (1989) had participants in a project for implementing educational computing in science courses complete the SoCQ to indicate the degree of implementation; by the end of the second year of the project, profiles of participants had changed from one typical of non-users towards one of users. Cicchelli and Baecher, in a number of studies (1985; 1987; 1989; 1990), indicated that concerns of elementary and secondary teachers on the process of implementing computers in their schools developed in a hierarchical order, from self to task to impact. Finally, Hope (1995) found that teachers in an American elementary school had self and task concerns at the beginning changing to impact ones as their involvement with computer technology increased.

Technology training and concerns became the focus of other research since teacher education is often regarded as the answer to successful implementation. The heterogeneity of teacher concerns and the dynamic nature of educational computing as an innovation pose significant challenges to the in-service provider. Hadley and Farland (1985) used the SoCQ to study the degree of acceptance of university faculty towards the use of computers in an effort to integrate computers into the teacher education curriculum in South Dakota, US Wedman et al (1986) investigated the effects of an inservice teacher education course and revealed that although after the course higher level concerns increased, intermediate level concerns did not rise as expected and lower level concerns still remained high. Similarly, Overbaugh and Reed (1992) tracked changes in teachers' concerns who attended university courses. Those enrolled in an introductory computer course, unlike those enrolled in a content-specific course using computers had significant changes in the informational and management concerns. Reed (1995) indicated that an enriched unit of instruction of hypermedia in education could affect teachers' attitudes. Todd (1993) studied faculty concerns about integrating computers in teacher education courses and found most intense concerns in the self stages; experienced users had more intense concerns about the impact stages than unskilled ones. Wells and Anderson (1995) measured educators' attitudes about integration of Computer-Mediated Communication in educational settings and found impact concerns increasing with computer experience.

Summary

Fuller's work suggests a developmental continuum of seven stages of concern for individuals involved. Higher "impact" stages are an indication of successful implementation level (section 2.4.2.1). Considerable research has focused on application of this CBAM model in innovation adoption in education and elsewhere. Extensive research on the stages of concern has also been specifically conducted in the field of educational technology and has supported this theoretical framework of the seven stages of concern (section 2.4.2.2).

To sum up, section 2.4 has focused on people's attitudes and concerns about implementation and has resulted in various aspects for consideration. First, that attitudes and concerns are researched as an important aspect of implementation practices. Second, that people in the process of implementation are likely to be different in terms of their attitudes and concerns. Third, that positive attitudes and high impact stages are necessary but not enough for successful implementation. It is worth exploring why people show reluctance to get involved, even if they seem favourable about an innovation. For this, we have to turn to the practical aspects and conditions.

2.5. ACTORS IN IMPLEMENTATION: PRACTICAL ASPECTS AND CONDITIONS

In this section, I discuss the complexities of the teaching profession and the problems in local conditions that may influence implementation.

2.5.1. The complexities of teaching

There are several complexities for consideration in interpreting people's reactions to innovations. In the case of new technologies, teachers often find it difficult to understand how these innovations impact on the improvement of the learning process at the practical level (Wells, 1976; Brummelhuis and Plomp, 1994; Heywood and Norman, 1988; Khan, 1995). From the point of view of a hard-pressed teacher trying to deal with limited resources, computing may seem like another bandwagon (Hawkridge, 1987; Grunberg and Summers, 1992). The introduction of computers may ask for new teaching strategies, types of classroom organisation, teacher roles and teacher-student relationships, leading to increased teacher workload (Apter, 1968; Walker, 1983 in Tetenbaum and Mulkeen, 1986; McCraw et al, 1995). New technologies require abilities, not well served by alternate resources (Tobin, 1984) and a different type of teacher: not an "actor" but a "manager" (Fasano, 1986; Budin, 1991; Moonen and Collis, 1992).

2.5.2. Problems in implementation conditions

Conditions may also prevent successful integration of computing into education. All over the world, implementation studies for educational computing refer to the various problems encountered: UK (Gardener, 1984; Ewen and Roberts, 1985; Opacic and Roberts, 1985); Latin America (Sanchez, 1991); US (Main and Roberts, 1990). Here, I provide an overview of hardware, software, training and curriculum integration shaped by the local characteristics in each country.

Hardware and Software

Implementation must take into account the specific economic and cultural environment as well as the financial resources available (Lefranc, 1990; Walker, 1995). Sufficient resources are necessary if technologies are to be used as effective learning resources rather than as a weak form of enrichment (Grattan, 1974; Maddux, 1989). In most countries, reports state the average hardware provision as limited (Pelgrum, 1994). Highly centralised education systems tend to have more standardised distribution of equipment while more decentralised systems such as the US or Canada have a greater variety of hardware and dependence on commercial, rather than governmental sources. Economically advanced nations like the EU and Japan tend to have more computers compared to disadvantaged ones like Latin America and Africa.

In the past, Wilson (1968) and Woeflel and Tyler (1945) suggested production of broadcasting programmes, designed to stimulate pupils' interest. Snider (1992) points that from teaching machines to computers, poor quality programmes and unreliable software have disappointed teachers and led them to reject the technology. Most country reports refer extensively to lack of quality software, relevant to the needs of educators or the curriculum (Plomp and Keursten, 1989).

Training

In the past, according to Robertson and Yokom (1973), most educators were unaware of the potential of the media. A number of researchers point to the need for teacher training (Norris, 1985; Millin and Barta, 1991; Young, 1991; Solomon, 1992). Effective staff development is seen as critical in implementation of new technologies in any educational system (Munday et al, 1991; Northwood, 1991; Stoddart and Niederhauser, 1993).

In an international perspective training does take place but is quite inadequate. In EU member states many teachers are insufficiently trained (Pelgrum, 1994). For example, in the UK teachers report that because of unavailability of training, they have to resort to self-help in their spare time (Bleach, 1986). In Japan, as of 1991, one quarter of the teachers were capable of operating computers; among these 34% capable of teaching others how to use computers (Santiago, 1993). In the US, the vast majority of teachers were found to have little or no training background on how to apply computers in teaching: only one third of all teachers had even ten hours of training (Office of Technology Assessment, 1988).

According to a Unesco report, internationally the highest priority is given to the training of the computer specialists, rather than the non specialists, usually provided with short "hands on" introductory courses. However, most research favours training that relates to a holistic view of technology both as an object as well as a means for instruction (Collis, 1995). Lane (1982), Callister and Burbules (1990) and Brown (1994) support training that integrates theoretical and practical perspectives, including a thorough reflection on the curricula, the possible place of technologies and the available hardware and software infrastructure. Benjamin et al (1990) also point that staff development should be continuous.

Curriculum Integration

In the past, broadcasting failed to be integrated with educational curricula at various levels (Mohanty, 1984) for different subjects, such as History, Geography, Social Studies and English (Powell, 1965). Curriculum integration is one of the priority areas with the introduction of computers, according to Cerych and Jallade (1986). As IT. emerges, the demands for a new curriculum will grow in every country. The needs of countries have much in common, so a great deal is to be gained from a commonality of purpose within schools (Nishinosono, 1989).

At the time, there is no clear consensus among countries about technology-related goals for particular elementary grade levels (Pelgrum, 1994). A survey of nineteen countries including China, India, Israel, Japan, New Zealand and several European countries indicates two major applications of computers in schools: learning about computers, that is acquisition of operational skills or using computers as an aid in teaching traditional subjects, that is integration of computing into curriculum (Pelgrum and Plomp, 1991 in Hativa, 1995). In most Unesco reports priority is given to computer studies, more acceptable in political terms than computing integration in the curriculum (Tucker, 1988). Some countries such as France and Ireland explicitly state that IT. should not be an object of study at an elementary level but rather be used as a cross curricular tool.

Sage and Smith (1983) suggest that there are deficiencies of our understanding of the principles behind the design and implementation of computer learning environments and the development of associated pedagogies. Blenkin et al (1992) argue that without a full appreciation of emergent theories, curriculum change can not have any hope of real success. Munn (1984) stresses that the secret of curriculum development is to identify examples of success, sometimes through planned experiments, sometimes by discovering individual initiatives and building on these. Harper (1987) and Wells (1976) point that teachers can develop computer educational curricula in conjunction with instructional technologists and curriculum designers.

2.5.3. Action research: a possible solution

The term "action research" was initiated in the UK (Elliot, 1991) to articulate an alternative paradigm of educational inquiry, supporting ethical reflection. According to Somekh (1986), applications of action research on IT in education have been particularly successful through projects, such as the "Pupils Autonomy in Learning with Microcomputers" (Somekh, 1991; Somekh and Davies, 1991) and the "Initial Teacher Education and New Technology" project (Somekh et al, 1992). In action research, emphasis is on improving practice rather than producing knowledge. Focus is on the practitioners' felt need to innovate that activates inquiry and continuing reflection. Action research is one of the best ways of giving teachers ownership of the change they are implementing. This approach prevents the phenomenon "innovation without change", often taking place because courses and materials are misunderstood at the stage of adoption by practitioners. The underlying assumption, adopted by this study as well, is that innovation success depends upon teachers' making it their own by relating theory to their own practices (Lewis, 1986).

Summary

Problems in terms of teaching complexities and local conditions are important for implementation of computing practices internationally. Action research is discussed as a possible solution to such problems. These problems are considered in exploring the implementation of educational computing in Cyprus as well. Hardware, software, training and curriculum integration are mentioned frequently throughout this thesis, especially while interpreting Cypriots' reactions to the innovation in terms of their views, attitudes and concerns.

2.6. CONCLUSION

The literature review highlights several perspectives adopted in this thesis that suggest the important role of actors in implementation. First, the implementation perspective holds the potential in illuminating the process of change and considers individual development. Second, the "change" paradigm and its "phenomenological" perspective draw attention to the different groups involved in implementation. Third, among other factors such as setting, innovation and process, actors are considered the key forces in shaping innovation (section 2.1). Fourth, educational technology from an "integrated" perspective (section 2.2) involves not only processes and products but also "people".

Educational computing is implemented worldwide for various reasons. The minimal implementation of educational computing internationally, lacking high levels of teacher involvement (quantitative aspect) or integration in usual practices (qualitative aspect) raises questions about reasons for failure (section 2.3). There is a need for identification of factors that contribute to success. As implementation depends on actors - especially teachers - then it is important to address actors' views on educational computing.

Attitudes and concerns are ways of reflecting on the views of various groups (section 2.4). In the area of attitudes, a vast amount of research undertaken has revealed different dimensions of these constructs. In the area of concerns, there is a developmental continuum of seven stages, useful for identifying the current stage of adoption. Research on these two dimensions -attitudes and concerns- indicate them as important for the study of implementation.

To sum up, literature suggests that individuals, especially teachers, are the gateway to successful innovations. A review of international practices shows that actors are often described as "reluctant" to implement, despite theoretically positive attitudes. Therefore, failure could be linked to different dimensions of people's attitudes such as their professional views about the educational value of an innovation and their meanings of the change. Moreover, failure could be linked to the practical implementation conditions that are problematic (section 2.5). Therefore, people's views and the context of implementation should be carefully considered in interpreting people's reactions to computing.

In the light of this review, I focus on the implementation process of educational computing in Cyprus to reveal the key factors and the ways in which they influence practices. I proceed to an overview of educational broadcasting to identify possible factors for consideration that can guide the analysis of educational computing (Chapter 4). Since I focus on different actors and their views, attitudes and concerns, I illustrate the nature and general trends of these constructs (Chapter 5). Finally, I explore actual implementation practices to indicate the role of actors and other factors in existing patterns (Chapter 6).

As we will see, although individuals' feelings about technology are reported as positive, implementation still falters. Attitudes explored will confirm that supporting views do not necessarily lead to successful adoption, in the absence of favourable local conditions. This is important since as some theorists such as Fullan (1982) suggest, actors only implement changes which are practical depending on the congruence between the change and their needs and the relative costs and benefits of implementation. The stages of concern will reveal a low implementation stage, suggesting that more work is needed and that real concerns should be addressed, if educational computing is to become successfully implemented. Moreover, different groups of people will be identified in terms of their involvement with the innovation in Cyprus schools.

The next chapter refers to the methodologies employed for data collection and the rationale behind the plan of action for this research.

CHAPTER 3: METHODOLOGY

This chapter is an account of the methods I adopted and the processes I pursued in conducting my research. First, I provide a rationale and methodological considerations for the research design. Then, I describe the research framework, which is divided into sections related to my research questions: historical research for educational broadcasting and computing; a quantitative survey of actors' views, attitudes and concerns; and research into the implementation practices.

3.1. RESEARCH DESIGN AND METHODOLOGICAL CONSIDERATIONS

Here, I discuss the development of a research design (section 3.1.2), appropriate to meet my study's research goals, outlined in section 3.1.1. Important methodological considerations are also highlighted in section 3.1.3.

3.1.1. Goals in conducting research

Decisions on the design and techniques of research were made based on three goals generated from the research questions in Chapter 1 (section 1.4):

- to examine what can be learned by the comparison between educational broadcasting and educational computing.
- to identify the general trends and nature of actors' views, attitudes and concerns on implementation aspects of educational computing.
- to examine the ways in which several key factors influence implementation practices in educational computing.

These goals seem more ambitious than those of most studies, already discussed in Chapter 2, which have focused either on attitudes or concerns or implementation practices alone. Such studies have taken the form of either attitude/concerns inventories of specific populations (section 2.4) or national surveys specifying implementation patterns and problems (section 2.5.2). So, I questioned whether it could be possible in a single study to approach the three goals above since they related to different components: the first to background analysis of the stories of educational broadcasting and computing; the second to exploration of the nature and trends of actors' views, attitudes and concerns; the third to investigation of several factors in school implementation practices.

I decided that focusing on just one of the above goals or carrying out research on a smaller scale, e.g. the district level - as I further discuss in section 3.1.3 - would minimise methodological problems. However, this would limit the scope and significance of my research. Since Cyprus is a small country, as I already stated in Chapter 1 (section 1.5), I decided that it was possible to collect data from all districts and thus to illustrate the whole implementation process. Therefore, I aimed to address all three of my questions from a national perspective.

3.1.2. An overview of the research design

The choice of the research design and the data gathering techniques was based on the need to answer my three research questions. I tried to turn this study into a manageable task by developing a research design consisting of three stages, each of them attempting to illuminate each of the areas of concern. In each of these stages, I employed different techniques and instruments for data collection. Here, I provide a brief overview of this design, although methodology is discussed in more detail in sections 3.2, 3.3 and 3.4.

First, because of the nature of the first research question, I decided to undertake historical research. As I explain in section 3.2, I reviewed historical documents related to educational broadcasting and computing. In the case of broadcasting, this documentary analysis was supplemented by interviews to provide the information necessary to re-construct the development of the process.

In order to answer the second research question, I decided to start an investigation with a wide perspective by undertaking a large sample survey of people's views, attitudes, concerns about educational computing. A "survey" strategy, addressing the populations of interest in the whole island would strengthen the breadth of the study. To obtain this big picture I resorted to quantitative research methods, to which I refer in detail in section 3.3. Therefore, I distributed questionnaires to teachers, parents, children on a large scale.

Finally, focusing still further, so that the process of implementation could be examined in detail, I decided to undertake both survey studies in all pilot schools as well as studies of four selected pilot schools. The survey studies could map out some general patterns about the implementation process; the studies on specific settings could help to determine not just *what* is implemented, but also *why* in an effort to achieve depth. I aimed to review the whole picture of implementation by allowing people in selected schools to elaborate on issues arising from the statistical analysis of survey data. So, except from quantitative techniques, I employed interviews to resolve the issue of determining factors and implementation practices in relation to the third research area.

These three research stages, responding to the three questions took place at different points of time as Table 3.1 shows. The research, therefore, consists of three sub-studies that were interrelated but also independent to a certain extent. Therefore, their methodology and findings are presented separately in this thesis.

Nature of Data	*Source/populations*	*Time for Collection*	*Time for Analysis*	*Section*
HISTORICAL RESEARCH Documents	Files/folders, Reports from Ministry of Education, PI	Autumn term 1995	Autumn term 1995	3.2
Interviews	Administrators of Ministry of Education and CBC	Autumn term 1995	Autumn term 1995	
SURVEY OF ACTORS' VIEWS, ATTITUDES, CONCERNS Attitudes/views Questionnaires	Parents, teachers, children in all pilot and some non-pilot schools	Summer term 1996	Autumn term 1996 Winter term 1997	3.3
SoC Questionnaires	Teachers in all pilot schools	Summer term 1996	Autumn term 1996 Winter term 1997	
RESEARCH ON IMPLEMENTATION PRACTICES Survey Questionnaires	Teacher coordinators in all pilot schools	Summer term 1996	Autumn term 1996	3.4
Interviews	Principals, computer coordinators, teachers, children in 4 selected pilot schools	Summer term 1997	Autumn term 1997 Winter term 1998	

Table 3.1 TIMELINE FOR RESEARCH

After this overview of my research design, I now proceed to present some important methodological considerations.

3.1.3. Methodological considerations

There are at least three methodological issues that should be addressed before the design described above can be acceptable. The first is that of integrating the macro and micro dimensions; the second concerns validity and reliability of the methods used; the third relates to generalisability of findings, that is the extent to which my findings can be used as knowledge about other situations. At the end of this section I also reflect on my role in this study.

A holistic perspective: quantitative and qualitative dimensions

In relation to the second and the third research question, I had to make decisions about the scale of the study. All the studies reported in the literature review (sections 2.4; 2.5) remained at either the micro or a macro level of analysis, focusing on either a school or a regional/national area respectively. In my study, I assumed that by taking into account both the macro and the micro dimensions, I could better capture the reality of implementation, which is quite complex and multi-level. A large-scale study covering individuals from all over the island would offer plenty of background information. Additionally, the in-depth study of a few cases helped to understand the more abstract numeric analysis of a large sample study. Therefore, I attempted to adopt a holistic perspective and integrate both the macro and micro dimensions.

This intention resulted in a combination of research techniques. Some researchers have a clear-cut methodological or philosophical commitment to either quantitative or qualitative paradigms - two traditionally opposed standpoints - to approach their research problem. However, I decided that a combination of both quantitative and qualitative methods could be sensibly used in my investigation. Quantitative research could best help me to reflect on the macro dimension. So, I achieved breadth by obtaining valid and representative, descriptive data at a national level, from a large number of respondents all over Cyprus. Qualitative research, on the other hand, could be used to approach my third question at the micro level. This choice enabled me to achieve depth by conceptualising actors' meanings and perspectives underlying implementation practices and revealing reality from the point of view of each of the individuals involved.

A major factor that limits educational research is methodological difficulties (McMillan and Schumacher, 1989). In my case, this particular research design based on a holistic approach and integrating various approaches involved problems. Dealing simultaneously with too many issues in a single study proved to be over-ambitious. My effort to gain both depth and breadth resulted in a large amount of data in the form of documents, interview transcripts and questionnaires. Giving structure to all this information was a particularly difficult task, as I show in sections 3.2, 3.3 and 3.4.

Validity and reliability

Like every researcher, I faced the issues of validity and reliability. Validity reflects the extent to which an account accurately represents the social phenomena, in this case the implementation process of educational computing in Cyprus. Reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions. Overall, the use of multiple research methods and the comparison of different kinds of quantitative and qualitative data helped me increase the validity of my study through triangulation. However, the inclusion of both quantitative and qualitative methods introduced problems for both techniques. These are further discussed in sections 3.2.4, 3.3.4 and 3.4.4.

Generalisability

This study resulted in important findings about the implementation processes related to educational innovations in Cyprus. I have stressed the uniqueness of the setting in terms of educational structures, decision-making processes and characteristics of the respondents, already discussed in section 1.2. However, this study enhances our understanding of the phenomenon of educational innovation, which can be extended to other settings as well. For example, this research illuminates important implementation aspects such as those pertaining to the conditions under which educational computing may be sustainable in countries that decide to initiate the innovation. Therefore, policy makers or researchers within the same theoretical parameters can use these findings in planning programme policy and further research, not just limited to elementary schools, not limited to educational computing and not limited to Cyprus.

My role as a researcher and a teacher

As I have shown in table 3.1, data collection and analysis for this study took place at different times. During this research project, except from being in England as a full time student at the University of London, I also spent considerable time as an elementary school teacher in Cyprus.

Being a Cypriot elementary school teacher and a researcher in education at the same time had certain implications for this study. On one hand, as an "insider" in the educational system of Cyprus, I had easier access to sources of information in the Ministry of Education and the schools. As I was familiar with the context of Cyprus, I was able to understand teachers' accounts in the interviews I conducted and thus provide a better interpretation of their reactions.

On the other hand, my double role could raise issues of objectivity at those parts of my study, that were not quantitative. I was aware that approaching educational reality often reflects the researcher's background. In the past, I had heard on various occasions that the kind of knowledge we produce ultimately depends on our assumptions about the world and our particular model of reality. Since I was particularly concerned not to contaminate my study with personal bias, I employed several techniques to detach myself as much as possible from the context of my study. I chose to work in a non-pilot school so that I would not be directly involved in the implementation process of the experimental programme. This, I believe, helped me protect the validity of my results. I was also careful during my visits to pilot schools and especially during my interaction with colleagues who acted as computer coordinators, not to express any views of my own on the implementation of educational computing.

Summary

In this section I have presented an overview of the design I adopted, as related to my research questions. I have also highlighted methodological considerations concerning the dimensions of the study, the validity and reliability as well as the generalisability of findings.

I will now discuss the methodological approach to each of my research questions in detail. Reference will be made to the objectives and method used; the nature of the data collected; the data analysis; and the limitations.

3.2. HISTORICAL RESEARCH FOR EDUCATIONAL COMPUTING AND BROADCASTING

3.2.1. Objectives and method

In my first sub-study, I intended to answer the first research question "What can be learned by the comparison between educational broadcasting and educational computing?". The specific objectives were first to describe the implementation process of the two innovations and second to explore factors key to this process, so as to study them in greater detail later. So, this sub-study aimed to act as a guide to the second sub-study.

Historical research seemed to be the most appropriate procedure to understand the dynamics of these particular innovations. Cohen and Manion (1994) suggest that historical research involves drawing conclusions from evidence relating to past events to predict the future. In the case of educational innovations in Cyprus this seemed to be very true since emphasis has shifted over time from educational broadcasting to computing.

3.2.2. Nature of the data collected

To construct the two stories of broadcasting and computing, I decided to use two main sources of data: documents and interviews. I report findings in Chapter 4.

Documents

I decided that the preliminary stage of data collection was the gathering of background information on the two innovations to familiarise myself with these projects. So, I investigated primary documentary sources of information, such as the Archives containing official records, stored at the Ministry of Education and the Pedagogical Institute (PI). I also used reports of the Director of Elementary Education (DEE), saved in the library of the PI. To access these, I was given special permission from the Office of Elementary Education.

Documentary analysis was employed for a number of reasons. First, because this method helped me to provide information on the stories of the two innovations based on reliable and accurate, often non-current records. Letters, policy statements and files could transmit a first-hand account of an event and were, therefore, considered as valuable sources of primary data. Second, the review of such documents helped me not only to place my work in context but also to develop an understanding of administrators' views, concerns and actions at the time and portray their values and beliefs about the innovations. As Silverman (1993) points out, the presence and significance of documentary products gives the researcher a rich vein in analytic topics. In this case, although the administrators often held different opinions on aspects of the innovations, they seemed to observe and record particular events in detail and disclose a reliable picture of the innovation processes employed. Third, the documentary analysis employed was unobtrusive and non-reactive as this method could be conducted without disturbing the setting or the individuals in any way. Finally, the facts and information provided through the documents, along with the process of analysis, could be made explicit to the reader and be easily checked.

However, I also had to face problems of documentary search such as those of authenticity, availability of documents, sampling, inference and interpretation (Cohen and Manion, 1994). As I was particularly concerned about the evaluation of the data and information, provided in the documents, I undertook action in two directions. First, I established the authenticity and genuineness of sources through external criticism aimed at the documents themselves rather than the statements they contained. I found the letters and reports genuine since they were official, numbered and systematically kept in files. Second, I questioned the accuracy of the content in the documents researched through internal criticism. I found out that the authors of the documents were administrators in high positions at the Ministry of Education, not under pressure from fear to distort or omit facts. Indeed, these individuals were very critical of the innovations in their comments and suggestions. Additionally, some of them, such as Epameinondas and Sycallides were interviewed as well; what they stated was consistent with their reports and other written documents at the time. Another difficulty was that most of the documents consisted of unpublished material, so they were harder to locate and less accessible than published reports. As educational broadcasting was an "old" innovation, although some documents and official reports were obtained, others - mainly correspondence - were not available at the Ministry of Education. Therefore, I was able to obtain a larger amount of data on educational computing, rather than broadcasting.

Interviews

For the case of educational broadcasting I tried to trace those individuals that were actively involved in the planning and implementation of the innovation at various administrative levels. The interview was chosen as the instrument to collect data from these administrators for two main reasons. First, because interviews could help validate and supplement historical documentary research. Second, because this method could elicit a range of detailed information and noteworthy viewpoints, which could provide valuable insight into the process of broadcasting and into the reasons why it failed to be institutionalised.

Since people's recollections were particularly subjective, sampling was a problematic issue. I decided to contact three administrators who represented different organisations during the period outlined in tables 4.1 and 4.2: Epameinondas and Theodosiadou, the Cyprus Broadcasting Corporation (CBC) representatives for educational radio (13.9.95) and television (5.9.95) as well as Sycallides, the Ministry of Education representative, the former Broadcasting Organiser (14.9.95). All three of them were willing to share their experiences, so I scheduled the interviews at their convenience.

I decided to perform the interviews in an informal, unstructured way. Each of the three individuals was encouraged to tell his/her own "story" in a flexible way. However, for accuracy purposes I had a list of several important issues that should be addressed. So, I resorted to my "agenda" of topics to be covered and probed accordingly when necessary. These topics were related to the phases of an innovation (section 2.1.3.2). A number of questions also emerged from the conversations. The probes were found vital in eliciting deeper thoughts from the respondents, enriching the accounts given of the various aspects of implementation processes. For example, a key question such as "How was educational radio introduced?" was followed by probing questions like: "What was the rationale for its introduction?", "Which were the goals?".

Interviews were tape recorded with the interviewees' prior permission and were fully transcribed.

3.2.3. The analysis

First, I tried to construct the story of educational broadcasting, using interview data. The first step was to collapse the interview data down to manageable proportions. At the beginning I presented data according to the individual interviewed. However, there was too much repetition and too little analysis.

Therefore, I re-organised the interview data and analysed them in a different way. The starting point of this was that of creating two summary sheets (corresponding to the two areas of interest: the process and the factors) for each individual. These sheets included a number of broad categories, developed from the literature review. On the first one - the process - these categories consisted of the phases of implementation, for example initiation or planning (section 2.1.3.2). On the second one - the factors - two categories emerged: the "actors" and the "conditions". Extracts of the interviews relevant in terms of these categories were written down on the summary sheets. Data on the "conditions" generated a number of sub-categories such as hardware, software, supplementary material, training and curriculum integration. In order to increase the validity and reliability of this analysis, I reviewed the interview transcripts several times.

Based on these summaries, I tried to identify similarities and differences across the participants so as to construct the story of educational broadcasting. At this stage I put together with the interview data of the three key informants the data provided by documents as well as official correspondence.

Second, I tried to construct the story of educational computing in a parallel way to broadcasting along the dimensions of the process and the factors - actors, conditions - involved on the basis of documentary data such as letters or reports.

At the final level of analysis, I tried to compare the two innovations and identify patterns of differences and similarities. As the processes of the two projects were similar, it seemed that educational computing was likely to fail like broadcasting. I decided to review factors, likely to have an impact on broadcasting and examine them in relation to computing. Actors emerged as a critical factor in the failure of broadcasting, so I decided to review people's views, attitudes, concerns in more depth as significant dimensions, necessary for the success of educational computing.

3.2.4. Limitations

The method of interviewing individuals had certain limitations. A major limitation here was that the process of educational broadcasting was revealed mostly at a level of subjective experience. Although the three individuals interviewed provided pieces of evidence depicting the reality of the implementation of educational broadcasting, their stories allowed potential personal bias in the study. So, the issue of objectivity could be raised since the perceptions and interpretations of each individual were highly personal. However, this would not have a significant impact on the outcomes since my only aim was to bring about information as a starting point for further research.

Validity was another area of concern as interviews are often criticised for low validity. This issue was addressed in several ways. First, the flexibility in the process of questioning made it possible to probe deeply and take advantage of small details. Further to that, I compared interview transcriptions with other written sources and official records dealing with the same issues. I also compared each interview with the interviews of the other two informants to identify points of major divergence or similarity. So, triangulation was carried out through comparison of data from different sources and interviewees to ensure the validity of findings.

The reliability of the three interviews could also be questioned. As the amount and quality of data collected depends on the relationship between the researcher and the respondents, replicability of interview data is not always possible. Cohen and Manion (1994) state that reliability of interviews hinges upon identification of sources of bias and application of techniques to reduce them. In this study, reliability of information was undermined by such factors as fading memories among interviewees since they were involved with educational broadcasting twenty or thirty years ago. So, I attempted to create an encouraging, friendly atmosphere where respondents would feel free to "tell their stories". I felt that tape-recording would not greatly affect the quality of the data since respondents were willing to speak openly and express themselves.

Summary

I conducted historical research to answer my first research question on educational broadcasting and computing. Documents and interviews were the main sources of data collection. The data analysis helped to highlight both the implementation process and the factors impacting on success. Certain limitations related to subjectivity, validity and reliability that apply to this sub-study have also been discussed.

3.3. A QUANTITATIVE SURVEY OF ACTORS' VIEWS, ATTITUDES AND CONCERNS

3.3.1. Objectives and method

My second question was "What are the general trends and nature of actors' views, attitudes and concerns towards educational computing?" (for findings, see Chapter 5). Three particular objectives resulted from this question: first, to explore views on the introduction of educational computing in Cyprus elementary schools in order to indicate level of consensus among groups; second, to illustrate the general trends and nature of attitudes towards computers; finally, to describe teachers' concerns to indicate the level of innovation adoption.

The literature review (section 2.3.3) underlines that different groups are regarded as critical to successful implementation. Within this framework, I addressed teachers, children and parents to construct a broad picture. Special attention was given to teachers working in pilot schools, due to the proposal in section 2.4 that the teacher is a crucial actor in implementation. Because of the scale of the study, the geographic distribution and the diversity of the populations of interest, as I already explained in section 3.1, questionnaires were selected as the best instrument for this educational enquiry. Different questionnaires for each population were designed, piloted and administered to schools. These are presented in detail in the next section.

For teachers, to avoid bias in terms of sampling, questionnaires were sent to a considerable number of elementary schools in all five districts of the island (Fig. 3.1): all twenty seven pilot schools and twenty two non-pilot schools. Schools were considered as pilot if they participated in the experimental program for the introduction of educational computing. The list of these schools and the names of their computer coordinators were obtained from the Ministry of Education. The number of non-pilot schools within each district reflected district size; schools were chosen in diverse settings (urban/suburban).

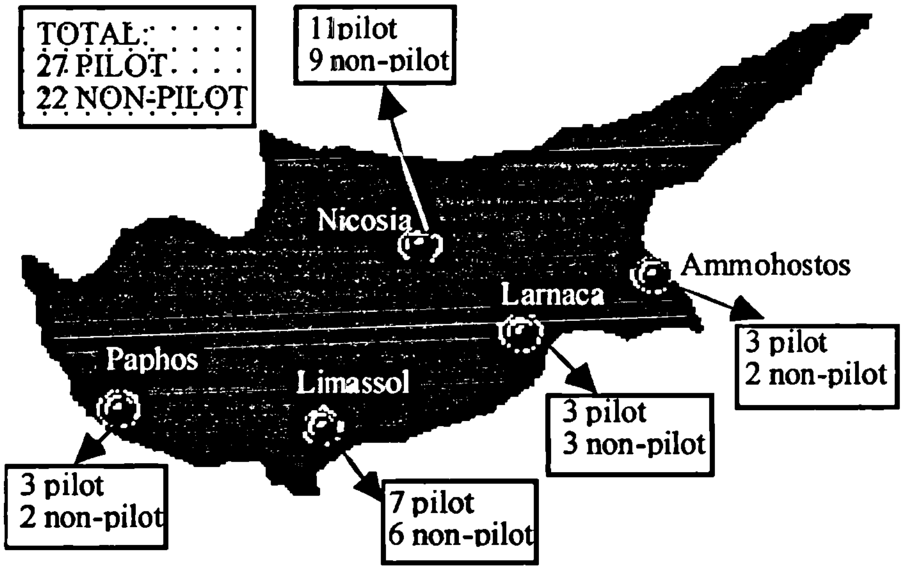

Figure 3.1 SAMPLING (Districts)

For parents and children, because of their large numbers in each school, it was not considered practical or significant to obtain data from all these pilot and non-pilot schools. Therefore, a smaller number of schools was randomly selected for the populations of parents and children: two pilot and two non-pilot schools were identified in each of the largest districts such as Nicosia and Limassol; one pilot and one non-pilot school were chosen in each of the rest of the districts, that is Ammohostos, Larnaca and Paphos. Questionnaires were given to all children of one fifth grade class (10-11 years old) in each of these schools and their parents (mother or father).

3.3.2. Nature of the data collected

As I have already shown in the previous section, the second research question comprised three components: views, attitudes and concerns. Therefore, I had to investigate teachers', parents' and children's attitudes and views about computer introduction. In relation to the third aspect of concerns, exploration of this construct could, as mentioned in section 2.4.2, only apply to the individuals directly involved in implementation, in my case teachers of pilot schools.

Therefore, two types of questionnaires were used: attitudes/views questionnaires for teachers, parents, children and the "stages of concern" questionnaire for pilot teachers. All questionnaires are provided in Appendix IV in Greek and in English. Information on the development, the piloting and the administration of these instruments is provided in the next sections.

3.3.2.1. Development

During the design process, I put a special effort into clarity of wording and simplicity since the questionnaires were aimed for self completion; most instructions involved putting ticks in boxes; questions dealing with the same issue were grouped together. Questionnaires included a front page explanatory letter and were kept as short as possible.

Attitudes/Views Questionnaires to teachers, children, parents

These questionnaires were designed to provide responses on various aspects, related to attitudes and views about educational computing (Table 3.2). Similar items were included for the three sub-populations so as to make comparisons among groups possible. There were different sets of variables, related to:

- *Population characteristics*
    - Demographic variables (personal)
    - Computer experience
- *Views on computer introduction*
    - Beliefs on computer introduction
    - Reaction to goals for computer introduction in elementary schools
    - Teachers' training needs, problems faced/anticipated, current media use
- *Computer attitudes*

Population characteristics represented variables likely to influence views and attitudes. The second and third sets of variables, that is views and attitudes corresponded to the components of the second research question.

After reviewing the literature on attitudes, I decided that there were a number of instruments which had been repeatedly used and were considered as highly valid and reliable (mentioned in section 2.4.1.1). Use of such instruments would enable me more accurately to compare my findings on Cypriots with those of international studies. Therefore, for the part referring to computer attitudes I used the "Computer Attitudes Scales" for all populations and the "Semantic Differential Instrument" for children. With the exception of this part, I designed on my own all other parts of the questionnaires.

INFORMATION:	*Teachers*	*Students*	*Parents*
PERSONAL Gender, age, school (teachers, parents, students), Position (teachers) or occupation (parents) Highest level of education attained (teachers, parents)	*Part A*	*Part A*	*Part A*
COMPUTER EXPERIENCE Computer exposure at home (teachers, parents, students) and school (teachers, students) or work (parents). Frequency and ways of computer use (teachers, parents, students). Training background (teachers) Computer proficiency (teachers parents)	*Part B*	*Part B*	*Part B*
BELIEFS ON COMPUTER INTRODUCTION Beliefs on level of computer introduction, subjects, number of computers, awareness about the project Opinions about computers in education (teachers, parents)	*Part C*		*Part C*
TRAINING NEEDS Needs for training in computing Special areas where training is needed (teachers)	*Part D*		
PROBLEMS FACED/ ANTICIPATED Importance of each expected or experienced problem on a list (software, hardware, training, support, curriculum integration) provided (teachers)	*Part E*		
CURRENT USE OF TECHNOLOGIES Frequencies of media (TV, video, slide projector, overhead projector, tape recorder) currently used (teachers)	*Part F*		
COMPUTER ATTITUDES A Computer Attitude Scale (teachers, parents, students) A Semantic Differential Instrument (students)	*Part G*	*Part C*	*Part D*
REACTION TO GOALS FOR COMPUTER INTRODUCTION IN ELEMENTARY SCHOOLS Importance of each goal for computer introduction on two lists, "ideally" ie. if conditions make them possible and "practically" ie. considering the real conditions (teachers, parents) One list of goals for computer introduction (students)	*Part H*	*Part D*	*Part E*

Table 3.2 CONTENT OF QUESTIONNAIRES

The "Computer Attitude Scales" (Tables 3.3; 3.4; 3.5) included items adapted from the questionnaires developed for parents, children and teachers by Davidson and Ritchie (1992). These questionnaires were based partly on a preassessment questionnaire by Smith et al (1988) and an attitude instrument by Savenye et al (1991, 1992). The particular instruments were chosen for a number of reasons. First, they were designed for the same populations as mine, that is parents, children and teachers. All instruments used the same basic set of questions with relevant modifications according to the characteristics of the sub-populations, allowing for a convenient comparison. Second, they provided a balanced item pool indicating different factors such as "computer anxieties" or "attitudes towards teaching with computers". The fact that the attitude complex consisted of independent factors ensured internal consistency (Oppenheim, 1992). Third, the items used a five point Likert scale, ranging from "strongly disagree" to "strongly agree" providing linearity of equal-appearing intervals in reactions to statements. This supported unidimensionality, ensuring that items measured the same construct and that the scale measured one construct at a time. Fourth, the scales had high reliability for all sub-populations (Cronbach's alpha: teachers, 0.87; students and parents, 0.79). I decided that these scales could be useful as just descriptive - rather than prescriptive - devices providing subtle insights into groups with regard to particular attitudes. The items included were the same as the ones in the original scales in all cases except from the case of children. Not all Cyprus schools had computer labs or clubs. So, the two items "I am excited about new things in the computer lab" and "I would like to belong to a computer club" - included in the original scales for children - were found inappropriate and were omitted from the questionnaire given to Cypriot children.

I value teaching with technology
I think computers are dehumanising
I fear that computers may take over some parts of a job that I enjoy.
I think students are more motivated when they can learn using computer technology
I think instruction by computer technology is just another fad.
I think teachers compete with slick packages and high tech machines.
When utilising computers, the teachers' role is diminished
I like to teach with computer technology.
I think quality instruction using technology will only enhance my teaching
I enjoy reading about computers.
I think that using instruction via computer technology will help improve students' performance
When utilising computer, the teacher becomes guide/facilitator
When utilising computers, the teacher is able to further individualise instruction.
I feel afraid to touch a computer
I feel afraid that I might break or damage a computer
I feel tense when people talk about computers.
I feel intimidated by people who know something about computers.
I feel confident that I can learn how to use a computer.

Table 3.3 ITEMS OF TEACHERS' COMPUTER ATTITUDE SCALE

I feel afraid to touch a computer
I feel afraid that I might break or damage a computer
I feel tense when people talk about computers.
I enjoy reading about computers
I feel intimidated by people who know something about computers.
I feel confident that I can learn how to use a computer.
I think computers are dehumanising
I fear that computer may take over some parts of a job that I enjoy.
I think students are more motivated when they can learn using computer technology
I think instruction by computer technology is just another fad.
I think that using instruction via computer technology will help improve students' performance.
When utilising computers, the teachers' role is diminished
When utilising computer, the teacher becomes guide/facilitator
When utilising computers, the teacher is able to further individualise instruction.

Table 3.4 ITEMS OF PARENTS' COMPUTER ATTITUDE SCALE

I would like to belong to a computer club
Someday, I would like to have a job working with computers
I like to learn with a computer
It is more exciting to learn with a computer
I can learn "better" using a computer
I enjoy reading about computers
I can learn to use a computer
Computer lessons are fun
I would like to experiment on the computer
Schools should have computers
I would like to use a computer at home
I get excited about new things in the computer lab.
I feel afraid to touch a computer
I feel afraid I might break or damage a computer
I feel nervous when people talk about computers
Computers are not interesting to me

Table 3.5 ITEMS OF CHILDREN' S COMPUTER ATTITUDE SCALE

Children's attitudes in particular were measured with an additional instrument, the "Semantic Differential Instrument" (Table 3.6) to provide further support for their reactions to the five point Likert scale already mentioned. This instrument was adapted from the work of Nelson (1989) in W. Australia; Williams et al (1983) in the US; Harvey and Wilson (1985) in the UK. Reference to these studies has already been made in sections 2.4.1.1 and 2.4.1.2 (students) of Chapter 2. This particular instrument was again chosen for a number of reasons. First, it was specifically designed for children allowing simple responses and included pairs of words. Second, validity and reliability were established through research practices. In other studies, a seven point scale was placed between each adjective pair and students were asked to tick the spot on the scale which reflected their feelings about computers. For this study, this scale was not included since younger children had problems indicating their reactions on a range. Therefore, children were asked to circle the one word in each of the 20 pairs that best expressed their views about computers.

I think that computers are:			
Good	Bad	Understandable	Confusing
Smart	Stupid	Big	Small
Interesting	Boring	Simple	Complicated
Easy	Hard	Useful	Useless
Friendly	Scary	Hardworking	Lazy
Fast	Slow	Organised	Disorganised
Expensive	Cheap	Important	Unimportant
Old	New	Colourful	Dull
Different	Same	Creative	Unimaginative
Special	Ordinary	Fun	Uninteresting

Table 3.6 ITEMS OF CHILDREN'S SEMANTIC DIFFERENTIAL INSTRUMENT

Stages of Concern Questionnaires to pilot teachers

Pilot school teachers were given an additional questionnaire, in an effort to gain information about teachers' concerns during implementation of the experimental computer program and to specify the level of innovation adoption. Fortunately, my search to find the original SoC instrument (described in section 2.4.2.1) was successful. I was also able to find the guide to the instrument with detailed instructions for administration of the questionnaire and interpretation of the results.

My decision to use the SoCQ (Hall et al, 1977) without any modifications other than its translation in Greek was based on particular strengths of this instrument. First, the SoCQ had been extensively used in implementation of innovations in educational technology or other educational programmes internationally. This would enable me to interpret my findings in terms of the literature on concerns (section 2.4.2) and draw the profiles of specific populations on a developmental continuum of seven stages.

Second, the SoCQ was designed at the Research and Development Centre for Teacher Education (University of Texas at Austin) and was based on the theoretical constructs of Fuller's work (O'Sullivan and Zielinski, 1988). Therefore, it had a substantial theoretical background.

Third, the SoCQ was aimed primarily for teachers involved in innovations and could be used at any point during the individual's relationship with the innovation, from nonuser to expert. Therefore, it was ideal for my goal to investigate pilot teachers who were at different levels of involvement.

Finally, the particular instrument was tested for validity and reliability on various occasions. According to Broyles and Tillman (1985) the psychometric properties of the SoCQ are acceptable for research and project decision making. Evidence offered in support of the validity of the instrument include (a) high item correlation with the stage to which each item was assigned (b) a decreasing correlation between subscales as the distance between them increases, supporting the hypothesised order of the scale and (c) factor analytic data providing partial support for the independence of the subscales (Bailey and Balsha, 1992). Reliability studies indicated high internal consistency ranging from 0.8 to 0.93 (George and Rutherford, 1978 in Cicchelli and Baecher, 1989) and raw score test-retest correlations ranging from 0.65 to 0.96 on the factors.

As the guide of the instrument suggested, an introductory page presented the purpose of the questionnaire and gave instructions for completion. Participants were told to substitute the phrase "computers in the classroom" or "educational uses of computers" for "this innovation" or "this approach" or "the new system". The statements represented the seven fundamental areas of concern (section

2.4.2). A respondent was required to circle a number from 0 to 7 for each statement to indicate the degree to which each concern was true.

0	1	2	3	4	5	6	7
Not true of me now (very low concern)			Somewhat true of me now (low concern)				Very true of me now (high concern)

3.3.2.2. Piloting

Some parts of the questionnaires were translated in Greek: the "Computer Attitude Scales", the "'Semantic Differential Instrument" and the "Stages of Concern Questionnaire". Therefore, it was important to make sure that my translations were proper and consistent with the original statements. To do that, I contacted two Greek doctoral students with a teaching background at the University of London and asked them to translate these parts back to English.

Teachers

The questionnaire for teachers - including both the views/attitudes questionnaire as well as the SoC questionnaire - was pilot tested with a group of 13 colleagues from various urban and suburban schools. Fortunately, teachers did not seem to have any major problems in responding to the questionnaire. However, I realised that individuals were not very willing to complete open-ended questions. Therefore, I proceeded to changes in the layout and design of part B. Open-ended questions about frequency of use at home and at school were replaced by multiple-choice statements. The open question on training background was substituted by a table with different columns as follows:

- Have you had any training on computers? yes ( ) no ( )

If yes, a. where did you have it?..
b. for how long?..
c. what kind of training did you have?..

CHANGED TO

If yes,

Where did you have training?	For how long?	What kind of training? (content)

Part D was also added. Instructions for part H were changed to bigger size letters to make the difference between "ideal" and "practical" more obvious to respondents. Finally, teachers had difficulties with the introduction page to the SoCQ. Alterations were made to improve clarity and consistency.

Parents

The parents' questionnaire was tested with fifteen adults with children in urban and suburban schools. Like the teachers' questionnaire and for the same reasons, the layout of part B was changed with open-ended questions being replaced by multiple-choice statements.

Students
The questionnaire was pilot tested with sixteen students in a suburban, non-pilot school, where I worked as a teacher. Changes were made following students' comments. The layout and design of part B created difficulties since this involved conditional statements based upon their answer to the initial question. To improve this, the layout was given in two different forms.

- Do you have a computer at home?

yes ( )	If yes ....
no ( )	If no ....

OR

yes ( )	no ( )
If yes	If no ....

Children found the vertical form easier to complete, so this version was used in the final questionnaire. HyperCard was used to make the design of this part more attractive. A reminder was added asking children to check they had completed all items. For Part C, children questioned the third option "I don't know" asking whether this meant "I don't know how to answer" or "I don't know about computers". To avoid this, "Neither agree nor disagree" was used.

3.3.2.3. Administration
I first wrote to the Director of Elementary Education (DEE) of the Ministry of Education in April 1996 seeking for permission to undertake a research in educational computing (Appendix IV). I specified that the research would involve distribution of questionnaires to teachers, parents and children. Approval was given some days later.

The instruments were administered during May and June 1996. In the Nicosia district, I gave questionnaires for teachers and parents/students, wherever applicable, to one teacher in each school who collected them after completion. In other districts questionnaires were mailed and followed up by phone calls.

Response rates in districts other than Nicosia were lower (section 5.1.1) because access to these teachers was more difficult. For example, the return rate for pilot teachers in Paphos was rather low (8%). So, I decided to visit these schools in early January 1997 and give questionnaires again personally this time. The return rate was raised to 71%. This experience suggests that personal contact is crucial in establishing that survey questionnaires are returned to the researcher.

3.3.3. The analysis

There were different levels of quantitative analysis: descriptive exploration of data, investigation of relationships between variables, factor analysis. For this purpose, I used the statistical packages SPSS and StatView. Some open questions were analysed qualitatively, generating categories for analysis.

Data exploration: Descriptive statistics

Most of the questionnaire data were either nominal-qualitative category statements- or interval scale measurements. First I proceeded to data exploration. Missing values in all cases were discarded from the analysis.

Attitudes/Views Questionnaires to teachers, children, parents

I generated frequency distributions for most items to make descriptions of sub-populations and comparisons of their views possible. I also obtained means and standard deviations for interval data such as items of the computer attitude scales to indicate trends of several groups' attitudes. Expressing counts as percentages made them easier to compare. Percentages were rounded to the nearest whole number.

Stages of Concern Questionnaires to pilot teachers

For the SoCQ I produced individual and group raw scores, percentiles, and profiles as well as frequency count of peak high scores as indicators of the trends in teachers' concerns. Here I explain how I obtained all these.

The scoring procedure was that developed by Hall et al (1979). Five items were associated with each of the Stages of Concern. Since each item was rated along a seven point scale, the raw score total for each stage was a number between 0 - 35. Raw scores were converted to percentile scores for interpretation. This resulted in seven percentile scores per individual which indicated the relative intensity of concerns. Percentile scores were normed from the responses of the 646 individuals who completed the questionnaire during validity studies in the spring of 1975 (Hall et al, 1977). High and low scores were not absolute but relative to other stage scores. The descriptive analysis of the intensity of concerns was based on the following (Broyles and Tillman, 1985):

80th percentile=high 60th percentile=moderate 40th percentile=low

Once I processed the SoCQ data I proceeded to the simplest form of interpretation by identifying the highest stage score. From the listing of percentile scores I circled the highest score (peak score) for each individual. When another stage score was also within one or two percentile points, both were circled. Then I counted the number of individuals that were high on each stage. I followed the same technique for obtaining the second high stage score. Then, I interpreted the highest and second highest scores on the seven stages of concern, according to the instructions of Hall et al (1977), analysed in Table 2.2 of section 2.4.2.1. The findings of this analysis are reported in section 5.4.1.1.

I also proceeded to profile interpretation by analysing the complete profile of my population. To do that, I averaged the percentile scores of all individuals in each of the seven stages of concern and I generated a graph, which showed what types of concern were the most or least intense on a developmental continuum. Then, I interpreted the profile of the average Cypriot teacher, based on the instructions of Hall et al (1977). These findings are shown in section 5.4.1.2.

Relationships: Chi-square analysis/ANOVA

After this first phase, I proceeded to confirmation of data characteristics (Kinnear and Gray, 1997). I used formal statistical tests to investigate the relationships between variables within or across groups and confirm that the patterns observed were not merely chance occurrences. For such comparisons, I chose the chi-square for nominal data and the one-way ANOVA for interval data.

The chi-square test determined the significance of differences between independent groups (Erickson and Nosanchuk, 1979; Siegel and Castellan, 1988). The hypothesis tested was that the groups differed with respect to some characteristic, that is to the relative frequency with which members fell in several categories. Chi-square analysis revealed whether the differences in proportions exceeded those expected by chance. To establish the valid use of chi-square, as Kinnear and Gray (1997) recommended, values obtained were considered significant only when the cells with expected frequency less than 5 were not more than 20%. This analysis was conducted, for instance, to explore the relationship between people's computer views and demographic/other variables to indicate effects to opinion formulation (section 5.2.1); views of groups such as parents and teachers to indicate levels of consensus (section 5.2.1); highest stages of concern and demographic/other variables to show intensity of concerns on different stages (section 5.4.1.3).

ANOVA tested the hypothesis that the group means on some dependent variable were equal. ONEWAY ANOVA produced a one-way analysis of variance for an interval level dependent variable by one numeric independent variable, defining the groups for the analysis. When obtaining statistical difference between means and if the requirement for the homogeneity of variance was met, I performed unplanned post hoc comparisons (Tukey's HSD test) to show which pairs of groups differed at the 5% level. For example, I carried out analysis of variance to explore the relationship between computer attitude factor means and demographic/other variables (section 5.3.2.2).

Computer attitudes: factor analysis

Exploration of the nature and trends of several groups' attitudes was a major component of this thesis. I was interested to find out which factors emerged in the computer attitude scales of parents, children and teachers in Cyprus; how the emerging factors related to those originally identified by Davidson and Ritchie (1994); whether their factors were stable by appearing in the same definition in this study or split up and formed new complexes.

Since the fundamental concern was the extraction of common factors and the examination of the structure and subscales, I chose factor analysis as the data reduction technique for the computer attitude scales. Factor analysis is a set of techniques designed to account for the correlations among a set of variables in terms of relatively few factors.

I decided to undertake factor analysis for the three groups of interest: parents, children and teachers. For the case of teachers, since these were of particular interest to this study as they are the key actors of change, I decide to further analyse the data separately for pilot/non-pilot schools.

I found the total matrix sampling adequacy for factor analysis sufficient: parents, 0.76; children, 0.85; teachers (pilot), 0.87; teachers (non-pilot), 0.81. The Bartlett test of sphericity was significant, indicating the presence of factor structure in all cases; parents, $\chi^2(104) = 585.54$, $p=0.0001$; children, $\chi^2(104)=964.52$, $p=0.0001$; teachers (pilot), $\chi^2(170)=1279.48$, $p=0.0001$; teachers (non-pilot) $\chi^2(170)=1141.19$, $p=0.0001$.

In order to indicate the number of factors, I applied Kaiser's criterion that only factors with eigenvalues greater than one are retained (Child, 1990). In all cases, I extracted four factors with such eigenvalues (with the exception of non-pilot teachers where five factors emerged). However, I decided to obtain only three factors for all populations for two reasons. First, because generation of scree plots (Fig. 3.2; 3.3) indicated that although eigenvalues of the fourth or the fifth factors were over one, the change in the slope was small. Second, because Davidson and Ritchie (1994) had generated three factors so comparison of results with their findings was made easier.

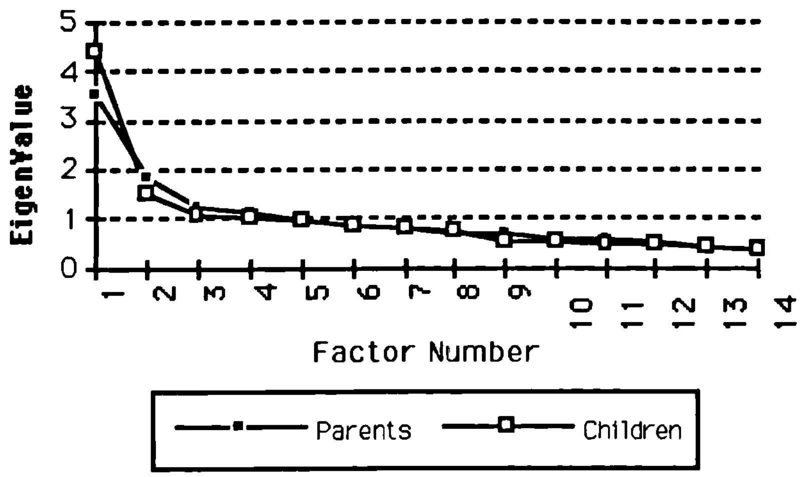

Figure 3.2 FACTOR SCREE PLOT - PARENTS, CHILDREN

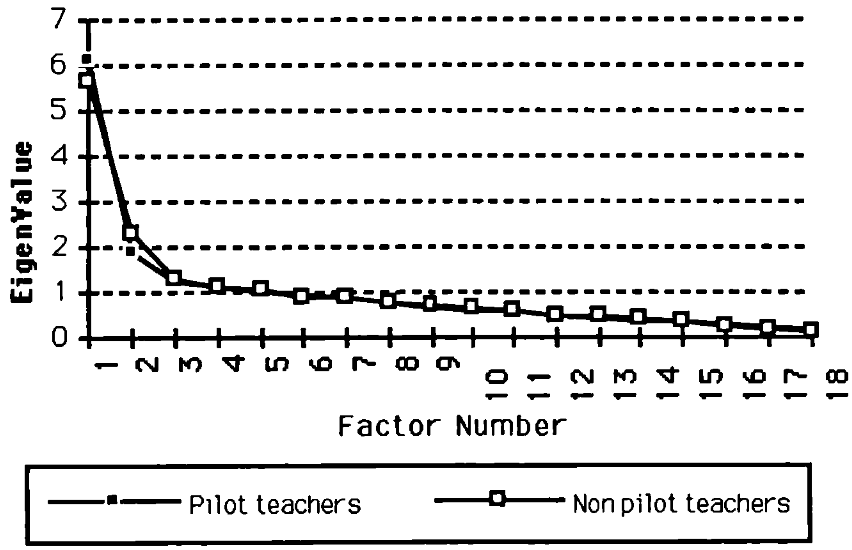

Figure 3.3 FACTOR SCREE PLOT - TEACHERS

However in all cases, I also conducted analyses with all the factors (four or five) that had eigenvalues greater than one so as to explore possible changes in the resulting structure (Appendix II, part A). The analysis with more than three factors did not indicate dramatic changes. Although addition of more factors could split items up into different factors of a narrower range, only one or two items removed from other factors and loaded on the new ones. The only exception was the case of pilot teachers, since a considerable number of items moved from factor 2 to factor 5, creating another "cluster" dimension. This tendency of new factors not to attract a great number of items could be attributed to the comparatively small number of items in this study which made it possible for factors to emerge, defined by only one or two common items. This fact reinforces the decision to extract only three factors.

I conducted rotation to maximise the relationship between variables and some of the factors (Child, 1990). I applied varimax procedures which resulted in both orthogonal and oblique rotations. In orthogonal rotation, the axes were held at

90 degrees from each other and in oblique rotation were rotated through different angles, no longer at 90 degrees. I obtained results on both cases, in a structure matrix (correlations) or a pattern matrix (loadings), presented in Appendix II, part A separately for parents, children and teachers. For interpretation, I decided that since orthogonal rotation assumed independence among factors, in cases where factors were correlated (r >0.4), I would refer to oblique structures. Such were the cases of students and pilot-teachers. In the other cases of parents and non-pilot teachers, reference was made to orthogonal solutions (section 5.3.2.1).

Rotation resulted in three values for each questionnaire item: one on each factor. These values are called loadings, a mathematical term that expresses the correlation between the item and the factor. While interpreting the factors, loadings greater than 0.3 were taken as significant (Child, 1990). I decided to report both significant and insignificant loadings in Appendix II, part A. Of the three values that each item had - one for each factor - the highest value indicated the factor to which the item loaded. For example if item 1 had a loading of 0.38 on factor 3, 0.87 on factor 1 and 0.05 on factor 2, then it meant that it belonged to factor 1 (the highest value), although it had a significant loading (value >0.3) on factor 3 as well. When one item had similar loadings on two factors, for example 0.44 for factor 1, 0.05 for factor 2 and 0.40 for factor 3, then I assumed that it failed to load clearly on one factor since it loaded on both factors 1 and 3.

Next, I named the factors according to the major items included. I compared my results to the structure found in the study of Davidson and Ritchie (section 5.3.2.1).

Then I proceeded to compute factor scores of individuals on the combination of items contributing to each of the three emerging factors. Such means were indicated as either positive or negative deviations, creating a pattern of reactions for groups (Appendix II, part B) and were used to check relationships using ANOVA as I stated in the previous section.

Open question: Qualitative analysis
There was only one open question on the parents' and teachers' attitudes/views questionnaire: "What are your views on computer introduction in Cyprus elementary schools?". This aimed to explore the nature of people's views about implementation and provide answers to the second research question.

Since the literature review (section 2.4) highlighted that feelings of people towards an innovation are important, I proceeded to identify groups of different views to show what was behind such opinions. Therefore, I summarised categories of information to discover patterns of interest.

Responses were categorised into three groups: supportive, opposing and implementation comments. First, supportive statements indicated people in favour of educational computing. These statements were divided into two sub-groups: general, showing approval of the innovation; specific, bringing a rationale for computer introduction, sub-categorised as mentioned in section 2.3 into social, vocational, political, technological and educational. Second, statements were categorised as opposing, when they showed opposition to computer introduction. These were classified into groups according to the respondents' major concern, that is age of learners, other priorities, consequences, lack of need. Finally, the third group of responses included teachers' comments on the implementation process with different sub-categories such as hardware or software. Findings are reported in section 5.2.2.

After categorising responses into domains, frequencies were tabulated (Table 5.3). I transformed qualitative data into numbers for two reasons. First, to reduce the amount of data and enable analysis in terms of frequencies. Second, to enable some degree of quantification and make data analysis more precise.

3.3.4. Limitations

In response to the second research question the numeric measurement of actors' views, attitudes and concerns was in itself problematic and raised issues of validity and reliability: the human beings involved were complex living organisms, actively selecting the stimuli to which to respond. Except from this complexity, the dynamics of educational practice and research minimised the value of knowledge acquired through purely quantitative processes.

To deal with this, I tried to undertake action in two directions. First, I used instruments, similar to or adapted from those of other studies. While I do not presume that the citing of other quantitative research on attitudes increases the credibility or validity of my own research, it is nevertheless noteworthy that several past studies related to implementation have also employed - as the mainstays of their investigations - questionnaires similar to the ones I used. The use of pre-existing instruments as I have already mentioned also made it possible to place Cyprus within the broader international literature and research framework so as to make more valid comparisons. Second, I paid attention to sampling issues to ensure that similar results could be obtained if the study was replicated.

Summary

The second sub-study focused on the second research question and aimed to investigate actors' views, attitudes and concerns. Questionnaires were used as the main method of data collection in relation to these aspects. Specifically, the attitudes/views questionnaire was distributed to teachers, parents and children and the SoCQ questionnaire measuring concerns to pilot teachers only. A number of methods for analysis applied to the data: descriptive statistics; chi-square analysis; ANOVA; factor analysis; qualitative analysis. Some limitations on the validity and reliability of this sub-study result from the use of mainly quantitative methods to obtain data. The use of pre-existing instruments and sampling techniques were applied to deal with these limitations.

3.4. RESEARCH INTO THE IMPLEMENTATION PRACTICES

3.4.1. Objectives and method

My third research area aimed to answer the question "In what ways do several key factors influence integration of computing into school practices?" The objectives were as follows: to specify the extent and the content of the current implementation practices; to determine the role of actors and their views, attitudes and concerns on one hand and the role of practical conditions on the other in implementation practices. Findings are reported in Chapter 6.

Given the exploratory character of the study, to be able to analyse computer use in schools with breadth and depth, two steps were taken. First, I followed a quantitative survey study to all pilot schools. Second, I focused on four pilot schools and employed the qualitative method of the interview. These two phases took place at different times (Table 3.1).

For the first phase, I already had obtained the names of all the pilot schools and their computer coordinators from the Ministry of Education (section 3.3.1). For the second phase, I chose four pilot schools (a, b, c, d) for more in-depth analysis for two main reasons. First, these schools - according to the Curriculum Development Unit - had made serious attempts to develop the innovation. Studying schools without significant output would only show the reasons of not adopting. I decided that analysing the situation in schools actively involved in putting the innovation into practice could highlight the key issues about the implementation process. Second, these four schools were diverse, according to the information provided by the survey questionnaires. The schools differed on several grounds such as the time of computer introduction: Phase A: 1993-94 (a, d), Phase B: 1994-95 (b, c); size: medium (a, d), large (c), small (b); setting: urban (a, b), suburban (c, d); district: Nicosia (a, b, c), Ammohostos (d).

3.4.2 Nature of data collected

Survey Questionnaires to teacher coordinators: all pilot schools

Initially, little information was available about computers in Cyprus schools other than some data on existing hardware provided by the Curriculum Development Unit (CDU). So, I decided to conduct a survey of computer coordinators in all the elementary pilot schools so as to gain a snapshot of the country's computing use and elicit information about several implementation aspects (Table 3.7). The information collected provided the basis on which I made the selection of the four schools for the second phase, as explained above.

INFORMATION:	
GENERAL INFORMATION Name of school Number of children Number of teachers	*Part I*
HARDWARE Number, models, way and year of acquisition of computers, printers and CD-ROM Location of computers	*Part II*
SOFTWARE Titles, way and year of acquisition, subject	*Part III*
PROBLEMS List of problems encountered; frequency of appearance	*Part IV*
USE Frequency in computing use across different school grades Subjects where computing is applied and activities organised Goals and frequency of application	*Part V*
NEEDS Needs in specific areas	*Part VI*
COMMENTS/SUGGESTIONS Suggestions and comments on the innovation; opinions about the process	*Part VII*

Table 3.7 CONTENT OF COORDINATORS' QUESTIONNAIRES

I contacted all the computer coordinators either personally or through phone-calls. All of them seemed willing to cooperate in providing information on the practices in their schools.

Interviews with key personnel: four selected schools

I conducted interviews with key personnel actively involved in the implementation of computing at the four pilot schools selected for three main reasons. First, for triangulation purposes to validate questionnaire results. Second, interviews helped enrich existing data by providing additional background information. My major concern was to seek facts and information about communication and application of the innovation and how the cycle of its progress developed after initiation by the implementers. Interview questions were intended to identify possible factors of implementation success and develop my understanding of the ways in which government practice affected actors in the school environment. Third, I wanted to reveal scenarios of implementation in various settings so as to investigate different patterns of use that emerged and possible reasons for that. Interviews elicited personal understandings and opened up new dimensions of the problem.

Interviews were semi structured and questions pre-set. As I have discussed in section 2.1.3.1, change is studied on several levels: individuals, institution, community and the wider environment. My interview questions were designed to capture the "truths" on each of these systems. So, questions focused on the individual (eg. "When did you first encounter computers?"); the school (eg. "How did your school get involved in the experimental program?"); the classroom (eg. "Can you tell me a story of success using computers in the classroom?); the social environment (eg. "What are your views on reactions/behaviour concerning computing of other teachers at your school?"). The complete list of questions is provided in Appendix IV. The order and wording of these questions was not strictly followed; probes were used so as to elicit deeper views from the respondents and enrich the accounts given.

In anticipation of differing views about events and procedures, cross-referencing of the information at the various system levels became necessary. Hence interviewees included principals, computer coordinators, children and other teachers who commented on implementation aspects of the innovation. The questions were adjusted according to the population interviewed. I tried to keep all interviews short, except from those of the computer coordinators, who were considered as valuable sources of information. These interviews preceded my visits to their schools and lasted for 60-90 minutes at the coordinators' convenience. I visited three coordinators at home while one preferred coming to my house. The interviews of the rest of the actors took place during visits to the four selected schools and lasted 5-15 minutes. Access to the four schools was arranged after phone-calls to the principals, who were willing to help me. The fact that I was a teacher myself made things easier: the teachers, the principals and the children did not seem reserved to open themselves up to me and provide their own insight into the processes in which they were involved. These interviews were tape recorded and then transcribed.

3.4.3. The analysis

There were again different levels of analysis: descriptive exploration of survey data; qualitative analysis of the open question on suggestions/comments; and analysis of interview data.

Survey data: Descriptive statistics

For the quantitative part of survey data, I used the package Excel. The analysis of this set of data was quite simple, as all I wanted was some descriptive statistics on the areas investigated: hardware, software, curriculum integration use, problems and needs. I made reference to each of these areas separately for each of the four schools chosen to draw profiles of the schools for in-depth study. Tables and figures were generated to provide an overview of all pilot schools and specify where each of the four schools lied (for findings see section 6.1).

Open question: Qualitative analysis

As we see in Table 3.7, part VII was designed to elicit comments and suggestions of computer coordinators on the innovation with the open question: "Add any comments that you may have about the introduction of computers to your school or to the elementary schools of Cyprus in general". Because of the nature of the question, a variety of responses were generated.

Categorisation was a personal interpretation of the data so as to make sense of the innovation, as seen by computer coordinators. I tried to generate issues of concern to the teachers such as hardware, software, training, curriculum integration. Responses were grouped into the categories above. Comments on issues other than these were grouped as "general". I report findings in section 6.1.6.

Interview data: Qualitative analysis

I decided to group interview data under the ten implementation factors identified by Fullan (Table 2.1). I considered Fullan's (1992) implementation perspective - presented in more detail in section 2.1.5 - ideal for the analysis of interview data for three major reasons. First, Fullan's work reflected the implementation perspective and the phenomenological approach adopted by this thesis. As Fullan's perspective was basically subjective, emphasis was on the picture as seen by the individuals and the meanings as perceived by them. Second, this framework provided a comprehensive list of factors and processes involved in putting the new policy into action. Fullan had arrived at this list after a review of recent literature. Therefore, by choosing this perspective, I could avoid the risk of running into an overwhelming number of factors while examining actual school practices. Finally, this choice was made because of my overall goals in conducting this research. My aim was to research into the implementation of an innovation in the educational system of Cyprus. This could be done by identification and application of known factors in the context of this study rather than initiation of new implementation factors for consideration.

The process of grouping data under these ten categories was quite tedious but was necessary to simplify the data for further analysis that would follow. After the data were classified in Fullan's conceptual framework, I was able to make more sense of the interview material and interpret the data. The next step was to take a closer inquiry into the patterns developed to build up the overall picture of implementation processes. Finally, I searched for evidence that created similarities or differences both across as well as within schools. Findings are reported in section 6.2 of Chapter 6.

3.4.4. Limitations

In this third sub-study, most limitations arise from the use of qualitative methods of data collection and analysis focusing on four schools. One could argue that interviews on selected sites can not assure valid and reliable findings. Limitations on the method of interviewing in terms of validity and reliability and ways to address them have already been discussed earlier in section 3.2.4. To further improve the validity of this set of data, I also adopted the strategy of "multi-side case studies" by choosing different schools for in-depth study.

The fact that I examined only a few cases of pilot schools in dealing with the third research question could also raise criticisms about generalisation of results. One could argue that such an examination results in incomplete perspectives on the innovation process as accounts are only partial, and not necessarily representative of the whole population. I have to stress though that this was only the last part of the study that followed more general survey results. My aim was primarily to obtain deeper understanding of the true picture of implementation, as experienced by a number of individuals rather than generalise these specific findings to all Cyprus schools.

Summary

In answering the third research question, I conducted research in two phases. First, I obtained survey data from all pilot schools through questionnaires sent to computer coordinators. Then, I selected four pilot schools and I carried out interviews with key personnel and other actors. Statistics analysis and qualitative analysis were applied for the survey data and the interview data respectively. Certain limitations that arise refer to the generalisability of the findings, resulting from the choice of the four schools.

3.5. CONCLUSION

This chapter has outlined the range of research methods used for the study. Decisions related to data collection and analysis have been made on the basis of the three research questions. Therefore, the research design has comprised three sub-studies, each attempting to answer one of the research questions.

In answering the first research question, that focuses on a comparison between educational broadcasting and computing, I have employed historical research on documents and interviews. To obtain data for the second research question, that explores actors' views, attitudes and concerns about educational computing, I have distributed questionnaires investigating these constructs in all populations of interest: teachers, parents and children. Finally, for the third question that focuses on the implementation practices and the factors influencing them, I have carried out a survey of teacher coordinators in all pilot schools along with interviews in four selected pilot schools.

Several threats to validity, reliability and generalisability of the findings have arisen at several points of the research and I have tried to face such limitations. A major strength, however, is the use of different kinds of techniques, necessitated by the nature of the three research questions. This diversity of resources explored provides considerable breadth and depth of analysis, integrating both the macro and micro dimensions.

Findings to the first, second and third research questions are presented in Chapters 4, 5 and 6 respectively. I now begin with the first set of results, outlined in Chapter 4.

CHAPTER 4: EDUCATIONAL BROADCASTING AND EDUCATIONAL COMPUTING

As the aim of this chapter is to provide answers to my first research question, let me restate this question, along with its two sub-questions.

What can be learned by the comparison between educational broadcasting and educational computing?

- How does the implementation process of the two innovations evolve?
- What are the factors key to this process?

I address the first and second sub-questions in sections 4.1 and 4.2 respectively. In each section, I describe implementation first of educational broadcasting and second of computing in Cyprus elementary schools over a period of time. The two stories are constructed separately from primary data, as I explained in section 3.2. The organisation of this chapter makes it possible to draw parallels between the two innovations and highlight differences or similarities in both the process and the factors in an effort to predict the fate of educational computing.

4.1. THE IMPLEMENTATION PROCESS

Here, I outline the historical development of both educational broadcasting (section 4.1.1) and computing (section 4.1.2) to provide basic background information. Comparisons of the two innovations are then made in section 4.1.3.

4.1.1. Educational Broadcasting

4.1.1.1. Initiation

Educational media were first introduced to Cyprus in 1937. At that time, the inspector for audio visual aids in Surrey, London, UK gave a seminar to educators of selected elementary schools. Officially, the story of educational technology on the island started later. In 1957, Sycallides was appointed as the first inspector of audio visual media. Schools were given help and support through visits. Principals and teachers were encouraged to apply new ways of delivering instruction besides textbooks.

4.1.1.2. Planning and administration

Policy was controlled by different committees: the Educational Broadcasting Service, the General Advisory Committee on Educational Broadcasting, the Executive Sub Committee on Educational Broadcasting and Special Advisory Committees. I will discuss each in turn.

Educational Broadcasting Service (EBS)

The Educational Broadcasting Service (EBS) formed as an independent institution under the Ministry of Education responsible for educational radio and television. It was headed by an Organiser who participated in seminars and workshops organised or sponsored by the Council of Europe. The Service recruited secondary and elementary school teachers on full or part time bases. The EBS cooperated closely with the Elementary, Secondary and Technical departments of the Ministry of Education, the Cyprus Pedagogical Academy (CPA) and the Pedagogical Institute (PI) on the one hand, and the Cyprus Broadcasting Corporation (CBC) on the other (Sycallides).

Service responsibilities included decision making about the content and form of the programmes transmitted and the supplementary material produced. The Service had an Audio Visual Aids collection with single concept filmloops, slides and filmstrips; 16 mm films and projectors were available for loan to all teachers. Experienced personnel offered advice on the use of educational technology hardware; visited schools to attend the programmes transmitted, to investigate problems, help with deficiencies and get feedback through questionnaires; provided for a continuous communication channel. Later on, the EBS was renamed to "Educational Technology Service" under the PI.

General Advisory Committee on Educational Broadcasting

The General Advisory Committee made decisions about programme content and the classes to which the programmes were to be directed. The chairman of this Committee was the Minister of Education, the vice chairman was the president of the Advisory Council of CBC and the secretary was the Organiser.

Executive Sub Committee on Educational Broadcasting

This committee was the executive organ of the General Advisory Committee and comprised the General Director of the Cyprus Broadcasting Corporation (CBC) as chairman, the Organiser as secretary and Department Heads of the Ministry of Education and the CBC as members (Kouyialis, 1977).

Special Advisory Committees

These Committees comprised teachers specialising in particular subjects. Members offered assistance to the Organiser and the Educational Broadcasting Service (EBS), relevant to the content of the series of programmes.

4.1.1.3. Implementation

Educational Television: A 20-year Cycle

In 1964 the first steps were taken towards establishing educational television (Sycallides). The Cyprus Broadcasting Corporation (CBC) also seemed interested in the innovation (Theodosiadou).

Year	Hardware	Training	Software	Supplementary material	Curriculum Integration
1964-65		Training by CETO in Cyprus and London. 2 one-day workshops			
1965-66	Provision of T.V. sets begins: secondary		Experimental transmission of programmes begins: secondary		T.V. as a medium.
1966-67		Seminars for principals and specialised teachers	Experimental transmission continues: secondary Production of programmes begins	Distribution begins of: "Notes for teachers", "Notes for Students" (some series)	
1967-68			Normal transmission of programs begins: secondary		
1973-74	All secondary schools equipped Provision of T.V. sets begins : elementary				
1975-76			Experimental transmission of programmes begins: elementary		
1976-77			Normal transmission of programmes: elementary, secondary		
1980-81			Production of programmes ends.		
1983-84			Transmission ends		

Table 4.1 IMPORTANT YEARS: INTRODUCTION OF EDUCATIONAL TELEVISION

In April 1965 the Ministry of Education and the CBC decided to cooperate and promote experimental television for secondary education. At the time, secondary schools were limited in number, located in large communities with electricity supply, so they could be easily supplied with equipment (Sycallides). Students' and teachers' reactions to experimental classes "exceeded all optimistic hopes". So, the Ministry of Education decided to proceed to the formal introduction of television for secondary schools as from 1966-67. Production of television programmes took place from 1966 to 1976 and the CBC often ran revisions (Table 4.1).

In 1973, the Ministry of Education introduced educational television into elementary schools as well. The first experimental series for elementary schools was to be transmitted in November, 1974. However, the project was interrupted in 1974 when Turkey invaded Cyprus.

The decision to introduce educational television into elementary schools was renewed during 1975-76. The first experimental series in the schools equipped before invasion resulted in positive feedback from all sectors. So from 1976-77 educational television became part of elementary education. However, when the innovation became institutionalised teachers appeared reluctant to embrace the innovation with open hands and described its implementation as problematic.

According to Theodosiadou, all of a sudden educational television production stopped in 1976, because of improper CBC infrastructure, that is lack of sufficient transmitters. However, in the 1979-80 and 1981-82 reports (Ministry of Education, 1980; 1982) production and transmission seem to be taking place until much later.

In 1983-84 the two partners, the Ministry of Education and the CBC, decided to re-examine the issue of transmission. Educational television was considered "an old innovation" that no longer served the educational needs and so it was abandoned. What is interesting is that television is reported as being very successful. According to Sycallides, Cyprus was considered by administrators in Greece as a pioneer in educational broadcasting.

Educational Radio: Same Process, Same Fate

A report of the Commonwealth Secretariat (1974) states that educational radio was introduced in elementary schools by the Ministry of Education in 1968, two years after the introduction of television into the secondary schools. Radio was ideal for elementary schools located in rural communities without electricity.

Year	Hardware	Training	Software	Supplementary material	Curriculum Integration
1968-69			Normal transmission of programmes begins: elementary Production of programmes begins.	Distribution begins of: "Notes for Teachers", "Notes for Students".	
1971-72		Training in London.			
1973-74	All elementary schools equipped				
1982-83			Production of programmes ends.		
1983-84			Transmission ends		

Table 4.2 IMPORTANT YEARS: INTRODUCTION OF EDUCATIONAL RADIO

According to Epameinondas, the Cyprus Broadcasting Corporation (CBC) and the Ministry of Education wanted to make educational radio work as successfully as overseas, to support school work and educate both teachers and students. Formation of committees and experimental programmes preceded the decision to introduce radio on a permanent basis during 1968-69 (Table 4.2). Later experts of the British Broadcasting Corporation (BBC) visited Cyprus to offer advice.

The fate of this innovation was similar to that of educational television. In November 1985 representatives of the CBC and the Pedagogical Institute (PI) met and discussed the issue of educational radio. They decided that changes in educational technology, pedagogy and teacher attitudes prevented them from continuing transmission. Radio programmes should be taped and used whenever possible. Epameinondas, in charge of educational radio at the CBC, thought that the innovation which had overcome many problems and functioned in such a wonderful way in other countries should be continued. So, he suggested that CBC alone could undertake the responsibility of educational radio. However, the whole issue was forgotten.

Communication between the CBC and the Educational Technology Service of the PI continued. In April 1986 they cooperated to produce some radio programmes about Cypriot poets and national anniversaries. However, the close co-operation of the past was not to return. At the time, the two partners deal with broadcasting and technology separately.

On one hand, the CBC produces radio programmes that provide information to children about different issues including Cyprus mines, harbours and agriculture. The programmes are of broader interest but not didactic or knowledge based. Tapes are sent to schools on request. CBC producers visit schools and interact with children who, according to Epameinondas, share their dreams and problems.

On the other hand, the Educational Technology Service is responsible for the design, realisation, production and multiplication of teaching materials including slides, sound recordings, video and slide-tape programmes for all levels of education. The Service also trains teachers in the design, infrastructure and effective use of media in the classroom and in the maintenance of equipment; advises on selection and purchase of materials for school use in cooperation with the inspectors and the School Committees; and visits schools to show how media can be utilised.

The historical review of educational broadcasting in Cyprus has not been undertaken in an attempt to re-introduce it. Besides, such an effort would seem out of time since the innovation itself has changed enormously in the past fifty years. Rather, this review aims to guide the analysis of another innovation: educational computing. So, now the focus is shifted to educational computing.

4.1.2. Educational Computing

This section aims to outline the process of educational computing introduction. Like educational broadcasting I follow the major phases of development: initiation through implementation. As the cycle of this innovation is not yet complete, we can not as yet discuss evaluation or institutionalisation.

4.1.2.1 Initiation

Computers were first introduced into Lyceums, that is the last three grades of secondary schools (ages 15-18) during an initial experimental period. Reasons given by the Ministry of Education for this were budgetary constraints, the limited number of secondary schools which made provision of equipment easier and the age of the students who were more mature to handle computers. In the period 1986-88, within the framework of the endeavour of the Department of Secondary Education to prepare pupils for life, computer science was made a compulsory subject in the first year and one of the supplementary subjects in the second and third year for all Lyceum students. Computer science teachers were hired to teach the subject which was reported as popular (Ministry of Education, 1991; 1992). The Department of Secondary Education also launched a scheme in 1992-93 of releasing for one day per week and training all secondary teaching personnel in the use of the computer as a teaching aid. The introduction of new technologies in secondary schools was considered as proceeding at a fast pace after the initial problems of equipment needs, adaptation of the curricula and personnel training (Ministry of Education, 1994).

During 1990-91 with a letter to the DEE (Ministry of Education, Folder 121/82/Z: 10.6.91), the principal of Kornesios Elementary School suggested introduction of computers on an experimental basis in Maths for the following year. The Cyprus Pedagogical Academy (CPA) and the Pedagogical Institute (PI) indicated interest in supporting this attempt. Lessons for children of this specific school would take place at the PI which was located near the school and had all the necessary computing facilities.

4.1.2.2 Planning and administration

Advisory Committee for the Introduction of Computers in Elementary Schools (ACICES)

The ACICES was set (Ministry of Education, Folder 121/82/Z: 16.7.91) to examine the possibility of introducing computers into elementary schools on a wider scale. This body comprised inspectors of elementary schools, a representative of the Ministry of Education, the principal of Kornesios and a representative of the PI. The committee was expected to prepare a report by October 1991 with suggestions about equipment and software, organisational arrangements and support as well as a timetable for the introduction of the innovation (Table 4.3).

During its first meeting (5.9.91), the ACICES discussed ways through which to integrate computers into the curriculum; addressed issues such as factors of success, educational goals, teacher training, financial limits, and support by qualified teachers and foreign organisations such as the British Council and the American Centre. In its second meeting (18.10.91) the ACICES discussed ways to involve parents, teachers, principals and inspectors in the experimental programme (Ministry of Education, Folder 121/82/Z).

Advisory Council for Computers

The Advisory Council for Computers comprised the General Director of the Ministry of Education, the Directors of Elementary, Secondary and Technical Education and the Directors of the Cyprus Pedagogical Academy (CPA), the Pedagogical Institute (PI), the Higher Technical Institute and the Productivity Centre.

The members suggested setting up a sub-committee to prepare a report on the trends and needs of the Cyprus market in informatics and on the new developments and effects of technology in the worlds of work and education. The Director of Elementary Education (DEE) presented possible problems such as the shortage of specialised elementary teachers and the lack of equipment and software. This body submitted the complete plan "IT. IN EDUCATION '93" to the Planning Bureau (PB) so budgetary provisions could be made with reference to all levels of education in respect to curriculum, training and equipment needs (Ministry of Education, Folder 121/82/Z: 17.2.92).

The Curriculum Development Unit (CDU)

The schools were contacted by the Curriculum Development Unit (CDU) that came into existence in 1993-94 with the secondment of one teacher. In a report, this Unit stressed the importance of clarifying the aims of introducing computers as a cross curricular tool to elementary schools and the need for an IT curriculum (Ministry of Education, Folder 121/82/Z: 15.9.93). The CDU suggested the preparation of a 5-year plan adjusted to the funding limits; provision of proper educational software from Greece or its production by computer companies in Cyprus; investigation of ways to provide teacher training; training on acquaintance with educational software for classroom use so that teachers can prepare their own material; feedback to the Support Group and the PI by trained teachers experimenting in schools; encouragement of cooperation with all sectors such as Parent Associations and the University of Cyprus.

In another report (Ministry of Education, Folder 121/82/H: 22.12.93), the CDU suggested that computers be established in schools on a permanent basis instead of being transferred from place to place to become an integral part of teaching; be given to a limited number of schools to make technical help possible. In a letter (Ministry of Education, Folder 121/82/2Z: 17.10.94; 26.10.94) the CDU suggested appointment of district computer coordinators as well as preparation of a teacher's guide on software use, classroom organisation and evaluation.

The Interdepartmental Committee for Computers:

During 1991-92, the Interdepartmental Committee for Computers came into existence, comprising inspectors and representatives of the Teachers' Union, the Pedagogical Institute (PI) and the Curriculum Development Unit (CDU). Throughout 1993-94 this committee had several meetings.

4.1.2.3. Implementation

There were five phases in the plan for computer introduction (Table 4.3). However, there was certain delay in carrying out the plan as Table 4.4 shows. Phase A began in December 1993 when 16 computers and 4 printers were ordered. Delivery to schools was delayed until May 1994. The experimental program was applied in eight pilot schools: three in Nicosia, two in Limassol, one in Larnaca, one in Paphos and one in Ammohostos. These schools had access to equipment: computers (1-2 each school) and printers (only 4 schools). Experimental plans were applied only to the three upper grades while one teacher became the coordinator and was responsible for computers and for participating in regular meetings of coordinators.

The Director of Elementary Education (DEE) with a letter to the General Director of the Advisory Council (Ministry of Education, Folder 121/82/Z: 8.2.94) reported that Phase A of the plan for computer introduction had been completed and that the work was in Phase B. Contrary to the financial provisions of the 5-year plan (Table 4.3), only £ 30 000 were actually approved in the Development Budget for 1994. The Advisory Council should get together to find ways of investing this amount. The DEE suggested further teacher training of 180 teachers by the Pedagogical Institute (PI) in different districts and purchase of equipment and software.

Phase A (1991-92)	• Experimental introduction of computers in Geometry at Kornesios elementary schools with the help of the PI. The ACICES watches and evaluates the process. • The Report for the introduction of computers is finalised and submitted to the DEE and the Advisory Council. • An initial training plan for teachers is prepared. • Initial contacts are being made with the University of Cyprus in order to teach Computer Literacy to students in the Department of Education.	No expenses
Phase B (1992-93)	• The PI starts teachers training in computers as a teaching tool. • A number of teachers are educated abroad. • The Support Group is established. It prepares instructions for use of computers and ways of teaching. • Experimental introduction of computers in schools that have the necessary equipment. • Invitation of expert from abroad who will deal with intensive teacher training and inspector training. • Contacts with teachers and parents and discussion on the importance of computers in teaching. • The ACICES watches and evaluates the process.	Computer purchase (£ 8000) Computer Maintenance (£ 800) Software development (£ 5000) Personnel for training and support (£ 40000) Experts from abroad (£ 5000) Miscellaneous (£ 2000) Total (£ 60800)
Phase C (1993-94)	• Purchase of additional computers (30-40) for school needs. • Introduction of computers in schools that have the necessary equipment • Parents are informed about the plan of action and are encouraged to support this whole attempt. • The Support Group prepares the curriculum for the computers with the aims, means and activities. It also prepares a guide for teachers. It visits schools and informs teaching staff about the content of programs for teaching. The ACICES watches and evaluates the process.	Computer purchase (£ 20000) Computer Maintenance (£ 2800) Software development (£ 5000) Personnel for training and support (£ 60000) Experts from abroad (£ 5000) Miscellaneous (£ 2000) Total (£ 94800)
Phase D (1994-95)	• Purchase of additional computers (100-150) which will serve schools needs (25-30 probably) • Introduction of new forms of communication between the Ministry of Education, the District Offices of Education and schools and between schools and information exchange on administrative and teaching issues. • The ACICES watches and evaluates the process.	Computer purchase (£ 75000) Computer Maintenance (£ 10300) Software development (£ 10000) Personnel for training and support (£ 60000) Miscellaneous (£ 2000) Total (£ 157300)
Phase E (1995-)	• The innovation is spread in all schools	No expenses

Table 4.3 TIMETABLE FOR INTRODUCTION OF EDUCATIONAL COMPUTING PREPARED BY ACICES

During 1994-95, the number of pilot schools increased by sixteen for the whole island, that is six in Nicosia, four in Limassol, two in Larnaca, two in Ammohostos, two in Paphos. So, pilot schools became twenty-four in all. A new development was the appointment of district coordinators to promote the plan for computer integration in schools. These were pilot teachers who would visit schools in their district. Their major responsibility would be to act as agents of contact between the General Coordinator at the Curriculum Development Unit (CDU), the Ministry of Education and the pilot schools. During their meetings they discussed their roles and their problems and they decided to ask pilot school coordinators to prepare a report with their comments and suggestions by the end of the year.

Year	Hardware	Training	Software	Supplementary material	Curriculum Integration
1992-93		Training provided			
1993-94	Equipment provided for 8 schools.	Training provided: Seminar D1702. Demand for more teachers to participate Scholarships for the US.	Some software sent	Development of lesson plans Guide for the Teacher	Curriculum Program for computers failed to be published.
1994-95	Equipment provided for 16 more schools.	Training provided: Seminar D1702, D2702	Evaluation of existing software. Purchase of software	No more supplementary material	

Table 4.4 IMPORTANT EVENTS: INTRODUCTION OF EDUCATIONAL COMPUTING

The CDU (Ministry of Education, Folder 121/82/2Z: 27.1.95) suggested the development of a 3-year plan of action with clear aims and goals and provision of teacher training, equipment, software, educational and technical support and a timetable with its progress. The CDU stressed that without such planning "the faith of educators to this particular innovation would be gone". The CDU also suggested evaluation of Phase B on a scientific research basis. It also referred (Ministry of Education, Folder 121/82/2Z: 19.12.94) to the need for constant cooperation with educational organisations such as the British Council to provide for educational and economic support of the programme.

The Interdepartmental Committee decided to evaluate the program for computer introduction in elementary schools as it had been implemented up to that time. Therefore, the Director of Elementary Education (DEE) asked for the help of the Pedagogical Institute (PI) in data collection and analysis (Ministry of Education, Folder 121/82/Z: 18.5.95). In the Director's letter to the Advisory Council (Ministry of Education, Folder 121/82/3Z: 14.6.95) he reported lack of: appropriate software in Greek, funds, technical support and supplementary material. He suggested the preparation of a long term plan about introduction of IT, invitation of an expert to comment on the existing program, creation of a support team for software development and technical help.

4.1.3. Comparison of the two innovations

Drawing data from the two previous sections and considering other information provided by documents or the interviewees, I will now proceed to comparisons in terms of the process employed (Table 4.5). This analysis is based on the understanding that future developments often depend on judgements made about past innovations.

		Educational Broadcasting	*Educational Computing*
Different	*Cycle of innovation*	• Complete.	• Incomplete.
	Initation	• 1960s • As a "tool" in elementary and secondary schools.	• 1990s • As a "tool " in elementary. As a "subject" and a "tool" in secondary schools.
Similar	*Initation*	• "Imported" from Europe, US (developed world). • Necessary to introduce. • No needs analysis preceded innovation although believed to serve personnel and resources needs. • Introduction as a "tool" in elementary schools to support existing subjects.	• "Imported" from developed countries (EU). • Imperative to introduce. • Introduction not preceded by needs assessment for Cyprus. • Introduction as a "tool" in elementary schools to enrich existing methods.
	Planning	• Various administrative committees involved. • Foreign organisations involved.	• Different administrative bodies involved. • Foreign organisations involved.
	Implementation	• Funds allocated for programmes, staff salaries. • Top down administrative processes. • Experimental plans before normal introduction. • Bottom-up development of innovation. • Problematic implementation.	• Important costs for resources, training. • Top down administrative processes. • Five phase experimental plan in selected schools. • Bottom-up development in pilot schools. • Problematic implementation.
	Evaluation	• Minimal	• Minimal

Table 4.5 COMPARISON BETWEEN THE TWO INNOVATIONS: THE PROCESS

Differences

As we see in Table 4.5, one major difference is that for broadcasting the innovation was institutionalised in all schools for a while whereas for computing we are still at the level of experimentation with only a few schools involved. So, broadcasting has completed its cycle whereas computing has not.

There are certain differences in the nature of the two innovations as educational devices which seem to impact their way of introduction into the educational system. In general, the computer seems to offer more options as to possible classroom use. On the one hand, the computer can be either a group or an individual learning medium while the television/radio usually accommodates group learning activities-usually the entire class. On the other hand, the computer can be seen as either a new curriculum subject or as another one classroom tool whereas the television/radio can only be viewed as a tool. Therefore, broadcasting was implemented only as a tool in both elementary and secondary schools; computing was introduced as a tool in elementary schools but in secondary schools it became a subject per se (section 4.1.2.1).

The time of initiation also differs by almost 30 years, so differences have taken place in terms of the political situation. For example, the Turkish invasion (section 4.1.1.3) caused major problems for the project of educational broadcasting such as budgetary constraints since funds were cut down to save money for refugees. The invasion also resulted in lack of equipment since stores where the television sets were kept were in the occupied area and were looted by invaders (Kouyialis, 1977). Computing, on the other hand, was initiated in times of peace. Another example is the dependence of the educational system of Cyprus on that of Greece. The system in Cyprus has traditionally been influenced by the system in Greece because of cultural bonds between the two countries and the fact that many of the textbooks that are used in elementary schools are sent by the Greek government. Sycallides suggests that this dependence impacted negatively on the implementation of educational broadcasting since this innovation had not been implemented in Greece first and as a result, was viewed with skepticism by the teachers. This is not the case for educational computing as Greece is now a member of the EU; Greece has preceded Cyprus in implementing educational computing; the dependence has decreased since a lot of textbooks for the elementary schools are now produced in Cyprus as well. So, computing is probably implemented in better times.

Similarities

Both innovations were "imported" into Cypriot schools, after their application in other countries, more developed than Cyprus. In fact, introduction of both innovations seemed to reflect imitation of practices, considered important in other countries. For example, Theodosiadou suggests that "educational broadcasting was introduced because of its success overseas". At that time, educational television was very popular in Europe, in the US and elsewhere. In fact, in the UK a substantial output of programmes for schools had already been produced (Wilson, 1968). Computing, on the other hand, is considered significant in the EU and therefore, necessary for Cyprus as well. Considering that Cyprus is a country between the developed and developing world without major research centers, imitation of practices in other countries is not surprising.

Both broadcasting and computing were introduced with the belief that technology has special powers as an agent of change and is inescapable in Cyprus education. It is really interesting, however, that the two innovations were introduced without attempting any major research or needs assessment in Cyprus. There has been some effort to justify initiation of the innovations within the particular context of Cyprus. For example, broadcasting was believed to help overcome problems such as lack of personnel and shortage of school buildings that had been identified not only abroad but also in Cyprus (Kouyialis, 1977). In general, though, as Sycallides suggests:

> "in this place we never start up something and check how it proceeds or what kind of progress we have. Most people are trained abroad and they imitate what is being done there. We are usually very impressed and want to show off. We want to do everything. We do not just take the medium and use it according to our needs no matter whether or how they use it in England or the US. Cypriots hurry to produce too much in a limited amount of time."

Both broadcasting and computing were introduced in the Cyprus elementary educational system, not *as new subjects*, but *as tools*, reflecting international trends. So, both innovations were introduced as methods to enrich teaching of school subjects, suggesting integrated models. This intention conflicts with the underlying structures and emphases of the Cypriot educational system. As I have stated in section 1.2 the system often perpetuates certain traditions such as encyclopaedism, humanism and the Christian Orthodox epistemology, that promote academic knowledge rather than methods. In this country, knowledge is perceived as being divided into relatively tightly defined subject areas. Each subject has specialised material to be covered. This characteristic of the local context makes it easier for innovations to be supported as separate subjects with specific content for instruction and centrally planned textbooks rather than as classroom tools. This is further supported by the fact that most of the innovations that have been institutionalised refer to new subjects and not new methods (section 1.2). Attempts to introduce cross-curricular subjects or innovations as tools have met with little success. In the light of this, the survival of both innovations was problematic from the beginning.

At the administrative level, the planning phase in both cases outlined ambitious plans and involved a variety of committees and bodies, set to support implementation (sections 4.1.1.2; 4.1.2.2). These committees seemed similar across the two innovations: the Educational Broadcasting Service (broadcasting) and the Curriculum Development Unit for Computers (computing) aimed to visit schools and prepare supplementary material; the General Advisory Committee on Educational Broadcasting and the Advisory Committee for the Introduction of Computers made decisions about implementation of the innovations.

Foreign organizations were involved to a certain extent in the development of both innovations, showing that the UK or the US functioned as bodies of influence over time. Institutions abroad such as the CETO and Bedford College, London University were interested in the introduction of educational broadcasting in developing countries such as Cyprus. The British Council sponsored training in broadcasting. Technical assistance in educational television was granted to Cyprus by the Council of Europe. Within this context, in August 1964, the director of the CETO, visited Cyprus to suggest that educational television could support formal education (Annual Report, 1966-67). For the case of educational computing, the Fulbright Office sponsored training and reference was made to inviting experts from abroad to offer advice.

Financial considerations were stated as important. For educational broadcasting, £ 5,000 per year were allocated to the CBC for production and transmission expenses. Staff salaries and traveling came under separate heads of expenditure within the Ministry of Education and the EBS. A considerable amount of money per year was also allocated for educational computing. The ACICES in the initial plan had referred to financial costs of the experimental programme (Table 4.3). These provisions were approved as part of the annual Developmental Budget.

The experimental plans for both innovations were initiated by the Ministry of Education in a "top down" approach, consistent with the centralised character of the Cypriot educational system - as I have explained in section 1.2. As I have already shown, both ideas for change were initiated by the Ministry of Education and then passed down to the schools; the initiation of educational broadcasting was decided by a few administrators of the Ministry (section 4.1.1.2); introduction of computing followed centralised decision-making processes although initiated by an individual (section 4.1.2.1). Evaluation was reported as not happening or happening on a limited scale.

However, despite centralisation, innovations were expected to be developed at the school level from "bottom up" by teachers. As I have stated in Chapter 1, Cypriot teachers function within the framework of centrally planned curricula and regulations but maintain autonomy in their classrooms. At the school level, implementation of both innovations appeared problematic, as I will show later on. This could explain why teachers were reluctant to implement. Autonomous teachers would not be willing to implement a "tool" if they regarded the "tool" as a source of practical problems for them.

Summary

Although the innovation of educational broadcasting has flourished and been implemented in the past, it failed to reach institutionalisation. Currently, there are no transmissions while production still continues but within a different context.

Recently, educational computing was introduced as another innovation in the educational system of Cyprus. Differences between computing and broadcasting in their nature as innovations show that computing is more flexible and can be implemented in different ways: either as a "tool" or as a "subject". Differences in the time of their introduction also show that computing is initiated in better times for Cyprus in terms of politics and development and seems promising.

However, innovative projects such as educational broadcasting and computing in Cyprus have been essentially similar as experiments on a continuum. Broadcasting and computing have both been "imported" into Cyprus after their application in more developed countries without any prior research or needs assessment; have involved several committees and foreign bodies at the administrative level, promoting top-down processes; have expected development at the school level although implementation seemed problematic and financial considerations important. One can assume that there is a danger that computing may follow the fate of educational broadcasting and fail to be institutionalised.

Therefore, it is important to review factors that are likely to influence this process so as to highlight the various elements required for an innovation to succeed and proceed to further research and recommendations for computing. Two factors were researched into: the actors' perceptions and the conditions. These factors will be presented in broadcasting and computing separately, before I proceed to comparison between the two innovations. As the major focus of this thesis is the "people" in implementation, I shall begin with the actors' perceptions, moving to the other aspects.

4.2. FACTORS KEY TO THE PROCESS

4.2.1. Educational Broadcasting

4.2.1.1. The actors' perceptions

At the administrative level, the cooperation between the Ministry and broadcasters was problematic as the two parts were not determined to cooperate. Confusion seemed to dominate the distribution of roles and responsibilities for representatives of the Cyprus Broadcasting Corporation (CBC) and the Educational Broadcasting Service (EBS). As Epameinondas states, CBC producers felt that Ministry employees interfered in their work and had asked that cooperation be stopped at the script and content review. So, lack of consensus in views and actions of various groups was evident.

At the school level, evaluation by the EBS showed that the reaction of some teachers to educational broadcasting was negative. Both media - educational television and radio - were perceived as invading teachers' classrooms and threatening their work (Epameinondas). According to Sycallides, EBS representatives explained to teachers the supplementary and exploratory role of both television and radio, that would not replace them but help them transmit information, not effectively presented to the children otherwise. However, some teachers complained that radio prevented them from taking initiatives and others did not perceive radio programmes as helpful. According to Epameinondas, research revealed high percentages of teachers against educational radio and negative comments such as "...educational radio is not needed", "...we do not agree". Secondary teachers were even less receptive and positive compared to their elementary colleagues (Epameinondas).

Surprisingly, Reports such as that of the Director of Secondary Education for 1977-78 and 1978-79 (Ministry of Education, 1980) claim that "the reactions of educators, students, parents and other interested parties were very positive and suggestions were made for enrichment". However, these reports are not specific as to what they mean by "reactions" or what aspects of the reactions they refer to.

To sum up, consensus among different groups was far from ideal while some people were against the innovation for different reasons. However, we lack information about the nature of individuals' attitudes and concerns and whether these were personal or professional; the trends in these attitudes since different sources reported different data; the extent to which attitudes influenced implementation practices.

We should remember that people function within a specific context and other factors could be important as well: if teachers indeed did not favour broadcasting, there could be good reasons for that. With this in mind, in the next section I proceed to an overview of the rest of the factors which reflect the conditions: hardware, software, supplementary material, training and curriculum integration.

4.2.1.2. The conditions

Hardware

Resources for educational broadcasting were distributed in most schools. All secondary schools and all elementary schools were provided with TV sets by School Committees and the Co-operative Society of Cyprus respectively (Kouyialis, 1977). All elementary schools (63,068 pupils) were also equipped with radio sets. However, as Sycallides suggests, location of such equipment was often a problem since they were installed in classrooms and not in a special Audiovisual Aids room.

Software
The first Geography and Science televised lessons were transmitted to meet needs such as teacher shortage for Geography and lack of labs/equipment for Science and Biology (Sycallides). These lessons continued to be produced during 1979-80 and 1980-81 (Ministry of Education, 1980; 1981). Reports for 1979-80 (Ministry of Education, 1980) and 1980-81 (Ministry of Education, 1981) state that programmes on other subjects such as the history and culture of the Turkish-occupied part of Cyprus were produced locally as well. Later on, some programmes from the Educational Television of Scotland concerning primary health education and other topics were also broadcast. Epameinondas suggests that when programmes were not in Greek, there were translation problems: the voice of a teacher or actor introduced an experiment or basic terms with poorly translated phrases and expressions.

The first radio series included history programmes titled "Byzantium". Programmes on sound, music, rhythm, games, and fairy tales ("mime, music and movement") were produced for the first grades, an idea transferred from the English system. Other radio programmes were about national or religious anniversaries or about the history of Cyprus and Greece. Later on, teaching English for elementary and secondary grades was also introduced. The main emphasis was on pronunciation and vocabulary enrichment so narrative parts or dialogues were performed by native speakers (Sycallides, Epameinondas).

Radio programmes for teachers included thirteen broadcasts on mathematics and ten programmes on language. Another series called "Ekpaideftika Themata" (Educational Issues) aimed to familiarise teachers with new educational trends. This series replaced teacher training since seminars could not be conducted at the time. Epameinondas suggests that these programmes failed for several reasons. First, teachers in these programmes communicated thoughts and ideas that were not really their own; this was obvious to the listeners. Second, the discussion of some issues was better for face-to-face interaction than radio transmission.

In general, the quantity of programmes seemed satisfactory. The Director of Elementary Education (DEE) and the Director of Secondary/Higher education in their reports for 1979-80 (1980) refer to programme production as "useful, continuous and consistent". The Reports of the DEE for 1980-81, 1981-82 and 1983-84 (Ministry of Education, 1981; 1982; 1984) mention that a large number of educational radio programs were transmitted.

However, the quality of the programmes remained questionable. On the one hand, the Ministry reports described the programmes as successful. On the other hand, according to Theodosiadou, the Cyprus Broadcasting Corporation (CBC) thought that programmes did not fully develop the potential of the medium. Epameinondas suggests that most programmes were knowledge-based, so the content would be more suitable for face to face interaction between teacher and student than for transmission.

Supplementary material

The Educational Broadcasting Service provided free leaflets as supplementary material: "Notes for the teachers" and "Notes for the students" (Kouyialis, 1977). Teachers' notes provided information about the schedule, form and content of the programmes, suggestions for classroom activities as well as explanation of difficult phrases to discuss before transmission. Students' notes included exercises consolidating the topic as radio or television series was only the stimulus. These notes provided mostly knowledge-oriented information, and in some cases replaced existing textbooks.

Training

Epameinondas suggests that there was lack of consistent and serious training in educational broadcasting. Although some people were sent abroad, there were no experts in the field; the majority of teachers lacked considerable background over broadcasting.

Educational seminars were organised in the UK or Cyprus for administrators, actively involved in radio and television production. All permanently seconded members of the EBS along with selected CBC employees had similar training through scholarships overseas. In 1964, Sycallides and Kouyialis from the Ministry of Education along with Theodosiadou and Daniel from the CBC attended seminars on educational television at the Council for Educational Television Overseas (CETO) in England. In 1971-72 Epameinondas, Kouyialis and Tsouli were trained on educational radio in the UK. The London courses involved practical work and programme production. People trained abroad were not given the chance to share their experiences with other colleagues. Epameinondas reveals that after his training in England he had suggested organising seminars but this was not made possible.

In Cyprus, an intensive course on educational television was organised in 1964 by the CETO for selected representatives of elementary and secondary education (teachers and inspectors) and the CBC (Sycallides). This course familiarised participants with television techniques, equipment, production, planning and budgeting (Kouyialis, 1977).

At another level, some training was also provided for practicing teachers. The Ministry had allowed responsibility for training to the EBS. Two workshops on educational television were organised for principals and teachers in 1964 (Kouyialis, 1977). Principals could learn about television applications to education and subject specialists could explore television use in their fields (Sycallides, 1966). The Annual Report 1966-1967 stated that in an effort to acquaint the educators with the value of educational television, the Ministry of Education organised seminars between January and May 1966 for principals and teachers of Geography, Biology and Physics (Ministry of Education, 1967).

Curriculum integration
There is no evidence that broadcasting was ever effectively included in the school curriculum in Cyprus. The description of the programmes highlights relevance to school subjects. According to the Public Information Service (1973) the programmes were offered within the framework of the curriculum and television was to be used as a strong visual medium. The same applied for radio lessons. The guidelines to the Organiser suggested that: radio programmes should be incorporated into the curriculum not just be merely listening sessions; participation of the students was vital; elaboration and practical work should be done in connection with the programme; the radio lessons should be complete, not exhausting the subject, thus providing opportunities for further study.

No reference is made to special time allocated for broadcasting within the everyday classroom activities. However, the televised lessons aimed to be incorporated into a 45 minute teaching period as follows: ten minutes before to plan any necessary activities, twenty minutes to the program itself and fifteen minutes for follow-up discussions. Like the televised lessons, the radio lessons aimed to make up a fifteen minute part of a 40 minute teaching period. Teachers were expected to turn on the radio on transmission time. Later on, according to Epameinondas, the Service decided to tape the programmes and send them to schools to allow for flexibility in use. This worked better because the teachers were free of time constraints.

4.2.2. Educational Computing

4.2.2.1. The actors' perceptions
At the administrative level, I have already stated the reactions of the Curriculum Development Unit (CDU), the Advisory Council, the Advisory Committee for the Introduction of Computers in Elementary Schools (ACICES) and the Director of Elementary Education (DEE) to the experimental program in section 4.1.2. In spite of the supportive attitudes of most bodies and committees involved, there

were different viewpoints on aspects such as training, equipment and funding. The Planning Bureau (PB) seemed to hold a rather negative attitude towards this innovation. In a report (Ministry of Education, Folder 121/82/Z), the PB (P.B. 146/82/2: 15.4.94) indicated weaknesses in the plan for inclusion of computers in schools: there was no provision for computer inclusion in the Gymnasium, that is the first three secondary grades so there was no consistency within different levels of education; educational results of computer usage abroad were not encouraging; the shortage of Greek software and educated personnel further increased the possibility of a failure. In another report (Ministry of Education, Folder 121/82/Z) the PB (P.B. 146/82/3: 2.11.94) stressed that computers should only be used if research findings indicated improved educational achievement compared to traditional methods of teaching; the number of pilot schools should not be extended before the work done was evaluated; and that teacher training should slow down.

At the school level, as far as teachers, parents and children are concerned, in documentary research there was no information about their views and attitudes, except from teachers' willingness to attend training.

4.2.2.2. The conditions

Hardware

The number of computers in schools is a major factor for the integrative process although availability is not a guarantee for educational use. The Advisory Committee for the Introduction of Computers in Elementary Schools (ACICES) recommended purchase of IBM compatible computers; initially big schools would have at least four computers and small ones only one.

No provision for purchase of computers had been made in the National Budget for Education for 1993. Therefore, the Ministry of Education requested that budgetary funds for another chapter (62A, Article 742: Purchase of Machinery Equipment and Services) be used for the purchase of equipment for schools (Ministry of Education, Folder 121/82/Z: 30.8.93). The amount was allocated after approval by the Ministry of Finance.

During 1994-95 budgetary funds had been approved (Ministry of Education, Folder 121/82/2Z: 1.9.94) under the Article 06.742 "IT. in Elementary Education" of Chapter 20.02.3 for the purchase of equipment. The Interdepartmental Committee for Computers insisted in February 1995 that these funds should be allocated for support of the existing twenty-four schools. The Department of Elementary Education decided to equip the schools with more computers (Ministry of Education, Folder 121/82/2Z: 8.2.95). Therefore, the sixteen new pilot schools were equipped with 2 computers and 1 colour printer each. A computer company offered free equipment for another three schools: two in Nicosia and one in Limassol. The Director of Elementary Education (DEE) also suggested that money from the fourth financial contract between Cyprus and EU -aimed at the development of economic and technical cooperation between the two parts- be used for computer equipment for elementary schools.

Software

Initially, the ACICES supported the establishment of a special Service within the Ministry of Education to deal with software translation and production according to the schools' needs. The Interdepartmental Committee suggested the establishment of a Support Group for software development and purchase.

During 1994-95 the eight schools of Phase A needed additional software for Phase B. The Curriculum Development Unit (CDU) suggested that educational software in the market be evaluated by the Department of Elementary Education. The Department responded positively to this request and informed school principals to wait for the evaluation of software before purchasing any. The PB suggested that programmes be prepared by the University of Cyprus or be provided from Greece after adjustments had been made. The Director of Elementary Education (DEE) suggested the purchase of programmes for Geography and Maths as well as stories for the first grades (Ministry of Education, Folder 121/82/2Z: 19.12.94). However, even after this, the CDU stressed in January 1995 that schools kept requesting software appropriate for the curriculum of Cyprus.

Supplementary material

The Advisory Committee for the Introduction of Computers in Elementary Schools (ACICES) suggested the establishment of a support committee that would prepare supplementary material. There was an urgent need for this: during Phase A the first eight schools had no such material and this was realised at Phase B to a greater extent.

The CDU prepared 5 lesson plans for word processing (WRITE) and graphics (PAINTBRUSH) while it planned to prepare material for geometry (LOGOWRITE); it also developed a "Guide for the Teacher" along with two discs. Two reasons why the Unit dealt only with word processing and graphics were first the lack of other software in Greek and second the shortage of funds for the purchase of other software. Therefore, the Unit contacted Greece and Israel to find free software.

Training
The ACICES supported teacher training either in Cyprus or abroad, using a special program designed by the Pedagogical Institute (PI) for inservice teachers and by the University of Cyprus for future teachers.

In January 1994, the Fulbright Program offered scholarships for teacher training in computers on funding from the Organisation for International Development. Application criteria for selection of the successful candidates included computer experience and academic qualifications. This offer was welcomed since there was a considerable lack of experienced teachers. The Planning Bureau (PB) considered the training unnecessary since a possible program in Cyprus by the PI would probably be more beneficial to teachers (P.B. 137/81/2: 30.3.94 in Ministry of Education, Folder 121/82/Z). However, during the summer of 1994, twenty Greek and ten Turkish Cypriot teachers attended training at the Institute of Public Service International, University of Connecticut. This program included seminars, visits to schools, production of teaching material and interaction with other teachers.

In Cyprus, teacher training was undertaken by the PI that organised a general series of 20 seminars of 3 teaching periods each (D1702). This series beginning January 18, 1994 was offered first in Nicosia and then in Larnaca and Paphos. The seminar D2702 about multimedia was introduced during 1994-95. Training aimed at familiarising teachers with word processing, graphics, databases and spreadsheets so as to utilise computers in their classroom. The interest that was expressed for attending the seminars was great. A large number of candidates were rejected because of limited equipment. Training seminars were also planned for inspectors of elementary schools but they did not take place.

Other alternatives were also applied. A workshop (MULTIMEDIA) was organised during the last week of June 1994 by experts from Bedfordshire and was attended by 6 teachers only who prepared a specific multimedia programme for elementary schools. Taking the initiative, thirty-eight teachers were trained at five pilot schools by a colleague (October-December 1994). On the other hand, several contacts were made with experts from Israel who agreed to visit Cyprus during the Autumn of 1995-96 to train teachers and visit pilot schools.

The Curriculum Development Unit (CDU) considered the training seminars of the PI inappropriate since the training centres did not have the necessary equipment to run the software used in pilot schools (Ministry of Education, Folder 121/82/2Z: 17.10.94). The content of the seminars was also considered too general. At a meeting with the Director of Elementary Education (DEE) the issue of revision of the content of seminars D1702 and D2702 was raised.

Teacher training was on the agenda of the Interdepartmental Committee as well. A large number of teachers insisted on attending the series of computer training seminars at the PI while the selection of only a few participants raised complaints. There was a major need for the secondment of two more teachers responsible for teacher training and for provision of such training for inspectors.

The DEE (Ministry of Education, Folder 121/82/Z: 17.3.94) stressed that in future 300 teachers would be educated on a basic level while another 180 at a more advanced level; four teacher specialists in computers should also be seconded as members of the CDU for computers so as to be responsible for teacher training.

Curriculum integration

The Advisory Committee for the Introduction of Computers in Elementary Schools (ACICES) outlined the goals of computer introduction into elementary schools, which were "the enrichment and support of existing curricula subjects". Children would be prepared for a life that would be directly affected by technology, and be helped to develop skills in using computers as tools. Concept understanding, information search and presentation, creativity and active child-centred learning would be facilitated. Some activities suggested were: collection, classification and interpretation of information, problem solving, graphics and model construction.

The Curriculum Development Unit (CDU) prepared the "Curriculum Programme for Computers", a new chapter that was to be included in the new edition of the "Cyprus National Curriculum" under publication. This programme provided for three levels each related to two classes of elementary school and specified basic IT skills that should be acquired. Although inclusion of this chapter was to be promoted, it was finally decided not to proceed because "more time was needed for its application and improvement" so that it would be published later on separately.

No time was allocated within the curriculum for inclusion of educational computing in the everyday classroom activities.

4.2.3. Comparison of the two innovations

Our review of educational broadcasting has pointed that failure could be attributed to actors' views and attitudes about the innovation. On the other hand, reluctance to implement could be linked to the local context. I will now compare the two innovations (Table 4.6) along these two dimensions: the actors' perceptions (section 4.2.3.1) and the conditions (section 4.2.3.2).

4.2.3.1 The actors' perceptions

I have already stated that change is a process of mutual adaptation with different groups interacting. Therefore, it is important to review both innovations with respect to the actors involved. Reference has already been made to actors in relation to educational broadcasting and computing in sections 4.2.1.1 and 4.2.2.1 respectively. Here, I draw comparison patterns.

		Educational Broadcasting	*Educational Computing*
Different	*Actors' perceptions*	• Interviews state that at the school level, some people were against innovation • Ministry reports state reactions of teachers, students and parents as positive.	• No information on people's reactions at the school level • No reports on reactions of teachers, students or parents.
	Conditions	• Quantity of equipment sufficient for schools. • Satisfactory quantity of programmes. • Supplementary material for students and teachers • No reports on significant problems on training.	• Financial problems in providing computers • Provision of software considered inadequate. • Supplementary material only for teachers so far. • Great demand for training but limited supply.
Similar	*Actors' perceptions*	• Conflict of bodies such as the EBS and the CBC on roles and responsibilities.	• Conflict of bodies such as the PB and the DEE about aspects of the innovation.
	Conditions	• Software aimed for existing subjects; some locally produced; translation problems • Involvement of foreign organisations to sponsor training abroad; limited training in Cyprus by EBS • No special time for innovation	• Software aimed for school subjects; some locally produced; translation problems • Involvement of foreign organisations to sponsor training some training in Cyprus by the PI. • No special time for computing.

Table 4.6 COMPARISON BETWEEN THE TWO INNOVATIONS: THE FACTORS

Differences

At the school level, Ministry reports refer to attitudes of teachers, parents and children towards broadcasting as positive. However, we have evidence that teachers were not fond of educational broadcasting and were not willing to embrace the innovation with open arms in their classrooms. We lack such information on computing.

Similarities

At the administrative level, in both innovations Cypriots did not share the same perceptions about roles and goals. As I have shown in section 4.2.1.1 for the case of broadcasting there was conflict between the CBC and the EBS. In a similar way, as I discuss in section 4.2.2.1 the PB and the DEE did not share the same understandings about the development of educational computing. This shows confusion of certain bodies or individuals about various aspects of the innovations. This conflict is a characteristic of the Cypriot educational system, as I have suggested in the introduction; administrators easily import innovations, but struggle to set policies and establish clarity for themselves and others.

In both cases, the actors' views, attitudes and concerns at the school level were not studied in detail. As these are important dimensions for implementation success, as I stress in section 2.4, more attention should be paid to them.

4.3.2.2 The conditions

Differences

Resources were provided to a great extent for educational broadcasting since all schools were equipped with television or radio sets. In computing, distribution of equipment was more problematic since more funding was required. In a country with public education financed by the government, which pays for the salaries of the teachers, awards annual grants to all local authorities and undertakes the cost for school buildings, expenditure on additional resources seems very demanding.

In terms of quantity, the software for educational computing and supplementary material were more scarce than programmes for broadcasting (Table 4.6). There are no reports on significant problems with training so training could be thought of as less problematic for broadcasting than computing. In the case of computing especially, the PI could not meet the teachers' demand of training and had to exclude applicants from attending seminars. If we consider that training is optional with seminars held in the afternoon, during teachers' free time on a voluntary basis, rejecting interested candidates is rather discouraging.

Similarities

To begin with, both broadcasting and computing were implemented within the same setting, that is Cyprus elementary schools. So, we would expect certain similarities in local conditions, despite the different time of implementation.

The software quality remained questionable in both cases. The issue of relevance was raised since the programmes related to school subjects but were not considered very appropriate for the Cyprus curriculum. Translation problems were also reported. In both broadcasting and computing, more attention was given to the training of administrators or selected personnel, directly involved in implementation rather than practitioners on a wider scale. Educational seminars were organised through scholarships overseas only on a limited scale and for selected participants.

In both cases, there was lack of integration into curricula. Although programmes aimed for inclusion into the regular classroom practices, this was not happening. There was no official compulsory inclusion of both innovations in the National Curriculum to establish them as a major component of the school system. Goals for use lacked clarity. This is consistent with the national lack of concern about goals and aims since these are imported without real theoretical discussion about their local relevance and meaning. In Cyprus, school time is centrally and homogeneously set for all schools and is limited since children only attend school in the mornings. No special time was allocated for these innovations. So, teachers had a hard time integrating them into their usual intensive timetable.

Summary

The analysis of factors related to implementation of educational broadcasting was undertaken, considering two dimensions - the actors' perceptions and the conditions - to reveal reasons for this failure.

Information on actors, when provided, points to conflict at the administrative level and to reluctance to implement broadcasting at the school level. Teachers have been presented by the interviewees as fearful of their replacement by media, holding anxieties. On the other hand, Ministry reports describe teachers' attitudes as positive. However, such reports are not specific as to which dimensions of attitudes they refer to: personal or professional. Reluctance could be attributed to the fact that Cypriot teachers lacked faith in the educational value of broadcasting, viewing media as useless. In general, actors' perceptions seemed to be an important reason for failure but had not been studied systematically in the case of educational broadcasting.

On the other hand, an examination of other factors has revealed that conditions made institutionalisation of the innovation very difficult for the actors involved. Sufficient resources, some training, adequate programmes and supplementary material were provided but the quality of broadcasting programmes remained questionable and curriculum integration was problematic. Therefore, the local context of implementation was another important reason for failure.

Next, I reviewed factors that are likely to influence educational computing in a parallel way to broadcasting so as to proceed to a comparison between the two innovations and provide recommendations for further research on computing.

In relation to actors' perceptions, on the one hand, existing data supported conflict and lack of consensus at the administrative level for both innovations.

This could be considered as negative for the development of educational computing. On the other hand, at the school level limited information was only provided for the case of educational broadcasting that did not reflect systematic research.

In relation to conditions, data suggest that computing is probably different than broadcasting but in a negative way; it seems more problematic in terms of quantity of resources, software, supplementary material and training. It is also similar to broadcasting in that they both face problems in software quality and curriculum integration. In such conditions, it would appear unlikely for educators to embrace computing with open arms.

4.4. CONCLUSION

In this chapter I have outlined the two stories of educational broadcasting and computing to reveal what can be learned by the comparison of the two innovations. My findings in section 4.1.3 indicate close similarity between the computing and the educational broadcasting initiative in terms of the process. In the case of computing the situation on several aspects seems more problematic than broadcasting. Therefore, computing will probably have the same fate as educational broadcasting and fail to be institutionalised in classroom practices.

The preliminary analysis of educational broadcasting in section 4.2.1 of this chapter showed that *actors' perceptions* as well as *implementation conditions* are critical for success. This was further supported by the literature review (section 2.4; 2.5). Since a lot of questions remained unanswered with respect to educational computing, I decided to explore these factors influencing implementation in more detail. So, in light of the findings in section 4.2.3 and the literature search, I proceeded to further research.

As people's perceptions seemed to be an important aspect for success of implementation, I decided that I had a unique opportunity to undertake research in this area with respect to educational computing. Therefore, I proceeded to collect data on the nature and the trends of people's views, attitudes and concerns about computers in general and the experimental programme in particular. I decided to focus on different groups of actors - parents, teachers and children. Of special interest were teachers' perceptions since, as the literature review points, an innovation can not be accepted as a resource for improving practices unless educators are positive about it; the teacher is still the agent upon which a nation's educational administrators depend to implement policies. These data become the focus of Chapter 5.

Further to this, I decided to examine the role of actors' perceptions along with the role of the conditions more closely at the school level to reveal the ways in which they impact on implementation practices. These will be discussed in Chapter 6.

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CHAPTER 5: ACTORS' VIEWS, ATTITUDES, CONCERNS

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This chapter aims to answer the second research question in this thesis "*What are the general trends and nature of actors' views, attitudes and concerns about educational computing?*" This has the three following sub-questions:

- What are the general trends and nature of actors' views on implementation aspects?
- What are the general trends and nature of actors' attitudes towards the innovation?
- What are the general trends and nature of involved teachers' concerns about the innovation?

In section 5.1 I describe the characteristics of the respondents. In section 5.2 I focus on the first sub-question, actors' views; in section 5.3 on the second, actors' attitudes; and in section 5.4 on the third, teachers' concerns. The actors explored are the three different groups of students, parents and teachers who, according to the "change" paradigm, are likely to influence the implementation process. I begin with an overview of the actors' characteristics, which will be useful in exploring the impact of certain variables on views, attitudes and concerns.

5.1. CHARACTERISTICS OF THE ACTORS

Here I describe the characteristics of the respondents that were surveyed (Table 3.2: Part A, B). From the response rates I establish in section 5.1.1 that the sample is considerable. I then outline the profiles of the respondents in terms of their demographics (section 5.1.2) and computer background (section 5.1.3).

5.1.1. Response rates

Population	District	*NICOSIA*	*LIMASSOL*	*LARNACA*	*PAPHOS*	*AMMOHOSTOS.*	*TOTAL*
STUDENTS	Number	41/44	30/40	22/25	32/32	31/31	156/172
	Percentage	93%	75%	88%	100%	100%	91%
	Number	39/55	52/52	19/25	20/20	26/26	156/178
	Percentage	71%	100%	76%	100%	100%	88%
PARENTS	Number	27/44	25/40	18/25	24/32	26/31	120/172
	Percentage	61%	63%	72%	75%	84%	70%
	Number	32/55	44/52	21/25	19/20	16/26	132/178
	Percentage	58%	85%	84%	95%	61%	73%
TEACHERS	Number	99/146	29/102	17/39	37/52	24/38	206/376
	Percentage	68%	28%	44%	71%	63%	55%
	Number	80/121	47/68	24/46	9/10	20/32	180/277
	Percentage	66%	69%	52%	90%	63%	65%

pilot schools ***non-pilot schools***

Table 5.1 RESPONSE RATES

Generally, the response rate was 386/654 (59%) for teachers, 252/350 (72%) for parents and 312/350 (89%) for students (Table 5.1). These rates are satisfactory, considering the wide scale of the survey and the fact that personal access to populations outside Nicosia was not easy, as I have explained in section 3.3.2.3.

5.1.2. Demographics

Of the total 312 children, 51% were boys. This was consistent with the statistics: boys are 52% of the elementary school student population (Unesco, 1995). Children were either 10 (44%) or 11 years old (54%). Half the children were from pilot and half from non-pilot schools.

Of the total 252 parents, 57% were women, perhaps because children preferred to give the questionnaires to their mothers. However, we do have a reasonable representation of paternal opinion. Most parents were aged between 30-49 (91%); a majority had graduated from elementary or secondary school (58%) while a smaller group had attended college or university (32%); about 48% had children in pilot and 52% in non-pilot schools.

Of the total 386 teachers, more than half (56%, pilot; 69%, non-pilot) were women in accordance to the statistics of Unesco (1995) (64% female teachers). The largest group were aged between 20-29 (38%, pilot; non-pilot, 47%). Almost three-quarters of the respondents were teachers, the remaining being either principals, assistant principals or "others", such as secondary or nursery teachers working temporarily in elementary schools. The majority (75%, pilot; 69%, non-pilot) were graduates of the Cyprus Pedagogical Academy (CPA) and the rest of universities abroad.

5.1.3. Computer background

Access to computers: home, work, school

At home, about one-quarter of children and parents owned a computer (Fig. 5.1). Some teachers (48%, pilot; 36%, non-pilot) also indicated computer ownership. The fact that more teachers than parents had access to a computer at home could indicate that Cypriot teachers favour technology for personal use. Although at present it seems that only some people have access to computers, due to the small size of the island and the rapid pace of growth, one could expect that quite soon computers could be accessible in most homes. This prediction could be further supported by the fact that of the non-owners, more than half (57%) of parents and half of teachers indicated their intention to buy a computer. 95% of children non-owners reported that they would like to have a computer at home.

Computers were also available in other places for people that could not access them at home. Of the children, four-fifths of non-owners indicated that they had used a computer elsewhere: 47% at school; 38% at relatives' houses; 10% at parents' work; 5% at private institutes. Of the parents, 41% reported availability of computers at work (Fig. 5.1). This is interesting since more parents have access to computers at work than at home. Considering the economic development of the island and the intention to join the EU, it seems that the job market in Cyprus proceeds rapidly to get the technology integrated into everyday practices.

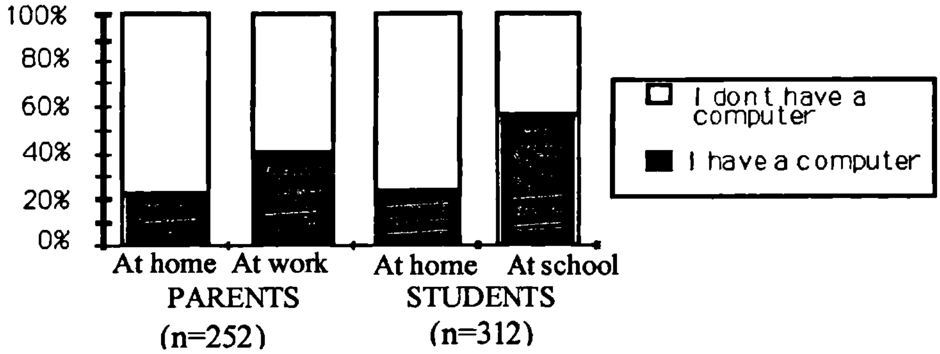


Figure 5.1 PARENTS AND STUDENTS - COMPUTER AVAILABILITY

At school more than half children indicated that they had access to computers (Fig. 5.1). 92% of children not having computers at their schools indicated that they would like to. Except from pilot-teachers, surprisingly, 20% of non-pilot teachers also reported that they also had computers at school. This reveals that some non-pilot schools, not involved in the experimental programme, have proceeded on their own to buy equipment. This was interesting, considering that such schools lacked support from the Ministry for computer acquisition. These data could lead to the conclusion that computers become increasingly available in schools. However, as I will explain in the next section, availability of machines alone does not automatically lead to their use.

Use of computers - home, work, school

In this section, data apply only to individuals with access to computers. Unfortunately, when reporting on frequency of use, the terms "sometimes" and "often" are quite subjective and could be interpreted differently by individuals. So, I focus on basic trends, resulting from use of the term "never".

At home, most owners tended to use the computer, as Figure 5.2 illustrates. These data show that of all three groups, the children tend to make the most use of the technology at home. There is also an interesting difference between pilot and non-pilot teachers, as the first ones reported higher frequency of use.

Both children who owned and children who had used computers elsewhere (Fig. 5.3) reported mainly playing games, making drawings and word processing. Of the parents, about one-quarter of the owners indicated use for word processing, for job tasks or exploration of software. Of the teachers, about one-half indicated word processing, production of handouts for the school, games, use of the Internet and programming. This suggests that there is a trend in all the populations to use various kinds of software for different tasks. Teachers and parents tend to use their home computer for job related tasks.

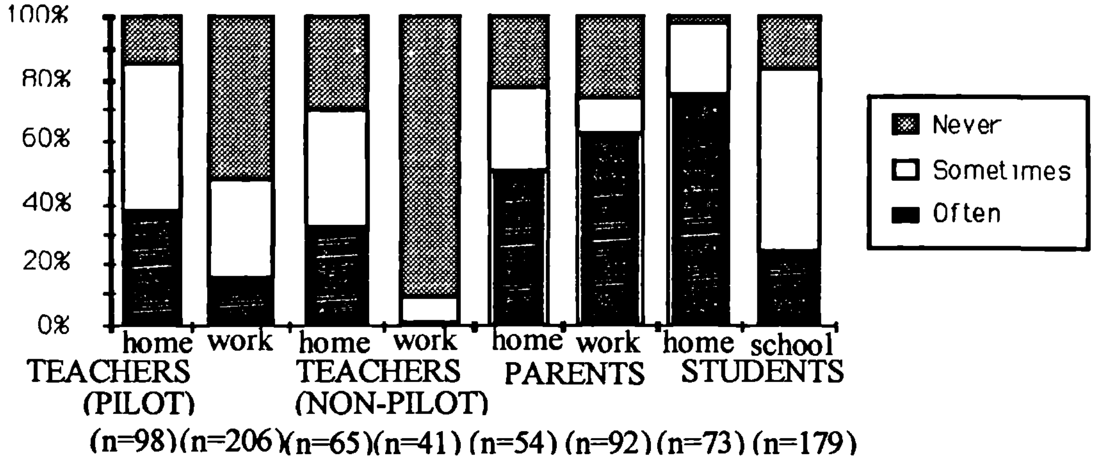


Figure 5.2 TEACHERS, PARENTS, STUDENTS -FREQUENCY OF COMPUTER USE

At work, for parents with access to computers, the frequency of use was quite high as shown in Fig. 5.2. 43% of the people with computers at work reported ways of use: 90% used them for job related tasks. This is again indicative of the market trend to integrate technology into everyday practices.

At school, Fig. 5.2 shows that more than one-half of pilot teachers never used computers. This shows that despite availability of computers at school (Fig. 5.1) a significant proportion of teachers and to a less extent children report limited use. Surprisingly, some non-pilot teachers also reported some computer use.

At school, children (Fig. 5.3) used computers mainly for drawings, word processing, and games. Their favourite task on the school computer was drawing (39%), playing games (29%) and writing (21%). Most teachers failed to indicate ways of use; some reported word processing and preparation of school handouts. Overall, these practices reflect diversity of use. However, we still lack information about the goals of such use at school.

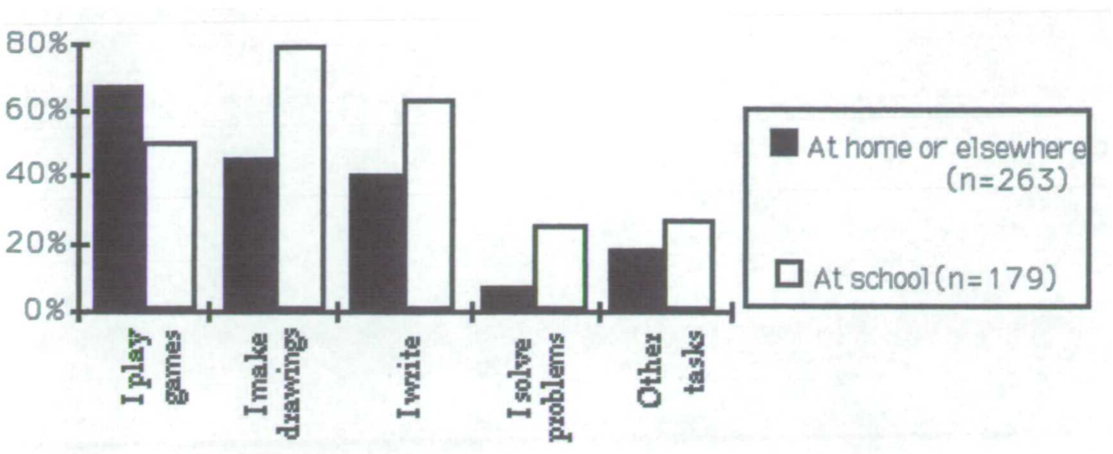


Figure 5.3 STUDENTS - WAYS OF COMPUTER USE AT HOME AND AT SCHOOL

Self-rated computer proficiency

Respondents reported various levels of computer proficiency (Fig. 5.4). Interpretation of these percentages could be misleading since people's ratings of where they stand on a scale are influenced by their self-concept and self-confidence. Still, this indicated a range of people with different levels of computer ability. No considerable difference was found between parents and teachers, although the average pilot teacher seemed more proficient compared to his/her non-pilot colleague. This could be attributed to computer access.

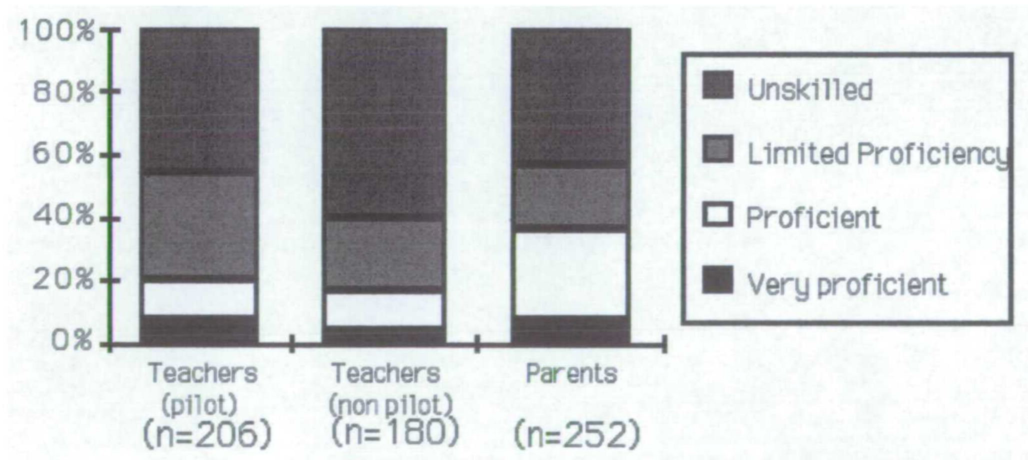


Figure 5.4 TEACHERS AND PARENTS - LEVEL OF COMPUTER PROFICIENCY

Training background

It was interesting to note that more than half teachers, both pilot and non-pilot, reported lack of computer training, although this group was larger for non-pilot schools (Fig. 5.5). These data could be interpreted in two ways. First, the data could indicate inefficiency of administrative services to systematically explain the technical or educational aspects of the innovation to the practitioners who are either directly involved or expected to get involved in the near future in the innovation. As I have already mentioned in Chapter 4 (section 4.2.2), the Pedagogical Institute (PI) had not been able to meet teachers' needs for training.

Second, the data could suggest that a considerable group of individuals without pre-service training also lack interest for in-service voluntary training.

As Fig. 5.6 shows, most of the trained teachers had attended courses either at the PI, the Ministry of Education, the university during their studies or at private institutes. Some respondents received training (Fig. 5.7) for some months or several weeks and some others for one year or more. The largest group had courses about general computing (31%, pilot; 37%, non-pilot) or use of specific software (44%, pilot; 39%, non-pilot). The fact that people had referred to various sources other than the PI for training, mostly on a voluntary basis indicated that trained individuals are interested in technology.

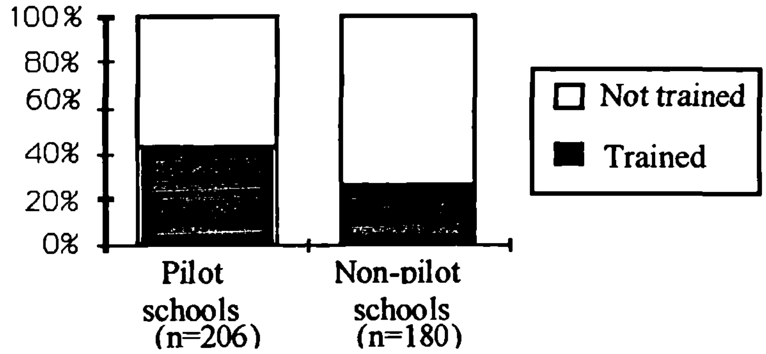


Figure 5.5 TEACHERS -TRAINING

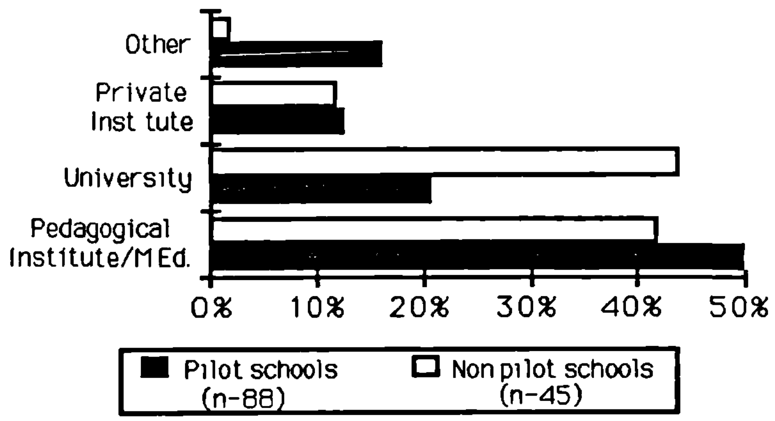


Figure 5.6 TEACHERS -SOURCE OF TRAINING

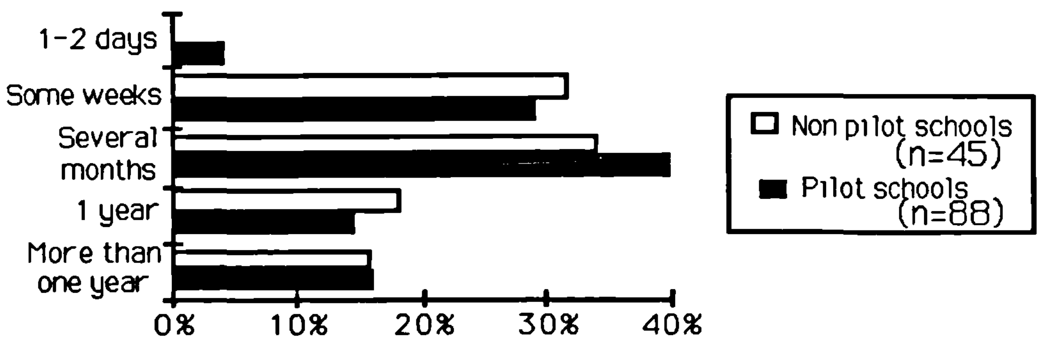


Figure 5.7 TEACHERS - DURATION OF TRAINING

Summary

The populations surveyed, that is the parents, children and teachers vary with respect to demographics such as age, gender or educational level attained (section 5.1.2). Cypriots also differ significantly in their computer background (section 5.1.3). These differences have two main implications. First, considering that Cyprus is a small country, one could assume that this diversity reflects a quite representative picture of several groups of Cypriots. Second, this diversity suggests that I could proceed to comparisons between groups to see how these differences are reflected in aspects of actors' views, attitudes and concerns.

Findings related to the computer background of the people researched show some interesting trends. It seems that computers are invading all areas of Cypriots' lives: home, work, school. Although computer ownership is still limited and ranges from 23% (children, parents) to 48% (teachers), most non-owners plan to buy a computer. The availability of computers in the workplace indicates that the job market integrates the new technology. Availability of computers at home and at work suggests that the Cypriots are oriented towards change. This societal trend to get access to new technology should have implications for school practices as schools would be expected to help children become familiar with the new technology. This underlines the importance of the computer experimental programme.

I have further indicated that to a certain extent although computers are present in some schools their use is still limited. When different groups -especially children- have access to computers at home, the frequency of use at the personal level is quite high. The same is true for parents with access to computers at work. However, at school, the frequency of use is low for teachers and students. The educational use of computers appears limited compared to personal use. Maybe this can be attributed to the problematic implementation in schools.

Most parents and teachers describe themselves as "unskilled" in computer use whilst most teachers lack training background. This is interesting, considering that pilot teachers are expected to make use of the innovation. We could think that if the policy of implementation emphasised training, pilot teachers could be easily trained as their number at the moment is rather small. On the other hand, it seems that some teachers voluntarily turn to other sources for training, but we lack evidence as to whether their interest relates to personal or educational use.

The people's views will now be explored in the next section 5.2.

5.2. VIEWS ON IMPLEMENTATION ASPECTS

Here, I aim to answer my first sub-question "What are the general trends and nature of actors' views on implementation aspects?". First, in section 5.2.1 I indicate trends in views, focusing on beliefs (section 5.2.1.1) and reaction to goals for computer introduction (section 5.2.1.2). With these data, I reveal the degree of consensus among actors as well as the effect of some variables on their views. Since teachers are important, I also outline this group's training needs, problems and current use of technology (section 5.2.1.3). Second, in section 5.2.2 I explore the nature of people's views to reveal aspects of particular concern to actors.

5.2.1. General trends in views

5.2.1.1. Beliefs on computer introduction

Here, I describe parents' and teachers' beliefs on computer introduction: level of education, number of computers, way of introduction, subjects for computer use, computer introduction in Cyprus elementary schools and awareness of computer introduction (Table 3.2, Part C). I also proceed to comparisons within and between groups. Frequencies in numbers and percentages as well as significant chi square findings are provided in Appendix III (Part A).

Level of education for computer introduction

Most teachers and parents replied that computers should be introduced from elementary school level while the rest were against introduction before secondary school (Fig. 5.8). This shows that almost all Cypriots favour introduction of computers in education at some stage.

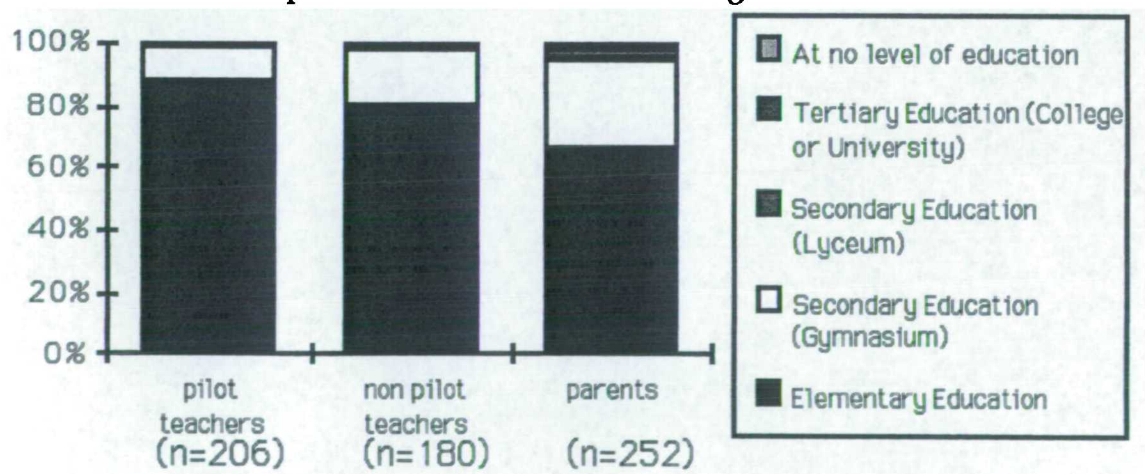


Figure 5.8 LEVEL OF EDUCATION FOR COMPUTER INTRODUCTION

Number of computers per school

Most teachers and parents indicated preference for "some computers per classroom" (Fig. 5.9). Some others favoured "one computer per classroom" and less individuals "one per child". So, views about this particular aspect varied.

There was an interesting difference on the number of computers that was considered as ideal between pilot and non-pilot teachers ($p<0.01$): 69% (pilot) compared to 53% (non-pilot) responded "some per classroom"; 5% (pilot) compared with 15% (non-pilot) responded "one per child". This may be because pilot teachers are more aware of the practical difficulties in providing sufficient equipment for all children.

A significant difference was also obtained between parents and teachers ($p<0.05$): 16% of parents compared to 9% of teachers were in favour of "one machine per child"; 52% of parents compared to 61% of teachers preferred "some per classroom". This shows parents' concern about equal access of children to machines.

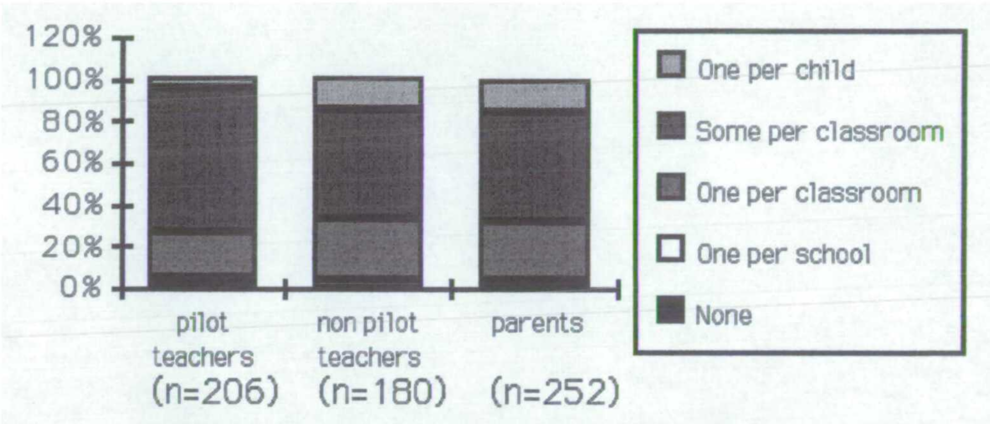


Figure 5. 9 NUMBER OF COMPUTERS AT SCHOOL

Way of computer introduction

As I illustrate in Figure 5.10, about half the teachers and a quarter of parents supported computing as a teaching medium. About one-third of teachers and half the parents wanted it as a separate curriculum area. Fewer teachers and parents preferred computing "as a topic within existing subjects".

Therefore, it seems that only some individuals prefer the "integrated" model, that is the computers as a tool for existing subjects, also supported by the international trends and the Ministry of Education. A considerable group favours the "technical" model of computer introduction as a new teaching area. This second group seems to support the structures of the Cyprus system, which promote encyclopaedism and humanism as expressed in the emphasis on curricula subjects (section 1.2). The difference in views is consistent with the conflict underlying the Cypriot culture, often reflected in debates on educational issues.

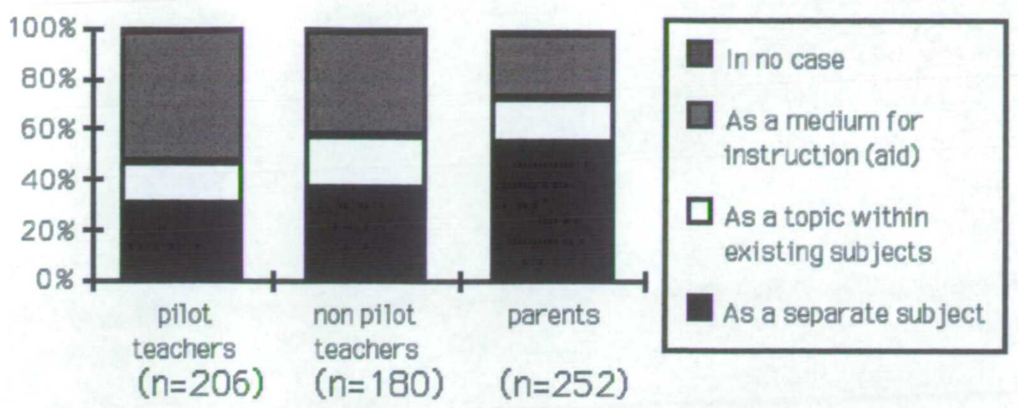


Figure 5.10 WAYS OF COMPUTER INTRODUCTION

Subjects for computer use

About half the teachers supported computer use for all school subjects whereas half the parents preferred use for some subjects only (Fig. 5.11). Again, Cypriots do not share the same views even if schools would adopt the "integrated" model of the computer as a tool, as promoted by the Ministry.

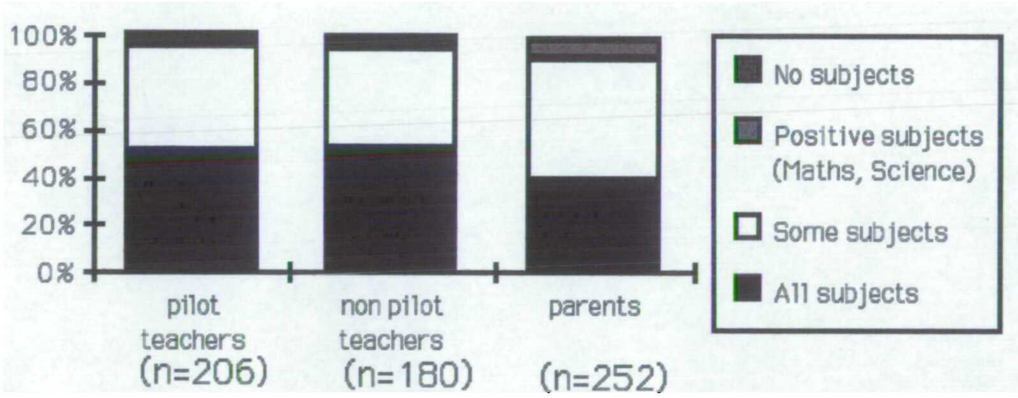


Figure 5.11 SUBJECTS FOR COMPUTER USE

Support for computer introduction in Cyprus elementary schools

Most teachers and parents agreed with the introduction of computers in Cyprus elementary schools (Fig. 5.12).

Support for computer introduction in Cyprus elementary schools was related to a number of variables. Significantly, more pilot parents (90%) than non-pilot ones (76%) favoured computer introduction ($p<0.01$). This could suggest that pilot schools probably receive more community support. For parents ($p<0.05$), 93% (owners), compared to 81% (non owners), and for teachers ($p<0.01$), 95% (owners) compared to 84% (non-owners) as well as 95% (trained) compared to 86% (non-trained) indicated that computers should be introduced. This trend shows that as people get familiar with the new technology through either ownership or training, they become more supportive for its use in schools.

Another difference was also detected between teachers and parents: 89% of teachers compared to 83% of parents indicated support. All these differences indicate that although most people seem positive, they are likely to react differently to introduction of computers in Cyprus schools according to their computer background and status (teacher/parent, pilot/non pilot).

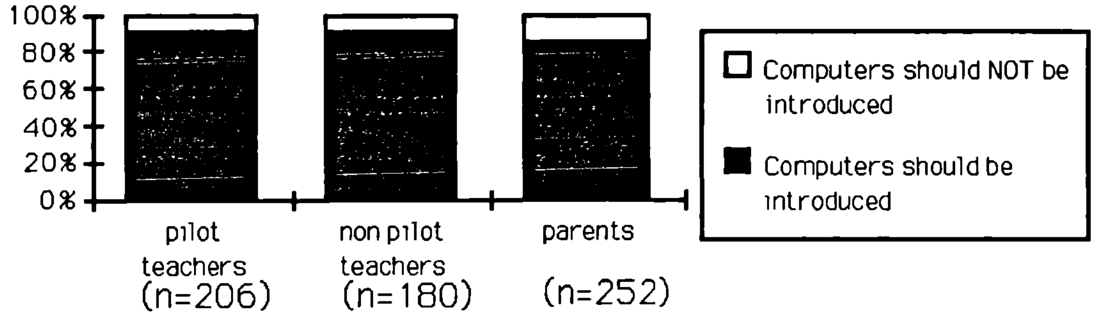


Figure 5.12 COMPUTER INTRODUCTION IN CYPRUS ELEMENTARY SCHOOLS

Awareness about the experimental programme for computer introduction

Most teachers and parents showed awareness about computer introduction in some pilot schools. A considerable percentage of non-pilot teachers and parents said they did not know about the experimental project (Fig. 5.13).

As expected, people in pilot schools were more aware about computer introduction ($p<0.01$): 89% (pilot), compared to 26% of parents (non-pilot) as well as 97% (pilot) compared to 81% of teachers (non-pilot) reported awareness. Finally, awareness about computer introduction was related to training ($p<0.01$): 95% (trained) compared with 86% (non-trained) teachers responded positively. In general, a very large difference ($p<0.01$) was obtained between parents and teachers: 89% of teachers compared to only 56% of parents indicated awareness. This shows that although Cyprus is a small place, the community is not always aware of the experimental plans in schools.

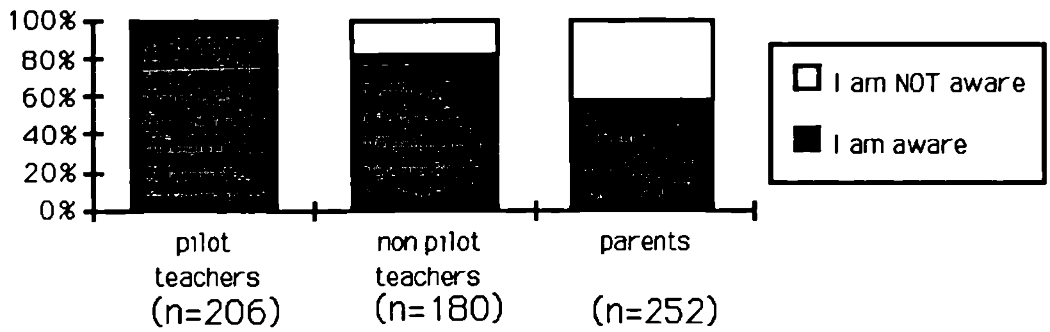


Figure 5.13 AWARENESS ABOUT COMPUTER INTRODUCTION

5.2.1.2. Reaction to goals for computer introduction

Here, I outline the parents', teachers' and children's reactions to the goals for computer introduction at both the ideal and practical level (Table 3.2). Frequencies and significant findings are provided in Appendix III (Part B). Table 5.2 shows the ranking of goals for each group based on the percentages of responses, considering goals as either "very important" or "somewhat important". Number 1 is the highest ranked statement, number 2 the second highest etc.

I think that computers are introduced to schools to help children:	A	B	C	D	E	F	G
be able to find information they need	1	2	1	1	1	1	1
be able to manage computers when they are grown up	4	5	2	4	1	2	2
be able to create things of their own	3	4	3	5	2	3	6
become more active in their learning	4	3	2	2	2	3	3
maintain interest and become informed about the world.	2	1	4	3	3	3	5
find a better job later on	6	8	7	7	4	4	3
learn school subjects	4	6	6	6	4	5	1
deal with difficult and complex problems	5	7	5	6	5	6	4

A: pilot teachers (ideal)	C: non-pilot teachers (ideal)	E: parents (ideal)
B: pilot teachers (practical)	D: non-pilot teachers (practical)	F: parents (practical)
		G: students

Table 5.2 RANKING OF GOALS FOR PARENTS, TEACHERS, STUDENTS

The table above illustrates that parents, children and teachers consider different goals as most or least important. However, it is interesting to note that information handling as a goal for computer introduction came either first or second in preference for all populations. This could be attributed to the fact that the system in Cyprus emphasises encyclopaedic knowledge (section 1.2).

Parents' and teachers' reactions to goal statements were different in several cases (Appendix III, Part B). On the ideal level the vocational goal "find a better job later on" ($p<0.01$) was considered more important by parents rather than by teachers. Parents' concern about the future of their children is understandable as for Cypriots, education is highly valued, as I have mentioned in section 1.2. Goals that reflected the pedagogical dimension such as active learning, creating, information handling, motivating were more important for teachers than for parents: "find information they need" ($p<0.01$); "become more active in their learning"($p<0.05$); "maintain interest and become informed about the world" ($p<0.05$); "learn school subjects" ($p<0.05$). On the practical level, an interesting pattern arose as parents compared to teachers considered almost all goals as more important ($p<0.01$). This could reflect teachers' awareness of the obstacles to practical application of such goals and possible reluctance to implement.

There were no significant differences between pilot and non-pilot schools on teachers' and parents' importance ratings on computer introduction goals either ideally or practically (Appendix III, Part B). That could suggest that pilot schools do not differ from non-pilot ones and that implementation has not resulted in clear and concrete goals. In the case of students, differences were obtained on two goals: "find a better job later on" ($p<0.01$) and "deal with difficult and complex problems" ($p<0.05$); non-pilot children considered these goals more important than pilot ones. Although other differences were not significant, pilot children compared to non-pilot ones tended to consider all goals as less important.

5.2.1.3. Teachers' training needs, problems, media use

Here, I address teachers' views on their computer training needs, problems and use of other media. Frequencies are reported in Appendix III (Part C).

Training needs

The great majority of teachers (pilot, 88%; non-pilot, 82%) indicated training needs, which were similar regardless of the school they worked at. Of these, most teachers as shown in Fig. 5.14 preferred training in educational computing applications. This preference shows that teachers want practical training emphasising classroom practices. Smaller numbers wanted more "technical" specialised training in the use of operating systems, telecommunications, programming, multimedia and specific software. This trend could show that some Cypriot teachers want to be knowledgeable about the computer as a technological device either for personal use or for educational use - before they use it in the classroom.

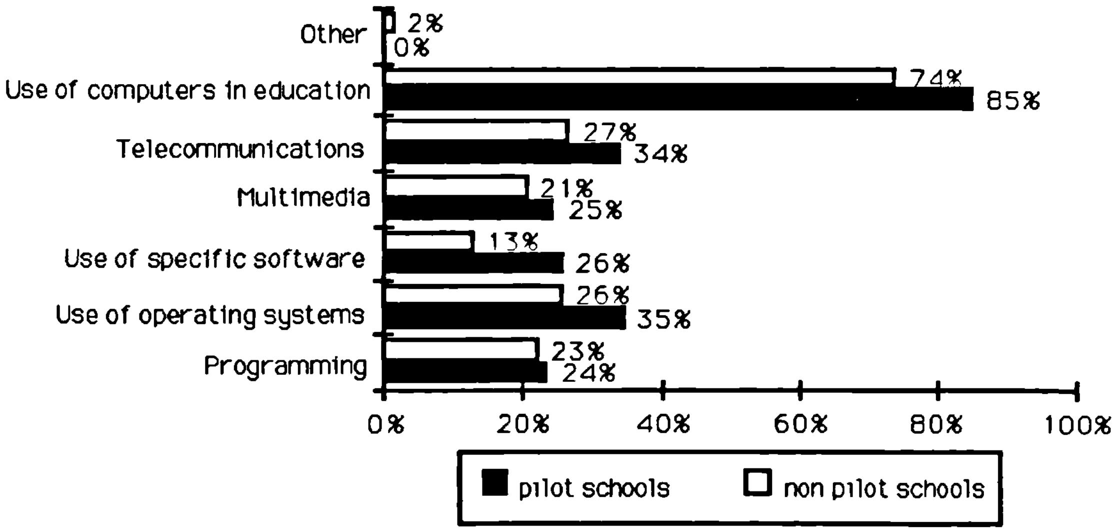


Figure 5.14 TEACHERS -TRAINING NEEDS

Teachers' perceived problems

Training was rated as a "very important problem", considered necessary by teachers before implementation. Curriculum integration, supplementary material, technical support and hardware were seen as "important problems". Most teachers reacted to software importance with the option "I don't know". That may indicate lack of awareness on what software actually means (Fig. 5.15).

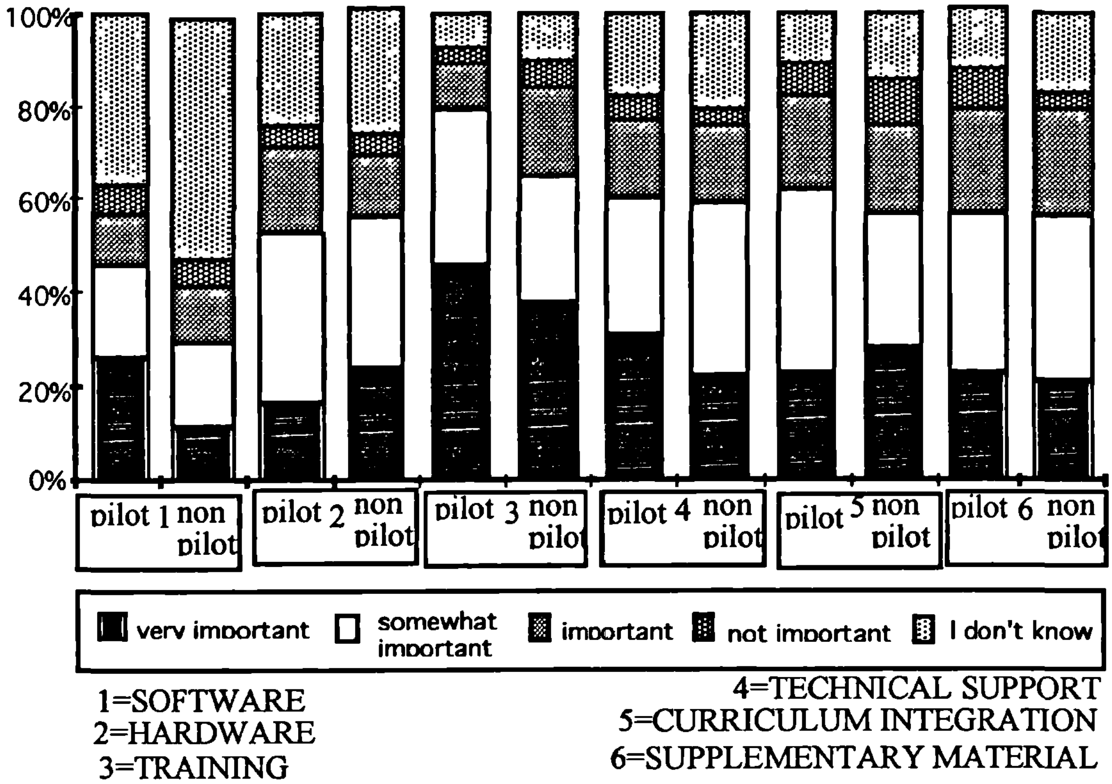


Figure 5.15 TEACHERS - PROBLEMS ANTICIPATED/EXPERIENCED

Teachers' use of other technology (media)

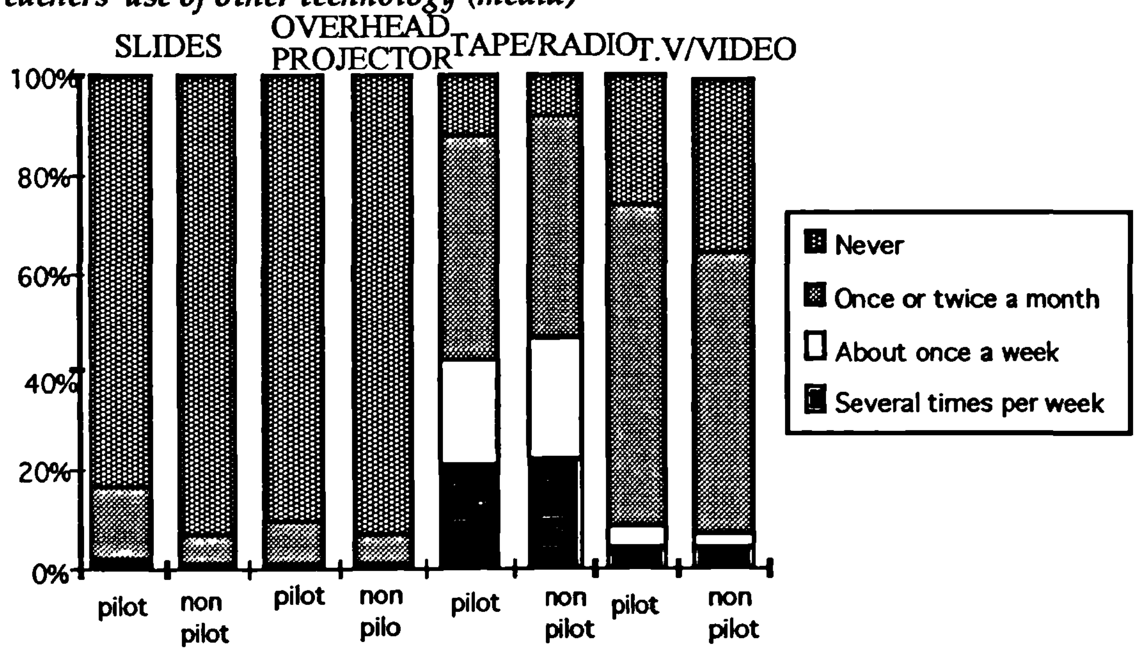


Figure 5.16 TEACHERS - USE OF TECHNOLOGIES

Most teachers never used slides or overhead projector. Teachers tended to use tape player/radio and video/TV "once or twice a month". Use of the television was indicated by more teachers, compared to radio. General use of media was rather limited (Fig. 5.16). This supports the suggestion made earlier that innovations, introduced as tools for instruction, often fail to be integrated into usual everyday teaching practices, because of the epistemological traditions.

5.2.2. Nature of views

So far, the findings indicate that actors are predominantly supportive of computer introduction with interesting differences on implementation aspects such as goals, subjects, hardware. The fact alone that the community favours introduction of computers in Cyprus elementary schools could make the innovation more likely to survive. However, individuals seem to hold diverse views on computer implementation, probably because of different rationales. These rationales are likely to have an impact on patterns of application.

			Teachers (pilot) n=144	*Teachers (non-pilot) n=114*	*Parents n=199*
SUPPORTIVE	General		15 (10%)	8 (7%)	50 (25%)
	Specific	*Society*	22 (15%)	17 (15%)	30 (15%)
		Job market	4 (3%)	6 (5%)	33 (17%)
		Politics	4 (3%)	2 (2%)	1 (<1%)
		Technology	11(8%)	5 (4%)	3 (2%)
		Education	40 (28%)	33 (28%)	36 (18%)
		Higher Education	1 (<1%)	1 (<1%)	13 (6%)
OPPOSING	Specific	*Age*	1 (<1%)	7 (6%)	17 (8%)
		Consequences	2 (1%)	2 (2%)	12 (6%)
		Other priorities	3 (2%)	1 (1%)	2 (1%)
		Not necessary	2 (1%)	1 (1%)	6 (3%)
IMPLEMENTATION COMMENTS	Hardware		6 (4%)	4 (3%)	
	Software		12 (8%)	1 (1%)	
	Training		22 (15%)	6 (8%)	
	Curriculum integration	*Goals*	3 (2%)		
		Time	4 (3%)	1 (1%)	
	General	*Planning*	23 (16%)	12 (10%)	
		Timing	5 (3%)	1 (1%)	
		Cost		3 (3%)	
		Suggestions	4 (3%)	3 (3%)	

Table 5.3 CATEGORISATION AND FREQUENCIES OF RESPONDENTS' VIEWS

Therefore, I explored the nature of people's views about implementation. I aimed to find out what was behind the supportive views to indicate how the educational application of computers was perceived by Cypriots (section 5.2.2.1). I also wanted to highlight areas where people could bring negative feelings (section 5.2.2.2) and to point out that such feelings are likely to exist and that administrators should be sensitive to them.

Parents (79%) and teachers (70%, pilot; 63%, non-pilot) responded to the open question "What are your views on computer introduction in Cyprus elementary schools?" (Table 3.2, Part C) in various revealing ways. The analysis, outlined in section 3.3.3, generated different views related to educational computing: supportive, opposing and implementation comments (Table 5.3).

5.2.2.1. Supportive statements

General

Some teachers and parents provided brief approving responses that were categorised as general, if they failed to indicate reasons for support but included adjectives such as "helpful", "useful", "good" and especially "necessary". Such statements did not seem driven by enthusiasm for the potential of technology but rather rationalisation, expressed by the "necessity" for educational computing.

Specific

These statements were more revealing as to what lies behind support for technology introduction. Different rationales for computer implementation emerged, signifying diversity in views about the role of technology in the classrooms. This could mean that Cypriots seem receptive to computing because they perceive it as necessary to their personal and national progress for different reasons (section 2.3.1). Each rationale is important as it is likely to have a different impact on policy at the national level and practices at the school level.

Some people gave responses which could be classified as related to the **"society"** (Table 5.3). Such responses indicated that computers are "part of our lives", "a symbol of our times", "a reality", "a necessity" since they have "invaded" or "dominated" everyday life. Most respondents seemed afraid that children would be unable to cope with these new products. Another rationale was similar to the social one but in this case it was not society that drives into computing but **"technology"**. Few teachers and parents shared this view and referred to "modernisation", "technological development", "evolution". Most statements could imply that education must follow technological achievements without making judgements about technology. Application of any of these two rationales in Cyprus would probably result in policies favouring computer awareness courses with little hands-on experience. The goal could be for children to learn the principles on which computers work at a superficial level to "become familiar with the computer", "know about it", "learn to use it". In-depth computer knowledge would not be required but lack of basic knowledge would be considered "illiteracy".

Other statements were related to the **"job market and the future"**. These statements had a futuristic aspect and referred to the computer as "the medium" or a "necessity" for any future job, a "decent job" as one respondent mentioned. Some typical responses were: "...because it will be the basis of all activities and jobs of the future", "so that children can grow professionally in the society of the future", "so as to learn to use computers for their future careers". A few teachers expressed this "vocational rationale" while the percentage of parents was much higher (Table 5.3). Within this framework, emphasis could be on application programmes such as word processing or spreadsheet analysis, useful to students when they possibly move into jobs. Children could take courses in "computer literacy/science", followed up by examination. This is probably the rationale behind computer introduction in the Cypriot lyceum, as computing is treated as a separate school subject, on which students are evaluated. So, focus would be on computers as a subject, not as a tool.

Some respondents viewed computing in terms of **"politics"**, and especially in relation with the effort of Cyprus to become part of the EU and meet European standards. Few teachers and parents expressed this perspective with responses such as: "we have to coordinate our efforts with other developed countries especially the EU since we want to join as a member", "our entrance to Europe demands we don't fall behind", "so that the current level of education becomes higher and more competitive compared to European countries". This rationale is probably reflected in the tendency of the Cypriot educational authorities to import innovations, imitating European practices.

A lot of individuals supported **"education"** as the major rationale for computer introduction. This was expressed by emphasis on the instructional effectiveness of new media to "support teaching", "facilitate learning", "broaden experiences". This would probably focus policy on computer introduction in existing school subjects, taught more effectively with the vision, sound and movement and the motivating power of computing; learning becomes "easier", "faster" and "stimulating". This rationale was also seen in responses mentioning more individualised, active and independent learning leading to higher thinking skills: "...develop thinking abilities and strengths", "...become more active in learning", "promote mental growth". Some respondents emphasised locating and presenting information, constantly changing in this world. Generally, application of this rationale would probably emphasise technology as a medium rather than an object. This rationale seems to be reflected in the Ministerial guidelines to pilot schools to use the computer as a tool.

Another view brought up mostly by parents, supported that computer introduction in elementary schools should promote children's progress in **"higher education"**. A few respondents shared this view: "...makes student familiar with a necessary medium for secondary school", "will have a positive effect on their further education", "will help them later in secondary schools use the machine to its best advantage". This seems related to the reality of competitive Cyprus secondary schools where computers are taught as a subject.

In general, the rationale behind computer introduction could have certain implications for the policy implemented. Introduction of computers because of the "society", the "technology" and the "job market" would result in policies that favour computers as a subject. These rationales would be more consistent with the underlying structures of the Cypriot educational system. On the other hand, application of the educational rationale would favour initiation of computers as a tool. The Ministry seems to favour the latter, as the European standards require, following the "politics" rationale. However, I have shown that Cypriots favour both trends. Therefore, since teachers are autonomous, one might expect them to adopt different goals and develop different applications of computing into their practices (see Chapter 6).

5.2.2.2. Opposing statements

There were a few explicit responses indicating a negative reaction to the introduction of computers (Table 5.3). Some teachers and parents mentioned children's **"young age"** as a major obstacle to computer introduction: "children are too young", "too early", "children are not mature". Some people reacted against involvement of children with "electronic games" while others suggested introduction in secondary education as an alternative.

Some teachers and parents were concerned with the **"consequences of technology"**. They did not want children to spend time and energy on computers, in case this interfered with other subjects or affected their health. Some pointed out that technology prevented intellectual development ("the child's brain does not work"). Another criticism was the effect on the personality of users; children could lose the ability to interact with each other: "the human aspect is minimised", "no human relationship between teacher and student", "turn our children into robots"'. Thus, as the school is a place for socialisation, the computer could be doing more harm than good.

Other teachers and parents put "**emphasis on the basics**" and not technology: "time should be invested in language, mathematical thinking and other major goals", "...children must learn basic skills such as reading, writing...", "....better have children read literature than deal with computers". Other teachers and parents supported that computers are "**unnecessary**": "using a computer in elementary schools is totally useless...", "...they don't need them", "...children are already loaded with too much...". These reactions seem to be related to the structure of the educational system that tends to promote academic knowledge.

In general, most people did not express opposing views to introduction of computing. In the few negative statements, reasons reflect on the whole, an evaluation of the impact of technology on children and the school curriculum, that is the educational dimension. Also, the educational system in Cyprus based on humanism and encyclopaedism (section 1.2) seems to impact negatively on the way computing is viewed.

5.2.2.3. Implementation comments

A point of interest from Table 5.3 is that only teachers, especially pilot ones commented in various ways on several aspects of implementation; parents failed to express any views on the process.

A few teachers showed dissatisfaction with "**hardware**" quantity: "schools should be equipped with all necessary media like special desks...", "not enough computers to cover all needs", "by having 2-3 computers per school nothing is getting done!"

Dissatisfaction about the quality of educational "**software**", that was found isolated and badly attuned to the curriculum was indicated by some teachers. A need was expressed for improved quality: "software should relate to the curriculum", "proper software should be found", "...software in Greek".

Some teachers suggested that acceleration of innovation was proportional to the amount and quality of "**training**". Some respondents suggested "mandatory training" before computer introduction.

A few teachers commented on "**curriculum integration**". They were concerned about the aims of computer introduction: "there should be clear goals for pilot schools", "nobody has informed us about the aims", "...should be an understanding that computers should not be a subject but a medium". Some teachers were concerned about time allocation for this subject: "time is limited", "no provision for regular time in the school schedule".

Success occurs when there is a base to build upon. Some teachers expressed negative opinions about the efficiency and effectiveness of the process. They talked about mistakes such as lack of trained personnel, software and hardware in the planning process, characterised as "unorganised" and "superficial". Most statements were very explicit: "...*too much in a rush*", "without systematic planning", "effort... should be on an organised basis", " ...a disaster for education". Some wondered about the timing of this innovation, expressing conflicting views: "should be introduced without further delay", "should be introduced when all children own computers at home". Other teachers commented on the cost: "the cost for introduction in all schools will not be analogous to the benefits that will come out", "slow process since no funds are available for this purpose", "a lot of expenses, if applied". Some teachers gave suggestions on parental or private sector involvement, institutionalisation of the innovation in other schools, use in urban schools only and application on an experimental base only.

In general, teachers are particularly concerned about hardware, software, training, curriculum integration in terms of goals and time and other issues such as costs and planning. These aspects directly relate to the implementation conditions, described in section 2.5.2. They have also been discussed in section 4.2.1 as a factor for the "failure" of educational broadcasting and in section 4.2.2 as problematic at the administrative level for computing as well. Here, I have shown that these aspects are an issue of concern at the school level as well and they will be discussed again by the computer coordinators in Chapter 6. Therefore, it seems that addressing these issues will be critical for the success of the innovation.

Summary

In section 5.2.1 I have revealed certain trends of Cypriots' views on computer introduction. First, the overwhelming majority of teachers and parents support computer introduction in Cyprus elementary schools. This is also consistent with the findings of section 5.1 about computer availability at home and at work which could put pressure on schools from the community to adopt new practices. This further indicates that Cypriots are oriented towards change and are likely to support the experimental programme of the Ministry of Education.

Second, people vary both across and within respondent groups in their views on several aspects of implementation such as the level of education for computer introduction, the method of introduction, the number of computers at school, the subjects for computer use. This is reasonable since different individuals are likely to have different views. However, when individuals are involved in implementation, this diversity could be problematic, as I explain below. Significant differences were obtained in three directions: between pilot/non-pilot populations; between parents/teachers; according to computer background.

It was interesting to find out that only a few differences were obtained between pilot and non-pilot populations in terms of their views on implementation: pilot teachers indicated that they favoured less computers per school; pilot parents were more supportive of computer introduction; pilot parents and teachers were more aware of the experimental programme compared to non-pilot respective populations. This trend shows that individuals in pilot schools are likely to be more receptive towards educational computing than others in non-pilot schools. However, populations in pilot and non-pilot schools did not seem to differ in their reaction to goals for computer introduction as a result of implementation practices. This could be an indication that experimental implementation has not resulted in the development of clear goals.

Between parents and teachers considerable differences were obtained: parents compared to teachers are less supportive of computer introduction and less aware about the experimental programme; favour access to as many computers as possible. This indicates that the community compared to school personnel is not so much involved with the innovation. Parents' and teachers' reactions to the goals for computer introduction also differ at both the ideal and the practical level. Most teachers favour pedagogical goals reflecting active learning, creating, information handling, motivating whereas parents vocational/social ones. This shows that parents and teachers lack consensus as to what computer use means.

Differences in views also occurred in relation to computer background. The greater the involvement in terms of ownership and training about computers, the more favourable people are. Therefore, increase in home computers or training provision is likely to strengthen support for the experimental programme.

Data in section 5.2.1.3 show some interesting aspects in relation to teachers. Most teachers think they need practical training in the use of computing in education; this could show that especially pilot teachers' needs have not yet been met. Views on problems seem to express teachers' feelings of insecurity. On the other hand, use of media remains minimal; only a small group of teachers use media several times a week. This shows that the extent of application of media in Cyprus schools is limited and the reasons for this need to be investigated.

In section 5.2.2 I have focused on the nature of respondents' views. I found that people' views seemed to be of three types: those that were supportive of the innovation, those that were against it and those that expressed some form of skepticism, reflected in comments on the implementation process. First, supportive reactions reflect a range of rationales for computer introduction. The most prevalent amongst rationales across all groups is "education"; then comes "society". One important point here is that more parents compared to teachers support the "job market" rationale and the "higher education" rationale. Different rationales may suggest different patterns of implementation. Second, negative feelings are expressed by a small group on various grounds related to the consequences of computers on children and to the emphases of the Cypriot educational system. Third, teachers, especially pilot ones, comment on several aspects of the implementation process such as hardware, software, training and curriculum integration which seem to be critical for the success of the innovation.

In general, Cypriots are shown to hold diverse views about the goals and the process of computer implementation. This implies that Cypriots lack consensus as to what educational computer knowledge and practice is. On one hand, this could be explained considering characteristics of the context: Cyprus is a place without major research centers, that has "imported" the innovation from the developed world as I have shown in Chapter 4; computing has raised conflict as it has been initiated as a tool in schools that place emphasis on knowledge in the form of fixed school subjects. On the other hand, the background of the respondents could also explain the diversity of opinions obtained. Teachers are more likely to consider educational benefits that computing may bring for their students compared to parents that are more concerned about their children's future employment prospects. So, it is understandable why Cypriots do not share a common vision about the innovation.

This diversity of views obtained has certain implications for the implementation of educational computing in Cyprus schools. Examination of people's views leads to the emergence of two major trends, continuously reflected in respondents' statements: first is the computer as an independent subject, supported by a social, technological or vocational rationale; second is the computer as a learning tool, supported by an educational rationale. The first trend is favoured by the structures of the Cypriot system that emphasise different school subjects while the second is supported by international trends, also reflected in the Ministerial policies mentioned in Chapter 4. It is also important to note that although parents are more likely to favour the first and teachers the second, these two trends emerge in each respondent group. Therefore, we would expect various computing practices to be developed at the school level, reflecting actors' different meanings. This diversity is probably interesting at the experimentation level, as I will show in Chapter 6. However, such variation of vision might eventually prove dangerous if the innovation gets institutionalised in all schools since clear goals have to be communicated to individuals involved, such as parents and teachers.

The literature review and the analysis of broadcasting have outlined that practices are influenced by beliefs. This first set of data on views has outlined lack of common vision among actors, favouring two conflicting trends that are likely to have a negative impact on implementation. Except from views, attitudes are also believed to be important factors in the implementation process. For this reason, the next section will present more research on people's feelings about computers.

5.3. ATTITUDES TOWARDS EDUCATIONAL COMPUTING

Here, I aim to answer the second sub-question "What are the general trends and nature of actors' attitudes on implementation aspects?". First, in section 5.3.1 I indicate the trends in attitudes by providing data from the semantic differential instrument (section 5.3.1.1) and the computer attitude scales (section 5.3.1.2). Second, in section 5.3.2 I reveal the nature of several groups' attitudes towards the innovation through factor analysis of data which identifies attitude factors, responsible for successful computer adoption. I also proceed to explore the relationship between several variables and the attitude factors that emerge.

5.3.1. General trends in attitudes

5.3.1.1. Semantic differential instrument

As I explained in section 3.3.2.1, I used the semantic differential instrument (Table 3.6) for children only to indicate trends in their attitudes. Results from the twenty adjective pairs of words referring to computers indicated very positive overall students' attitudes in both pilot and non-pilot schools (Table 5.4).

The computer is... (n=312)

Good	98%	Bad	2%	Understandable	91%	Confusing	9%
Smart	97%	Stupid	3%	Big	86%	Small	14%
Interesting	98%	Boring	2%	Simple	53%	Complicated	47%
Easy	80%	Hard	20%	Useful	98%	Useless	2%
Friendly	98%	Scary	2%	Hardworking	99%	Lazy	1%
Fast	93%	Slow	7%	Organised	98%	Disorganised	2%
Expensive	93%	Cheap	7%	Important	98%	Unimportant	2%
Old	96%	New	4%	Colourful	76%	Dull	24%
Different	83%	Same	17%	Creative	91%	Unimaginative	9%
Special	72%	Ordinary	28%	Fun	97%	Uninteresting	3%

Table 5.4 STUDENTS- SEMANTIC DIFFERENTIAL INSTRUMENT

Differences were obtained according to computer ownership, gender and school attended (Appendix II, part C). Differences occurred on two items according to ownership: 94% of computer owners compared to 70% of non-owners found the computer "colourful" ($p<0.01$); 97% of computer owners compared to 89% of non-owners "creative" ($p<0.05$). Only two other items produced significant gender differences: 72% of boys compared to 89% of girls found the computer "easy" ($p<0.01$); 96% of boys compared to 89% of girls "fast" ($p<0.05$).

Children of pilot and non-pilot schools differed on 5 items. As illustrated in Figure 5.17, more pilot children considered the computer as "easy" ($p<0.01$), "friendly" ($p<0.05$) and "understandable" ($p<0.05$) and "colourful" ($p<0.05$) compared to non-pilot children. However, less pilot children thought of the computer as "creative" ($p<0.05$) than non-pilot ones. This indicates that the application of the experimental programme in pilot schools made the computer relatively easier, more friendly, more understandable, more colourful and less creative for children.

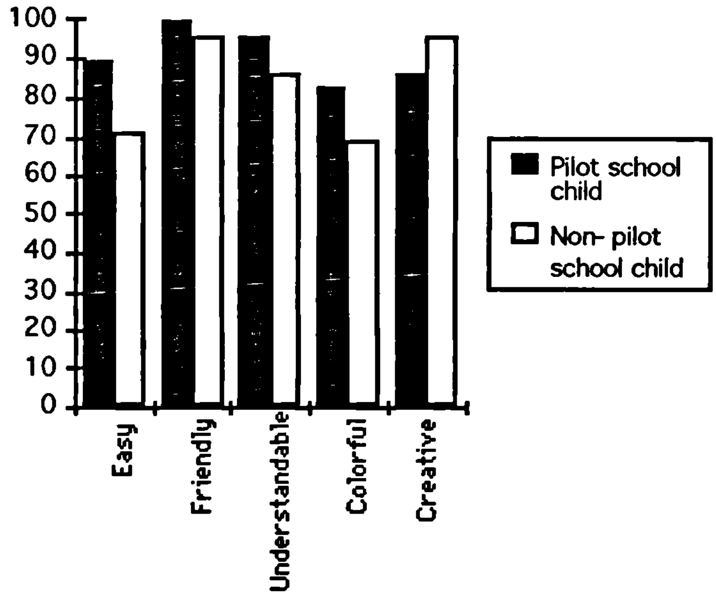


Figure 5.17 STUDENTS - SCHOOL CHILD ATTENDS

5.3.1.2. Computer attitude scales

Here I report on the results of the computer attitude scales, designed by Davidson and Ritchie (1994), as I mentioned in section 3.3.2.1 (Table 3.3; 3.4; 3.5). These produced, on the whole, very positive attitudes for all populations: students, parents and teachers as illustrated in Tables 5.5, 5.6, 5.7.

In general, most Cypriots tended to agree with positive statements about technology and disagree with statements reflecting anxieties and concerns. This finding is consistent with findings of other studies, mentioned in Chapter 2, that describe attitudes towards technology as positive. For example, Davidson and Ritchie (1994) using the same instrument also reported positive attitudes of all these populations in an American elementary school before application of a computer implementation plan. Since student, teacher, and parent attitudes remain positive and anxieties low, then this study could indicate widespread support for the introduction of computers into classrooms.

n=252

STATEMENTS (from highest to lowest agreement)	Means	S.D.
I feel confident that I can learn how to use a computer.	4 20	0 72
I think students are more motivated when they can learn using computer technology	4 00	0 92
I think that using instruction via computer technology will help improve students' performance.	3 84	0.94
I enjoy reading about computers	3 74	1 02
When utilising computers, the teacher is able to further individualise instruction.	3.44	0.93
When utilising computer, the teacher becomes guide/facilitator	3 24	0.99
I fear that computer may take over some parts of a job that I enjoy.	2 80	1 27
I think computers are dehumanising	2 43	1.13
When utilising computers, the teachers' role is diminished	2 40	1.00
I feel intimidated by people who know something about computers.	2 31	1.08
I think instruction by computer technology is just another fad.	2 28	1 15
I feel afraid that I might break or damage a computer	2.15	1 10
I feel tense when people talk about computers.	1.74	0.85
I feel afraid to touch a computer	1 74	0 90
Scale: 1 strongly disagree, 2 disagree, 3 neutral, 4 agree, 5 strongly agree		

Table 5.5 PARENTS' COMPUTER ATTITUDE SCALE

n=312

STATEMENTS (from highest to lowest agreement)	Means	S.D.
I would like to use a computer at home	4 57	0.86
I can learn to use a computer	4 45	0.88
Schools should have computers	4.33	1.11
Someday, I would like to have a job working with computers	4 31	0.96
I like to learn with a computer	4 29	0.98
It is more exciting to learn with a computer	4.17	1.00
Computer lessons are fun	4.01	1.18
I enjoy reading about computers	3.94	1.18
I would like to experiment on the computer	3.75	1.33
I can learn "better" using a computer	3 64	1.15
I feel afraid that I might break or damage a computer	2.70	1 27
I feel nervous when people talk about computers	1.53	0 85
I feel afraid to touch a computer	1.40	0 75
Computers are not interesting to me	1.39	0 78
Scale: 1 strongly disagree, 2 disagree, 3 neutral, 4 agree, 5 strongly agree		

Table 5.6 STUDENTS' COMPUTER ATTITUDE SCALE

However, this study differed from that of Davidson and Ritchie in an important way. In that study, after a year of computing implementation, there were significant changes on Americans' attitudes - as I mention in section 2.4.1.2 - on six items for students, four items for teachers and three items for parents. So, actors became even more positive and their anxieties lowered. Surprisingly, in the case of Cyprus, no significant differences emerged from a comparison of pilot and non-pilot populations. That could be an indication that implementation in pilot schools has not been substantial enough to have an impact on any of these attitude items for either parents, students or teachers. This could also suggest that people remain positive on a theoretical level since their attitudes are not influenced by the experimental plan.

STATEMENTS (from highest to lowest agreement)	*Pilot (n=206)* Means	S.D.	*Non-pilot (n=180)* Means	S.D.
I value teaching with technology	4.15	0.54	4.19	0.65
I think quality instruction using technology will only enhance my teaching	4.08	0.76	4.14	0.65
I like to teach with computer technology.	3.99	0.74	4.03	0.81
I feel confident that I can learn how to use a computer.	3.89	0.82	4.15	0.81
I think students are more motivated when they can learn using computer technology	3.89	0.82	3.80	0.92
When utilising computer, the teacher becomes guide/facilitator	3.72	2.28	3.62	0.76
When utilising computers, the teacher is able to further individualise instruction.	3.68	0.75	3.78	0.70
I think that using instruction via computer technology will help improve students' performance	3.64	0.77	3.70	0.77
I enjoy reading about computers.	3.36	1.09	3.22	1.10
I think teachers compete with slick packages and high tech machines.	2.72	0.71	2.70	0.73
I think computers are dehumanising	2.60	1.07	2.65	1.05
I fear that computers may take over some parts of a job that I enjoy.	2.44	1.05	2.54	1.08
I think instruction by computer technology is just another fad.	2.22	0.89	2.20	0.83
I feel intimidated by people who know something about computers.	2.18	1.01	2.14	1.07
I feel afraid that I might break or damage a computer	1.97	1.04	2.16	1.10
When utilising computers, the teachers' role is diminished	1.99	0.86	2.07	0.79
I feel afraid to touch a computer	1.89	0.93	2.04	1.12
I feel tense when people talk about computers.	1.82	0.84	1.89	0.89
Scale: *1* *strongly disagree* *2* *disagree* *3* *neutral*	*4* *agree*		*5* *strongly agree*	

Table 5.7 TEACHERS ' COMPUTER ATTITUDE SCALE

I now proceed to show important dimensions of attitudes, which could be contributing to the lack of successful implementation.

5.3.2. Nature of attitudes

As I have outlined in section 2.4.1.1 of the literature review, attitudes are multi-dimensional constructs. Since different aspects of attitudes could be related to implementation practices, the exploration of the nature of attitudes could result in important implications especially for Cypriot teachers.

So, first I present the structure of the factors, resulting from the factor analysis of attitudes. I then proceed to comparisons of factor scores according to variables to explore interesting relationships. Explanation of the methods for data analysis have been provided in section 3.3.3.

5.3.2.1. The structure of factors

I chose three factors for rotation. These factors have, as I mentioned in section 3.3.3, eigenvalues which ranged for parents from 1.24 to 3.55, accounting for 47% of the total variance; for students from 1.04 to 4.38, accounting for 49% of the variance; for non-pilot teachers from 1.31 to 5.62, accounting for 51% of the variance; for pilot teachers from 1.23 to 6.23, accounting for 53% of the variance. Results from factor analysis for all groups are presented in Appendix II, part A.

It was possible for an item to have significant loadings (>0.3) on one or more factors. In any case, items were included in the factor, for which they had the highest factor loading (Appendix II, part A). In a small number of cases, items had similar loadings on two factors (>0.3). Where this occurred, items were taken as loaded on more than one factor (Table 5.8; 5.9; 5.10).

Across all groups, a similar structure of factors was extracted, reflecting the personal, the educational and the general dimension. Therefore, effort was put to name the factors in a parallel way so as to make comparisons between groups possible. Factor 1 was named "Anxieties about computers/personal" and reflected concerns about computing at the personal level. For parents and students, factor 2 was named "Learning with computers/educational" since items included were related to learning aspects of technology. For teachers, this factor was called "Attitudes towards teaching with computers/professional" since it reflected views on educational applications of computing, related to teachers' work. Factor 3 indicated general views and concerns about computers and was named "Attitudes towards computers/general". Generally, we could state that this study has revealed several facts concerning the field of Cypriots' attitudes towards computers: that there is a certain "anxieties" dimension at the personal level; an "educational" dimension, related to the positive impact of computing on teaching and learning as well as the role of teachers; and a general "concerns" dimension about computers not only in education but also in society.

The identification of the same three factors for the three groups does not imply that these dimensions have much in common across the populations. It is important to note that although factors were named in the same way for parents, students and teachers, the statements within each factor varied considerably across groups. This was due to the fact that questionnaires for the three populations differed in the content and number of items included. Even when several items were consistently used along all three populations, they did not behave in the same way across all groups. Some items such as "I feel afraid to touch a computer" loaded on the same factor (factor 1) for all groups. Other items such as "I enjoy reading about computers" loaded on different factors for each group: factor 2 for parents and pilot teachers, factor 3 for students and factor 1 for non-pilot teachers.

	Statement	Original factors*
	Factor 1 "Anxieties about computers/personal"	
1	I feel afraid to touch a computer	a
2	I feel afraid I might break or damage a computer	a
3	I feel tense when people talk about computers	a
8	I feel confident that I can learn how to use a computer	a
	Factor 2 "Learning with computers/educational"	
4	I enjoy reading about computers.	a
9	I think students are more motivated when they can learn using computer technology.	b
11	I think that using instruction via computer technology will help improve students' performance	b
13	When utilising computers, the teacher is able to further individualise instruction.	c
	Factor 3 "Attitudes towards computers/general"	
6	I think computers are dehumanising	a
7	I fear that a computer may take over some parts of a job that I enjoy	a
10	I think instruction by computer technology is just another fad	b
12	When utilising computers, the teacher becomes guide/facilitator	c
14	When utilising computers, the teacher's role is diminished	b
	Loaded on more than one factor	
5	I feel intimidated by people who know something about computers (Factors 1, 3)	a

*Original factors reflect the factors named by Davidson and Ritchie (1994) in their own study.
a=Anxieties about computers
b=Attitudes towards instruction with computers.
c=Opinions of the teachers' role with computers

Table 5.8 FACTORS FOR PARENTS

The personal dimension (factor 1)

Factor 1 included four items for parents (Table 5.8); two for students (Table 5.9); five for teachers (Table 5.10). Items that loaded on this factor across all groups were: "I feel afraid to touch a computer"; "I feel I might break or damage a computer"; "I feel tense when people talk about computers" (for students it also loaded on factor 2). Other items that loaded on this factor were: "I feel confident that I can learn to use a computer" for parents and pilot teachers (for non-pilot teachers it also loaded on factors 2 and 3); "I enjoy reading about computers" for non-pilot teachers; "I feel intimidated by people who know something about computers" for teachers. All statements reflected personal anxieties about computers.

The item "I feel confident that I can learn how to use a computer" also had a significant loading on factor 2 (educational) in the case of parents and pilot teachers and on factor 3 (general) in the case of pilot teachers. This indicates that for these populations confidence about computers is related not only to the personal but also to the educational and the general dimension and shows their concern about their adequacy to meet demands of the new technology in schools and the society. In the case of students, both items included on factor 1 also had significant loadings on factor 3 (general). That could mean that children do not necessarily view their personal fears about computers as conflicting with "fun", "interest", "excitement", expressed in the statements of the general dimension.

	Statement	Original factors*
	Factor 1 "Anxieties about computers/personal"	
1	I feel afraid to touch a computer	c
2	I feel afraid that I might break or damage a computer	c
	Factor 2 "Learning with computers/educational"	
13	It is more exciting to learn with a computer.	a
14	I can learn "better" using a computer.	a
	Factor 3 "Attitudes towards computers/general"	
4	I enjoy reading about computers	b
5	I can learn to use a computer	b
6	Computer lessons are fun	b
7	I would like to experiment on the computer	b
8	Schools should have computers	b
9	Computers are not interesting to me.	c
10	I would like to have a computer at home	b
11	Someday, I would like to have a job working with computers	a
	Loaded on more than one factor	
3	I feel tense when people talk about computers. (Factors 1, 2)	c
12	I like to learn with a computer (Factors 2, 3)	a

*Original factors reflect the factors named by Davidson and Ritchie (1994) in their own study.
a=Learning with computers
b=General attitudes towards computers
c=Computer anxieties

Table 5.9 FACTORS FOR STUDENTS

The educational dimension (factor 2)

Factor 2 included four items for parents (Table 5.8); two for students (Table 5.9); seven for non-pilot teachers; eight for pilot teachers (Table 5.10). Items that loaded on this factor for both teachers and parents were: "I think students are more motivated when they can learn using computer technology"; "I think that using instruction via computer technology will help improve students' performance"; "When utilising computers, the teacher is able to further individualise instruction". Other items that loaded on this factor were: "I enjoy reading about computers" for parents and pilot teachers (for pilot teachers this item also loaded on factor 3); "When utilising computers, the teacher becomes guide/facilitator" for teachers only. Statements of this factor concerned educational use of new technologies.

Several items of this factor received significant loadings on factor 1 (personal): in the case of parents "I enjoy reading about computers"; in the case of non-pilot teachers "I like to teach with computer technology". One item of this factor loaded significantly on factor 3 (general) in the case of pilot teachers: "I think students are more motivated when they can learn using computer technology".

NON PILOT	PILOT	Statement	Original factors*
		Factor 1 "Anxieties about computers/personal"	
4	4	I feel afraid to touch a computer.	c
5	5	I feel afraid that I might break or damage a computer.	c
6	6	I feel tense when people talk about computers.	c
7	–	I enjoy reading about computers.	b
8	8	I feel intimidated by people who know something about computers.	c
–	11	I feel confident that I can learn how to use a computer.	c
		Factor 2"Attitudes towards teaching with computers/professional"	
1	1	I like to teach with computer technology.	b
2	2	I think quality instruction using technology will only enhance my teaching.	b
3	3	I value teaching with technology.	a
–	7	I enjoy reading about computers.	b
12	12	I think students are more motivated when they can learn using computer technology.	a
14	14	I think that using instruction via computer technology will help improve students' performance.	b
16	16	When utilising computer, the teacher becomes guide/ facilitator.	b
17	17	When utilising computers, the teacher is able to further individualise instruction.	b
		Factor 3 "Attitudes towards computers/general"	
9	9	I think computers are dehumanising	a
10	10	I fear that computers may take over some parts of a job that I enjoy.	a
13	–	I think instruction by computer technology is just another fad.	a
15	15	I think teachers compete with slick packages and high tech machines.	a
18	18	When utilising computers, the teachers' role is diminished.	a
		Loaded on more than one factor	
–	13	I think instruction by computer technology is just another fad. (Factors 2, 3)	a
11	–	I feel confident that I can learn how to use a computer. (Factors 1, 2, 3)	c

*Original factors reflect the factors named by Davidson and Ritchie (1994) in their own study.
a=Attitudes towards teaching with computers–personal values and beliefs
b=Attitudes towards teaching with computers--professional view
c=Anxieties about computers

Table 5.10 FACTORS FOR TEACHERS (NON-PILOT, PILOT)

The general dimension (factor 3)

Factor 3 included four items for pilot teachers; five items for parents and non-pilot teachers; eight for students. For students, most items loaded on this factor. Items that loaded on this factor for both teachers and parents were: "I think computers are dehumanising"; "When utilising computers, the teacher's role is diminished"; "I think instruction by computer technology is just another fad" (for pilot teachers this item also loaded on factor 2); "I fear that the computer may take over some parts of a job that I enjoy". Other items that loaded on this factor only for parents were: "When utilising computers, the teacher becomes a guide/facilitator" and "I feel intimidated by people who know something about computers" (this item also loaded on factor 1). For parents and teachers statements on this factor reflected concerns about possible implications of computer use for society or education.

Some items on this factor also had significant loadings on factor 1 (personal): in the case of parents "I fear that a computer may take over some parts of a job that I enjoy"; in the case of students "I enjoy reading about computers". Other items had significant loadings on factor 2 (educational): in the case of parents "When utilising computers the teacher's role is diminished"; in the case of students "Computers are not interesting to me"; in the case of non-pilot teachers "I think instruction by computer technology is just another fad"; and finally in the case of pilot teachers "I fear that computers may take over some parts of a job that I enjoy".

Comparison to Davidson and Ritchie

As I have already mentioned at the beginning of section 5.3.2 my aim here was to reveal the nature of Cypriots' attitudes since these could have a significant impact on implementation of educational computing. Therefore, it is interesting to examine how the factors identified by Davidson and Ritchie relate to the factors extracted, after using the same instrument in Cyprus. The work of Davidson and Ritchie (1994) using this instrument suggests three factors for each group, indicated as the "original factors" on Tables 5.8; 5.9; 5.10. A comparison of the Cypriot sample in this case and the sample in their case resulted in the following findings.

As illustrated in Tables 5.8, 5.9 and 5.10, there are certain similarities between the factors of this study and the original factors of Davidson and Ritchie (1994). First, in all cases, Davidson and Ritchie's factor "Anxieties about computers" was clearly extracted. Maybe, this could mean, that of the attitudinal items those related to fear felt by a person towards computers are the ones most easily identified and clustered together, regardless of the context of the innovation. Cypriots, like Americans share certain fears about computers at the personal level, which should be addressed. Second, several items loaded on similar factors as the ones identified by the two researchers. The association of the results between the two studies was stronger in the case of teachers, where only two items moved to a different factor in this study. This indicates that teachers in the two samples are not very different as they tend to share common aspects of attitudes, despite the local context.

However, some interesting variations were obtained in the factor structure of the Cypriots compared to the Americans, especially for children and parents. First, in the case of parents, the personal factor "Anxieties about computers" was similar to Davidson and Ritchie's "Anxieties about computers", capturing four items of the eight constituting the American sample. The remaining four items of the American factor moved to factors 2 (educational) and 3 (general) in this study. Davidson and Ritchie's "Opinions of the teachers' role with computers" could not be extracted as a different factor at all (Table 5.8). Items on their "Attitudes towards instruction with computers" loaded on either factor 2 (educational) or 3 (general): items reflecting positive aspects about learning and technology loaded on the educational factor; items indicating negative implications of computing on education loaded on the general factor. Therefore, items reflecting attitudes on the educational dimension of computing did not load on only one factor like the Americans but rather split up into two directions.

Second, in the case of children, more items loaded on "Attitudes towards computers/general" than any other factor. This is different from the study of Davidson and Ritchie (1994) that has an equal distribution of items in each factor (Table 5.9). This could have happened because of children's background. American students used computers in their school while half of the Cypriot pupils did not, as they came from non-pilot schools as well. Therefore, since most children lacked experiences, the number of items on more specialised factors such as factor 2 (educational) and factor 1 (personal) was limited. As a result, the educational and the personal factor for the Cypriot sample only captured two items of the four items that were present in the respective factors in Davidson and Ritchie's study, namely the "Learning with computers" and the "Computer anxieties". The high correlations between all factors could mean that all dimensions were interrelated in Cypriot children's perceptions.

Third, in the case of teachers, two items ("I value teaching with technology", "I think students are more motivated when they can learn using computer technology") that loaded on the other researchers' factor "Attitudes towards teaching with computers--personal values and beliefs", in this analysis loaded on the professional factor (Table 5.10). This could show that these items fall into the educational rather than the personal dimension of attitudes towards computers for Cypriot teachers of both pilot and non-pilot schools.

Such differences in the two studies could be explained on the basis of the research context. Attitudes are constructs conceived within the cultural context. Differences between the two samples were indicated because this new study was carried out in a different country and all items were translated in Greek.

5.3.2.2. Factors related to demographic and computer background variables

This survey also involves an effort to find relations between factors extracted and demographic or computer background variables, outlined in section 5.1. I also study whether implementation could account for differences in Cypriots' attitude factors by comparing pilot/non-pilot populations. As I explain in section 3.3.3, I employed ANOVA processes to identify significant results (Appendix II, part B).

The personal dimension (factor 1)

For all populations, most significant differences occurred on factor 1 "Anxieties about computers/personal" as anxieties appeared less with involvement of Cypriots with computers.

For parents, this factor was related to several variables such as computer availability at home ($p<0.01$), availability at work ($p<0.01$), computer proficiency ($p<0.01$) and highest level of education attained ($p<0.05$). Higher personal anxieties were indicated for non-owners compared to owners; Cypriots without computers at work compared to others; "unskilled" compared to "very proficient", "proficient" or "somewhat proficient" ones; elementary school graduates compared to university graduates.

For children, this factor behaved differently with gender ($p<0.05$) and computer ownership at home ($p<0.01$). This study suggests that boys and computer owners have less fears about the use of computers than girls and non-owners respectively. The former relationship could be related to stereotypical views that technology is a "male oriented" discipline while the latter could be related to personal experiences of using computers.

For teachers, most significant differences were related to computer ownership for both pilot and non-pilot teachers ($p<0.05$), training and position at school for non-pilot teachers ($p<0.01$), computer proficiency for both pilot and non-pilot teachers ($p<0.01$), highest level of education for pilot teachers ($p<0.05$), age for both pilot and non-pilot teachers ($p<0.05$), frequency of use at school for pilot teachers ($p<0.05$) and at home for pilot ($p<0.05$) and non-pilot teachers ($p<0.01$). Higher personal anxieties were shown by non-owners compared to owners; non-trained teachers compared to trained ones; assistant principals and teachers compared to "others"; "unskilled" compared to "proficient" and "somewhat proficient" ones; CPA graduates compared to university graduates with higher degrees; people aged 50-59 compared to people aged 20-29; people who "never" used computers at school or home compared to frequent ("often") users. These trends may be given plausible explanations. For example, "others" working in elementary schools are on special contracts for limited periods of time and are not very anxious about computing. Another example is that university studies involve some computing work, so teachers with higher degrees are more familiar with technology.

The educational dimension (factor 2)
For children, "Learning with computers/educational" was influenced by gender ($p<0.01$); girls had more positive reactions about learning with technology than boys. However, causality can not be determined on the basis of these data.

For teachers, "Attitudes about computing/professional" was influenced by age for non-pilot teachers ($p<0.05$) and frequency of use at home for pilot ones ($p<0.05$). Older (50-59) and younger (20-29) respondents held more positive attitudes about the educational impact of technology than middle age ones (30-39). Maybe younger or older people, approaching retirement, could be enthusiastic about technologies more easily while middle aged ones are preoccupied with other aspects and may be more sceptical. On the other hand, pilot teachers who "never" used computers at home were less positive than frequent ("often") users. This could suggest that to a certain extent, personal experience maximizes faith in the educational value of computers.

Comparison to Davidson and Ritchie
Davidson and Ritchie (1994) in their study indicated that after a year of implementation, students' factors "General Attitudes towards computers" and "Computer Anxieties" as well as parents' "Attitudes towards instruction with computers" were significantly positively changed (section 2.4.1.2).

In the case of Cypriots, it was interesting to see whether implementation in the pilot schools had resulted in changes in the three factors I identified. Therefore, I decided to compare populations in pilot and non-pilot schools. Unfortunately, actors in pilot schools were not found different in terms of the attitude factors - the personal, the educational, the general- compared to actors in non-pilot schools. Therefore, the experimental plan in pilot schools did not seem to have an impact on the Cypriots' attitudes.

Summary
This section has resulted in several interesting findings. First, that the attitudes of Cypriots - students, parents and teachers - are predominantly positive towards computers (section 5.3.1). This could indicate widespread support for educational computing. Second, that there are no differences on attitude items between pilot and non-pilot populations because of implementation of the experimental plan. Therefore, further research was conducted, involving factor analysis to provide more insight into the nature of attitudes of these groups.

Cypriots' attitudes are indicated as multifaceted, having three different dimensions: the personal, the educational and the general (section 5.3.2.1). The first reflects personal anxieties, the second teaching and learning, the third societal concerns. This structure has been obtained consistently for all three populations: parents, children and teachers. However, the items included in each of these factors have been different across groups due to the variation in the number and context of items for each group. The factor structure has also certain similarities to that obtained by Davidson and Ritchie (1994) especially as to the extraction of the personal dimension and the item structure of the teachers' factors. However, differences were obtained in the item structure of the parents' and children's factors, that could be attributed to the different local context.

Exploration of the relationships between factors extracted and demographic/computer background variables (section 5.3.2.2) suggests that mostly personal and at a lesser extent, educational attitudes can be demonstrated to be different for different groups. Cypriots' personal anxieties (factor 1) tend to minimise as their involvement with technology increases. Surprisingly, people's perceptions of the educational dimension of computing (factor 2) do not differ significantly with computer background variables such as proficiency, training or ownership. This could suggest that although Cypriots are likely to be heterogeneous in personal anxieties, which decrease as they proceed to higher involvement with technology, they are only slightly different as to their educational and general dimensions of computer attitudes.

The results of this study compared to the study of Davidson and Ritchie (1994) were different in one important way. The American study indicated significant differences in attitude factors across groups after a year of computing implementation. In Cyprus, computing implementation in pilot schools through the experimental plan did not have an impact on the personal, educational or general dimension of people's attitudes. This suggests that implementation is only superficial, as one would expect to see important differences between pilot and non-pilot populations, if the experimentation was successful.

These findings have certain implications for the implementation of educational computing in Cyprus elementary schools. Any attempt to get Cypriots involved in implementation would mean addressing the various dimensions extracted: personal, educational and general. I will discuss this in section 7.3 of Chapter 7.

So far, I have shown Cypriots' attitudes as constructs consisting of various factors, not impacted by implementation in pilot schools. However, I proceeded to a more detailed analysis of pilot teachers for two reasons. First, as the literature review in section 2.4 indicates, teachers are of particular interest to this thesis as they are the key to successful implementation. Second, teachers have also been stated as a critical factor for implementation, when analysing the innovation of educational broadcasting (section 4.2.3.1). Therefore, in the next section I aim to reveal the concerns of Cypriot pilot teachers, users and non-users of computing and possibly indicate different groups of individuals within schools. Concerns, as explained in Chapter 2, are like attitudes, multi-faceted constructs including various factors. The factors in this case are defined: seven stages of concern on a developmental continuum, reflecting the "self", "task" and "impact" dimensions. These concerns could show more practically where Cypriot pilot teachers stand.

5.4. TEACHERS' CONCERNS

Here, I aim to answer the third sub-question "What are the general trends and nature of involved teachers' concerns about the innovation?". First, I indicate the trends of these concerns in section 5.4.1, using two forms of interpretation: the highest stage of concern (section 5.4.1.1) and the percentage profile (section 5.4.1.2). Since concerns could be shaped by specific variables, I also explore these relationships to indicate characteristics of different groups of pilot teachers (section 5.4.1.3). Of special interest is the profile of the group of teachers more likely to get involved with the innovation. Second, I focus on the nature of concerns in section 5.4.2.

5.4.1. General trends in concerns

5.4.1.1. Highest Stages of concern

The simplest form of interpretation is examining the highest and second highest stage score, as I mention in section 3.3.3. This analysis is beneficial since it does not involve averages, influenced by dominant high and low individual scores.

Before proceeding to present Cypriot teachers' scores, it is important to briefly review what it means to peak on each specific stage, as already shown in Table 2.2 (section 2.4.2.1). As far as a peak stage 0 (awareness) is concerned, its interpretation depends on whether the individual makes use of the innovation. For non-users high stage 0 shows awareness and concern about the innovation; for users this indicates lack of concern (Hall et al, 1977). Individuals with peak stage 1 (informational) are interested in more descriptive general information about the innovation. Those on stage 2 (personal) have intense personal concerns about the innovation and its possible consequences on them. A peak stage 3 (management) is indicative of individuals, concerned about time, logistics and other managerial problems related to the innovation. A peak stage 4 (consequences) shows concern about the impact of the innovation. Respondents peaking on stage 5 (collaboration) are concerned with coordinating use of the innovation with colleagues and those peaking on stage 6 (refocusing) have other ideas about the innovation and want them put into practice. Hall et al (1977) suggest that while the first three stages reflect non-users, a peak at either stage 3, 4, 5 or 6 usually reflects users. As shown in Table 5.11, only 20% of Cypriot pilot teachers peaked on any of the last four stages. This suggests that the majority of Cypriot teachers have not progressed into high levels of implementation.

Highest Stage of Concern (n=206)

Stages	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Frequency	100	53	27	10	0	21	11
Percentage	48%	26%	13%	5%	0%	10%	5%

Second Highest Stage of Concern (n=206)

Stages	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Frequency	23	78	55	40	8	9	15
Percentage	11%	38%	27%	19%	4%	4%	7%

0= awareness 1=informational 2=personal 3=management
4=consequences 5=collaboration 6=refocusing

Note: Some respondents had more than one highest or second highest stages of concern.

Table 5.11 FREQUENCY OF HIGHEST AND SECOND HIGHEST STAGE

The largest group of Cypriot pilot teachers had a peak score 0. This is the only case when the peak score alone would be insufficient for interpretation since other information is required, as provided in section 5.4.1.4. A lot of Cypriots have "self" concerns, peaking on stages 1 and 2, which suggests that these individuals feel uneasiness about the innovation and may probably need more training. The fact that only a few respondents are principals could explain why only a few individuals have a peak stage 3 (management). Since none of the pilot teachers in this study had a peak stage 4 (consequences), then Cypriots either have not thought about the impact of computing on their students or believe the innovation to be non-problematic. Only some Cypriots are concerned with coordinating use of the innovation with colleagues, peaking on stage 5 (collaboration). The few respondents peaking on stage 6 (refocusing) could proceed to replacing or altering the innovation from its present form.

To develop additional insight into the dynamics of concerns, the second high stage score was also analysed, as illustrated in Table 5.11. This shows that the largest group are concerned about stage 1. Second comes stage 2, third stage 3, fourth stage 0, fifth stage 6 and last stages 4 and 5. Most respondents seem aware of the innovation and want more information about it. It is interesting to note that in terms of concerns, several groups are identified with different needs, which should be addressed while implementing educational computing.

5.4.1.2. The profile of the average Cypriot teacher

After exploring the most intense concerns, I also aimed to form the profile for the whole island district (Table 5.12) to get an overview of where the average Cypriot pilot teacher stands. To do this, I averaged the unique individual SoC profiles of all teachers, as I explained in section 3.3.3.

The composite concern profile for all pilot schools in Fig. 5.18 corresponds with the typical "nonuser" profile. As Hall et al (1977) point out, in all the research that has been done to date using the SoCQ, the nonuser concerns profile stands out most clearly and consistently. Nonusers' concerns are normally highest on stages 0, 1, and 2 ("self" concerns) and lowest on stages 4, 5 and 6 ("task" and "impact" concerns). A nonuser is not someone who is not using the innovation at all but someone whose personal concerns about the innovation outweigh concerns about implementation into the environment (Hall et al, 1977). This profile reflects interested individuals who are aware of the innovation (stage 0) and want to learn more about it from a positive proactive perspective (stage 1 is slightly higher than 2). The only diversion from the typical nonuser profile is the tailing up of stage 6. This shows that respondents have other ideas, seen as having more merit than the proposed innovation and is possibly a warning signal against the innovation.

Stages	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Means overall	78.5	75.2	72.2	61	50.5	44.4	50.5

Note: Percentile Score means are means of all individual raw scores after they have been converted into percentiles according to the "Stages of Concern Raw Score-Percentile Conversion Chart for SoCQ"(p. 27) in Hall et al (1977)

Table 5.12 DESCRIPTIVE SUMMARY OF SoC PERCENTILE SCORE MEANS STAGES OF CONCERN

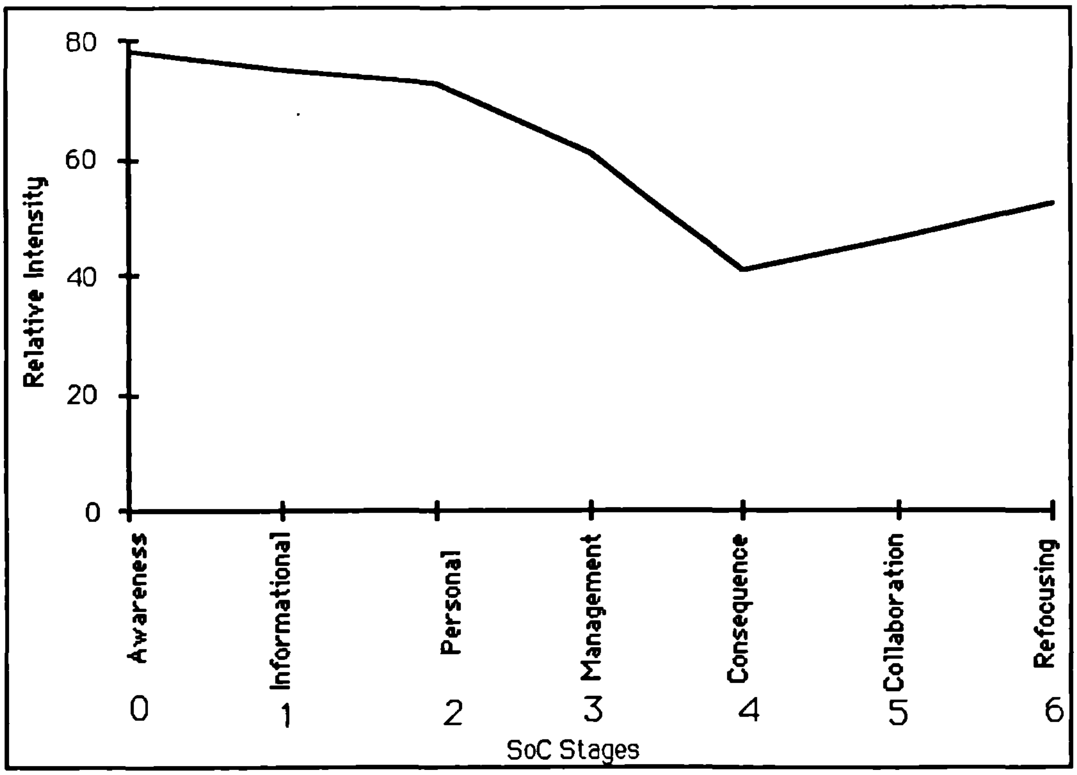


Figure 5.18 COMPOSITE FROM ALL PILOT SCHOOLS, 1996

So, the average Cypriot teacher could be classified as a "nonuser" but receptive towards educational computing. The average teacher is not yet focused on the management of the computer in the educational process or concerned about the effects of using it in the classroom. Therefore, there is a need to progress from high "self" concerns to high "task" and "impact" concerns. Except from the average profile, within schools, a closer look at individual profiles could be useful. The heterogeneity of teachers in each pilot school should be taken into consideration by training providers. More insight into profiles of individuals within specific schools is provided in section 6.2.1.1.

5.4.1.3. Using demographic and computer background variables to show characteristics of groups of teachers

In section 5.4.1.1, I showed that pilot teachers peaked on different stages of concern. In section 5.4.1.2 I showed the profile of the average pilot teacher which is likely to vary across different groups of individuals.

So far, I have indicated (section 5.3.2.2) that for pilot teachers, personal anxieties were related to computer ownership, proficiency, highest educational level, age and frequency of use at home and at school. In the same way, different kinds of concern could be related to demographic and computer background variables.

Literature in section 2.4.2.1 suggests that implementation succeeds when people move from high self to high impact concerns. Therefore, it is useful to identify those individuals who have already progressed along this developmental continuum since they can contribute to the success of educational computing. In order to identify the characteristics of these teachers, I conducted chi-analyses of variables and the peak stage scores of section 5.4.1.1 (Appendix I, part B). I also generated profiles of several groups towards the innovation according to several variables (Appendix I, part A).

Characteristics of individuals peaking on different stages

Table 5.13 shows the results of comparisons between pilot teachers with different characteristics on demographic and computer background variables in their peak stages of concern about educational computing. Percentages reflect the number of respondents in each group that peak on the specific stages.

Most significant differences occurred on "self" stages, that is awareness, informational and personal. In particular, stage 0 (awareness) was found related to age, position and highest educational level at $p<0.05$ and to proficiency, computer ownership, frequency of use at home and frequency of use at school at $p<0.01$. Stage 1 (informational) was related to proficiency ($p<0.05$) and stage 2 (personal) to highest educational level. In addition, differences also occurred on "impact stages", that is consequences, collaboration and refocusing. Collaboration was related to gender at $p<0.05$ and to training, computer ownership, frequency of use at home and at school at $p<0.01$. Refocusing was related to frequency of use at school at $p<0.01$.

		Highest Stage of Concern						
VARIABLE	*Groups*	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Age	*20-29 (n=77)*	38%						
	30-39 (n=39)							
	40-49 (n=41)							
	50-59 (n=46)	67%						
Gender	*Man (n=87)*						16%	
	Woman (n=113)						5%	
Position	*Principal (n=15)*	53%						
	Assistant principal (n=30)	70%						
	Teacher (n=150)	43%						
	Other (n=10)	60%						
Highest level of education	*CPA (n=152)*	53%		10%				
	University/first degree (n=40)	37%		25%				
	University/higher degree (n=10)	20%		20%				
Computer ownership	*Yes (n=98)*	37%					18%	
	No (n=108)	59%					3%	
Frequency of use (home) (for computer owners)	*Often (n=37)*	11%					46%	
	Sometimes (n=45)	42%					2%	
	Never (n=14)	79%					0%	
Frequency of use (school)	*Often (n=32)*	9%					41%	16%
	Sometimes (n=62)	43%					11%	6%
	Never (n=102)	79%					1%	1%
Proficiency	*Very proficient (n=13)*	8%	0%					
	Proficient (n=28)	21%	25%					
	Somewhat proficient (n=66)	38%	36%					
	Unskilled (n=91)	69%	24%					
Training background	*Yes (n=88)*	27%					20%	
	No (n=111)	65%					2%	

0= awareness 1=informational 2=personal 3=management
4=consequences 5=collaboration 6=refocusing

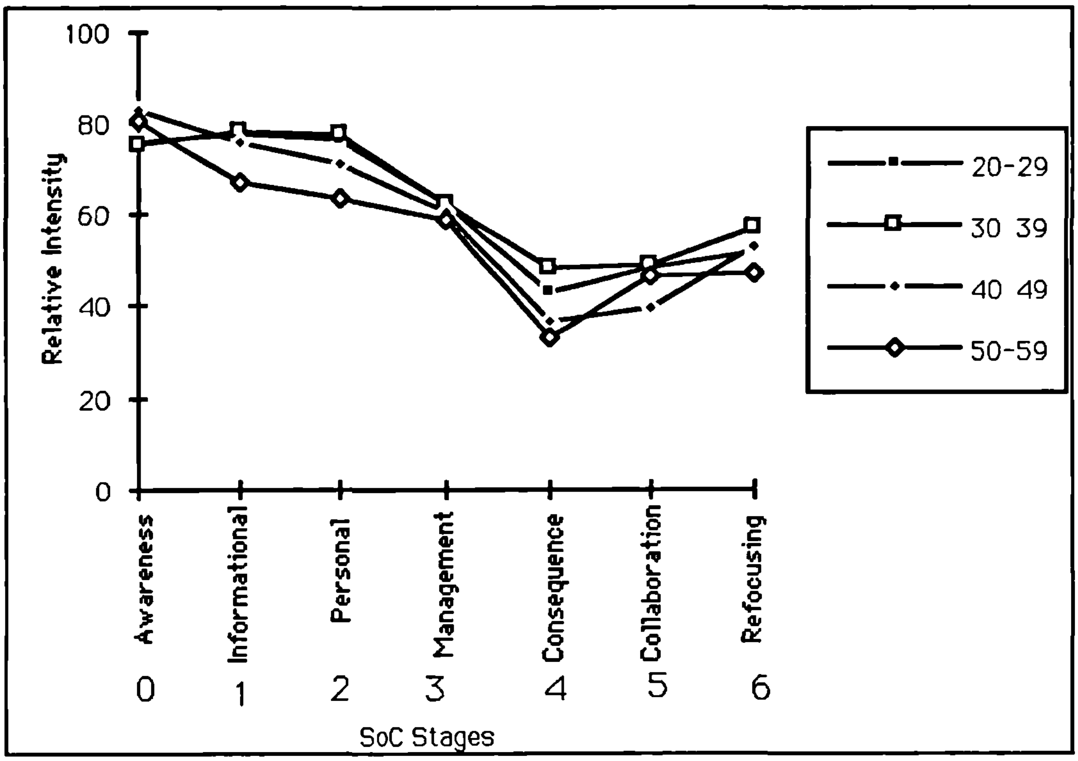
Table 5.13 COMPARISON BETWEEN ACTORS ON HIGHEST STAGES OF CONCERN

To further examine the characteristics of individuals, I examine profiles of different groups according to demographic and computer background variables to see the development of concerns across the continuum of the seven stages in more detail.

Characteristics of individuals forming different profiles

Demographic variables

Figure 5.19 shows a similar pattern for all ages since differences are rather small. It seems though that older teachers close to retirement may be less concerned about the impact of the innovation on them personally or about their adequacy to meet new expectations.



5.19 AGE: PERCENTILE SCORE MEANS -STAGES OF CONCERN

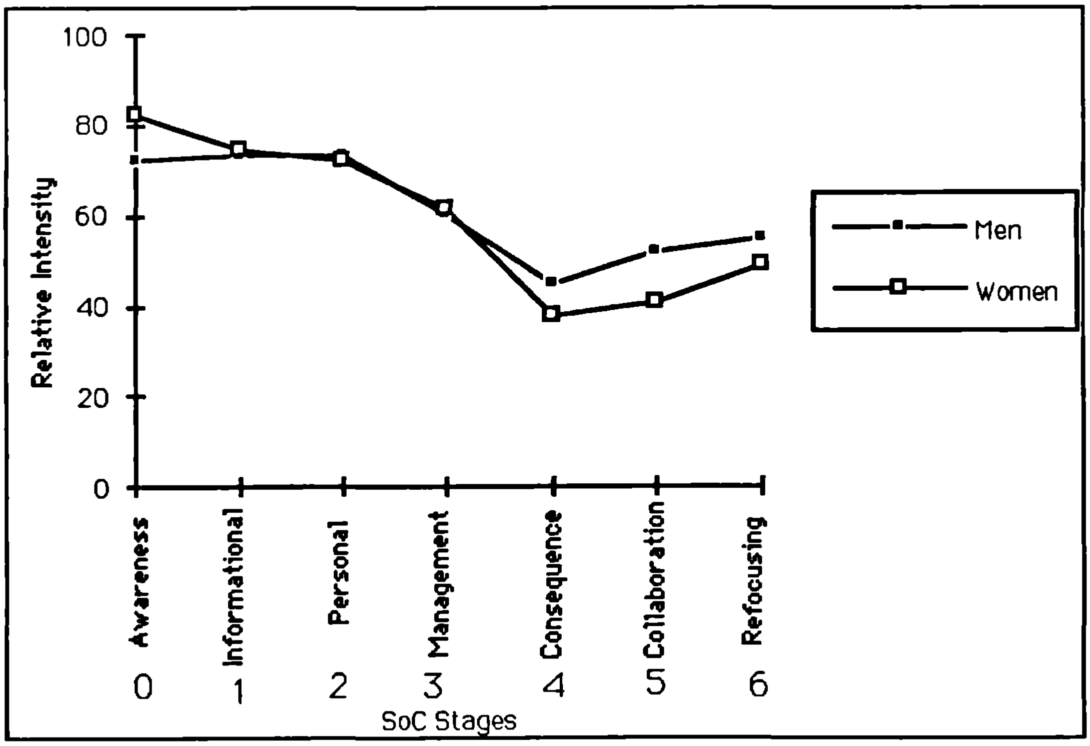


Figure 5.20 GENDER: PERCENTILE SCORE MEANS -STAGES OF CONCERN

Both men and women have similar scores on all stages with men having slightly higher impact concerns (Fig. 5.20). Men are much higher than women on stage 5 (collaboration); men are more concerned about cooperation among professionals in implementing the innovation. There is little gender-related variation on refocusing (stage 6), that is thinking about alternatives to computers.

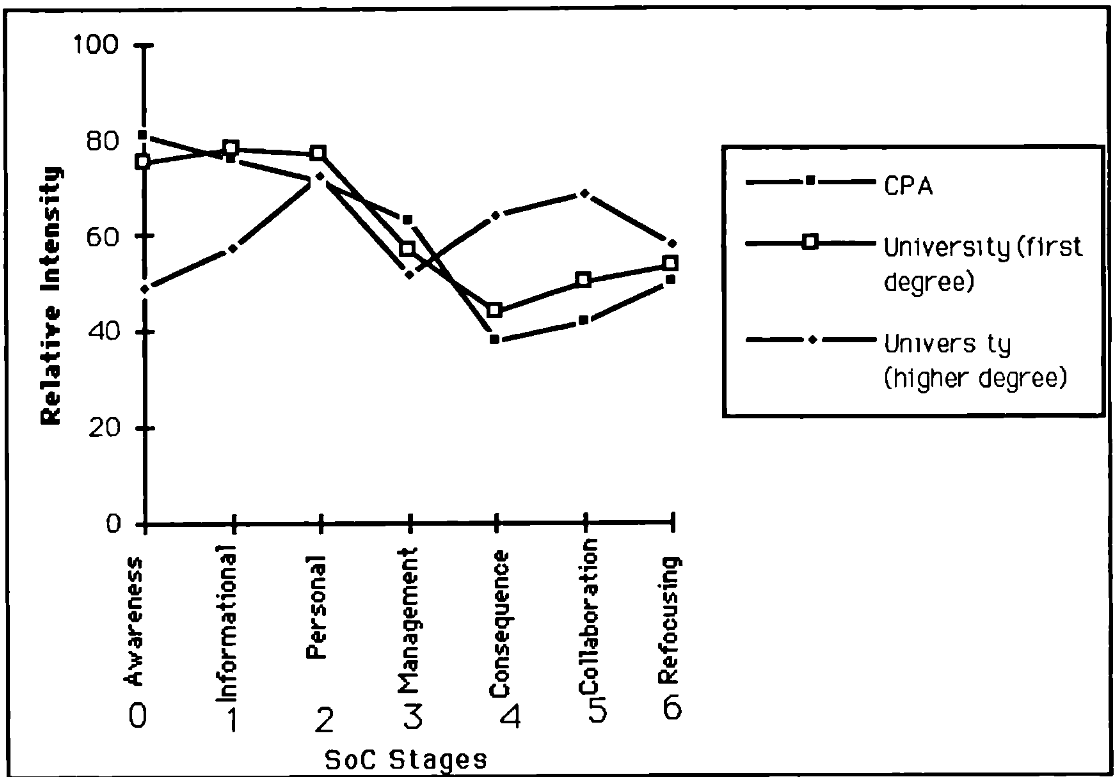


Figure 5.21 HIGHEST EDUCATION LEVEL: PERCENTILE SCORE MEANS -STAGES OF CONCERN

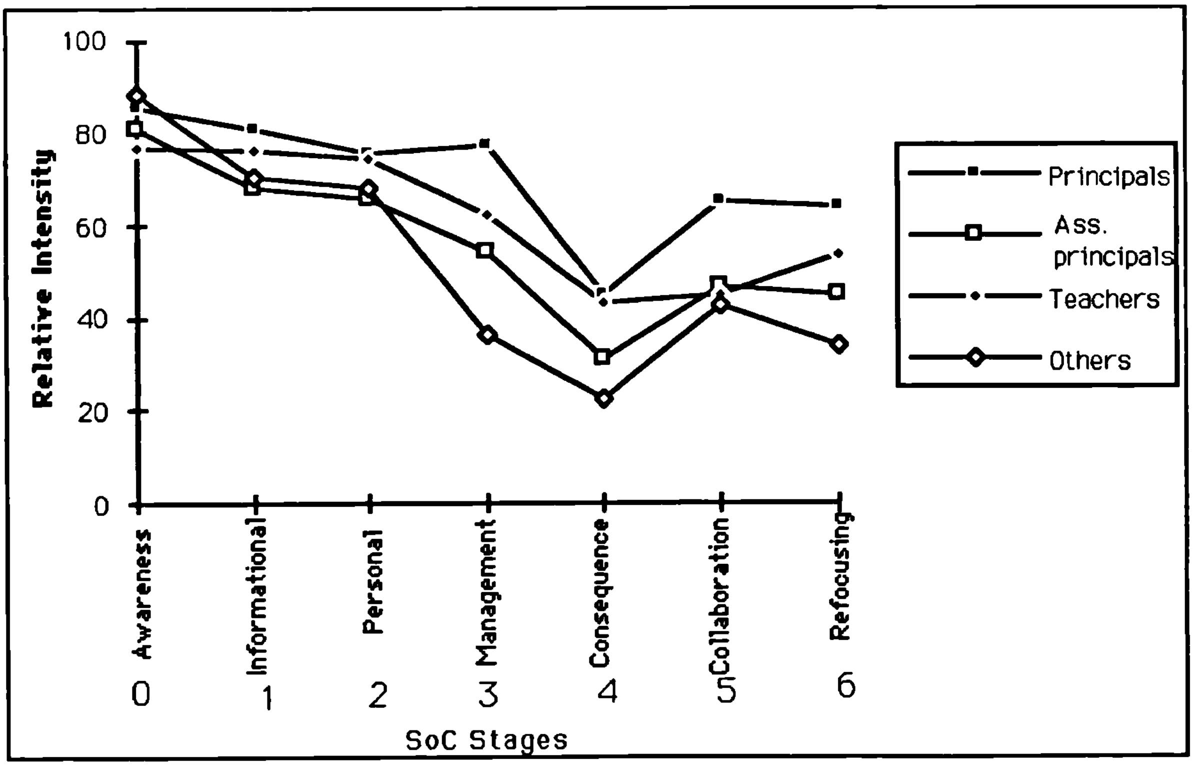


Figure 5.22 POSITION : PERCENTILE SCORE MEANS -STAGES OF CONCERN

Generally, as the teachers' educational level gets higher, self and task concerns get lower and impact concerns higher (Fig. 5.21). Differences among the groups are particularly strong on stages 1, 4 and 5. University (higher degree) compared to CPA graduates seem less concerned on the awareness and the information stage and more concerned on the consequence and collaboration stages. This may be because teachers, educated in other countries since higher degrees are not offered in Cyprus, are more informed about IT and have moved from self to impact concerns.

As far as position is concerned, again stage 0, 1 and 2 concerns are very high for all groups (Fig. 5.22). Management, collaboration and refocusing concerns are much higher for principals. Managing use of the innovation and coordinating others are often indicative of leaders. Assistant principals have lower scores than both principals and teachers. This may be explained on the grounds that these people have both administrative and teaching responsibilities as well as a multidimensional role in the school. So, they are less concerned about the innovation than the rest of the personnel.

Computer background variables

A first observation for teachers with or without training is that the profiles are similar in shape, with trained teachers on higher levels of concern on all stages except from stage 0 (Fig. 5.23). It is surprising to notice that these two groups are not very different at stage 1. Given that we are looking at the effect of training, the close scores on the informational stage are not expected as those who have already been trained would be expected to have lower informational concerns.

The biggest differences between trained and non-trained teachers are indicated at the impact stages. For example, the two groups differ on collaboration as there is a 28 point difference between trained and non-trained teachers; training raises collaborative concerns. This phenomenon is presumably related to the fact that most teachers work in isolation from each other in a school district, and without some formally established opportunity for a shared experience. So there are no convenient mechanisms to establish collaboration between teachers.

Self-perceptions of people about their computing abilities have an effect on their SoC (Fig. 5.24). The higher the self-rated proficiency, the lower the self and the higher the impact concerns. For example, there was a significant 57 point difference between very proficient and unskilled teachers on awareness. On the three last stages of consequence, collaboration and refocusing great differences were indicated among the four groups; "very proficient", "somewhat proficient" and "proficient" teachers had higher means than "unskilled" ones.

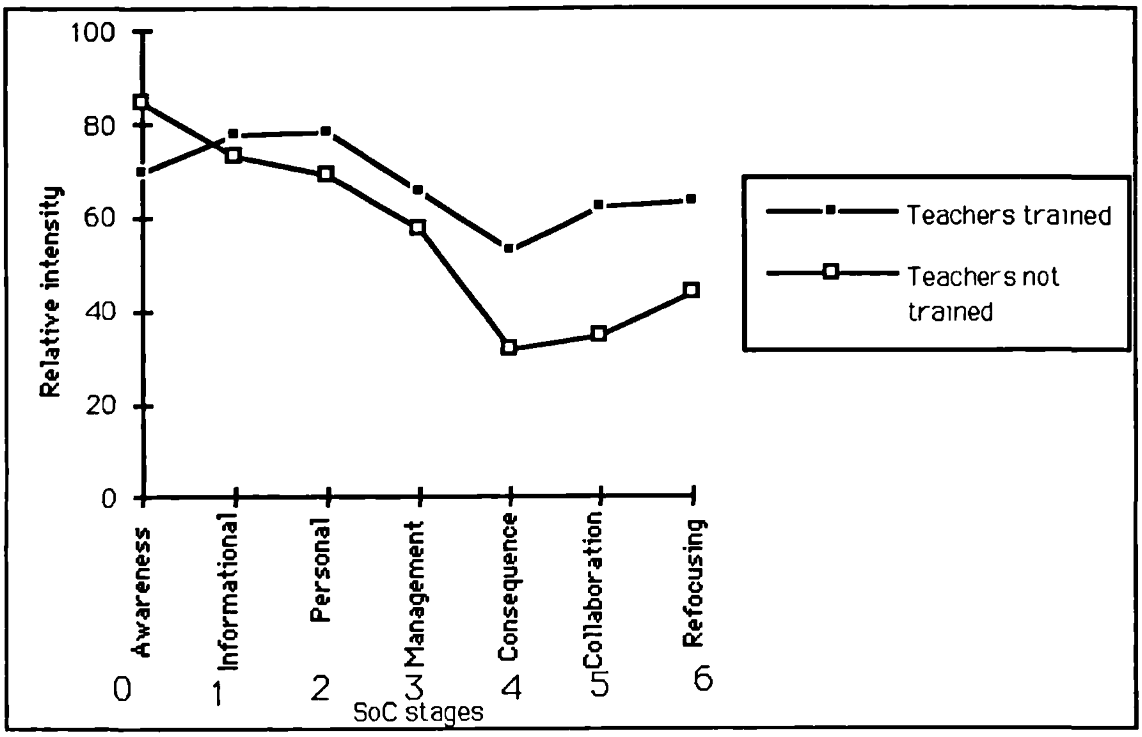


Figure 5.23 TRAINING: PERCENTILE SCORE MEANS -STAGES OF CONCERN

Computer owners seemed to have higher concerns on consequence and collaboration and lower on awareness than non-owners (Fig. 5.25). This might indicate that computer ownership tends to drop self and raise impact concerns.

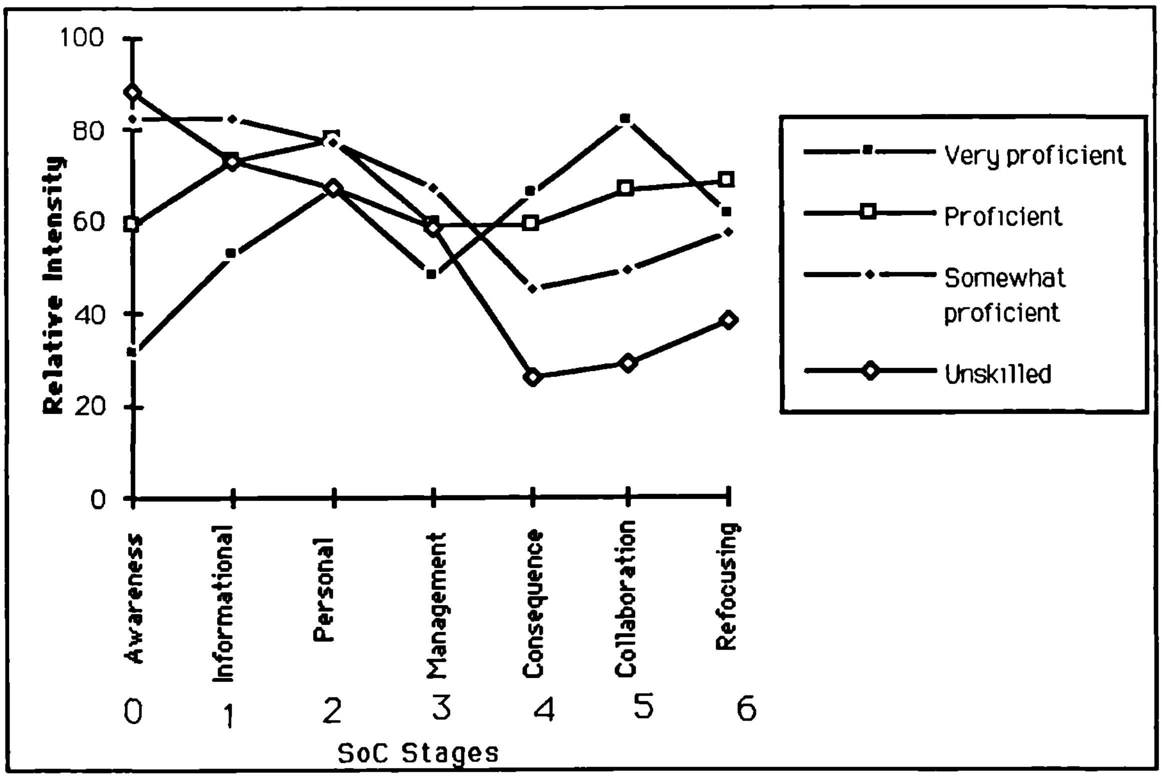


Figure 5.24 PROFICIENCY: PERCENTILE SCORE MEANS -STAGES OF CONCERN

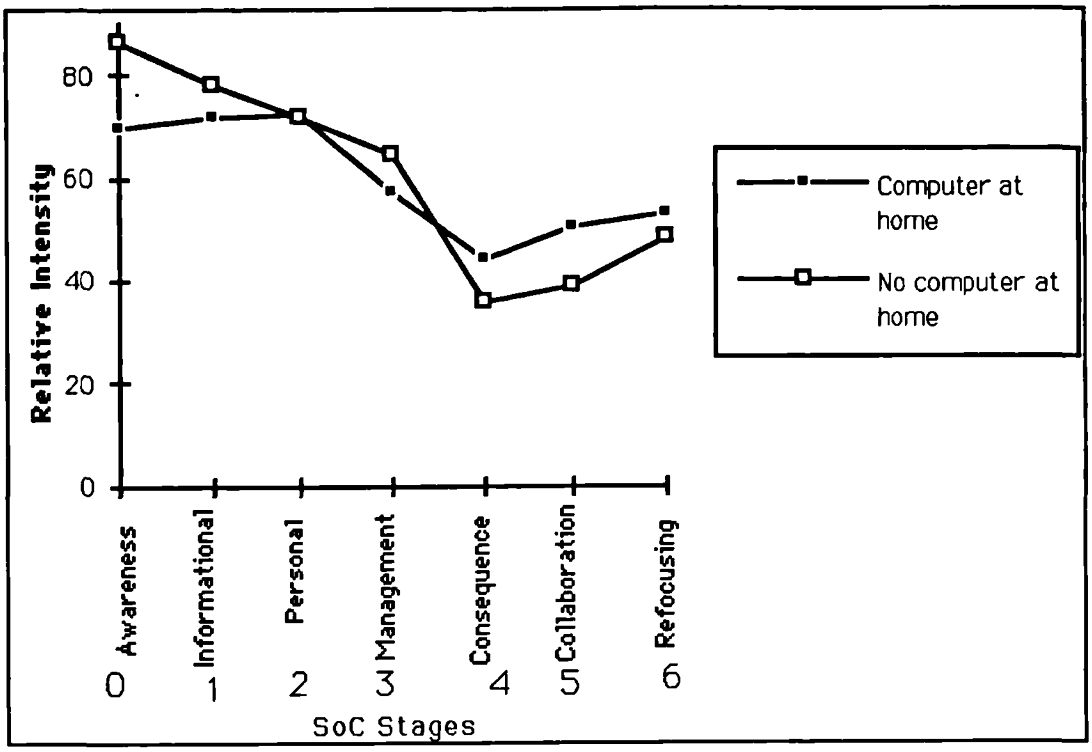


Figure 5.25 OWNERSHIP : PERCENTILE SCORE MEANS -STAGES OF CONCERN

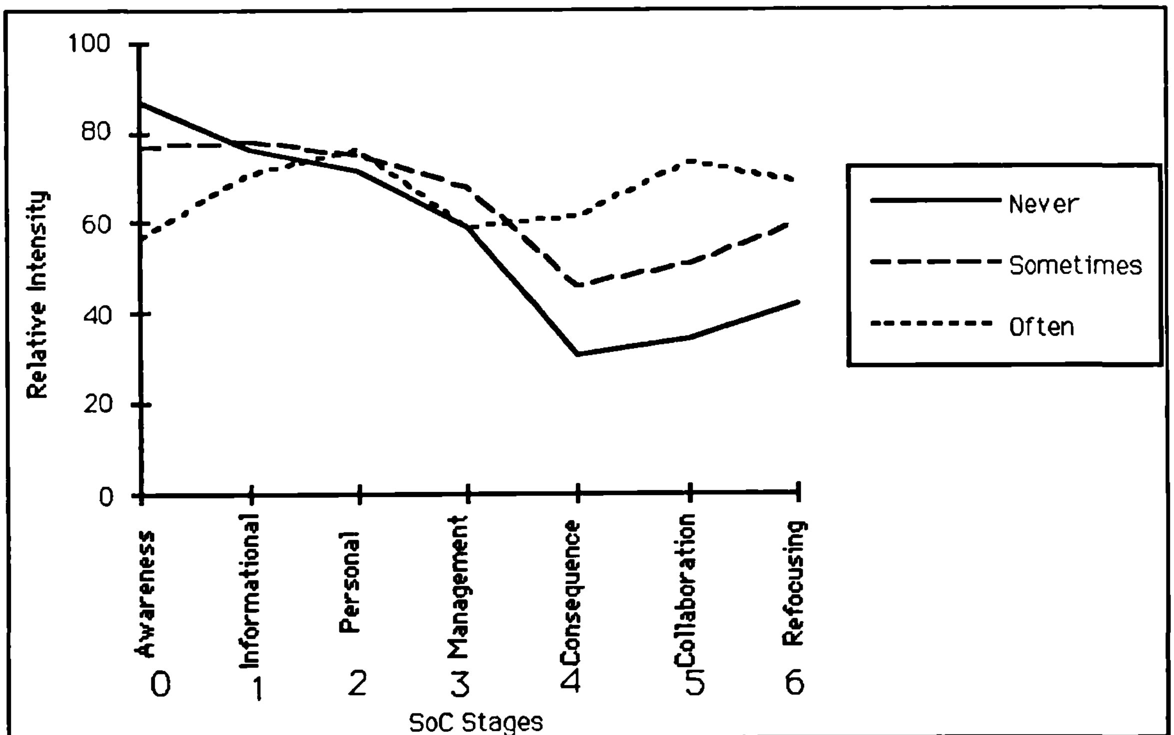


Figure 5.26 FREQUENCY OF USE (SCHOOL): PERCENTILE SCORE MEANS -STAGES OF CONCERN

An initial observation is that the profiles of teachers who use/do not use computers either at school or at home are very different mainly at stages 0, 4, 5 and 6 and not so different on stages 1, 2 and 3 (Fig. 5.26, 5.27). Stage 0 scores even for frequent users are still high but lower than those for non users. This may mean that experienced users tend to have other things to be concerned about, outside the innovation (Hall et al, 1977). In general, it seems that actual use of the innovation causes lower self stages such as awareness and higher impact stages such as collaboration and refocusing.

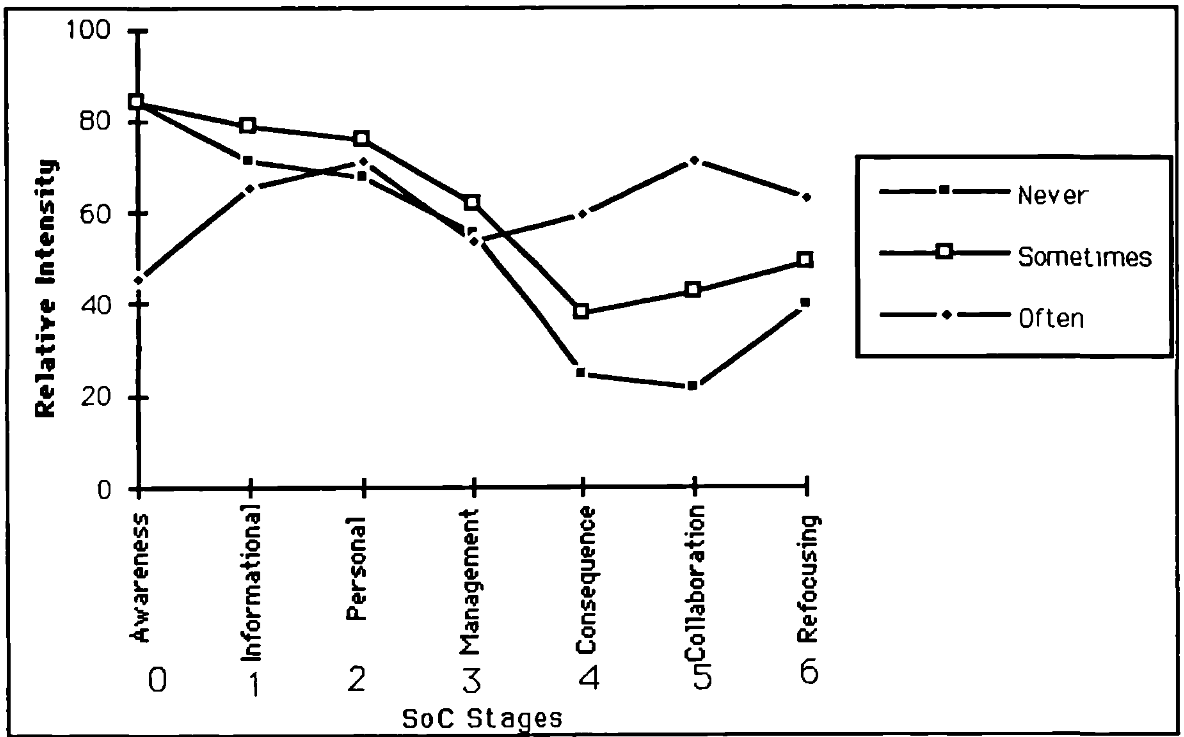


Figure 5.27 FREQUENCY OF USE (HOME): PERCENTILE SCORE MEANS -STAGES OF CONCERN

To sum up, examination of the characteristics of groups peaking on different stages and forming developmental profiles leads to two important findings.

First, the frequency of use at school supports the theory behind the SoCQ for the developmental continuum of concerns. In Table 5.13 we see that individuals, not extensively experienced or involved with the innovation are more likely to peak on "self" concerns; the involved teachers seem likely to have high "impact" stages. This is further illustrated in Figure 5.26, as the people who use computers frequently at school have lower "self" and higher "impact" concerns, compared to those who are not involved with the innovation. So, to facilitate implementation, there is a need to help people move from "self" to "impact" concerns.

Second, we see that Cypriot pilot teachers with certain characteristics are more likely to develop higher levels of involvement with the innovation. While examining people peaking on different stages, we have seen that teachers that are younger, trained, proficient, computer owners, university graduates who tend to use the computer either at school or at home are probably groups that are more likely to have high "impact" concerns. All the figures in this section that show profiles of different groups suggest that persons with a high educational level, training background, high "proficiency" in computing or a computer at home are more likely to move from "self" to "impact" concerns. School principals also show high impact concerns and are likely to contribute to the success of educational computing (Fig. 5.22).

5.4.2. Nature of concerns

Information about concerns in general and the SoCQ in particular have been provided in Chapter 2. Concerns, just like attitudes are multi-dimensional constructs with different factors. As individuals move from unawareness and nonuse of an innovation into a more highly sophisticated use, their concerns develop from being most intense at stage 0, 1 and 2 to being most intense on stage 3 and to finally becoming most intense at stages 4, 5 and 6 in a hierarchical order, starting with self, moving on to task and finally to impact concerns. So, unlike attitudes which have quite independent dimensions, concerns are reported as developmental in nature.

To support or reject this assumption, a correlational matrix was computed based on the raw scores data (Table 5.14). This provided for a summary of how the scales (each measuring one stage) interrelated. In general, with some exceptions, the correlations near the diagonal were higher than those more removed from it. Correlations were particularly high between stages 1 and 2 (0.77); 4 and 5 (0.74); 4 and 6 (0.78); 5 and 6 (0.75). This pattern corresponded to the expected order of the stages of concern: each stage is more likely to be related to the next stage than to a stage further along the line. So, the developmental nature of concerns was confirmed.

SoC	*0*	*1*	2	3	*4*	5	*6*
0	1.00	0.30	0.06	0.31	-0.15	-0.24	-0.01
1		1.00	0.77	0.62	0.48	0.38	0.45
2			1.00	0.60	0.66	0.57	0.60
3				1.00	0.54	0.36	0.55
4					1.00	0.74	0.78
5						1.00	0.75
6							1.00

Table 5.14 CORRELATION MATRIX FOR STAGES OF CONCERN

Summary

This section has described the current status of concerns of Cypriot pilot school teachers. Overall, the average respondent has a "nonuser" typical profile, emphasising "self" concerns (section 5.4.1.2) that implies a rather low implementation level. As the literature suggests people with this profile do not successfully utilise the innovation until personal concerns are lowered (section 2.4.2).

However, pilot teachers are likely to be heterogeneous as to their peak concerns (section 5.4.1.1). Demographic and computer background variables considered, there are important differences in the resulting profiles of various subgroups (section 5.4.1.3).

Of interest is the fact that frequent computer users at home and at school do not share the "nonuser" profile, as they have high "impact" stages. This could be a result of a transition which happens as the innovation is being used by the teachers. As I have pointed in section 2.3, success often implies teachers' high involvement with the innovation. The relationships demonstrated by this set of data suggest that as teachers get involved, their concerns move beyond the self-directed, personal level. Therefore, the key to implementation progress could be to get individuals to move from peak "self" concerns to peak "impact" ones.

Of interest is also the fact that people with certain characteristics such as high educational level, training background, computer ownership at home, proficiency in computing are more likely to develop the innovation as they have lower "self" and higher "impact" concerns.

These findings lead to certain implications about computing success. First, the Ministry should focus on those individuals with the characteristics above that are more likely to make the innovation work. Second, a good indication of progress would be to help other individuals move in the developmental continuum by lowering their self concerns. The Ministry should consider aspects that are within its authority limits such as the provision of training in order to change the implementation level in pilot schools. These recommendations are further discussed in section 7.1.2 of Chapter 7.

5.5. CONCLUSION

In this chapter, I have explored several groups' perceptions, that is views, attitudes and concerns about implementation. Educational computing is an innovation imported from abroad into the local context, so its development is likely to be shaped by the perceptions of Cypriots.

In section 5.1 I have indicated that computers invade all areas of people's lives: personal, professional, educational. In general, it seems that Cypriots differ significantly in terms of their demographics and computer background. So, I decided to explore how these differences are reflected in aspects of their views, attitudes and concerns in the rest of this chapter.

In section 5.2 I have shown that despite the general support for introduction of computers in Cyprus elementary schools, different groups of people hold diverse views about the goals and the process of computer implementation. Therefore, Cypriots - both parents and teachers - do not share consensus on the way in which educational computing has been introduced: some want computers as a subject and others as a tool. So, although Cypriots are positive about integrating technology into their school curricula, their culture supports a degree of "conflict", also reflected in other educational matters of the island such as the goals of education, as mentioned in section 1.2. The lack of consensus as to what knowledge and practice in computer use is, indicates that the innovation perceives different meanings for different people. Although at this stage of experimentation diversity is interesting, it could evolve into a threat towards the innovation in the near future.

In section 5.3 I provide information on several groups' attitudes towards educational computing. People seem to hold positive attitudes in general. Factorial analyses indicated that Cypriots' attitudes are multi-faceted - like the attitudes in the study of Davidson and Ritchie (1994), but with different item structures - with several dimensions: the "personal", the "educational" and the "general". This could show that different aspects of attitudes may be related to implementation practices. Exploration of the relationships between factors extracted and demographic/computer background variables suggested that mostly personal and to a lesser extent, educational attitudes can be demonstrated to be different for different groups. Despite the heterogeneity of people as to personal anxieties, they were not very different in their educational and general attitudes about computing. Although the study of Davidson and Ritchie (1994) had shown changes in dimensions of people's attitudes after a year of computing implementation in an elementary school, in the case of Cyprus the experimental plan in pilot schools did not seem to have an impact on any of these aspects; pilot and non-pilot populations appeared similar. As attitudes are mostly theoretical constructs, I proceeded to explore pilot teachers' concerns to explain where these teachers practically stand.

So, in section 5.4 I focused on pilot teachers' concerns. Analysis of the teachers' SoCQ resulted in the "non-user" profile, implying a quite low level of adoption. So, although theoretically the picture, as indicated by attitudes, is that of willingness to adopt, practically the average Cypriot pilot teacher has higher "self" concerns than "task" or "impact" ones. Teachers' intense self or impact concerns seem related to demographic or computer background variables. The results of chi-square analyses suggest that the intensity of concerns varies for groups which reasonably would differ on other variables; the higher the experience, the higher the impact and the lower the self concerns. Teachers with high educational level, computer proficiency, training background or computer ownership are likely to contribute more to successful implementation of the innovation. In general, teachers are a heterogeneous group with different needs to be addressed.

To sum up, attitudes, views and concerns are important to consider in the case of computing implementation in Cyprus elementary schools. So far, I have provided insight into the people in all schools in general and the people in pilot schools in particular. This has resulted in the following important findings.

First, the average Cypriot pilot teacher has been found supportive and positive - just like other actors such as parents and children - in theory. Surprisingly, the pilot teacher has not been found significantly different from his/her non-pilot colleague in terms of views or attitudes. This, along with the non-user profile obtained through analysis of concerns, could suggest that implementation of the experimental programme falters and that individuals are reluctant to get involved. So, one could conclude that people either think about computers only "romantically" without connecting them to the real world or face practical difficulties in implementing technology in their schools.

Second, the group of teachers is heterogeneous in terms of demographic and computer background, impacting on their views on computer introduction, their personal and professional/educational attitudes as well as their self, task and impact stages. On one hand, there are different dimensions of Cypriot teachers' views, attitudes and concerns that should be considered for successful implementation. The personal, self concerns can be easily addressed as these can change with more computer experience or training courses. However, the general or educational dimensions are more difficult to deal with. On the other hand, people with certain characteristics are more likely to develop successful involvement with the innovation, that is those who are younger, university graduates, computer trained, proficient individuals or computer owners that make use of the innovation at home. This diversity has two implications: first, that teachers should not be treated in the same way; second, as the system in Cyprus supports autonomy in the classroom to an extent, this diversity could result in practices that are shaped by the dynamics of those individual actors, more likely to get involved within the context in which they function.

In the light of these findings I will move on to explore the role of all these constructs - views, attitudes and concerns - in the extent and content of implementation practices. Except from the "actors" aspect, I also aim to analyse several other factors such as the practicalities of applying the innovation within the local conditions that may have an impact on failure or success. Therefore, the next chapter focuses on implementation practices and factors.

CHAPTER 6: IMPLEMENTATION PRACTICES AND FACTORS

This chapter aims to answer the third research question" *In what ways do several key factors influence integration of computing into school practices?"* in terms of the following sub-questions:

- What is the extent and the content of the current implementation practices?
- What is the role of actors and their views, attitudes and concerns in implementation practices?
- What is the role of practical conditions in implementation practices?

First, in section 6.1 I present statistics on all pilot schools to indicate usage aspects reported by computer coordinators and to answer the first sub-question. In section 6.2 I focus on four selected schools, as I explained in section 3.4 of Chapter 3. I will review the characteristics of these schools to provide the context for the interpretation of the remaining results (section 6.2.1). Then, I will present data through Fullan's conceptual framework on implementation factors to highlight the role of such factors on application patterns (section 6.2.2).

There are two points that need to be mentioned first. Any possible minor inconsistencies in sections 6.1 and 6.2 can be attributed to the different timing of the data collection: I conducted the survey during 1995-96 whereas I investigated the four selected schools during 1996-97. Also, in describing current implementation practices in Cyprus elementary schools, I provide both a quantitative and a qualitative dimension. As I mention in section 2.3.2 of the literature review, the quantitative aspect refers to the extent to which computing is integrated into current classroom practices, indicated by the frequency and intensity of computer use. The qualitative dimension refers to the content of the practices implemented and is related to objectives and activities.

To describe the extent and the content of educational computing integration in Cyprus pilot schools, the survey conducted in all pilot schools will now be described.

6.1. SURVEY STATISTICS: ALL PILOT SCHOOLS

In this part I present the findings related to all pilot schools, with regards to the survey questionnaire I described in section 3.4.2 (the questionnaire is provided in Appendix IV). In the figures and the tables reference is also made to the four selected schools, a, b, c and d, extensively discussed in section 6.2.

6.1.1. Response rates

The response rate of computer coordinators to the survey questionnaire was satisfactory (Table 6.1). Survey data for 1995-96 indicated that pilot schools varied in numbers of children and teachers and were located in both urban and suburban areas. In terms of size, no school had less than six teachers.

District	NICOSIA	LIMASSOL	LARNACA	PAPHOS	AMMOHOSTOS	TOTAL
Number	11/11	5/7	3/3	2/3	2/3	23/27
Percentage	100/100	67%	100%	67%	67%	85%

Table 6.1 RESPONSE RATES OF COMPUTER COORDINATORS

6.1.2. Hardware

First, I investigated educational technology hardware such as computers, printers and CD-ROM. As I have indicated in section 5.2.1.1 most teachers and parents indicated preference for "some computers per classroom" while others for either "one computer per classroom" or -parents especially- "one per child". The picture revealed here probably suggests that not even the "one per classroom" scenario was present. The study showed that no modems or other telecommunication and projection equipment were available at that time.

Tables 6.2 and 6.3 show the distribution and location of hardware in all pilot schools. A separate column indicates the selected schools a, b, c , d and shows where these schools fitted into the data.

A. Computers

During 1995-96 there were a total of ninety-two computers in the twenty-three schools surveyed (Table 6.2). Eighteen schools had three, four or five computers each; three only had two computers each; and two had six or seven each. There was an average of about four computers per school, that is less than one computer available per classroom. It must be remembered that the computer is largely an individual learning tool and special television monitors accommodating group activities more easily - to offset the small number of machines - were not available. The majority of computers were IBM/IBM compatible MS-DOS operating systems (85 out of the 92 machines in all schools) while the rest were Macintosh.

Most schools were provided with computers between 1993 and 1996 while two of them started earlier (1991). Eight schools distributed their provision of machines over a period of four years and two of them over six years.

Computers were either sent by the Ministry of Education, donated or bought; different combinations occurred in most schools. Generally, twenty-one schools were provided with computers by the Ministry; thirteen purchased computers and eleven were donated machines. We can conclude that most support came from the Ministry, although it seems that schools had the option to act on their own initiative and proceed to alternative ways of acquisition.

Hardware	Frequency of hardware available	Number of schools	Percentage (n=23)	Selected schools
Computers	Two computers	3	13%	
	Three computers	6	26%	
	Four computers	5	22%	c
	Five computers	7	30%	d
	Six computers	1	4%	a
	Seven computers	1	4%	b
Printers	One printer	15	65%	d
	Two printers	8	35%	a b c
CD ROM	No CD ROM	6	26%	
	One CD ROM	11	48%	a d
	Two CD ROM	4	17%	b c
	Three CD ROM	2	9%	

Table 6.2 ALL PILOT SCHOOLS - HARDWARE AVAILABLE

B. Printers

There were thirty-one printers in total. Fifteen schools only had one printer each while eight schools had two each (Table 6.2). Twelve schools were equipped during 1993 and/or 1994 while another six were provided with printers later on. The major source of provision was the Ministry of Education since sixteen schools received printers in this way. Only one school was donated a printer while eight schools were involved in the purchase with their own funds.

C. CD Rom

Several schools (6/23) lacked CD ROM. Of the remaining schools, eleven had only one CD ROM compatible machine while another six had two or three (Table 6.2). Most schools with access to CD ROM (13/17) reported acquisition during 1994-96. Most schools (11/17) had bought equipment while the Ministry provided CD ROM for only one school; two schools acquired their CD ROM through donations.

D. Location of equipment

The most common location for the computer was the classroom, with special labs coming second (Table 6.3). Fifteen schools had computers in classrooms and six in special labs. Three schools had computers available for use by the headmaster and one school for the teachers. Some schools reported computers in other places: one in the secretary room and three in the technology room.

Location of hardware	Number of schools	Percentage (n=23)	Selected schools
In classrooms	15	65%	b c
In special labs	6	26%	a d
In the headmaster's office	3	13%	d
In the teachers' room	1	4%	
In other places	4	17%	

Table 6.3 ALL PILOT SCHOOLS - HARDWARE LOCATION

Type	Software	Number of schools	Percentage (n=23)	Selected schools
Operating Systems	DOS	5	22%	
	Windows	17	74%	b c
General	ClarisWorks	2	9%	b
	Excel	1	4%	
	Word Perfect	3	13%	d
	Write	1	4%	d
Mathematics	Math Blaster	17	74%	a b c
	Math Rabbit	16	70%	a c
	Math 3	16	70%	a c d
	Areas	5	22%	
	Logo	2	9%	
	Learning Logo	1	4%	
	Conversion of units	5	22%	a d
	My numbers	1	4%	
	Arthur's Problem Teacher	1	4%	d
Encyclopaedias	Greek Encyclopaedia 2002	16	70%	a c
	Grolier Encyclopaedia	1	4%	c
Geography	Geography of Greece	20	87%	a c d
	Atlas CD	1	4%	
Language	Reader Rabbit	1	4%	b
	Bailey's Book House	1	4%	b
	Dictation Support	1	4%	b
	My first CD	1	4%	c
	Fairy Tales	11	48%	
	Alphabet	1	4%	
Science	Science	1	4%	
	BodyWorks	1	4%	
Games	Games	1	4%	
Art	Kid Pix	22	96%	a b c d
	Kid Pix Studio	1	4%	d
	PaintBrush	2	9%	d

Table 6.4 ALL PILOT SCHOOLS -SOFTWARE PER SUBJECT AREA

6.1.3. Software

Educational software for different subjects of the curriculum were available in varying proportions (Table 6.4). With the exception of "common use" software that was used for operational or general purposes, the majority of software was for Mathematics. Some of the most popular software were: KidPix (96%), Geography of Greece (87%), Windows (74%), Math Blaster (74%), Math Rabbit (70%), Math 3 (70%) and the electronic Greek Encyclopaedia 2002 (70%). This picture reveals that there is more support for specific subjects such as Greek, Maths and Geography.

82% of software was sent by the Ministry of Education while 11% was bought. Most of the software (63%) was acquired during 1995/96.

6.1.4. Curriculum integration: use

As often stated, introducing computers into public schools will not in itself change teachers' approaches to instruction; the key is how technology is used. To answer how and why computers are used, respondents specified the frequency of use per grade level, the activities and the subjects as well as the goals.

Selected schools a, b, c and d are indicated in the tables and figures of this section as well: in tables 6.5 and 6.6 in a separate row; in figure 6.1 over the bars.

A. Frequency of use

Grades	Never	At least once a year	At least once a month	At least once a week	Almost every day
1st grade	13 (62%)	3 (14%)	4 (19%)	1 (5%)	0 (0%)
	a b c		*d*		
2nd grade	13 (62%)	1 (5%)	5 (24%)	1 (5%)	1 (5%)
	a b		*c d*		
3rd grade	11 (52%)	1 (5%)	3 (14%)	5 (24%)	1 (5%)
	a b		*c*	*d*	
4th grade	7 (30%)	2 (9%)	3 (13%)	8 (35%)	3 (13%)
			d	*a c*	*b*
5th grade	4 (17%)	0 (0%)	7 (30%)	7 (30%)	5 (22%)
	b c			*a d*	
6th grade	4 (17%)	0 (0%)	5 (23%)	9 (41%)	4 (18%)
	b			*a d*	*c*

All pilot schools *(n=23)* *Selected schools*

Note: Schools a and b were KB, that is they only had the three upper grades (4th, 5th and 6th).

Table 6.5 ALL PILOT SCHOOLS -FREQUENCY OF USE PER GRADE LEVEL

Different schools employed quite different computer usage patterns: in some schools only one grade was highly involved in computer use on a daily basis; in others all or some grades were involved but some more frequently than others.

Generally, there was an interesting trend: computer use was more likely among higher grade children (Table 6.5). Thirteen schools never used computers for 1st and 2nd graders, aged 6-8, while only four had not used computers for 5th and 6th graders, aged 10-12. Only one school used computers for 1st and 2nd graders on a daily basis while four or five schools used them daily for 5th and 6th graders. The highest frequency value (mode) per grade level was: "never" for the 1st, 2nd and 3rd grade (62%, 62% and 52% of schools respectively); "at least once a week" for the 4th and 6th grade (35% and 41%); "at least once a month" and "at least once a week" for the 5th grade (30%).

B. Ways of use: subjects and activities

Different patterns in use were indicated for different schools (Table 6.6). The core curricular areas, that is Greek/Language Arts and Maths, were most frequently cited as those using computers. Other subjects were Art, Geography and Design and Technology. Less popular topics were English and Science.

Most schools reported increasing use of computers for a number of subjects while moving to the higher grades. This is the case, for example, with Greek where from only 4% (1st grade) we move to 48% (6th grade). Other such examples are with Maths and Art.

Grades	Greek	Maths	Art	English	Geogr.	Science	Design/ Technol.	General
1st grade	1 (4%)	4 (17%)	2 (9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
		d	*d*					
2nd grade	3 (13%)	3 (13%)	2 (9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (4%)
		d	*d*					
3rd grade	6 (26%)	6 (26%)	4 (17%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (4%)
	d	*d*						
4th grade	7 (30%)	6 (26%)	4 (17%)	1 (4%)	2 (9%)	0 (0%)	0 (0%)	2 (9%)
	b	*b d*	*b d*	*b*				
5th grade	10 (43%)	11 (48%)	4 (17%)	0 (0%)	6 (26%)	1 (4%)	4 (17%)	0 (0%)
	d	*a d*	*d*		*a*			
6th grade	11 (48%)	8 (35%)	4 (17%)	0 (0%)	3 (13%)	1 (4%)	2 (9%)	1 (4%)
	a d	*a d*	*d*		*a*			

All pilot schools ***(n=23)*** ***Selected schools***

Note: School c did not indicate ways of use

Table 6.6 CURRICULUM SUBJECTS DELIVERED USING COMPUTERS PER GRADE LEVEL

During teaching of Greek among the activities that were mentioned were recognising letters (1st grade), listening to stories on CDs (2nd grade), word-processing (all grades) on summaries, poems, essays and other texts as well as researching in electronic encyclopaedias (upper grades). Maths activities included recognising numbers (1st grade), games (3rd, 4th grade) as well as drill and practice (2nd, 3rd, 4th grade); upper grades (5th, 6th) also worked with specialised software on topics such as areas and fractions. Art was also a popular subject for computer use for all grades and teachers reported the use of packages such as PaintBrush and KidPix. Geography, on the other hand, was quite popular for 4th, 5th and 6th graders; reference was made to a special software programme sent from the Ministry on the Geography of Greece as well as to activities such as searching for information on databases, data collection and presentations. Science was not as popular as Geography and the teachers of the two schools, mentioning computer use for this subject, failed to specify specific activities. Design and Technology in six schools also involved the use of computers to some extent.

C. Goals for use

The survey showed that the computer is most often used for the development of computing skills (78%), the development of student interest (78%) and as a medium (74%) as seen in Fig. 6.1. The development of active, cooperative, individualised, interdisciplinary learning and the support of special curriculum areas were less frequently reported as goals for computer use.

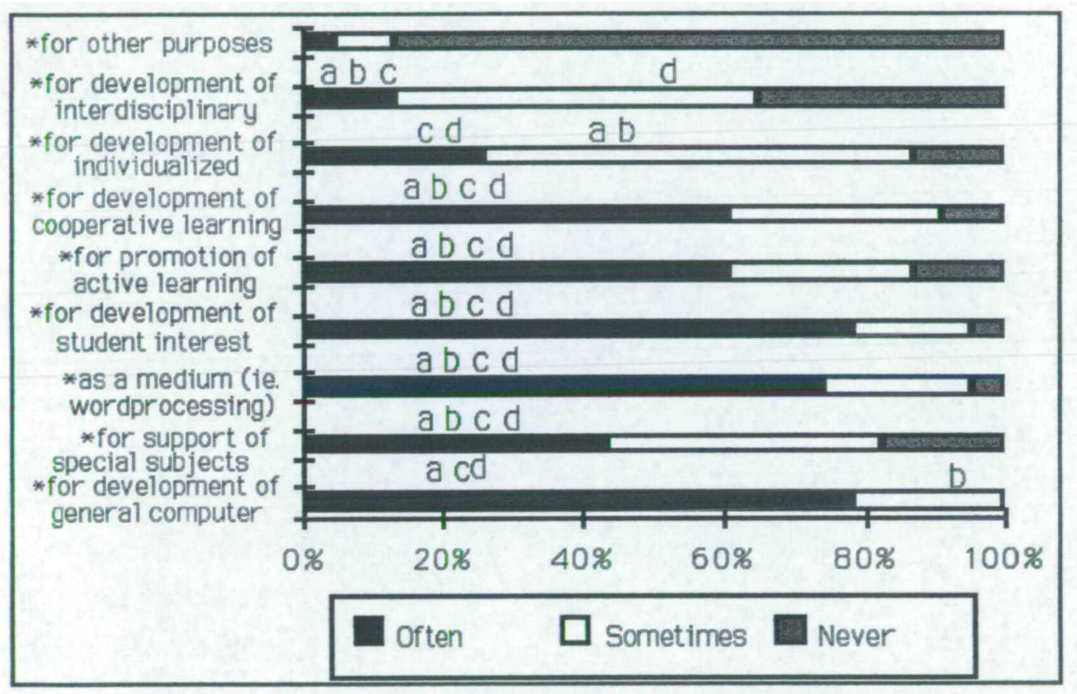


***Figure 6.1** ALL PILOT SCHOOLS -GOALS FOR COMPUTER USE*

6.1.5. Problems and needs

I explored computer coordinators' problems and needs (Table 3.7). The open-ended comments about problems are illustrated in Figure 6.2 and are as follows:

- Time was mentioned by more than half of the coordinators and seemed to relate to the curriculum integration issue. Coordinators referred to the pressure of an already overloaded curriculum and the lack of a specific time set on a weekly basis for computers.
- The problem with personnel was again frequently mentioned and was described as the need for training on computer educational applications.
- Shortage of hardware was problematic since almost one out of three schools reported lack of computers and supplementary equipment.
- There was lack of software, relevant and supportive to the curriculum.

- Lack of supplementary material was a less frequently mentioned problem area. Some coordinators reported lack of personal time to organise and train other colleagues and requested that special time should be made available for this purpose by the Ministry.
- Other problems were related to lack of technical and administrative support.

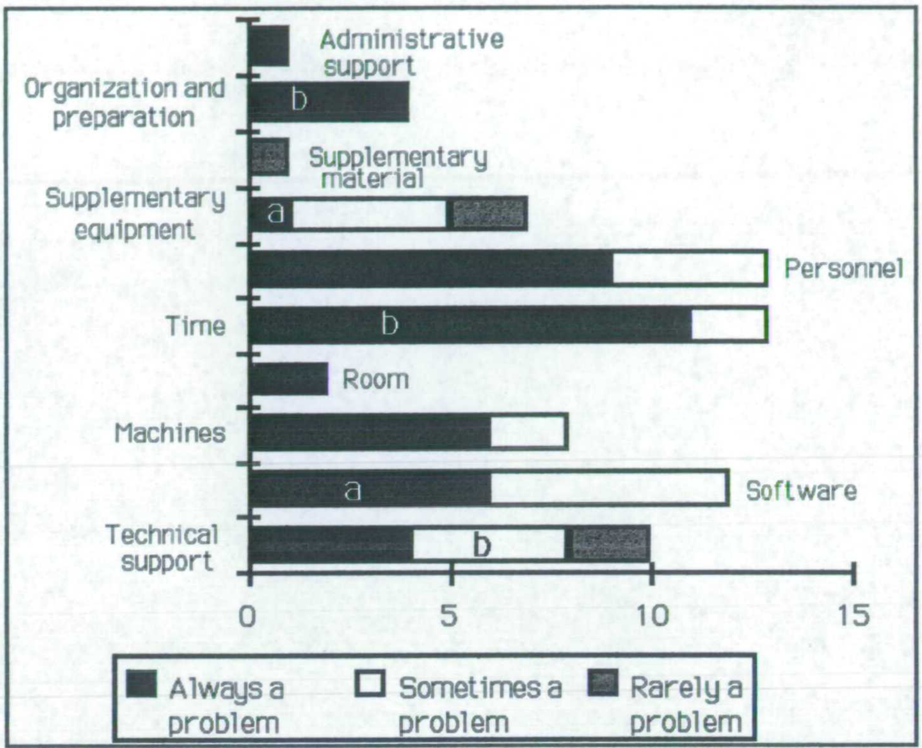


Figure 6.2 ALL PILOT SCHOOLS -PROBLEMS ASSOCIATED WITH COMPUTER USE

Coordinators were also asked to indicate whether they had needs in the five areas, as shown in Figure 6.3. Their responses indicated the following:

- Twenty two schools needed improved quantity and quality of computers and equipment. Nine teachers complained about insufficient numbers of computers, while eight asked for specifics such as CD ROM, peripherals, scanners, multimedia, extended memory, sound cards, better printers and special trolleys for the computers.
- Nearly all schools felt the need for improved quality and quantity of educational software. Thirteen teachers wanted more instructional programmes in Greek, relevant to curriculum subjects such as Geography, History and Science. Suggestions were also made for software to help children with learning disabilities and special needs; multimedia programmes with sound, movement and vision; programmes adjusted to individualised student needs; and educational games to facilitate the learning processes.
- Training needs were indicated by twenty two schools. Five coordinators suggested training on a regular basis while another two demanded provision

of in service training by the Ministry. Three stressed that training should concentrate not only on technical aspects but also on classroom applications.

- Twenty one schools stated their dissatisfaction with supplementary material and the need for lesson plans, sample lessons, handouts, textbooks and teachers' guides. As one teacher mentioned, such material should specify "the way of teaching, assessment and experimentation with computers". Overall, teachers required models, examples and detailed directions for integration of IT into the National Curriculum.
- Seventeen schools felt the need for provision of more technical support. As some teachers mentioned "the teacher can not and will not become a technician".

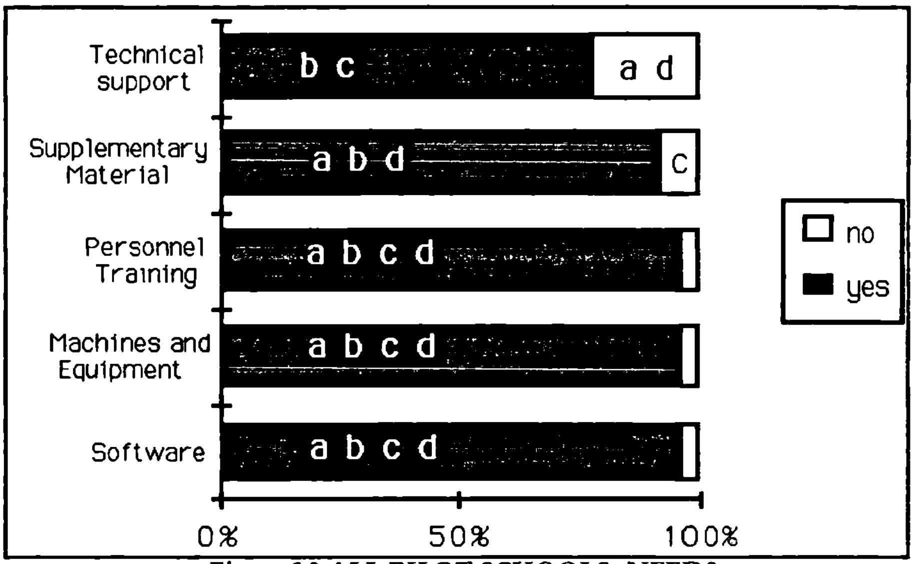


Figure 6.3 ALL PILOT SCHOOLS -NEEDS

Needs are usually indicated when there are associated problems. In the case of pilot schools, problems (Fig. 6.2) and needs (Fig. 6.3) seem interrelated as they address similar areas. However, they are not always consistent. For example although supplementary material appears mostly as "sometimes a problem" yet almost every pilot school feels the need for more.

6.1.6. Suggestions/Comments

Although some teachers offered suggestions while discussing their problems and needs, they also responded to the open question about possible suggestions or comments on the implementation process (Table 3.7). These suggestions were similar to the views of teachers about implementation, reported in section 5.2.2.3. This means that like other teachers, coordinators are particularly concerned about hardware, software, training, curriculum integration in terms of goals and time and other issues such as costs or planning.

Hardware was mentioned as one of the implementation problems but there were hardly any suggestions about this aspect. One coordinator expressed the urgent need for a special computer lab.

Six coordinators showed dissatisfaction about the quality of educational **software** since as one respondent stressed "software sent by the Ministry does not support active learning". One may infer that open market software was not found suitable for the Cyprus classrooms, so most statements reflected intense concern about the design and the production process. However, they offered different suggestions: "better for the Ministry to produce its own programmes and software, related to the goals and aims of the National Curriculum"; "software production should be assigned to private specialised companies based on specific standards drawn from the curriculum and the needs of students i.e. dyslexia".

Seven coordinators reflected on the **training** issue. An analysis of these statements shows concern about the frequency of training ("teachers should be trained on a regular systematic basis"), the scale (" ... for as many teachers as possible", " ...especially headmasters", "...the personnel of pilot schools"), the trainer ("...release time for the teacher coordinator to undertake this responsibility for educating colleagues", "...people who are directly related to information technology should be actively involved in the training process").

Curriculum integration was another area where suggestions were offered. There was confusion as to whether the computer should be used routinely in existing curriculum courses ("computers should be used as a tool or medium of teaching") or be treated in isolated sessions ("...there should be a regular time for computer teaching on a weekly basis so that computers can be used as a medium more effectively ", "computing should be a separate lesson"). There was certainly a trend favouring the addition of another curriculum subject area to the existing ones rather than integrating technology into instructional practice. This finding is consistent with the literature review of section 2.5.2 that suggests that both trends exist in various countries. I have also shown in section 5.2 that these trends exist within the group of pilot teachers in Cyprus as well, although, as I have previously explained, the official policy favours application of educational computing as a tool.

The issue of **personal time** was also brought up. Five coordinators commented on their lack of time with statements such as: "I feel the need to offer support to other colleagues to help them apply this innovation but I don't have the time", "...one needs time to explain some things even if these are just basic". As a solution they suggested time released from teaching for coordinators: "pilot schools should have a teacher coordinator with less teaching tasks". One coordinator commented on the **role of the teacher** as follows: "the greatest quality of the teacher who uses computers is his/her own belief in the necessity and usefulness of the machine".

The **innovation process** itself generated concern. Four coordinators were particularly positive about the process stating that: "I agree with the introduction of computers in elementary schools in Cyprus even if this is only happening at the experimental level", "this is just the initial stage of the innovation and even the problems should be regarded in positive ways". Organisation and planning of the process seemed to be an issue as well for four coordinators who expressed comments such as: "... experimental effort seems to be lacking coordination, without any defined aims and specific goals", "more planning and coordination is necessary between pilot schools and the administrators in high positions so that conclusions can be drawn and the innovation be improved".

For **possible institutionalisation** - through expansion of the innovation to other schools - two coordinators gave two contradictory statements: "...would be useful to expand the innovation in all schools", "expanding the innovation to other schools in the future seems to be unrealistic due to costs". The second coordinator concentrated on the sociological aspect of the equality of access as part of this expansion process, and expressed the view that "the fact that a class in a school of let's say 6th graders is using computers while the other one is not, may create a gap between children, teachers or even parents". A third coordinator believed that "the introduction of computers in schools should be happening in a faster pace, that is more equipment, more software". Therefore, coordinators are not aware of the scale of implementation for the future.

Funding and financing of the whole effort was another area of concern. Three coordinators said that : "... financing should be done to the schools rather than by the Ministry so that more equipment can be bought", "... more funds for more computers and software...". So, coordinators see problems of hardware and software and probably curriculum integration as a result of limited funds.

Summary

This survey has shown that in quantitative terms - the extent of technology integration into regular practices - implementation practices at school or subject level are limited. Nobody can doubt that technology is in the schools but pilot schools still seem to be at an early stage of development.

Many reasons could explain this phenomenon. Results indicate little disparity in availability of technology resources among Cyprus pilot schools: they all had limited quantities of hardware and software (sections 6.1.2; 6.1.3). Implementation is struggling with various problems encountered by the individuals involved. Needs, problems and suggestions address similar areas, which have also been highlighted in the case of educational broadcasting: hardware, software, training, curriculum integration, and supplementary material (sections 6.1.5; 6.1.6). Insufficiency in the quantity and quality of these make significant demands on personnel in terms of time and effort. These problems, reflecting practical conditions, were stated by coordinators as important reasons why computing integration is limited. For the innovation to be institutionalised, favourable conditions have to be provided to get more teachers involved.

As far as the qualitative aspect of integration is concerned, there is diversity of practices in the application of educational computing in pilot schools. Schools vary in the grades, the activities and the goals for which computing is applied (section 6.1.4). This signifies heterogeneity of curriculum integration practices.

This survey provided a useful overview of the pilot schools and showed limited integration of computing into classrooms, on one hand and development of diverse practices, on the other. However, I wanted to reveal the extent to which questionnaire responses reflected actual practice. I also needed to address my second and third sub-questions and examine the role of actors' views, attitudes and concerns on one hand and of practical conditions on the other in implementation of educational computing. To do this, as I mentioned in section 3.4 I focused on the four pilot schools, that were considered successful by the Ministry of Education. The results of this study are presented in the following section.

6.2. SELECTED PILOT SCHOOLS

This section is mainly divided into three sub-sections. In section 6.2.1, I provide the background to the four selected schools by describing their characteristics. In section 6.2.2, I analyse practices in these schools in terms of Fullan's implementation factors. Finally, in section 6.2.3, I summarise the outcomes.

6.2.1. Background: Characteristics of the schools

Here I aim to reflect on all kinds of data, that were collected so far, to form the profiles of the four selected pilot schools. This study has highlighted the importance of both actors' perceptions and local conditions as key factors in implementation in Chapter 4. Therefore, the characteristics of these schools in terms of actors' views, attitudes and concerns as well as the local context are outlined in order to indicate the ways in which these factors are likely to influence implementation practices. Of interest are possible patterns of similarities and differences that emerge within and across the four schools.

6.2.1.1. The actors' perceptions: views, attitudes and concerns

First, I tried to draw the profiles of these schools in terms of the personnel and their views, attitudes and concerns. Attention was given to the frequent users of the innovation at the school level to explore whether they shared similar characteristics. All coordinators were included in the group of frequent users. Questionnaire data were available for only some teachers in all of these four schools: 4/12 for a, 1/6 for b, 14/18 for c and 8/11 for d; the computer coordinators of the three schools; and the principal of one school. The rest of the personnel in these schools (including the coordinator of one school) failed to return the questionnaires.

Characteristics of the actors

		a n=4	b n=1	c n=14	d n=8
Age	*20-29*		1*	6	2
	30-39	1*		3*	3
	40-49	3		4	2
	50-59			1	1
Gender	*Man*	2*		5*	4
	Woman	2	1*	9	4
Position	*Principal*				1
	Assistant principal			2	
	Teacher	4*	1*	12*	6
	Other				1
Highest level of education	*CPA*	4*	1*	12*	5
	University (first degree)			2	3
Computer ownership	*Yes*	4*	1*	11*	4
	No			3	4
Frequency of use (home) (for computer owners)	*Often*	2*	1*	3*	2
	Sometimes	2		5	1
	Never			3	1
Frequency of use (school)	*Often*	2*	1*	2*	2
	Sometimes	1		5	5
	Never	1		4	1
Proficiency	*Very proficient*	1*			1
	Proficient		1*	1	2
	Somewhat proficient			7*	3
	Unskilled			4	2
Training background	*Yes*	1*		7*	5
	No	3	1*	6	3

Note: The sign (*) means that the coordinator is included in the number of personnel indicated. The numbers reflect the number of individuals in each school with the specific characteristic.

Table 6.7 SELECTED SCHOOLS - CHARACTERISTICS OF THE PERSONNEL

In general, across the four schools there were no significant differences in terms of demographic or computer background characteristics of the personnel.

Within schools respondents varied in such characteristics (Table 6.7). Most of them were graduates of the Cyprus Pedagogical Academy (CPA) and computer owners. Almost half of the teachers had been trained through various channels. Most considered themselves as "somewhat proficient" or "unskilled". Frequency of computer use at home and at school ranged to a great extent.

Two of the computer coordinators (a, c) were male, 30-39 and the other one (b) was female, 20-29. Coordinators were all Cyprus Pedagogical Academy (CPA) graduates. Although they were all computer owners and frequent users at home and at school, they differed significantly in their training background: one (a) had a specialised college degree in computing (programming) and considered himself as "very proficient"; another (b) had no training background at all and thought of herself as "proficient"; one more (c) had attended seminars at the PI and indicated that he was "somewhat proficient".

The principal of school d was 50-59, a computer owner and a frequent user at home and at school. Although he lacked training background, he considered himself as "very proficient".

I also investigated the characteristics of frequent computer users at school. Chi square analyses indicated no significant impact of variables on individuals' frequency of computer use at school. So, every individual regardless of age, position, gender, education, training, computer ownership or proficiency was equally likely to use computers in the classroom.

Views on implementation aspects

There were no significant differences across the four schools in terms of the views of the personnel on computer introduction. Within all schools respondents showed support for the innovation but had different views on implementation aspects such as ideal number of computers or way of introduction (Table 6.8). This finding was consistent with the data on all pilot schools of section 5.2.1.

Most teachers in these four schools wanted computer introduction from elementary school, considering "some computers per classroom" as the ideal number. Some supported computing as a different curriculum area; some as a topic within existing subjects; others as a medium of instruction. Some wanted computing for all subjects; others only for selected curriculum areas. So, the two trends of computing as a "subject" and as a "tool" reported in section 5.2 emerged again.

		a n=4	b n=1	c n=14	d n=8
When do you think children should become familiar with computers?	*Elementary education*	4*	1*	12*	8
	Secondary education			2	
How many computers do you think each school should have?	*None*			1	
	One per classroom			6	2
	Some per classroom	4*	1*	7*	6
Which do you think is the best way of introducing computers?	*As a separate subject*	3		2	
	As a topic within existing subjects			2	3
	As a medium for instruction	1*	1*	8*	2
For which subjects do you think computers could be used?	*All subjects*	3		12*	3
	Some subjects	1*	1*	2	5
Do you believe that computers could be introduced in elementary schools of Cyprus?	*Yes*	4*	1*	13*	8
	No			1	
Are you aware of the fact that computers have been introduced?	*Yes*	4*	1*	11*	8
	No			3	

Note: The sign (*) means that the coordinator is included in the number of personnel indicated.

Table 6.8 SELECTED SCHOOLS - VIEWS OF THE PERSONNEL

Coordinators had similar views on computer introduction: they believed that computers should be introduced from elementary education, "some per classroom" and as a medium for instruction. One (c) wanted computing for all subjects while the rest preferred application for some subjects only. Therefore, these individuals seemed to either express their belief in the computer as a "tool" or adopt the Ministerial guidelines that favoured this trend. The principal of school d believed that computers ("some per classroom") should be introduced from elementary school and be taught either as a separate curriculum subject or as a topic within existing ones, favouring both trends.

Views were not significantly related to the frequency of use at school - the quantitative aspect of success- as chi square analyses indicated. Respondents were equally likely to use computers in their classrooms regardless of their views. However, these views were likely to influence the content of practices, that is the qualitative aspect of computer integration.

Attitudes towards educational computing

As far as attitudes of actors involved are concerned, no significant differences were indicated on all three factors across the four selected schools. As Table 6.9 shows, attitudes were mostly reported as positive in all schools.

In section 5.3.2.2 the "personal" dimension of attitudes was found related to frequency of use at school at $p<0.05$. For the case of these four schools, none of the attitude factors, that is the "personal", the "professional" and the "general" was related to frequency of use at school. However, on the eighteen items of the computer attitude scale, the dominating trend indicated a relationship between attitudes and frequency of use: individuals who were frequent users tended to have more positive professional and general attitudes and lower personal anxieties (Table 6.10). Therefore, attitudes are likely to relate to the quantitative aspect of success, that is the extent of teacher involvement.

STATEMENTS	Means a n=4	Means b n=1	Means c n=14	Means d n=8
I value teaching with technology	4 5	5	3 9	4 2
I think quality instruction using technology will only enhance my teaching	4.5	5	3 7	4 1
I like to teach with computer technology.	4.5	5	3 7	4 0
I feel confident that I can learn how to use a computer.	4.2	5	4 3	3 7
I think students are more motivated when they can learn using computer technology	4 0	5	4 1	4.1
When utilising computer, the teacher becomes guide/facilitator	3 5	5	3 4	3.6
When utilising computers, the teacher is able to further individualise instruction.	4 2	4	3.8	3.5
I think that using instruction via computer technology will help improve students' performance	3.2	5	4	3.7
I enjoy reading about computers.	3.2	5	2 9	3.6
I think teachers compete with slick packages and high tech machines.	2.5	2	2 5	2.5
I think computers are dehumanising	1.7	2	2 6	2
I fear that computers may take over some parts of a job that I enjoy.	1.7	2	2.3	2.4
I think instruction by computer technology is just another fad.	1.7	3	2 0	1 5
I feel intimidated by people who know something about computers.	2.2	3	2.1	2
I feel afraid that I might break or damage a computer	1 7	1	1 8	1 9
When utilising computers, the teachers' role is diminished	1.5	2	2 1	1 5
I feel afraid to touch a computer	1 5	1	1 9	1.7
I feel tense when people talk about computers.	1.5	1	1 9	1 9

Scale: *1* *strongly disagree* *2* *disagree* *3* *neutral* *4* *agree* *5* *strongly agree*

Table 6.9 SELECTED SCHOOLS - ATTITUDES OF THE PERSONNEL

Concerns about educational computing

There were no significant differences in the personnel highest concerns, across the four schools (Table 6.11). Most people in these four schools peaked on "self" concerns such as awareness, informational and personal while just a few had intense "task" concerns such as management or "impact" concerns such as collaboration.

STATEMENTS	Means often	Means sometimes	Means never
I value teaching with technology	4 6	4 4	3.8
I think quality instruction using technology will only enhance my teaching	4.6	4.3	3.2
I like to teach with computer technology.	4 4	4.3	3 2
I feel confident that I can learn how to use a computer.	4 7	4 4	3 8
I think students are more motivated when they can learn using computer technology	4.3	4.2	3.8
When utilising computer, the teacher becomes guide/facilitator	4 3	3.8	3.0
When utilising computers, the teacher is able to further individualise instruction.	4.1	3.8	3.5
I think that using instruction via computer technology will help improve students' performance	4 0	3.7	3.8
I enjoy reading about computers.	3 7	3.4	2.7
I think teachers compete with slick packages and high tech machines.	2.5	2.6	2.8
I think computers are dehumanising	2.1	1 8	2 8
I fear that computers may take over some parts of a job that I enjoy.	1.7	2.3	2.5
I think instruction by computer technology is just another fad.	1.4	1.8	2.3
I feel intimidated by people who know something about computers.	1.9	2.3	2.3
I feel afraid that I might break or damage a computer	1.3	1.7	2.5
When utilising computers, the teachers' role is diminished	1.6	1.5	2.3
I feel afraid to touch a computer	1.3	1.6	2.5
I feel tense when people talk about computers.	1.4	1.4	2.8
Scale: 1 strongly disagree 2 disagree 3 neutral 4 agree 5 strongly agree			

Table 6.10 SELECTED SCHOOLS - ATTITUDES OF THE PERSONNEL AND FREQUENCY OF USE

	a n=4	b n=1	c n=14	d n=8
Stage 0 -Awareness	2		8	5
Stage 1- Informational	1		3	1
Stage 2- Personal			2	1
Stage 3- Management			1*	
Stage 4- Consequences				
Stage 5- Collaboration	1*	1*	1	2
Stage 6 -Refocusing				

Table 6. 11 SELECTED SCHOOLS - HIGHEST STAGES OF CONCERN

The average profile for the stages of concern is outlined in Fig. 6.4. Possible differences could be attributed to the sample size in each school; there was information on only one respondent in school b. Except from school b, the profiles of the rest of the schools were "non-user" profiles. This finding was consistent with data in section 5.4.1.2 that indicated the average pilot school teacher as a non-user. However, we should keep in mind that as with all schools, as I mentioned in section 5.4.1.1, within these four schools there was a range of peak concerns among teachers.

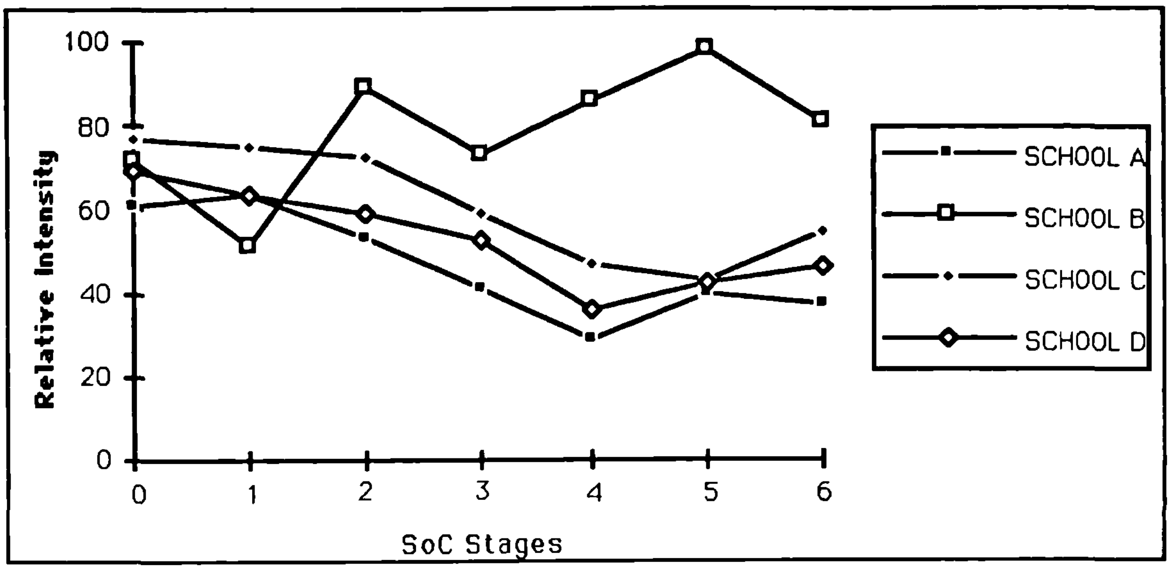


Figure 6.4 SELECTED SCHOOLS -STAGES OF CONCERN

	often n=7	sometimes n=11	never n=6
Stage 0 -Awareness	1	8	4
Stage 1- Informational	1	2	1
Stage 2- Personal		1	1
Stage 3- Management	1		
Stage 4- Consequences			
Stage 5- Collaboration	4	1	
Stage 6 -Refocusing			

Table 6. 12 SELECTED SCHOOLS - HIGHEST STAGES OF CONCERN AND FREQUENCY OF USE

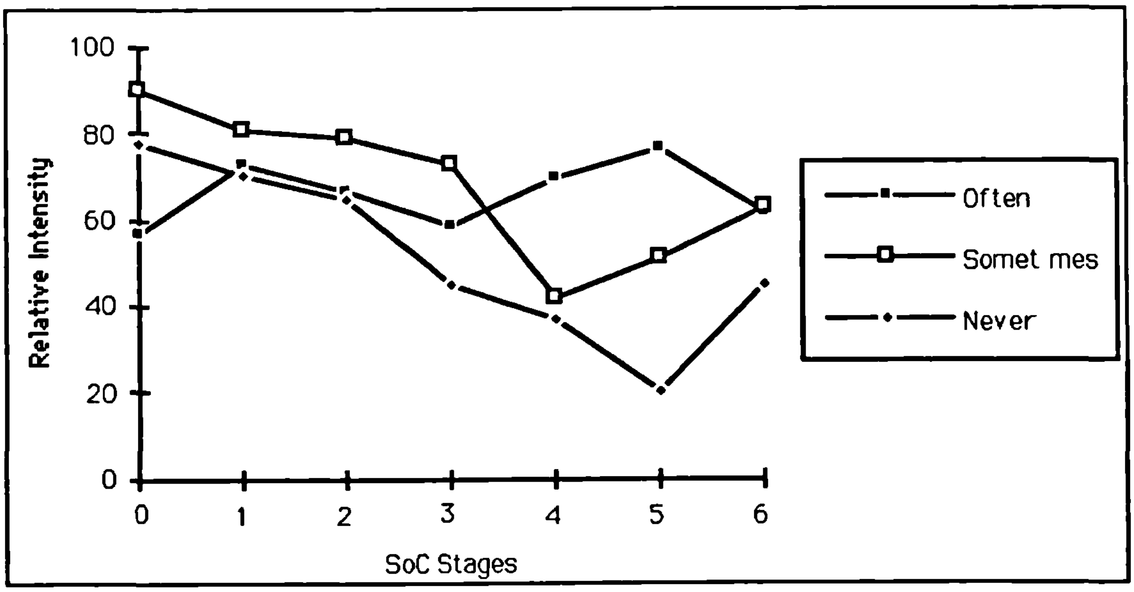


Figure 6.5 SELECTED SCHOOLS -FREQUENCY OF USE AND STAGES OF CONCERN

Research on concerns, reported in section 5.4.1.3, had indicated that awareness, collaboration and refocusing were significantly related to frequency of use. The higher the involvement, the lower the "self" and the higher the "impact" concerns. Data of the four schools combined supported these trends but not at a level of significance (Table 6.12; Fig. 6.5). All coordinators had stages of concern peaking on collaboration and management, as would probably be expected from frequent users. The principal of school d had very high stages of concern peaking on collaboration. So, concerns seem related to the frequency of use, reflecting the quantitative dimension.

To sum up, it seems that the four selected schools did not differ among them in terms of personnel characteristics, views, attitudes and concerns about the innovation. However, within the schools findings support the results of the previous chapter, that people differed: first in their demographics and computer expertise (section 5.1); second, in their views about computing implementation (section 5.2); third, in their attitudes towards computers (section 5.3); and finally, in their concerns about the innovation (section 5.4). Of interest is the fact that respondents that tended to be involved with the innovation, that is frequent users were likely to: have lower personal anxieties and more positive professional/educational and general attitudes; lower self concerns and higher impact concerns. So, attitudes and concerns seem to be related to the extent of computer integration (the quantitative aspect) while views seem to be related to the content of computer integration (the qualitative aspect). Implementation and policy should focus on these issues, as I explain in Chapter 7.

6.2.1.2. The conditions

Having provided information about the actors, I now shift the attention to the context in which these individuals function, that is the school conditions. As I explained in section 3.4.1 schools differed in the phase of computer introduction: Phase A/1993-94 (schools a, d), Phase B/1994-95 (schools c, d); size: large (school c), medium (schools a, d), small (school b); setting: urban (schools a, b), suburban (schools c, d).

Comparisons either between the selected schools and the survey schools or across the four selected schools give interesting results. First, the selected schools that were considered as successful by the Ministry were among those with the most equipment (Table 6.2). There was no significant variation in the hardware provision among the four schools; all had a number of computers ranging from four (c) to seven (b), printers ranging from one (d) to two (a, b, c) and CD Rom ranging from one (a, d) to two (b, c). However, selected schools differed over the location of the equipment; two schools had computer labs (a, d) while the others (b, c) located the computers in the classrooms (Table 6.3); one school (d) had a computer in the principal's office for administrative purposes. Two schools (a, c) indicated that equipment could be moved on trolleys. Second, all four schools had a variety of similar software, mostly provided by the Ministry of Education such as KidPix, MathBlaster, Geography of Greece (Table

6.4). Finally, the schools selected indicated similar problems (Fig. 6.2) and needs (Fig. 6.3) in hardware, software, supplementary material, teacher training and support.

Therefore, in terms of conditions, the schools selected were not different than the rest of the pilot schools. Within schools, there were slight variations in aspects such as location of equipment. These practical conditions are likely to influence both the extent of computer integration (quantitative aspect) and the content of classroom practices, related to computers (qualitative aspect).

6.2.2. The implementation practices: Factors for consideration

Considering the actors and the conditions, one could make some predictions about the quantitative aspect of success, that is "to what extent computing is used in school practices". Across pilot schools, we would normally expect schools to be equally "successful" in implementing the innovation since, from what we have already seen, they do not differ to a great extent in terms of the views, attitudes and concerns of their personnel and the practical conditions. However, within schools, individuals vary in their views, attitudes and concerns. Attitudes and concerns along with practical conditions seem related to the frequency of computer use. In such terms, some individuals are more "involved" than others.

Now, in terms of the qualitative aspect of implementation, that is "what is implemented", the source of information that is available is the survey statistics of section 6.1. These data indicated variation of actual patterns of use across schools (Table 6.5; 6.6), as I will further discuss in section 6.2.3.2. Therefore, we could predict that the quality of practices is a result of individual initiatives, impacted by the views that teachers hold about implementation and the practical conditions in the school.

In answering the second and third sub-questions, I aimed to explore the role of factors such as actors' views, attitudes and concerns on one hand and practical conditions on the other in implementation practices. So far, I have shown that both factors can be related to the quantitative and qualitative aspect of success as they influence the extent and the context of computer integration. Individuals with low personal anxieties and high impact concerns are likely to get involved with the innovation (quantitative aspect) in different ways (qualitative aspect) according to their views; conditions such as hardware or software are likely to influence the level of integration (quantitative aspect) in different ways (qualitative aspect). However, it became important to examine the ways in which such factors could affect implementation practice.

So, I visited the four selected schools and I conducted interviews with the personnel with the intention to bring more light into the practices carried out, as I explain in section 3.4.2. Fullan's "implementation perspective" (Table 2.1) was applied to facilitate analysis and interpretation and reveal similarities and differences across the four schools, as I mention in section 3.4.3. The first three factors (clarity/complexity, consensus/conflict about change and quality/practicality of change) clearly reflect actors' beliefs about the innovation. The rest of the factors (central office direction, commitment, support; process of implementation; professional development/assistance; implementation monitoring/problem solving; principal's leadership; community support; environmental stability) refer to the implementation conditions. Each of these ten factors is examined separately in the following sections.

6.2.2.1. Clarity and Complexity

Clarity

Clarity is defined by Fullan (1992) as follows:

> Implementers should have a clear understanding of what to do. Policies, written guides, in-service programmes can help clarify the meaning of change for those involved in the process. However, true understanding comes only when teachers are given opportunities and time to work with the innovation in the classroom and to talk about what they are doing with others. (Fullan, 1992, p. 31)

In the case of introducing computing into elementary schools in Cyprus, Ministry attention for clarity focused mainly on the organisation of several meetings between teacher coordinators of pilot schools on a systematic basis so as to share thoughts, problems and ideas. Certain material, hardware and software was distributed to schools followed by some general policy statements. One coordinator mentioned that:

> Some basic concepts had been written down i.e. to know what the space does, what the enter command does. However, there were no specialised goals such as "To use geography with a database".

At the time of the study, coordinators reported that the specifications of the experimental program were not outlined but they expected more material to be sent in the near future. They suggested that the Ministry has followed a general open-ended approach, allowing the innovation to grow from "bottom up", and observing the experimental settings to see what might happen.

Findings indicate that teachers actively involved lack clear understanding about implementation goals and ways to pursue them. Some Ministry documents have been forwarded to schools and people have been occasionally approached by the district coordinator to use computers as tools. However, teachers are not sure whether the computer should be used as a medium or as an object for instruction. Children's responses about the reasons for computer introduction also indicate diversity. The coordinators concentrate more on developing children's basic computer skills, which they consider as a prerequisite to using the computer as a medium. For example, coordinators explain that:

> I supported it then and I support it now that the computer is a wonderful medium but first the student should come to know it as an object of instruction before it becomes a medium.
>
> I taught some skills to the children (how to turn the computers on or click to get to accessories and double click to get to the word processor) before using the computer as a medium.

The lack of release time complicates the situation as teachers spend free time for preparation (school breaks, after school). They perceive any progress on clarity as a result of their own involvement with the program. As coordinators point out:

> Through my experience from the first year, I started clarifying by myself the process I should apply at least related to the general skills ... The Ministry's whole idea is that "We give you two computers, we give you five goals. OK, do the work"... something like problem solving, it is up to you.
>
> ...I had questions, I was confused as to how to proceed, what to do in my classroom first thing in the morning, how to arrange everything. Now this is our 3rd year in the project but... I find myself on another level. Let's just say, I know better what the Ministry expects from me...

Although one coordinator considers absence of strict directions as positive, on the whole this approach has created some frustration as actors (teachers, principals) are confused about their roles. The coordinators have come to speculate about their possible responsibilities: helping colleagues, filling in Ministry evaluation forms, preparing timetables for use of the computing facilities or solving technical problems. The following statements are indicative of this:

> My personal opinion is that everybody can do whatever ... I have the impression that what concerns the superiors is to present that work is getting done and nothing else.
>
> I believe that my colleagues do not have clear mental notions of what to do. Computing is not like Maths because it is not a school subject, there are no daily lesson plans and to be honest I don't have many ideas for its use.

Although all principals show supportive action, they have different perceptions of Ministry expectations; this could indicate that no instructions have been outlined by administrators concerning their role. For example they say that:

> Well, I don't know what I could do apart from watching and checking that the children get in the lab, that lesson activities are carried out, that the lab door is closed. Nothing beyond that...

I think that the Ministry expects us to share the effort for computer introduction... they have high expectations from us, but they must have been convinced by now that we are older, conservative and busy.

As I have mentioned in the introduction, the system in Cyprus is encyclopaedic, focusing on subjects, rather than methods. It is difficult for an innovation like educational computing to be developed as a tool as the Ministry expects, since the existing structures do not support it: there are no specific, outlined goals, no specific time for the innovation within the school curriculum, no software to achieve the goals set. Therefore, teachers lack clarity as to whether to treat computers as a subject or as a tool, a debate also reflected in people's views as we have seen in Chapter 5.

Complexity

Complexity is defined by Fullan (1992) as an issue related to the components of practice affected, the degree of difference from existing materials and beliefs and the difficulty of learning to make the necessary changes. Sometimes it is focused on organisational aspects of introducing computers in the classrooms and distributing software. However, it also involves aspects of the teaching practice such as activities, classroom organisation and teacher beliefs about the nature of learning. The complexity problem as experienced by teachers involved is important. Computer implementation is often a difficult practice since management and use reflect problems on a continuous base.

As data indicate, complexity is a dimension overlooked. The Ministry is aware of the problems that schools have in their effort to incorporate the new technology into the existing teaching procedures but can not solve them. The individuals involved refer extensively to issues such as the lack of curriculum time for computing or release time for teachers, large numbers of children per classroom, lack of special computer labs, minimal personnel interest for involvement and shortage of suitable software. Except from the organisational problems, implementation problems arise as well since use of computers involves transferring children to the classroom where they are located, tolerating higher levels of noise, dealing with technical problems and finding ways to incorporate this technology into the curriculum. For example, several respondents report:

I wanted to use computers on a weekly basis for Maths or Art. However, children would take lots of time to change classrooms and sit down. I wish that instead of one classroom with all the computers, we had 3 machines in each one so that access is more convenient. (teacher)

Once, one of the machines did not work, the other time another one ... I see their (children's) disappointment ... because they are really anxious to get to the

> **computers, and they have to wait for their turn when there are less machines in working condition. (teacher)**
>
> **We can't come around and say: We use one teaching period of this subject and computers get in the school curriculum under "Design and Technology"... Computers have to be introduced as a separate subject, time should be given to the teachers involved, not just for teaching but for preparation. (coordinator)**

This complexity results from the fact that the innovation is imported from abroad so that Cyprus will not fall behind. However, Cyprus still has a lot of problems related to the infrastructure of schools or the pressure of a demanding school curriculum that can not be effectively faced in a short period of time. Once again, complexity is related to the fact that computers are not a new subject, but a tool.

6.2.2.2. Consensus and conflict about the change

According to Fullan (1992), the possibilities for successful application of an innovation maximise when all implementers agree on the need, the appropriateness and the priority for a change effort. Teacher acceptance and commitment along with the consensus of administrators and parents are vital.

The Ministry often assumes that most teachers are enthusiastic or committed computer users. However, there is lack of understanding at the Ministry level of the degree to which teachers and students agree with the introduction of computers.

The data collected reveal support for computer introduction. This should be interpreted with care because, as Fullan (1992) states, consensus to the extent it currently exists, can be only superficially meaningful in the absence of experiences with concrete, high-quality usage. It seems that in these four schools coordinators are quite knowledgeable - some more while others less - and hold positive attitudes about computing on the personal level. Moreover, they seem theoretically convinced of the educational value of technology. However, although they are all engaged in practices, because of the several problems they face, they have their doubts about the institutionalisation of this innovation.

The principals, on the other hand, with the exception of one, lack experiences in computing and have concerns about technology on the personal level. This does not stop them from being supportive; they suggest that they try to do their best, within the framework of their perceived role. The teaching personnel of the schools seems to hold positive attitudes about computing theoretically. However, when it comes to practice, with the exception of a few, most of them hesitate to use computing. This might be happening because of lack of faith in the educational value of this new technology or lack of the infrastructure (time, curriculum, clear goals, software) to support such an application. Children seem knowledgeable and excited about the innovation but those not involved complain a lot. Some children of an involved classroom comment about others:

> They (the other children, not involved) tell us they want to play too but we tell them that we mostly write and we play only when we have our teacher's permission. They think we can do anything on computers just because they are located in our classrooms.

The inspectors seem to hold a neutral stand on the issue and are trying to keep some distance by avoiding to express any comments since they lack clear instructions about their role in this project. As one coordinator suggests:

> ... Right now, they (the inspectors) can not evaluate because nobody knows what they expect. That means that the child draws a simple circle on the computer and the inspector says "Well done...!!!" Is that what should be happening?

The Curriculum Development Unit (CDU) provides support on a systematic base through the district coordinator who visits the pilot schools but is unable to solve the various problems arising, mentioned in section 6.2.2.1. The Parental Associations and the local community, on the other hand, seem very supportive and provide funds for the purchase of equipment but they demand involvement of all children with the innovation (equal access to machines). Generally, one could suggest that in the schools studied, there is a certain degree of collaboration between the teacher coordinators and the CDU either directly or through the school principal, between the Parental Associations and the principals and between the teacher coordinators and the principals. However, there isn't much interaction between teachers.

6.2.2.3. Quality and practicality of change

Quality refers to whether the innovations result in improved student outcomes. The chances for success increase when benefits for the students are apparent to teachers. Practicality, on the other hand, is a matter of how "practical" the innovation is to the implementors. Practical innovations are those which relate to teacher and student needs, fit well with the teacher's situation and depend on the trade-off between personal costs (time, effort) and actual benefits of getting involved.

Both quality and practicality sometimes relate to the continuing variability and incompatibility of existing hardware and software and technical problems which may arise from time to time. Moreover, major constraints can be imposed by local curriculum structure and norms. It is highly likely that using computers increases teachers' workload in the long run, as they try to solve management, instructional and student monitoring problems (Fullan, 1992).

In this case, the Ministry does not try to establish certainty about learning outcomes of computing in any possible way. The teachers are yet to be convinced of the value of this new technology for their students and their everyday classroom practice. For example, one coordinator says:

> Maybe they have seen the power of the computer, but they are not convinced that it helps much in education. Maybe they sound positive but ... only in theory.

Coordinators who have faith in educational technology believe in it for different reasons: they think it promotes collaboration and competitiveness among student groups, helps individualised instruction, initiates children in a problem solving situation by providing information, stimulates student's interest and motivates. Two coordinators expressed the following views:

> Look, the only thing that excited me was my Geography Lessons through databases because they provide all data and make the student think about some problems. Why the computer and not an encyclopaedia? ... because I would need 50 encyclopaedias and ... produce the graph by myself. I totally disagree with those who use the computer to make drawings or run KidPix. Can't I draw on a piece of paper?... Now if I write text and then edit ...it is OK... there is the potential to do something useful. However it is with a database that you realise the real power of the computers.

> I have seen children - that would never say anything during group work - sit and write or express their opinion or draw something. I have seen children, whose handwriting is really messy, work on an assignment for the bulletin board. I have seen children dragging their mothers to the classroom to show them their printouts. I believe that my students have become self confident and they feel nice using a computer. In Maths, children with learning difficulties have worked on the computer on an individual basis and practised (20 minutes per day each). These children have been helped to a great extent.

However, although these people are certain of the quality of this change, they struggle with practicality issues on a trial and error basis during implementation. They have to teach technical basic skills to be able to proceed to more creative ways of using technology. Finally, the principals believe in the usefulness of new technologies because they perceive them as a necessity. They seem to lack strong positive attitudes about the educational impact of IT.

6.2.2.4. Central office direction, commitment and support

Central office direction and commitment are critical for the success of any innovation. Implementation is dependent on consistent communication with the administrators. Administrative pressure must be accompanied by assistance, that is adequate resources, training, release time and materials. The seriousness of the administrative intent is more obvious when teachers see real efforts taking place to help solve problems as they arise. Also those teachers who successfully apply the innovation need some form of acknowledgment or reward.

In Cyprus there is evidence indicating that encouragement and recognition are apparent. General support focuses on the provision of hardware and software without specific policy directions to guide utilisation. It is interesting to note here that the commitment of the central office is perceived as something different from the dedication of Ministry representatives such as the district coordinator or the CDU personnel. Therefore, there is a differentiation in the way implementers perceive administrators on one hand and representatives in direct contact with them on the other. The Ministry is treated as something "distant" and reference to it is accompanied by complaints. The schools do not like the administrators' attitude towards their problems and complain about the lack of planning. For example, one coordinator says that:

> The reason that this experimental application has taken place has nothing to do with the desire for progress in our schools. After observing some countries that already use computers, we want to be able to claim that we don't look like a third world country.

However, they show sympathy to the people visiting their school occasionally who undertake to pass on their problems to the management. They believe that messages are definitely transferred higher but that the ones at the top are incapable of giving satisfactory solutions.

6.2.2.5. Process of implementation and institutionalisation

It is important to have a clear organisational model and set of procedures for achieving establishment of change. Good implementation requires good planning. This means determining strategies for such things as acquiring and distributing materials, communicating role expectations, providing initial and follow up training, consultative assistance, monitoring and problem solving. Good planning is dependent upon active input and participation of users, managers and facilitators since they are the best in identifying problems and contributing towards effective solutions. Planning is the responsibility of administrators.

The main focus of planning is on the distribution and acquisition of software and hardware. Importance is also placed on establishing continuous interaction among innovation users during implementation. Such encounters can provide an opportunity for sharing and joint problem-solving. However, the dominant feeling of people in school settings is that of uncertainty and abandonment. Schools happened to be selected as pilot just because one or two teachers showed some interest in getting involved. From that point on, schools are practically left on their own with some superficial level of "supervision" to come up with ways for the best possible implementation. For example, one school principal said that:

> ....basically they gave us some general instructions when we received the computers. They only sent us some new software, some new information but there has been no systematic control or planning as to what each educator should be doing in the classroom. It is up to his/her judgement and decision making. It is just an issue of the teacher's personal initiative and input instead of the Ministry's specific plan of action.

Involvement with computing takes place during different school subjects with diversified non systematic aims, with different grades in various ways. As the Ministry's policy was open-ended, various patterns of use should be expected. The question though remains "What is the next stage? How can institutionalisation take place if implementation takes a variety of faces and it is not evaluated at all?"

6.2.2.6. Professional development and assistance

For teachers who have overcome their initial attitudinal and mechanical barriers, the main focus of professional development should be on how to integrate computers and software into their regular curriculum and classroom activity.

In the pilot schools examined, coordinators differ in their computer expertise (section 6.2.1.1). However, this variance does not seem to reflect in practices. The coordinator that considers himself as "most proficient" does not indicate more frequent use of computing in the classroom compared to the one that considers himself as "somewhat proficient". This point could be really important. Training and professional development are critical issues but maybe they are not the main obstacle in computing implementation. Some teachers suggest that even if training is provided on a systematic basis, their involvement will not increase as they are pressurised by the curriculum, the large numbers of students and the lack of clear understanding on how to proceed. It is also suggested that although personnel indicate positive attitudes towards computing, in practice they are not willing to change their teaching methods in any way. This kind of reaction is perceived as very natural by principals and coordinators who defend their teachers' lack of active participation in the program. For example, a principal says:

> Hesitation comes from teachers who don't have the knowledge background and decreases as we move to teachers that know more; They want time, more software and some specialised seminars so that they can feel confident that they are doing the right thing.

There are certain suggestions as to the form of training to increase efficiency. People are against "laissez faire" approaches, implemented so far, and want mandatory training, enforced by the Ministry in a more "coercive" way. For example, a coordinator points that:

The fact that my school is pilot should mean that all 30 teachers should come a week early from their summer vacation ... They should be told that it is no longer up to them but that they should get trained in the software which is to be used within the year.

6.2.2.7. Implementation monitoring and problem solving

It is important to establish effective ways of getting information about progress and problems from users to the administrators. There is a need for research to document working models of implementation, including mechanisms to monitor information about user concerns at the school system.

In this case, the Ministry has used three basic ways to promote implementation. The first is through the district coordinator and the CDU personnel who visited schools occasionally on a systematic basis to provide help. The second is through meetings of the coordinators of all district pilot schools as a strategy to get the right people talking together about application issues on a regular basis. Finally, the third way is through evaluation reports or questionnaires that are forwarded from the schools to the centre towards the end of each school year.

However, despite these strategies, the Ministry is perceived as unable to handle problems and give satisfactory solutions. The scenario reveals lack of high level research-based knowledge for implementation monitoring and management. The following statement of a coordinator is indicative of this trend:

All they ask us to do is write an annual report ie. our plans of what we want to do, or what we have done. Personally I doubt whether some things mentioned really happen. That is quite wrong because if you don't send the right messages, it is really hard to change things.

6.2.2.8. Principal's leadership

The principals' support is a critical factor in the implementation process (Fullan, 1992). The principals do not necessarily have to be experienced in the use of the innovation at the personal level. Research shows that sometimes principals depend on assistance from a "second change agent" (key teacher). However, they need to be "knowledgeable" about the innovation goals and uses so as to understand the needs and problems that teachers experience.

In Cyprus, the newness of computing and the suddenness of its arrival into schools caught many principals unprepared. In the four schools examined, with the exception of one, none of the principals had prior experience and they all differed in their levels of commitment to the innovation. One coordinator says:

Changes have been made to the worse since the principal changed last year. Look I believe that whether you succeed or not, you are highly dependent on the principal. If the principal believes that the computer has to be introduced and

> motivates you and asks what is going on and how you do it, he/she is a great help. However, if you have a principal who has to allocate 10 extra hours per week and gives them as support to teachers who deal with children with special needs, if the principal tells you that it is OK to deal with computers but not to a great extent, then you don't make any progress.

However, all principals accept that computers are a necessity for our modern society. Although some of them were actively involved in making their school part of the experimental programme, principals seem to have a rather "passive" role in this effort at this time. They are observers of what their teachers try to do in their classrooms and they try to respond positively to their requests. One coordinator points out:

> He helps whenever necessary....whatever I need to buy anything he never says no. He tries to help me work as best as possible, with as many children as possible so that use of the program is expanded.

Principals maintain friendly interaction with the CDU and consult with their coordinators about issues related to the project. They recognise their teachers' efforts, are proud of those involved and understand those who are not. They seem to be pressurised by parents who, in some cases, make their complains and demands very explicit although principals try to be protective of their personnel.

6.2.2.9. Community support

When communities take an active interest in the adoption of particular innovations, their support is a major factor in local commitment (Fullan, 1992). Therefore, if parents actively support a change, principals are likely to make it a priority and apply pressure to commit resources; teachers are more likely to try.

Data indicate widespread parental acceptance and encouragement of educational computing in elementary schools often indicated by participation in funding. Parents buy computers for their children, send them to private institutes in the afternoons and attend adult computer education classes. However, the community is not actively involved in the implementation process. As one coordinator says:

> I think that if the Parental Association was encouraged from the administrators it would offer more help. In some cases, they aren't supportive because we don't have the power to tell them "We want this thing because it is expected of us from our superiors".

Parents are not informed about the goals of the experimental program. All they know is that their children's school is pilot and they demand that all children have access to the computers. Parents lack awareness of the various problems regarding the practicality of the innovation. For example, one principal says:

> There is support but each parent has a rather personal view on the whole issue. They don't care about the school in general and whether their children will pass through some phase of this experimental program, in particular. They give their money and help in whatever is necessary within limits but they make their little revolution about children who do not use computers. And this brings extra problems and tension.

It is probably the case that parents are committed to helping their children "learn about computers" but it is not clear whether they understand what it means to "learn with computers". Therefore, there is a need to clarify the goals of the experimental programme and get the parents involved.

6.2.2.10. Environmental stability

According to Fullan (1990) the outcome of implementation is subject to the influence of changes in the general organisational and social context. Frequent or unexpected changes in administration or project leadership can have an enormous effect on the continuity of an effort. Usually, career advancement of key personnel is common and there is a great deal of routine changing of principals and staff. In the macro environment reasons for instability may be: instability of the technology market-place; uncertainty of continued funding; and staffing changes.

In this case, unpredictability seems to surround the technology brought into schools: machines and software need to be upgraded, as one coordinator says:

> From 1985 to 1997 dramatic geographical changes have taken place and this is a problem. The software still refers to Yugoslavia or the Soviet Union. What good is it to expose the children to this information? And there are mistakes on everything from their national anthems to their flags.

Since teachers can be transferred from one school to another every year, there is no guarantee that the coordinators or others actively involved in this project will remain in pilot schools. There is an element of uncertainty about what happens in case key staff personnel are moved since this effort is based to a great extend on personal initiative. Whether administrators like it or not, there seems to be a *certain level of dependency on individuals. Some people tend to have the* suspicion that the Ministry will ensure that somebody else undertakes the responsibility for the experimental programme. This uncertainty refers not only to teachers but also to principals and committees who make the decisions. For example, one coordinator says that:

> The program will be an "orphan". It is clearly personal and the Ministry can not exert any pressure on me in case I want to be transferred to another school next year. Maybe it will bring someone experienced...

6.2.3. The impact of factors on aspects of success

Now, I proceed to an overview of practices, highlighting aspects of success both quantitatively and qualitatively. Conclusions about existing implementation practices could be drawn at two different levels: across schools, and within schools. Success, as defined in Chapter 2, is indicated not by resources but by the extent (quantitative dimension) and patterns (qualitative dimension) of educational computing within the classroom.

6.2.3.1. Quantitative aspect: Extent of computing integration in regular practices.

First, across schools, as I have mentioned at the beginning of section 6.2.2, none of the schools is considered as "more successful" than others. The actual extent of use is similar: in all schools only one or two individuals are involved; even phase A schools that had computers earlier have not progressed in increasing computer use, compared to phase B settings. Overall, the extent of computer usage is quite low, although these four schools were considered by the Ministry of Education as successful compared to others.

Such homogeneity in the extent of practices and therefore "success" could be attributed to the fact that across schools, implementation factors do not vary significantly. On one hand, actors and their views, attitudes and concerns towards the innovation follow a similar pattern across all schools. On the other hand, the conditions such as hardware, software, problems and needs are not dramatically different.

As the analysis in section 6.2.2 has shown, Fullan's factors such as the characteristics of innovation and local conditions appear to follow similar patterns across all schools. There is a range in acceptance of innovation characteristics: some individuals are convinced of the quality of the innovation; others have their doubts about practicality; some have clarified goals; others seem frustrated because of the complexity of organisational structures. Central office direction appears loose, without pressure or fixed expectations; the district coordinator is perceived with feelings of sympathy while the Ministry administrators are blamed for inefficiency. The process of implementation is open-ended; focused on the distribution of hardware and software; based on people's initiative and interaction. Professional development is needed, although it has not been established that it will lead to teacher involvement with the project. Implementation monitoring and problem solving happen quite unsuccessfully through district coordinator's visits, reports to the Ministry and coordinators' meetings. Principals are mostly unskilled but supportive and cooperate with the other actors: the school coordinator, the district coordinator and parents. The community is positive and parental associations provide funds and pressure for children's equal access to machines. Schools lack environmental stability in technology, funding and personnel and this is a threat to the experimental programme.

Second, within schools, successful individuals could be defined as the frequent users, actively involved in computing, whatever the scenario of application. Within schools, some individuals such as the coordinators are more successful than others. It is interesting to note that in all schools successful individuals hold more positive attitudes and have higher impact concerns about the innovation compared to those that are not involved.

So, when local conditions are similar, practices will probably be applied by those individuals who have established clarity of goals, who are functioning in consensus with the other actors, have overcome complexity issues and are convinced of the quality and practicality of the innovation. These individuals are likely to be those who have access to hardware in a lab or their classroom and supportive software that is suitable for classroom use. These actors need organisational structures to accommodate the large numbers of children, adequate personal time for preparation and curriculum time within the existing subjects. They also need clarified, specialised goals and technical support.

6.2.3.2. Qualitative aspect: Patterns of use

Across schools, in terms of "what is implemented", patterns of practice vary extensively. This diversity is supported by both survey as well as interview data.

Survey data, provided earlier in section 6.1.4, suggest that the four selected schools do not share a common implementation plan (Table 6.5; Table 6.6). Differences were indicated on the subjects where computers were used, the frequency of use and the grades of the children involved. Therefore, in school a, children of all grades (4th, 5th, 6th) used computers at least once a week for Greek, Maths and Geography; in school b, only 4th graders used computers almost every day for Greek, Maths, Art and English; in school c 2nd and 3rd graders used them at least once a month, 4th graders once a week and 6th graders almost every day; in school d, 1st, 2nd and 4th graders used them once a month for Art and Maths and 3rd, 5th, and 6th graders at least once a week for Greek, Maths and Art. Diversity was also reflected in the goals indicated for computer use (Fig. 6.1): some goals such as use of computer as a medium or use for development of student interest were very frequently applied; others ranged in terms of rated importance. This shows lack of a homogeneous, consistent plan of action.

Interview data seem to enrich these survey data. In two of the schools (a, d) more emphasis has been placed on computer skills being acquired by as many children as possible; on application of timetables for use by all grades; and on location of computers in special labs. In the other two schools (b, c) computers are located in specific classrooms; they are used as a medium for school subjects, only after children have acquired basic skills; and are at instant access for some children only. So, schools a and d follow the pattern "more children, less interaction" while schools b and c seem to place more emphasis on "less children, more interaction".

This variation could be the result of the Ministry's open-ended computer introduction policy since there are no fixed educational goals that should be reached. To interpret how computers are used in school settings, the question must be "What is one trying to achieve?" The Ministry innovation plans seem to be directed at the fulfillment of some necessary conditions for computer use, such as provision of hardware, some software packages and training of a few teachers per school. There is confusion as to the goals as well as to the level of change desired in the existing curricula. So, schools follow different practices according to the resources available and the initiatives of the actors. It seems that quality of computer usage in elementary schools is characterised by the incidental nature of its application by individual teachers.

Within schools, it also appears that the wide range of practices reflects "what is implemented". Different applications have been developed during the three or four years of involvement, treating the computer either as an object or as a tool. It is important to note that here most stories of success, brought up by the coordinators involve use of computer as a tool: in school a the 6th graders did problem solving and locating information on a geography database; in school b the 4th graders created their own little stories; in school c the 6th graders printed their own advertisements; and in school d the 6th graders produced a newspaper front page using the communicative approach. If we take all such accounts provided by coordinators, we can extract similarities. First of all stories of successful applications are based on pedagogical principles: collaboration (group work where children have different roles); problem solving and creativity; new teaching methods (communicative approach). In all cases, computing is used as a medium, but children have already acquired basic computing skills. All activities involved supportive, suitable software (PC Globe, Word, KidPix) with which children are familiar. The teacher acquires the role of facilitator and has an organisational plan for the access of different groups to the computers. All activities are time consuming but take place within existing curriculum subjects (Greek, Geography) and are relevant to work done in these areas. Finally, all result in "impressive printouts", praised by people such as the principal, the inspector or the district coordinator.

So, we could conclude that when the policy of implementation is open-ended without predefined specialised goals other than the use of the computer as a cross-curricular tool, practices will probably vary according to each individual's views about the innovation and the resources available.

Summary

In general the pilot schools examined are equally successful in quantitative terms; extent of computer use is the same and is unfortunately low. This could be because of the similarity in local conditions and actors' perceptions across schools. None of these schools shows a higher level of implementation by extensive integration into everyday practices. However, pilot schools differ in the qualitative dimension of success, that is the kind of practices: different schools develop diverse application patterns and have different goals.

What has also been shown is that, within schools, individuals are not equally successful in getting involved with technology both quantitatively and qualitatively. Their response to the innovation is often related to their perceptions as well as the conditions available. Therefore, efforts aiming at effective institutionalisation should concentrate on assuring that individuals are not just theoretically but practically positive about the innovation. So, focus should be on good organisation and relevance to current curriculum practices.

6.3. CONCLUSION

In this section, I have presented several aspects of implementation practices. I examined both the broad picture of all pilot schools through survey statistics data (section 6.1) as well as the in-depth picture of selected schools. An overview of the actors and conditions in the selected schools (section 6.2.1) has preceded an analysis of implementation factors (section 6.2.2), according to Fullan's conceptual framework. In general, across schools differences are found, not in quantitative terms but only on qualitative aspects. On the other hand, within schools individuals vary in both quantitative and qualitative dimensions. In general, the growth of computer usage and application has primarily taken place due to individual initiatives within problematic conditions.

These findings have certain implications. First, there is heterogeneity of actors within Cypriot schools who are likely to react differently to the call for innovation. This is consistent with the findings of the previous chapter, where we have seen various groups of people emerging in terms of their background variables, personal anxieties or levels of concerns. Therefore, it seems that as different individuals function within the framework of an open-ended policy approach, maintaining a level of autonomy in their classrooms, they are likely to proceed to development of different practices or no practices at all.

Second, success is dependent on teachers who are highly involved and believe in the educational value of the innovation. These individuals are likely to struggle with various problems in their effort to develop an innovation. It is encouraging to see that, despite the low extent of implementation in schools and the practical difficulties, several Cypriot teachers are involved in different patterns of use. These individual initiatives should, therefore, be encouraged and supported.

Third, it is interesting to note that most pilot teachers fail to get involved, even though theoretically, as we have seen in the previous chapter, most of them appear supportive and positive. This could be due to the problems that arise from putting the innovation into actual practice. This seems to be related to the fact that computers are introduced as a tool in a system that is subject-oriented. It has already been mentioned that this makes application of educational computing, just like broadcasting in the past, difficult. The Ministry can follow two paths: either introduce computing as a subject, like in lyceums, with specific textbooks, software, time and goals within the curriculum or create all those conditions necessary for innovations to grow as tools, restructuring the elementary educational system. The challenge seems, therefore, to be on the policy on which we need to focus on. This will be considered in the next chapter.

CHAPTER 7: FINDINGS, IMPLICATIONS AND RECOMMENDATIONS

In this chapter, I provide a comprehensive summary of the main research findings of this thesis. Where appropriate, I mention the implications that these findings have for the implementation of educational computing. Some useful recommendations for improvement of the implementation process are then made taking into account the Cypriot context. I proceed to discuss the literature in terms of the findings and reflect on the methodology I adopted. I end this chapter with some ideas about the way forward for educational computing in Cyprus as well as further research.

7.1. SUMMARY OF FINDINGS AND IMPLICATIONS

The starting point for this thesis was an examination of the innovation of educational broadcasting that has failed to be institutionalised in the past. I aimed to examine the reasons for this failure and draw conclusions for the innovation of educational computing. In view of this, the broad research problem was framed as: "What are the key factors in implementation and in what ways do these factors influence implementation practices?". In this section I will provide answers to the three major research questions, outlined in Chapter 1.

7.1.1. What can be learned by the comparison between educational broadcasting and educational computing?

In Chapter 2, I identified a number of factors that appear to influence the implementation of educational innovations. In Chapter 4, the comparison of the two innovations - broadcasting and computing - revealed that despite differences in their nature and in their educational potential, their implementation processes (section 4.1.3) and factors (section 4.2.3) were essentially similar.

How does the implementation process of the two innovations evolve?

As indicated in section 4.1.3, both innovations were "imported" into the Cyprus elementary educational system, as necessary for the sake of modernity. Both innovations were introduced, not as "subjects", but as "tools", reflecting international trends and suggesting integrated models. This conflicted with the underlying structures of the Cyprus educational system, emphasising knowledge rather than methods.

At the administrative level, the initiation phase in both cases involved ambitious plans and organisational structures as well as different committees, lacking consensus. Evaluation was limited and financial considerations important. The experimental plans were initiated by the Ministry of Education in a "top down" approach, consistent with the centralised character of the Cypriot system. Both innovations were subject to development within the schools, that are semi-autonomous organisations. So, Cypriot teachers were left to implement the innovations and create them from "bottom up", integrating them into practices. However, implementation was described as problematic at the school level.

All these similarities indicated that computing may well have the same fate as educational broadcasting and fail to be institutionalised in classroom practices.

What are the factors key to this process?

Comparison patterns between the two innovations highlighted that factors for success were related to two dimensions: the actors' perceptions and the conditions (section 4.3.2). In terms of actors' perceptions, at the administrative level people in both cases seemed to show some conflict on aspects of the innovations; at the school level people were reluctant to implement while there were several questions probing the nature and trends of their views, attitudes and concerns. In terms of conditions, referring to software, hardware, supplementary material, training, curriculum integration or funding, the case of computing seemed more problematic than broadcasting.

The implication of this comparison is that people's perceptions along with local practical conditions shape the innovation context and should be carefully considered. In light of this finding, I proceeded to my second research question.

7.1.2. What are the general trends and nature of actors' views, attitudes and concerns about educational computing?

The findings of the first research question in Chapter 4 suggest the importance of actors' perceptions which had not been researched for the case of educational broadcasting. Literature further suggests that practices are influenced by beliefs, so actors' perceptions about the innovations could be crucial in implementation (section 2.4). So, in Chapter 5, I presented research findings on the general trends and nature of actors' views, attitudes and concerns.

Evidence from the literature reviewed in Chapter 2 (section 2.3.4) was that implementation involves various groups of participants at different levels of the system. Therefore, three groups - parents, teachers and children - with diverse demographics and computer background were researched.

What are the general trends and nature of actors' views on implementation aspects?

On one hand, views on computer introduction in Cyprus elementary schools were reported as mostly supportive (section 5.2.1). Within each actor group, some variation was also seen. In particular, individuals in any group with significant experience of technology were much more favourable about educational computing than those with little or no experience. So, first, results showed that in general Cypriots are in favour of the initiation of this innovation in schools and are likely to be supportive with time.

Second, different views about the way and goals of introduction of educational computing were expressed by the actor groups (sections 5.2.1.1, 5.2.1.2). These showed, for example, that teachers favoured pedagogical aims while parents thought computing should be directed to vocational achievement. So, different *groups of people hold diverse views about the goals and the process of computer* implementation. On the other hand, the nature of the views showed that the constructs had three dimensions: supportive, opposing and implementation comments that again signified different perspectives across respondents (section 5.2.2), for example as to the rationale for computer introduction. Here, there are two trends: introduction of computers either as a subject area or as a tool. This implies a conflict among Cypriots about what computer educational use means that could be problematic for the implementation of educational computing.

Third, populations in pilot and non-pilot schools were not found different in their reactions as a result of implementation. Only a few differences in views were obtained between pilot and non-pilot schools. For example, pilot teachers and parents were more aware about the experimental programme. Teachers indicated training needs, problems experienced/anticipated and limited media application (section 5.2.1.3). All these data seemed to imply that implementation falters in pilot schools.

Except from views, attitudes are also believed to be important factors in the implementation process. So, I proceeded to my second sub-question.

What are the general trends and nature of actors' attitudes towards the innovation?

As I have mentioned in Chapter 2, some research worldwide has focused on attitudes. Anxieties or fears towards new technologies have been described with various terms and associated with aspects, such as personal or professional (section 2.4.1).

Attitudes of Cypriot students, parents and teachers were found predominantly positive towards computers (section 5.3.1). This widespread support of computer implementation in schools is consistent with the trend of the Cypriot culture to favour change, as I have pointed in the introduction (section 1.2).

Since according to the literature, computer anxiety has several dimensions, I proceeded to study these further. Results of this study (section 5.3.2.1) show Cypriots' computer attitudes as multidimensional - like the attitudes of actors in the study of Davidson and Ritchie (1994) - with different factors: the personal, the educational and the general. This structure is consistent across all populations: parents, children and teachers: the personal dimension is the most easily extracted factor of individuals' feelings towards new technologies; the educational reflects teaching and learning; the general reflects societal concerns. Differences between the item structures of the attitudes of actors in this thesis and the actors in the study of Davidson and Ritchie (1994) were attributed to the local context. The exploration of the nature of attitudes suggests that different aspects of Cypriot teachers' attitudes may be related to implementation practices. Within schools, there are various groups of people with different attitudes on these three aspects. The implication is that all these dimensions should be considered by the Ministry if the aim is to maximise teachers' involvement with the innovation.

The personal dimension of the attitudes was found related to various demographic/computer background variables (section 5.3.2.2). This further implies that teachers' personal attitudes can be easily addressed as they can change with computer experience. However, the fact that the other two dimensions - the educational and the general - do not change much with any variables - with the exception of frequency of use at home and the educational dimension - is indicative that there is no movement in these dimensions. This suggests that the Ministry could focus on the personal dimension and affect this by providing more training courses or opportunities for higher involvement with the technology.

In all dimensions - personal, educational, general - there were no differences between Cypriots in pilot and non-pilot schools (section 5.3.2.2). This was different from the study of Davidson and Ritchie (1994) that had shown changes in factors of people's attitudes after a year of computing implementation in an elementary school. Therefore, implementation in Cyprus schools through the experimental plan did not seem to affect individuals' attitudes, that is the personal, educational or general dimension. That could be an indication that the pilot schools, having computers, are not different than the non-pilot ones and a sign that the implementation plan falters.

This important finding prompted me to research further into the specific concerns of the pilot teachers to explain where they practically stand. If the implementation process had been successful, I would expect most individuals to have high "impact" concerns. Otherwise, this would confirm, from another angle, that the implementation process is not successful in pilot schools.

What are the general trends and nature of involved teachers' concerns about the innovation?

Concerns, as explained in Chapter 2, are like attitudes, multi-faceted constructs including various factors, that are related to individuals involved in the implementation of an innovation. The factors in this case are defined: seven stages of concern on a developmental continuum, reflecting the "self", "task" and "impact" dimensions (section 2.4.2).

This study did not compare stages of concern over time to show possible progress. It revealed that for the time, the general profile for all pilot teachers is that of "nonusers" (section 5.4.1.2). So, although theoretically the picture, as indicated by attitudes, is that of willingness to adopt, practically the average Cypriot pilot teacher has higher "self" concerns than "task" or "impact" ones. This shows again a low overall level of implementation which will not improve unless personal concerns are lowered on the developmental continuum (section 2.4.2).

A comparison between pilot teachers' theoretical attitudes and practical concerns outlined some interesting findings. In theory, personal anxieties were low and related to a number of variables whereas practical, "self" concerns were quite high on the developmental continuum, especially when the level of experience or involvement with the innovation was limited. It seems then that in theory, educational and general attitudes are positive but practically, teachers seem to have quite low "task" and "impact" concerns. So, fears could be minimal theoretically but considerable practically probably because of the innovation's characteristics as perceived by the teachers or the local conditions.

This study has also indicated that in terms of concerns pilot teachers are heterogeneous. Demographic and computer background variables considered, within the group of pilot teachers, there are important differences in the individuals' peak concerns (section 5.4.1.1) and profiles (5.4.1.3); respondents with higher levels of experience or involvement with computing seem to have lower "self" concerns and move towards more intense "impact" concerns. The finding that pilot teachers are different means they should not be addressed as one homogeneous group by the Ministry of Education. This has two important implications.

First, that the Ministry should probably focus on those individuals that have higher "impact" concerns to apply the innovation successfully: those tend to be the teachers who have a high educational level, training background, high "proficiency" in computing and a computer at home. Second, the Ministry should then help other individuals move in the developmental continuum from peak "self" concerns to peak "impact" ones by providing training. This training could be delivered in diverse forms to match the different areas of concern that Cypriot teachers may have about the innovation, as I explain later in section 7.3.

7.1.3. In what ways do several key factors influence integration of computing into school practices?

So far, I have reported on people's views, attitudes and concerns. As I indicated earlier, another important parameter in the implementation process is the context in which the actors function. This is further supported by literature, that points to the significance of the local conditions for implementation success (section 2.5). Therefore, I proceeded to explore the ways in which factors such as actors' views and conditions are likely to have an impact on implementation practices. I focused both on the extent to which computing is integrated into classroom practices (the quantitative aspect) and on the content of the practices (the qualitative aspect).

What is the extent and the content of the current implementation practices?

Across schools, survey statistics, reported in Chapter 6, show that the overall level of implementation was low and that, despite reported positive attitudes (5.3.1), most Cypriot pilot teachers were not involved in educational computing practices. Implementation in all pilot schools seemed to be problematic in terms of resources, curriculum integration and software. This was further supported by in-depth data in the four selected - defined as "successful" by the Ministry of Education - schools; the extent of usage was rather limited across all schools (section 6.2.3.1). Apart from this, evidence suggests interesting diversity across pilot schools as to the qualitative aspect of success: each school's response to the innovation was different in terms of the activities and the goals for educational computing (section 6.2.3.2). It seems that when the policy of implementation is open-ended without predefined specialised goals other than the general aim of using the computer as a tool, the extent and content of practices will probably depend on the individual initiatives that can take place within pilot schools.

Within schools, this analysis further shows that pilot teachers differed in their involvement with the experimental programme, in terms of both their frequency of computer use (quantitative aspect) as well as the implementation patterns (qualitative aspect). Variation in the performance of different actors supports the existence of different groups of teachers within schools. It became, therefore, important to identify these groups and explore the impact of both their views, attitudes and concerns and the practical conditions - indicated in the case of educational broadcasting - in their reaction to the innovation.

What is the role of actors and their views, attitudes and concerns in implementation practices? What is the role of practical conditions in implementation practices?

Both actors' views, attitudes and concerns as well as the practical conditions influenced the extent and content of implementation practices in pilot schools.

In terms of the extent of involvement, that is the quantitative aspect of success, two major groups were detected: The teachers directly involved and teachers supportive in theory but reluctant to get involved.

The first group were teachers who developed practices related to computing application. Individuals with very positive attitudes and high "impact" concerns about the innovation as well as access to hardware, software and other resources were more likely to develop involvement with the innovation (section 6.2.1). Whatever computer usage seemed to have taken place was due to the initiatives of these few teachers (section 6.1.4). So, this study has indicated that some Cypriot teachers have the capability to integrate the innovation into their teaching approaches and determine its success. The implication of this is that teachers in Cyprus are the gateway to the success of an innovation.

However, problems in practical conditions frustrated individuals involved. Teachers tend to complain about the practicalities of computer implementation: they demand extra time, question the goals for use and need more support from their principal and colleagues (section 6.1.6). It seems that for them, involvement leads to workload, without any additional benefits. Teachers not only have to work out how technology can be incorporated into their lessons but also have to work through the logistical problems of deciding which students would use the computers at what times.

The second group was a majority group of teachers who were supportive of the introduction of computing in theory but failed to get involved in practice. There can be many interpretations for this. First, the Cypriots' reluctance to act could be attributed to their perceptions of the innovation's characteristics, that is how the innovation fits with their working conditions and value systems (section 2.5.1). Weaknesses in one or more product characteristics such as quality and practicality, complexity and clarity, need and relevance are major obstacles in implementation (sections 6.2.2.1, 6.2.2.2, 6.2.2.3). Second, even when beliefs are not only theoretically but also practically positive, the conditions outlined before can still prevent teachers from getting really involved in the implementation process. Third, Cypriots' reaction to innovations could be interpreted considering the educational structures of the Cypriot system. The encyclopaedic curriculum emphasises knowledge rather than methods and teachers struggle within limited time to meet the demands of various subjects. Teachers are autonomous to use any teaching method they want - and traditional teaching is usually the easiest - without any reward if they make an extra effort to apply new practices. So, considering the Cyprus context with its lack of motives for teachers to develop innovations - since they get promoted with age - and the mentality of "don't do anything you don't have to do", it is not surprising that teachers are reluctant to implement innovations.

This group of "supportive but reluctant to get involved" individuals could make the difference in implementation. If the aim is to get the innovation institutionalised, then higher levels of teacher involvement should be pursued. Therefore, the Ministry of Education has to address the needs of this group.

Variation in computer classroom practices, that is the qualitative aspect of success, reflected the diversity of teachers' views. Some teachers tried to use computers as a "tool" for the existing subjects, as the Ministry guidelines suggested. Other initiatives tried to treat computers as a separate "subject", conforming in this way to the structure of the encyclopaedic school curriculum. These two trends have also emerged before, in examining all populations' views about the introduction of computing (section 5.2). Therefore, as individuals differ in their perceptions of the innovation's practical application, diversity of practices is likely to develop. Therefore, the Ministry of Education has to clarify goals for the innovation, as I discuss in section 7.3.

Summary

The major findings of this study, related to the research questions, have been summarised and discussed in this section. The process of both educational broadcasting and computing has been described as similar, so focus should be on both the actors' perceptions and the conditions. Cypriots are supportive of the computing innovation but hold diverse views as to its implementation. Their attitudes are multi-faceted with different dimensions and their concerns are diversified. Overall computer integration into regular classroom practices is low. However, in pilot schools teachers differ in their level of involvement quantitatively and qualitatively: most are not participating while others struggle with unfavourable conditions to develop the innovation.

Therefore, treating Cypriot actors as one homogenous group would be a crucial mistake. Despite the uniformity in curricula and timetables in schools, people hold different expectations and views on the innovation process. Therefore, the innovation could take different forms in practice. So far, any growth of computer usage has primarily taken place due to individual initiatives within problematic conditions. So, the challenge is to focus on policy and turn the effort into making the equipment, the software and the training programmes work.

Before I proceed to my recommendations, it is important for the reader to be aware of the Cypriot context, with regards to the innovation process and the findings of this thesis.

7.2. TYING THE THREADS TOGETHER: THE IMPLEMENTATION PROCESS AND THE CYPRUS CONTEXT

As I mentioned in Chapter 1, Cyprus lies between the developed and developing world. Its effort to introduce the innovation has been accompanied by the problems that dominate practices worldwide, discussed in section 2.5.2: hardware, software, training. Even the patterns of implementation are similar to those of other countries: equipment has been delivered but real curriculum integration has not taken place, as I suggest in section 2.3.3. However, the experience of educational computing in Cyprus should be approached within the framework of the Cypriot context, shaped by the unique local conditions, which could support or prevent survival of the innovation.

7.2.1. The Cyprus context

There are a number of favourable conditions that can make an innovation more likely to succeed in Cyprus. First, Cyprus is small in size. Therefore, it would be easier for national plans for computing introduction to penetrate schools more effectively. Second, the system is centralised and schools are within the Ministry's control and monitoring. Centralisation, based on the educational tradition of the island, the small number of children and the belief that central authority establishes equal opportunities for all schools of Cyprus could facilitate development of any innovation, if the conditions were favourable. Third, there is a certain degree of democratisation, expressed by the active participation of a number of committees and bodies in decision making. It is possible to start an innovation after the initiative of an individual or the suggestion of another. Fourth, the Curriculum Development Unit, that has recently been established, produces textbooks and teaching material relevant to the local needs of Cyprus. Teaching material begins from bottom up since it is prepared by partly seconded teachers. So, an innovation could be accompanied by relevant material to make it more likely to be sustained. Fifth, despite centralisation, schools are semi-autonomous organisations, and teachers maintain a degree of autonomy in practices since they can apply any teaching methods they favor in order to serve the goals set by the National Curriculum. That makes it possible for teachers to develop innovations. Sixth, Cyprus is oriented towards change since it is influenced by a number of bodies and organisations that put pressure on the educational system to incorporate new practices. As a result, innovations will continue to be introduced especially now that Cyprus wants to join the EU.

In such terms, we could easily think that innovations would find fertile ground for establishment. Well, the fact is that the system also produces and perpetuates structures and traditions that make it especially difficult for innovations such as broadcasting and computing to succeed. First, as I stressed in Chapter 1, the system is characterised by conflict. Cypriots have been subject to influences from both the Greek and the British government, supporting either Greek-centered or Cyprus-centered education, education for national survival or education for economic development, emphasis on ideologies such as encyclopaedism, humanism and ethnicism or the practical needs. All these debates have been reflected in education, which has had conflicting goals over time. Second, the dominant epistemological traditions - similar with Greece - make it difficult to change the content and structure of education and to produce new knowledge. Emphasis is still on teaching and not learning, on the product and not the process of learning. Third, there is some lack of flexibility as students are in classrooms without the potential to be divided in other groups and teaching periods are centrally set in duration for all subjects. This means uniformity of teaching in diverse classes despite advertised teachers' autonomy. Fourth, there is no research before development and no research to inform on progress while introducing innovations.

With all these characteristics of the local context in mind, I can now proceed to an overview of the implementation process of educational computing in Cyprus elementary schools in the light of my findings. In order to understand and analyse the process of the innovation - a process that has been repeated for other innovations in the past, like in the case of educational broadcasting, as I indicated in section 4.1 - it is necessary to think in terms of the underlying culture and society as they are reflected in the educational paradigm of the country.

7.2.2. The implementation process of educational computing in Cyprus

First of all, efforts to integrate computers in education have fallen within the centrally controlled decisions regarding education and funding. Government policy adopted recommendations made by individuals and committees to introduce new technologies in education. Following this, educational computing was introduced as a subject per se and as a field of specialisation in secondary education lyceums. This effort represents the technical approach, favouring computer literacy as a new independent subject and supports the tradition of encyclopaedism. However, in the elementary schools efforts, described in section 4.1.2, were made to introduce computing as a tool as the international trends for an integrated approach recommended.

The decisions were easily taken at the central level within limited time. However, application of the experimental plan was delayed and implementation was slow for a number of reasons. Data from this study underline that, in contrast to most existing school subjects, computer education lacked a specific body of knowledge, textbooks and official curricula and supplementary material. Most teachers lacked training, software was not relevant and hardware was not always available (sections 5.2.2.3; 6.1.5; 6.1.6). However, since the policy makers at the Ministry felt obliged to proceed with some speed to the introduction of computers in Cyprus elementary schools, they adopted an experimental policy: they provided several pilot schools with hardware and expected the practices to be developed by the teachers.

Pilot teachers, in this sense, were expected to adopt an orientation to new methodologies and find ways to integrate computers into their usual practices. This was particularly difficult since these people worked within a demanding, mostly encyclopaedic curriculum, which placed emphasis on fixed knowledge and required equal opportunity of access to resources. However, as I have shown in section 6.2.2, some first experimental initiatives were developed based on a degree of autonomous work. In general, this showed that a number of pioneering Cypriots responded to the call of the Ministry and that diverse practices related to the innovation can be created.

Except from these individuals, in pilot schools a great number of actors failed to get involved. This is surprising since, as I have indicated in sections 5.2.1 and 5.3.1, the community is supportive of the innovation; actors hold positive attitudes in theory; some teachers have considerable computer background. However, it seems that individuals are reluctant to implement because of their perceptions of the innovation's characteristics, such as clarity or quality, as well as the unfavourable local conditions, outlined in Chapter 6.

So, implementation of educational computing in Cyprus seems to be handicapped by the fact that some teachers who are willing to get involved struggled to discover what the innovation is and how to develop it while others ignored it. It is unlikely for personnel to implement a change without support at extra workload and without feedback as to where the implementation leads. Adopting an open-ended strategy sounds progressive, but does not automatically lead to success in the absence of resources, training, teaching materials and support necessary to put the plan into practice. Therefore, this open-ended process is a good approach as a starting point for experimentation but then for successful institutionalisation, the policy has to be shaped and the goals need clarification.

7.2.3. The future of educational computing in Cyprus: chances for success

The results of this research can prove useful for the proper implementation of the innovation in the future. The question that remains is whether educational computing can be sustained in the form of a tool by the system, when the innovation is institutionalised in all Cypriot schools.

Pilot and non - pilot teachers in section 5.3.2.2 have not been found to differ significantly in terms of their views and attitudes about computers. This could suggest that the personnel would probably react in similar ways across all Cypriot schools. Therefore, all conditions unchanged, if application of the innovation expanded, we would normally expect that despite the general theoretical support, practices in all schools would not differ from those already developed in pilot schools, and only a few individuals would get involved.

In this case, the future of the innovation is questionable since computing resources are not accompanied by high teacher involvement and high levels of implementation. So, computing is likely to follow the fate of broadcasting.

In order to avoid this, recommendations for a different implementation strategy could be applied, based on the findings of this research. As I state in section 2.1.5.3 a fortunate combination of the right factors is needed to help change take place successfully. This is not simple since as Fullan (1982) states, several factors can not be inserted like pieces in a puzzle. However, when a low adoption level is detected, managers should determine which factors are not being satisfied and then proceed to corrective actions. As I will show below, to promote the sustainability of the innovation, management can alter interacting factors in favourable directions.

Summary

In Cyprus, the innovation process has resulted in low implementation. The Cyprus context with its unique local characteristics has highlighted several aspects of educational computing in elementary schools. In summary, the integrated approach, with the computer as a tool, advertised by the Ministry has been found unlikely to be sustained because of the complexities involved.

I will now proceed to discuss my recommendations which are directly related to the factors in the implementation process, identified by this study.

7.3. RECOMMENDATIONS

Cyprus is unique in some of its implementation patterns and factors. However, many of the problems reported in this thesis, relating to the process of computer implementation, are similar to those emerging from international attempts for application of the innovation (section 2.5.2). Therefore, some recommendations suggested for Cyprus can be applied to international practice as well after making modifications for each country in the light of its national context.

First, this implementation study underlines the importance of individuals for implementation success. Because of the uniformity in Cyprus schools, if we want the innovation to succeed, as many teachers as possible should get involved, reflecting the quantitative aspect of implementation. On one hand, we should focus on the pioneering individuals who hold positive attitudes and high "impact" concerns and encourage them in their practices. On the other hand, we should also try to find ways to involve the "positive but reluctant" teachers who form the majority, mentioned earlier in this chapter. As I have shown, actors' practices are influenced by their meanings of change. So, we should focus on people's perceptions, that are related to implementation.

Second, this study has also indicated that certain conditions can facilitate actors' actions to help them towards the successful implementation of an innovation. It is important not only to make teachers aware of the need for change and confident enough to attempt it through training, but also to provide them with support in doing so. So, conditions that could favor, facilitate or stimulate change should be addressed.

Therefore, this study has outlined that an improved implementation process focusing on the computer as a tool involves two important dimensions: the actors' perceptions as well as the conditions. The following recommendations address both of these dimensions and relate to training, curricular goals, funding, experimentation culture, hardware, software and new possibilities.

Training provision : the key to address actors' perceptions

First, there is a need, as I have shown in section 7.1.3, to consider all dimensions of people's attitudes. Personal anxieties have to be minimised. This is possible since, as I have indicated in section 5.3, involvement and experience can have an effect on these anxieties. Educational attitudes should also be addressed. The computer should not be seen as an obstacle in the classroom, as educational broadcasting was viewed in the past (section 4.1.2.1). The innovation should be perceived as an improvement, adding significantly to the children's learning experience.

Second, the practical application of the innovation should be highlighted. As I have repeatedly mentioned throughout this thesis, the challenge is in making sure that teachers are positive about the practical aspects of introducing educational computing as well as being positive in theory. I agree with Cuban (1986) who points that as part of their occupational culture, teachers have built informal criteria for what is productive in the classroom, embedded in an ethic of practicality. If teachers meet needs that arise from their classroom practice, the future of technology can be positive.

Third, focus should be on helping people move from "self" to "impact" concerns. I have shown in section 5.4 that most teachers have been found to have higher "self" than "impact" concerns as well as different developmental profiles with regards to computer implementation. These individuals should be helped to progress into higher levels of involvement.

Therefore, there is a need to address all the aspects above: minimise personal anxieties, strengthen faith in the educational value of the innovation, focus on the practical aspects of applying the innovation and help people progress to higher "impact" concerns. Providing training to meet all these aspects is important.

So, a variety of courses on different levels and topics is necessary, not only to educate on the personal level but also to clarify the role of technology in the classroom and draw links from theory to practice - necessary, as people reported in section 5.2.1.3. Training should also be diversified to meet different needs addressing the "self", "task" and "impact" concerns of teachers. Initial inservice activities could be more focused on providing teachers with relevant information about computers and less directed to the impact of computers on students since most teachers do not have high concerns on the consequence stage (section 5.4.1.1). These activities could reflect descriptive knowledge about computers: what computers can do, how they can be used and what their effects are on teachers personally and professionally. Consequently, activities appropriately matched to address self-concerns could effect shift from self concerns to task concerns. Next, trainers should address task concerns and finally impact concerns, always keeping in mind the developmental nature of concerns. So, training beyond the first computer course could be available as a way to successful implementation.

Training should be made available to all those interested, as this is not happening at the moment. Several teachers in pilot schools in sections 6.2.2.6 and 5.2.2.3 have further suggested mandatory training to ensure that before computers arrive in the remaining schools, all personnel are trained. Whether training becomes mandatory or not, various sources of training should be sought and established. First, preservice training courses should increasingly incorporate IT, addressing all the aspects of teachers' perceptions mentioned above. So, the University of Cyprus could establish courses for student teachers as part of the requirements for graduation. Second, in-service training might not be entirely the responsibility of the Pedagogical Institute since -as I have indicated in section 5.1.3 - this can not meet the demands of increasing numbers of teachers for staff development. As I have shown in section 6.2.2, in pilot schools certain teachers take the lead in helping others, who naturally turn to their more knowledgeable colleagues. Therefore, a method with the trained teachers training others could be developed as a supplement to training, building on the enthusiasm generated. This approach, enabling teachers in neighbouring schools to get together and exchange views and experiences could foster a developing community of users, already created, as we have seen in section 6.2, between school coordinators.

Clear policy statements communicated to all actors

This thesis indicates that the curricular dimension arises as the most significant problem area, relating to the qualitative aspect of success. First of all, people, as reported in section 5.2 hold different views on how, why and when computers should be used. Second, as shown in section 6.2.2, schools show a variety of practices, reflecting diverse goals. Although I suggest in section 5.1.3 that computers have been assimilated into daily life at home and work, their role is not clearly acknowledged in the National Curriculum. There is lack of clarity about the overall educational aims of computer classroom use. Therefore, I strongly share Hickey's (1993) recommendation that curricular planning must begin with goals. So, clear policy statements for computing and its integration into the curriculum, realistic about the availability of resources and the level of staff expertise, should be agreed and understood by all teachers and the Ministry.

Involve the community to facilitate funding

Financial considerations are important in implementation. As I have indicated in Chapter 4, certain amount of funds were allocated at the beginning of the experimental programme. However, I have shown in Chapters 5 and 6 that it is quite hard to meet the demands of pilot schools for funding. Implementation has generated additional running costs which also need to be taken into account for long-term planning, especially when the innovation spreads in all schools. Thus, the introduction of IT in education on a massive scale requires a lasting commitment from Cypriot finance authorities to spend more on education. In case this is not possible, alternative ways of funding should be sought. Schools could be encouraged to raise funds since, as I have shown in section 6.1, they have already proceeded to buy some of their own equipment and software. A recommendation, arising from these findings, is to use additional funding from other sources such as families or companies to complement public expenditure on educational computing. The community could get involved since, as I have shown in section 5.2, parents are supportive but most lack awareness about the experimental programme. Therefore, centrally driven policy could be combined with local initiatives to facilitate support.

Establishment of a culture in favour of experimentation

The structures of the system prevent application of the innovation as they focus more on knowledge and less on methodology. To encourage and sustain innovation practices, the management infrastructure needs to encourage a culture in which it is acceptable to experiment and engage teachers in their own process of reflection. This could be done through promotion of action research (section 2.5.3) in Cyprus classrooms. Individuals that have been involved in the innovation should be supported and rewarded. This could help teachers feel "owners" of the innovation. Time mostly needed, as actors continuously mention in Chapter 6, should be allocated so that teachers can work on the integration of the innovation into their practices. This poses challenge on the educational system to allow for more "time-consuming", "student-centered" activities and less material to be covered for each school subject.

Facilitating access to hardware

With respect to hardware, in all pilot schools at the moment there is an average of one computer for thirty or more children. As teachers reported in section 6.1.5, a high proportion of these machines have technical problems on a constant basis. I have shown in section 6.2 that in pilot schools, location of computers - in a lab or the classroom - strongly affects the type of technology use, students' access to computers and the extent to which teachers integrate technology into learning. Therefore, for successful implementation, teachers should be given access to computers and be provided with continuous technical support. Although findings suggest that different scenarios for computer provision and location can be applied in Cyprus, practices in Chapter 6 indicate that the classroom model - with some computers in all classrooms - is probably the most appropriate to facilitate integration for several subjects.

Provision of software, relevant to the curriculum

With regards to software, actors in section 6.1.5 have not found them suitable to the curriculum or proper for the students. Quantity is considered limited and quality unsatisfactory. To avoid existing complaints that computer use requires personal investment from teachers, high quality software should be purchased or produced by the Curriculum Development Unit. There is a place for both content-rich and content-free packages, as indicated in section 6.1.3. The first can aid the teaching of specific subjects such as Geography or History. The second such as spreadsheets and desktop publishing packages can help use IT to serve a wider variety of curriculum areas. On the other hand, most teachers have been found in section 5.2.1.3 to be "ignorant" about software. Therefore, there is a need to make them personally confident and competent in using software and aware of how they can to implement them at school. So, non-contact time to teachers and provision of good quality training, as mentioned before, could be allocated.

Consideration of new possibilities

New possibilities develop and they have to be carefully taken in consideration for the future of educational computing in Cyprus schools. For example, the emergence of networks provides a unique source of information and exploration for children. Moreover, since most teachers are computer owners, the Internet can act as a platform for teachers to communicate and share during implementation when physical interaction is difficult. Connections can be established from private or semi-governmental Internet providers at low cost for schools. The growth in home computers is also about to accelerate, as most non-owners indicated in section 5.1.3 their intention to buy a computer in the future. This will be extremely beneficial since children will have acquired the necessary skills before using the computer as a medium and will be familiar with technology before school.

7.4. DISCUSSION

7.4.1. Looking backwards: Reflections on the literature

Having reached this stage, I can relate my findings to the literature, outlined in Chapter 2. Data in this study support in many ways the theories proposed within the "change" paradigm and Fullan's "phenomenological" perspective. My research has confirmed the "change" paradigm (section 2.1.4.3) by showing that implementation is a lengthy and complex process - a "cycle"- that involves various groups of participants at different levels of the system (Chapter 4). In essence, both innovations of broadcasting and computing were not so much *planned* and implemented in schools but rather *created* in a process of mutual adaptation. This further supports the view of change as an evolutionary process that comes about through interaction at the school level rather than through technological planning or political conflict at the system level. People's perceptions and their understanding of the meaning of an innovation - suggested by the "phenomenological" perspective in section 2.1.5.2 - have been found critical to making sense of educational change. Yet, data in Chapters 4, 5 and 6 reveal variations in people's interpretation of both innovations and show that in practice, no attempt was made to help people gain a clear understanding of such a meaning. The fact that people are important was often overlooked or even ignored as their problems with implementation efforts remained (section 6.1.5). Therefore, this research points to the need for administrators to shift towards the people oriented dimension, emphasising the meanings of participants and to develop a strategy of implementation focusing on school specific concerns rather than superior knowledge and assumptions.

This research has also shown that the experience of Cyprus with respect to educational computing is similar in many ways to that of developed countries. The various rationales for computer introduction, proposed by Hawkridge (1990) in section 2.3.1 have been identified in Cyprus as well (section 5.2.2.1). Data have also shown that success, both in quantitative as well as qualitative terms has been minimal in Cyprus (section 6.2.3), as was the case with other countries (section 2.3.3).

My attempt to investigate people's perceptions as a reason for this failure led me to find Cypriots' attitudes towards computing as predominantly positive and multi-dimensional (section 5.3), as other studies suggest (section 2.4.1). However, although most international studies show that attitudes change with training or implementation plans (section 2.4.1.2), in this case, Cypriots' attitudes did not appear to be influenced by the experimental programme, as one might expect (section 5.3.1). My research has also confirmed the developmental nature of people's concerns (section 5.4), that Hall et al (1977) propose (section 2.4.2.1). However, what was not expected was that individuals' stages of concerns may not be consistent with the trends in their attitudes; people with highly positive theoretical attitudes towards an innovation have been shown to have high "self" concerns that indicate a low level of adoption.

In general, this research has been different than other studies - as reviewed in Chapter 2 - in that it has attempted in one single study not only to investigate several groups' attitudes, pilot teachers' concerns and administrators' views about an innovation but also to relate them to actual implementation patterns in schools. With respect to this, this research has indicated that it takes much more than positive attitudes or high "impact" concerns to achieve implementation success. Examination of attitudes or concerns alone, undertaken by other researchers (section 2.4), does reveal whether there is a base to build on but is not enough for prediction of success. Information is also needed on the conditions available, which have been found to explain people's reluctance to get involved. As a result, my empirical work points that in an effort to make more sense of a particular innovation, different sets of data on these aspects have to be collected. This finding is consistent with Fullan's theory that single-factor theories are not successful since effective implementation depends on a combination of factors that reinforce or undercut each other as an interrelated system (section 2.1.5.3). Therefore, locating and explaining how several factors function is important.

7.4.2. Looking backwards: Reflections on the methodology

This research consisted of three different sub-studies trying to answer the three main research questions, as explained in Chapter 3.

The first is a historical research for educational broadcasting and computing. In section 3.2 I emphasise both the advantages and disadvantages of this type of research. The main limitation in the interviews conducted was subjectivity as accounts reflected highly personal perceptions; validity and reliability can also be criticised to a certain extent. However, as the main aim of this sub-study was to bring about information as a starting point for further research, I do not believe that these limitations had a serious impact.

The second is a quantitative survey of actors' views, attitudes and concerns. In section 3.3 I discuss the limitations which arise from the extensive numeric measurement that was employed. To a certain extent, these are limitations that are unavoidable in quantitative research. All measures taken to counterbalance these limitations are also mentioned.

Finally, the third is research into the implementation practices and is mainly based on interviews. In section 3.4 I discuss the limitations that arise from the use of qualitative methods for data collection. The fact that selected sites for interviews were used is also discussed as an issue of concern.

Looking backwards, one of the major strengths of this research is the use of triangulation, an approach in which multiple observers, theoretical perspectives, sources of data and methodologies are combined (Bryman, 1988). Cohen and Manion (1994) refer to various kinds of triangulation: time triangulation takes into consideration the factors of change by utilising cross-sectional and longitudinal designs; space triangulation overcomes the parochialism of studies conducted in the same country by making use of cross cultural techniques;

combined levels of triangulation uses more than one level of analysis such as the individual, the interactive and the collective; theoretical triangulation draws upon alternative theories in preference to utilising one viewpoint only; investigator triangulation engages more than one observer; methodological triangulation uses either the same method on different occasions or different methods on the same object of study.

In this study, I employed methodological triangulation - especially in approaching the two of my three research questions - in several ways. First, I used multiple methods by drawing on several sources of data such as documents and interviews to answer the first question, as well as questionnaires and interviews to answer the third one. Second, I addressed multiple informants in conducting the interviews on educational broadcasting (section 3.2.4). Finally, I used multiple cases for the investigation of educational computing patterns by selecting four different schools (section 3.4.2).

Designing a study in which multiple cases, multiple informants, and more than one data gathering method were used greatly strengthened the study's usefulness for other settings as well. Overall, the use of multiple research methods as ways of examining the same research problem and the comparison of different kinds of quantitative and qualitative data helped me increase the validity of my study. This enabled me to combine macro and micro dimensions of analysis; to achieve breadth and depth; to adopt a holistic perspective so as to approach better the complex reality of implementation. On the other hand, a disadvantage is the fact that I appeared to examine diverse research questions. Making sense of a large amount of data in the form of documents, interview transcripts and questionnaires was a tedious task. However, this is counter-balanced by the fact that towards the end the various findings appeared to build a coherent picture. Therefore, if this research had to be done again, then labour saving ideas in data collection and analysis should be used in addressing all these research questions.

7.5. LOOKING FORWARD: IDEAS FOR FURTHER RESEARCH

In this thesis, I have already outlined an implementation strategy for introduction of the computer as a tool, as the Ministry reports in section 4.2 suggest. In the light of my findings, it is doubtful whether the Cypriot educational system can sustain the innovation with its present form under the pressure of a knowledge loaded curriculum. Therefore, educational computing might be more easily implemented as a new independent subject, just like in the lyceum. This would be consistent with the encylopaedic National Curriculum.

This trend of treating computers as just another subject has emerged at several points of this thesis. Teachers have repeatedly stated that they demand supplementary material, textbooks and curriculum time for computing. So, although they claim to support the notion of the "computer as a tool" for pedagogical reasons, maybe they favor a more technical approach. Parents also are particularly supportive of this trend, suggesting vocational and social reasons, as I have mentioned in section 5.2.

The scale of change involved in developing computers in education as a subject could be much smaller as schools can reduce the number of teachers involved. In such a case, it would be likely that there should be an identifiable timetable slot for computing. This would mean that the school schedule would have to change with this subject added or another subject removed. Teaching could be done either by computer specialists getting teaching jobs or by existing teachers. The computer lab model would be probably more appropriate and content-free application software would be used. Therefore, it would be interesting to research into the idea of implementing educational computing as a subject in some pilot elementary schools to reveal the level of implementation and indicate people's concerns in such a case. Such research would help show whether this alternative scenario would be more likely to lead to success, as it conforms to Cypriot system structures.

7.6. CONCLUDING REMARKS

The present study has shown how educational computing was implemented in some Cyprus elementary schools. I have also provided insight into teachers', parents' and children's views to better understand their feelings and perceptions about the innovation. Even though the call for the innovation has been launched some years ago, I have revealed that there is still much room for improvement.

In secondary schools, policies regarding the definition of what is important knowledge and practice in computer use have proceeded in a way, replicating usual practices; computing has been introduced as a subject. In elementary schools, it is still not possible to know which direction this innovation will go. At the moment, the innovation process, focusing on computing as a tool, has offered possibilities for teacher initiatives, but is has also conflicted with the traditional educational practice emphasising knowledge. Implementing educational computing in Cyprus through an open-ended approach has been handicapped by the fact that teachers are left to struggle and discover what the innovation is and how to develop it. This has led to serious problems, which have threatened the successful implementation.

As I have pointed, there is a need for further research. Experimental practices can not last forever. Experimentation is attempted in the sense of introducing computing to a small number of schools in the initial phase only. Universalism, based on homogenous treatment of all schools will dominate eventually. Uniformity in curricula, based on the need to provide equal opportunities will bring an end to the existence of "pilot" schools. So, the Ministry will have to decide what to do next: either introduce computers as a compulsory school subject or leave them as another cross-curricular tool, dependent on teachers' willingness to use them on a voluntary basis. I strongly believe that in the second case, in the perspective of an integrated approach across the curriculum, computing is likely to follow the fate of broadcasting. All things unchanged, the prediction of this thesis is that failure is a certainty.

Data in this thesis suggest that Cyprus can not avoid the challenge of placing educational computing into its educational agenda. The rationales in favour of the introduction of computing, as shown by this thesis, are plentiful and strong - even more so than they were with the effort to implement educational broadcasting. Educational computing is of outmost importance to Cyprus since it is promoted out of anticipation and conformity to international imperatives. Cyprus is moving fast forward into the 21st century. The background is also favourable: teachers, pupils and parents want and need computing.

So, action needs to be taken as soon as possible. This thesis has isolated some of the most important factors that need to be addressed to. If actors' perceptions and conditions are successfully dealt with, then the picture will be different. School personnel, curriculum developers and the Ministry of Education must therefore, increase their efforts. Only with a determined and coordinated policy will computing be implemented successfully.

The direction is hopefully, now clearer. Those responsible must take advantage of the potential that exists and take appropriate action. The road ahead will not be smooth. However, there should be no turning back!

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APPENDICES

I. Stages of Concern Questionnaires - Results

A. Percentile score means and other variables

SOC PERCENTILE SCORE MEANS ACCORDING TO FREQUENCY OF USE (SCHOOL)

Stages of concern

Frequency of use	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Never	88.06	76.66	70.83	59.89	29.64	32.76	40.25
Sometimes	74.31	75.74	73.81	66.00	46.42	51.69	58.81
Often	55.31	69.94	74.72	58.34	60.16	72.41	69.19

SOC PERCENTILE SCORE MEANS ACCORDING TO FREQUENCY OF USE (HOME)

Stages of concern

Frequency of use	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Never	83.85	71.07	67.92	55.21	24.28	21.71	39.43
Sometimes	84.20	78.53	76.11	61.66	37.73	42.75	49.15
Often	45.62	65.32	71.27	53.43	59.78	71.05	63.16

SOC PERCENTILE SCORE MEANS ACCORDING TO POSITION AT SCHOOL

Stages of concern

Position at school	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Principals	84.80	77.67	69.13	70.87	40.13	57.40	56.60
Assistant principals	81.07	68.20	66.13	57.43	29.90	42.53	45.50
Teachers	76.73	76.37	73.90	62.25	42.97	43.83	52.02
Others	88.80	72.00	67.00	35.50	21.20	38.80	31.50

SOC PERCENTILE SCORE MEANS ACCORDING TO TRAINING

Stages of concern

Training	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Teachers trained	69.98	77.06	76.94	64.90	52.17	60.28	60.97
Teachers non-trained	86.98	74.86	69.58	60.02	30.78	32.22	42.32

SOC PERCENTILE SCORE MEANS ACCORDING TO AGE

Stages of concern

Age	*0*	*1*	*2*	*3*	*4*	*5*	*6*
20-29	76.61	78.87	76.86	63.06	44.99	47.05	51.27
30-39	76.79	78.56	76.85	62.26	45.30	47.23	54.18
40-49	80.15	74.46	70.29	58.24	35.34	37.17	50.71
50-59	82.41	67.19	62.30	58.74	30.99	42.93	45.69

SOC PERCENTILE SCORE MEANS ACCORDING TO GENDER

Stages of concern

Gender	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Men	72.54	72.07	71.51	58.89	43.03	50.23	54.39
Women	83.18	77.57	72.60	62.75	37.19	38.72	47.04

SOC PERCENTILE SCORE MEANS ACCORDING TO HIGHEST LEVEL OF EDUCATION

	Stages of concern						
Highest level of education	***0***	***1***	***2***	***3***	***4***	***5***	***6***
CPA	81.01	75.90	71.19	63.09	37.68	41.95	49.88
University (first degree)	75.27	77.97	76.75	56.62	43.72	50.05	53.22
University (higher degree)	49.2	57.1	72.3	51.6	64.1	68.4	57.7

SOC PERCENTILE SCORE MEANS ACCORDING TO COMPUTER PROFICIENCY

	Stages of concern						
Computer proficiency	***0***	***1***	***2***	***3***	***4***	***5***	***6***
Very proficient	31.31	52.77	67.31	48.31	66.31	82.00	61.31
Proficient	58.92	73.03	77.78	58.93	58.96	66.50	68.61
Somewhat proficient	82.19	82.6	77.17	67.44	45.14	49.18	57.56
Unskilled	88.46	73.3	67.56	58.71	26.36	29.02	38.09

SOC PERCENTILE SCORE MEANS ACCORDING TO COMPUTER OWNERSHIP

	Stages of concern						
Computer ownership	***0***	***1***	***2***	***3***	***4***	***5***	***6***
Computer at home	69.79	71.91	72.41	57.39	44.25	50.31	52.95
No computer at home	86.46	78.10	71.95	64.33	35.95	39.09	48.30

B. Peak Stages of concern and other variables

CHI SQUARE ANALYSIS (SIGNIFICANT FINDINGS)

PEAK STAGES OF CONCERN

Awareness	Age ($\chi^2(3)=11$, $p<0.05$) Position ($\chi^2(3)=7.81$, $p<0.05$) Training ($\chi^2(1)=27.78$, $p<0.01$) Proficiency ($\chi^2(3)=35.52$, $p<0.01$) Highest educational level ($\chi^2(2)=6.21$, $p<0.05$) Computer at home ($\chi^2(1)=10.43$, $p<0.01$) Frequency of use (home) ($\chi^2(2)=22.10$, $p<0.05$) Frequency of use (school) ($\chi^2(2)=29.69$, $p<0.01$)
Informational	Proficiency ($\chi^2(3)=8.20$, $p<0.05$)
Personal	Highest educational level ($\chi^2(2)=6.66$, $p<0.05$)
Collaboration	Gender ($\chi^2(1)=6.35$, $p<0.05$) Training ($\chi^2(1)=18.89$, $p<0.01$) Highest educational level ($\chi^2(2)=9.97$, $p<0.01$) Computer at home ($\chi^2(1)=13.64$, $p<0.01$) Frequency of use (home) ($\chi^2(2)=29.26$, $p<0.01$) Frequency of use (school) ($\chi^2(2)=40.05$, $p<0.01$)
Refocusing	Proficiency ($\chi^2(3)=7.87$, $p<0.05$)

II. Computer Attitude Scales - Results
A. Factor Analysis
I. PARENTS

Eigenvalues and Proportion of Original Variance

	Magnitude	Variance Prop.
Value 1	3.55	.25
Value 2	1.83	.13
Value 3	1.24	.09
Value 4	1.09	.08

a. Extraction of 3 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 1	Factor 2	Factor 3
Factor 1	1		
Factor 2	-.06	1	
Factor 3	.38	-.16	1

Orthogonal Transformation Solution-Varimax

	Factor 1	Factor 2	Factor 3
Q1	.77	-.02	.17
Q2	.75	-.06	.12
Q3	.67	-.02	.15
Q4	-.31	.64	.18
Q5	.37	3.82E-3	.35
Q6	.17	-.25	.65
Q7	.33	.1	.56
Q8	-.53	.38	.02
Q9	.08	.74	-.14
Q10	.28	-.29	.47
Q11	.06	.76	-.29
Q12	-.12	.23	.43
Q13	-.1	.64	-.02
Q14	.13	-.31	.61

b. Extraction of 4 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1			
Factor 2	-.08	1		
Factor 3	.56	-.2	1	
Factor 4	.1	.13	.05	1

Oblique Solution Primary Pattern Matrix-Orthotran/Varimax

	Factor 1	Factor 2	Factor 3	Factor 4
Q1	.8	.02	-1.49E-3	.05
Q2	.76	.01	.01	-.06
Q3	.67	.04	.03	-.01
Q4	-.56	.68	.45	-.02
Q5	.08	.17	.57	-.26
Q6	-.05	-.26	.57	.34
Q7	.01	.21	.7	6.78E-4
Q8	-.64	.35	.19	.06
Q9	.04	.78	-1.01E-4	-.13
Q10	.05	-.21	.53	-1.19E-3
Q11	.15	.75	-.26	-.03
Q12	-.04	-.02	.02	.92
Q13	-.02	.53	-.14	.33
Q14	-.19	-.23	.73	.04

II. CHILDREN

Eigenvalues and Proportion of Original Variance

	Magnitude	Variance Prop.
Value 1	4 38	.31
Value 2	1 49	.11
Value 3	1 04	.07
Value 4	1 01	.07

a. Extraction of 3 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 1	Factor 2	Factor 3
Factor 1	1		
Factor 2	-5	1	
Factor 3	-52	53	1

Oblique Solution Primary Pattern Matrix-Orthotran/Varimax

	Factor 3	Factor 1	Factor 2
Q1	38	.87	05
Q2	45	.93	01
Q3	-28	7	78
Q4	.43	-.31	-.04
Q5	.74	03	-04
Q6	59	-4 55E-4	-02
Q7	.41	-3.99E-3	21
Q8	.73	21	07
Q9	-.59	13	.36
Q10	.68	-06	13
Q11	.56	14	27
Q12	44	-05	4
Q13	29	-06	.54
Q14	-02	05	.82

b. Extraction of 4 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1			
Factor 2	- 35	1		
Factor 3	- 3	3	1	
Factor 4	- 2	23	32	1

Orthogonal Transformation Solution-Varimax

	Factor 3	Factor 1	Factor 2	Factor 4
Q1	- 17	67	- 25	33
Q2	- 16	.71	- 3	01
Q3	- 14	61	45	- 32
Q4	.58	- 21	- 08	29
Q5	66	05	- 24	24
Q6	.55	03	- 18	05
Q7	55	05	03	37
Q8	.62	21	- 2	- 27
Q9	-.38	11	38	.63
Q10	.78	01	- 09	- 15
Q11	.65	17	- 01	-.09
Q12	.75	04	15	- 03
Q13	.71	05	29	13
Q14	55	.16	53	-.05

III. TEACHERS OF NON-PILOT SCHOOLS

Eigenvalues and Proportion of Original Variance

	Magnitude	Variance Prop.
Value 1	5.62	.31
Value 2	2.31	.13
Value 3	1.31	.07
Value 4	1.11	.06
Value 5	1.05	.06

a. Extraction of 3 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor2	Factor1	Factor 3
Factor 2	1		
Factor 1	- 24	1	
Factor 3	- 35	36	1

Orthogonal Transformation Solution-Varimax

	Factor 2	Factor1	Factor 3
Q1	.73	- 32	- 09
Q2	.87	- 26	- 05
Q3	.88	- 14	02
Q4	- 08	.84	15
Q5	- 12	.85	12
Q6	- 09	.7	21
Q7	14	-.55	-.27
Q8	- 03	.62	07
Q9	- 25	18	.61
Q10	- 03	1	.81
Q11	39	- 37	- 39
Q12	5	24	-.25
Q13	- 42	12	.5
Q14	68	03	- 21
Q15	- 04	18	.45
Q16	.37	09	- 16

	Factor 2	Factor 1	Factor 3
Q17	.52	- 07	- 1
Q18	- 36	35	58

b. Extraction of 5 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 2	Factor 1	Factor 3	Factor 4	Factor 5
Factor 2	1				
Factor 1	- 3	1			
Factor 3	- 2	18	1		
Factor 4	- 17	14	12	1	
Fa tor 5	15	- 12	- 11	- 05	1

s

Orthogonal Transformation Solution-Varimax

	Factor 2	Factor 1	Factor 3	Factor 4	Factor 5
Q1	.76	- 29	- 08	- 1	05
Q2	86	- 24	- 06	- 05	16
Q3	88	- 12	- 02	03	14
Q4	- 13	.79	- 01	35	1
Q5	-.19	.79	- 03	34	16
Q6	- 02	.74	18	05	- 23
Q7	09	-.6	- 32	05	16
Q8	- 04	.64	13	- 09	01
Q9	- 22	25	.78	-.15	-.1
Q10	- 07	09	.75	35	11
Q11	4	- 32	- 23	- 43	03
Q12	.52	26	- 24	- 13	02
Q13	-.42	07	34	45	- 08
Q14	64	03	- 22	- 05	23
Q15	01	1	05	82	- 16
Q16	11	02	- 06	- 07	.8

	Factor 2	Factor 1	Factor 3	Factor 4	Factor 5
Q17	34	- 1	291E-3	- 11	.62
Q18	- 28	38	.53	21	- 27

IV. TEACHERS OF PILOT SCHOOLS

Eigenvalues and Proportion of Original Variance

	Magnitude	Variance Prop.
Value 1	6.23	.35
Value 2	1.9	.11
Value 3	1.23	.07
Value 4	1.1	.06

a. Extraction of 3 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 2	Factor 1	Factor 3
Factor 2	1		
Factor 1	-44	1	
Factor 3	-.62	67	1

Oblique Solution Primary Pattern Matrix-Orthotran/Varimax

	Factor 2	Fact r 1	Factor 3
Q1	.72	05	-12
Q2	81	14	-05
Q3	.74	04	-.05
Q4	-01	.8	08
Q5	03	.8	09
Q6	-05	.8	5 42E-5
Q7	.4	-25	-4 20E-3
Q8	2	.77	-04
Q9	03	-02	.77
Q10	3	-11	94
Q11	39	-.85	55
Q12	77	-21	33
Q13	-34	11	39
Q14	58	-01	-17
Q15	19	-15	77
Q16	.6	04	1

	Factor 2	Factor 1	Factor 3
Q17	63	-1	23
Q18	-22	-26	74

b. Extraction of 4 factors

Primary Intercorrelations-Orthotran/Varimax

	Factor 2	Factor 1	Factor 3	Factor 4
Factor 2	1			
Factor 1	-42	1		
Factor 3	-51	62	1	
Factor 4	62	-44	-54	1

Oblique Solution Primary Pattern Matrix-Orthotran/Varimax

	Factor 2	Factor 1	Factor 3	Factor 4
Q1	.83	-01	-02	-8 19E-4
Q2	.94	06	06	-01
Q3	.94	-04	07	-.09
Q4	05	82	08	05
Q5	06	8	11	-.02
Q6	05	78	03	-.09
Q7	-18	-15	-09	.62
Q8	.05	.79	-.03	19
Q9	22	-03	.77	-.24
Q10	-.09	-01	.83	35
Q11	13	-8	.48	25
Q12	08	-09	.23	.75
Q13	-27	13	35	-.14
Q14	1	05	-.21	.56
Q15	11	-11	.73	04
Q16	-.15	17	-4 38E-3	.82

	Factor 2	Factor 1	Factor 3	Factor 4
Q17	03	1 70E-3	.15	.66
Q18	-.27	-.21	.66	-05

B. ANOVA - Factor scores

I. PARENTS

Investigation of the relationship between factor scores and the variables: school child attends (pilot, non-pilot), computer ownership at home, computer availability at work, gender, self rated proficiency and age.

COMPUTER ATTITUDE SCALE FACTORS BY AVAILABILITY OF COMPUTERS AT WORK

Factor	*Means yes*	*Means no*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	**-0.37**	**0.20**	**13.56**	**0.00 ****
Factor 2 (Learning with computers/educational)	-0.03	-0.05	0.03	0.87
Factor 3 (Concerns about computers/general)	-0.11	0.07	1.08	0.30

COMPUTER ATTITUDE SCALE FACTORS BY COMPUTERS OWNERSHIP AT HOME

Factor	*Means yes*	*Means no*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	**-0.45**	**0.14**	**11.40**	**0.00 ****
Factor 2 (Learning with computers/educational)	0.13	-0.02	0.87	0.34
Factor 3 (Concerns about computers/general)	-0.10	0.25	0.43	0.51

COMPUTER ATTITUDE SCALE FACTORS BY GENDER

Factor	*Means man*	*Means woman*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	-0.07	0.03	0.42	0.52
Factor 2 (Learning with computers/educational)	0.11	-0.08	1.71	0.19
Factor 3 (Concerns about computers/general)	0.11	-0.10	1.89	0.17

COMPUTER ATTITUDE SCALE FACTORS BY COMPUTING PROFICIENCY

Factor	*Means very proficient (1)*	*Means proficien t (2)*	*Means somewhat proficient (3)*	*Means unskilled (4)*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal) *Group 4 from 1, 2 and 3*	**-0.74**	**-0.49**	**-0.14**	**0.36**	**9.67**	**0.00 ****
Factor 2 (Learning with computers/educational)	0.12	0.2	-0.00	-0.13	1.32	0.27
Factor 3 (Concerns about computers/general)	0.42	-0.00	0.07	-0.08	0.70	0.55

COMPUTER ATTITUDE SCALE FACTORS BY SCHOOL CHILD ATTENDS

Factor	*Means pilot*	*Means non-pilot*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	1.18	0.99	0.60	0.44
Factor 2 (Learning with computer/educational)	0.10	-0.10	1.90	0.17
Factor 3 (Concerns about computers/general)	-0.03	0.01	0.06	0.80

COMPUTER ATTITUDE SCALE FACTORS BY HIGHEST LEVEL OF EDUCATION

Factor	*Means elementary school (1)*	*Means gymnasium (2)*	*Means lyceum (3)*	*Means college (4)*	*Means university (5)*	*Means other (6)*	*F ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal) *Group 1 from 5*	**0.36**	**0.17**	**0.06**	**-0.17**	**-0.39**	**0.07**	**2.57**	**0.03 ***
Factor 2 (Learning with computers/educational)	0.14	-0.02	-0.07	-0.01	-0.00	-0.15	2.28	0.92
Factor 3 (Concerns about computers/general)	0.34	-0.06	-0.12	-0.47	-0.05	0.14	1.47	0.20

COMPUTER ATTITUDE SCALE FACTORS BY AGE

Factor	*Means 20-29*	*Means 30-39*	*Means 40-49*	*Means 50-59*	*Means 60+*	*F ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	0.41	-0.04	0.03	-0.24	0.37	0.47	0.76
Factor 2 (Learning with computers/educational)	0.20	-0.07	0.08	0.14	-1.25	0.77	0.54
Factor 3 (Concerns about computers/general)	-0.63	0.01	0.03	-0.08	0.94	0.88	0.47

II. CHILDREN

Investigation of the relationship between factor scores and the variables: school child attends, computer ownership and gender.

COMPUTER ATTITUDE SCALE FACTORS BY SCHOOL CHILD ATTENDS

Factor	*Means pilot*	*Means non-pilot*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computing/personal)	-0.04	0.05	0.53	0.46
Factor 2 (Learning with computers/educational)	0.09	-0.09	2.66	0.10
Factor 3 (Attitudes towards computers/general)	0.07	-0.07	1.43	0.23

COMPUTER ATTITUDE SCALE FACTORS BY COMPUTERS OWNERSHIP AT HOME

Factor	*Means yes*	*Means no*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computing/personal)	**-0.32**	**0.10**	**10.21**	**0.00 ****
Factor 2 (Learning with computers/educational)	0.58	-0.02	0.35	0.56
Factor 3 (Attitudes towards computers/general)	0.37	-0.1	0.13	0.71

COMPUTER ATTITUDE SCALE FACTORS BY GENDER

Factor	*Means boy*	*Means girl*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computing/personal)	**-0.11**	**0.12**	**4.10**	**0.04 ***
Factor 2 (Learning with computers/educational)	**-0.18**	**0.18**	**10.50**	**0.00 ****
Factor 3 (Attitudes towards computers/ general)	-0.03	0.03	0.26	0.61

III. TEACHERS

Investigation of the relationship between factor scores and the variables: school respondent works, computer ownership at home, position at school, gender, training, self rated proficiency, highest level of education attained, age, frequency of use at home and at school (pilot).

COMPUTER ATTITUDE SCALE FACTORS BY COMPUTER OWNERSHIP AT HOME

TEACHERS-PILOT

Factor	*Means yes*	*Means no*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	**-0.22**	**0.20**	**4.22**	**0.04 ***
Factor 2 (Attitudes towards teaching with computers/ professional)	0.05	-0.04	0.20	0.65
Factor 3 (Concerns about computers/ general)	-0.10	0.09	0.63	0.43

TEACHERS- NON-PILOT

Factor	*Means yes*	*Means no*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	**-0.29**	**0.16**	**6.14**	**0.01 ****
Factor 2 (Attitudes towards teaching with computers/ professional)	0.02	-0.01	0.03	0.85
Factor 3 (Concerns about computers/ general)	-0.19	0.10	2.45	0.12

COMPUTER ATTITUDE SCALE FACTORS BY TRAINING

TEACHERS-PILOT

Factor	*Means trained*	*Means not trained*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/ personal)	-0.21	0.18	3.38	0.06
Factor 2 (Attitudes towards teaching with computers/ professional)	0.18	-0.15	2.81	0.09
Factor 3 (Concerns about computers/ general)	-0.12	0.14	1.18	0.27

TEACHERS- NON-PILOT

Factor	*Means trained*	*Means not trained*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	**-0.57**	**0.17**	**13.05**	**0.00 ****
Factor 2 (Attitudes towards teaching with computers/ professional)	0.27	-0.06	2.55	0.11
Factor 3 (Concerns about computers/ general)	-0.24	0.04	1.68	0.19

COMPUTER ATTITUDE SCALE FACTORS BY POSITION AT SCHOOL

TEACHERS- PILOT

Factor	*Means principal*	*Means assistant principal*	*Means teacher*	*Means others*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	0.43	0.06	-0.03	-0.26	0.58	0.63
Factor 2 (Attitudes towards teaching with computers/professional)	0.57	0.07	-0.03	-0.65	1.62	0.18
Factor 3 (Concerns about computers/general)	-0.04	0.08	-0.03	0.07	0.04	0.99

TEACHERS- NON-PILOT

Factor	*Means principal*	*Means assistant principal*	*Means teacher*	*Means others*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal) ***Group 2 from 3 and 4***	**1.18**	**0.51**	**-0.10**	**-0.43**	**6.48**	**0.00 ****
Factor 2 (Attitudes towards teaching with computers/professional)	-0.21	0.48	-0.00	-0.52	2.64	0.05
Factor 3 (Concerns about computers/general)	-0.49	0.44	-0.10	0.27	2.24	0.08

COMPUTER ATTITUDE SCALE FACTORS BY GENDER

TEACHERS- PILOT

Factor	*Means man*	*Means woman*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	-0.08	0.06	0.45	0.50
Factor 2 (Attitudes towards teaching with computers/professional)	0.05	-0.08	0.49	0.48
Factor 3 (Concerns about computers/general)	-0.15	0.11	1.17	0.28

TEACHERS- NON-PILOT

Factor	*Means man*	*Means woman*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal)	-0.05	0.01	0.08	0.77
Factor 2 (Attitudes towards teaching with computers/professional)	0.07	-0.06	0.45	0.50
Factor 3 (Concerns about computers/general)	0.03	-0.01	0.05	0.81

COMPUTER ATTITUDE SCALE FACTORS BY COMPUTING PROFICIENCY

TEACHERS- PILOT

Factor	*Means very proficient (1)*	*Means proficien t (2)*	*Means somewhat proficient (3)*	*Means unskilled (4)*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal) ***Group 4 from 1,2***	**-0.77**	**-0.74**	**-0.04**	**0.42**	**6.40**	**0.00 ****
Factor 2 (Attitudes towards teaching with computers/professional)	0.39	0.03	0.20	-0.25	1.77	0.15
Factor 3 (Concerns about computers/general)	-0.55	-0.09	0.06	-0.02	0.45	0.72

TEACHERS- NON-PILOT

Factor 1 **(Anxieties about computers/personal)** ***Group 4 from 2,3***	**-0.56**	**-1.05**	**-0.34**	**0.32**	**10.73**	**0.00** **
Factor 2 (Attitudes towards teaching with computers/ professional)	0.93	0.17	-0.06	-0.07	2.04	0.11
Factor 3 (Concerns about computers/ general)	-0.67	0.27	-0.29	0.11	2.06	0.11

COMPUTER ATTITUDE SCALE FACTORS BY HIGHEST LEVEL OF EDUCATION

TEACHERS- PILOT

Factor	*Means CPA (1)*	*Means University first (2)*	*Means University higher (3)*	*F Ratio*	*Prob. p*
Factor 1 **(Anxieties about computers/personal)** ***Group 1 from 3***	**0.09**	**-0.16**	**-1.11**	**3.31**	**0.03** *
Factor 2 (Attitudes towards teaching with computers/ professional)	0.05	-0.07	-0.36	0.46	0.62
Factor 3 (Concerns about computers/ general)	0.07	-0.17	0.11	0.34	0.71

TEACHERS- NON-PILOT

Factor 1 (Anxieties about computers/ personal)	0.10	-0.30	-0.09	1.78	0.17
Factor 2 (Attitudes towards teaching with computers/ professional)	-0.07	0.04	0.93	2.55	0.08
Factor 3 (Concerns about computers/ general)	0.04	0.09	0.19	0.24	0.77

COMPUTER ATTITUDE SCALE FACTORS BY AGE

TEACHERS- PILOT

Factor	*Means 20-29 (1)*	*Means 30-39 (2)*	*Means 40-49 (3)*	*Means 50-59 (4)*	*F Ratio*	*Prob. p*
Factor 1 **(Anxieties about computers/personal)** ***Group 4 from 1***	**-0.37**	**-0.05**	**0.29**	**0.37**	**3.28**	**0.02** *
Factor 2 (Attitudes towards teaching with computers/ professional)	-0.16	-0.07	0.07	0.27	1.01	0.38
Factor 3 (Concerns about computers/ general)	0.17	-0.18	-0.10	-0.05	0.47	0.70

TEACHERS- NON-PILOT

Factor 1 **(Anxieties about computers/personal)** ***Group 4 from 1, 2***	**-0.23**	**-0.35**	**0.39**	**0.57**	**5.93**	**0.01** *
Factor 2 **(Attitudes towards teaching with computers/professional)** ***Groups 1, 4 from 2***	**0.14**	**-0.57**	**-0.10**	**0.23**	**3.43**	**0.02** *
Factor 3 (Concerns about computers/ general)	-0.03	-0.16	-0.09	0.29	0.89	0.44

COMPUTER ATTITUDE SCALE FACTORS BY FREQUENCY OF USE AT SCHOOL

TEACHERS- PILOT

Factor	*Means Often (1)*	*Means Sometimes (2)*	*Means Never (3)*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal) *Group 1 from 3*	**-0.48**	**-0.18**	**0.24**	**3.81**	**0.02 ***
Factor 2 (Attitudes towards teaching with computers/professional)	0.21	0.21	-0.25	2.81	0.06
Factor 3 (Concerns about computers/general)	-0.35	-0.00	0.10	0.96	0.38

COMPUTER ATTITUDE SCALE FACTORS BY FREQUENCY OF USE AT HOME

TEACHERS- PILOT

Factor	*Means Often (1)*	*Means Sometimes (2)*	*Means Never (3)*	*F Ratio*	*Prob. p*
Factor 1 (Anxieties about computers/personal) *Group 1 from 3*	**-0.7**	**-0.13**	**0.39**	**4.28**	**0.02 ***
Factor 2 (Attitudes towards teaching with computers/professional) *Group 1 from 3*	**0.26**	**0.09**	**-0.77**	**3.46**	**0.04 ***
Factor 3 (Concerns about computers/general)	-0.3	0.17	-0.51	1.55	0.22

TEACHERS- NON-PILOT

Factor 1 (Anxieties about computers/personal) *Groups 1, 2 from 3*	**-0.82**	**-0.48**	**0.51**	**7.46**	**0.00 ****
Factor 2 (Attitudes towards teaching with computers/professional)	0.44	-0.20	-0.19	2.73	0.08
Factor 3 (Concerns about computers/general)	-0.33	-0.15	-0.07	0.21	0.81

C. Semantic differential instrument

CHI SQUARE ANALYSIS (SIGNIFICANT FINDINGS)

CHILDREN

Colourful/Dull	Computer at home ($\chi^2(1)-17$, $p<0.01$)
Creative/Unimaginative	Computer at home ($\chi^2(1)=4.74$, $p<0.05$)
Easy/Hard	Gender ($\chi^2(1)-12.98$, $p<0.01$)
Fast/Slow	Gender ($\chi^2(1)-4.97$, $p<0.05$)

CHILDREN (PILOT, NON-PILOT)

Easy/Hard	School (pilot/non pilot) ($\chi^2(1)=16\ 74$, $p<0.01$)
Friendly/Scary	School (pilot/non pilot) ($\chi^2(1)=3.75$, $p<0.05$)
Understandable/Confusing	School (pilot/non pilot) ($\chi^2(1)=7.95$, $p<0.05$)
Colourful/Dull	School (pilot/non pilot) ($\chi^2(1)=8.03$, $p<0.05$)
Creative/Unimaginative	School (pilot/non pilot) ($\chi^2(1)-8.24$, $p<0.05$)

III. Other questionnaire items - Results

A. Beliefs on computer introduction

I. FREQUENCIES

1. When do you think children should become familiar with computers?	TEACHERS pilot		TEACHERS non-pilot		PARENTS	
	Freq.	*Valid Perc.*	*Freq.*	*Valid Perc.*	*Freq.*	*Valid Perc.*
Elementary Education	176	*87%*	141	*80%*	160	*65%*
Secondary Education (Gymnasium)	24	*12%*	32	*18%*	73	*30%*
Secondary Education (Lyceum)	2	*1%*	4	*2%*	8	*3%*
Tertiary Education (College or University)	0	*0%*	0	*0%*	5	*2%*
At no level of education	0	*0%*	0	*0%*	1	*0%*
Total	**202**	**100%**	**177**	**100%**	**247**	**100%**

2. How many computers do you think each school should have?	TEACHERS pilot		TEACHERS non-pilot		PARENTS	
	Freq.	*Valid Perc.*	*Freq.*	*Valid Perc.*	*Freq.*	*Valid Perc.*
None	3	*2%*	0	*0%*	6	*2%*
One per school	6	*3%*	7	*4%*	6	*2%*
One per classroom	44	*22%*	51	*29%*	70	*28%*
Some per classroom	137	*69%*	94	*53%*	129	*52%*
One per child	9	*5%*	26	*15%*	39	*16%*
Total	**199**	**100%**	**178**	**100%**	**250**	**100%**

3. Which do you think is the best way of introducing computers?	TEACHERS pilot		TEACHERS non-pilot		PARENTS	
	Freq.	*Valid Perc.*	*Freq.*	*Valid Perc.*	*Freq.*	*Valid Perc.*
As a separate subject	55	*30%*	63	*36%*	134	*54%*
As a topic within existing subjects	32	*17%*	36	*21%*	44	*18%*
As a medium for instruction (aid)	97	*52%*	72	*42%*	65	*26%*
In no case	2	*1%*	2	*1%*	3	*1%*
Total	**186**	**100%**	**173**	**100%**	**246**	**100%**

4. For which subjects do you think computers could be used?	TEACHERS pilot		TEACHERS non-pilot		PARENTS	
	Freq.	*Valid Perc.*	*Freq.*	*Valid Perc.*	*Freq.*	*Valid Perc.*
All subjects	101	*51%*	93	*52%*	95	*38%*
Some subjects	90	*45%*	74	*42%*	130	*52%*
"Positive subjects" (Maths, Science)	6	*3%*	8	*4%*	20	*8%*
No subjects	3	*2%*	3	*2%*	3	*1%*
Total	**200**	**100%**	**178**	**100%**	**248**	**100%**

5. Do you believe that computers could be introduced in elementary schools of Cyprus?	TEACHERS pilot		TEACHERS non-pilot		PARENTS	
	Freq.	*Valid Perc.*	*Freq.*	*Valid Perc.*	*Freq.*	*Valid Perc.*
Yes	180	*89%*	155	*89%*	207	*83%*
No	22	*11%*	20	*11%*	42	*17%*
Total	**202**	**100%**	**175**	**100%**	**249**	**100%**

6. Are you aware of the fact that computers have been introduced in elementary schools of Cyprus?	TEACHERS pilot		TEACHERS non-pilot		PARENTS	
	Freq.	*Valid Perc.*	*Freq.*	*Valid Perc.*	*Freq.*	*Valid Perc.*
Yes	196	97%	143	80%	141	56%
No	7	3%	35	20%	110	44%
Total	203	100%	178	100%	251	100%

II. CHI SQUARE ANALYSIS (SIGNIFICANT FINDINGS)

PARENTS

Chi square tests investigated the relationship between beliefs and age, gender, highest level of education, school child attended, computer at home, computer at work and self-rated computing proficiency.

Do you believe that computers should be introduced into elementary schools of Cyprus?	School child attends ($\chi^2(1)=7.79, p<0.01$) Computer at home ($\chi^2(1)=4.21, p<0.01$)
Are you aware of the fact that computers have been introduced into some pilot elementary schools in Cyprus?	School child attends ($\chi^2(1)=99.04, p<0.01$)

TEACHERS

Chi square tests investigated the relationship between beliefs and age, gender, highest level of education attained, school teacher works, position at school, computer at home, training background and self-rated computing proficiency.

How many computers do you think each school should have?	School teacher works ($\chi^2(4)=17.98, p<0.01$)
Do you believe that computers should be introduced into elementary schools of Cyprus?	Computer at home ($\chi^2(1)=10.36, p<0.01$) Training background ($\chi^2(1)=8.39, p<0.01$)
Are you aware of the fact that computers have been introduced into some pilot elementary schools in Cyprus?	School teacher works ($\chi^2(1)=24.49, p<0.01$) Training background ($\chi^2(1)=8.11, p<0.01$)

TEACHERS AND PARENTS

How many computers do you think each school should have?	Group (teacher or parent) ($\chi^2(4)=11.21, p<0.05$)
Do you believe that computers should be introduced into elementary schools of Cyprus?	Group (teacher or parent) ($\chi^2(1)=4.23, p<0.05$)
Are you aware of the fact that computers have been introduced into some pilot elementary schools in Cyprus?	Group (teacher or parent) ($\chi^2(1)=89.13, p<0.01$)

B. Goals for computer introduction

I. FREQUENCIES

TEACHERS

Ideally, I think that computers are introduced to schools to help children:	Very important: Pilot	Very important: Non-pilot	Somewhat important: Pilot	Somewhat important: Non-pilot	Not important: Pilot	Not important: Non-pilot
learn school subjects.	42%	52%	53%	38%	5%	10%
be able to manage computers when they are grown up.	58%	59%	37%	38%	5%	3%
find a better job later on.	31%	34%	42%	46%	27%	20%
deal with difficult and complex problems.	41%	48%	43%	45%	16%	7%
be able to find information they need.	87%	85%	12%	13%	1%	2%
be able to create things of their own.	68%	72%	28%	24%	4%	4%
become more active in their learning.	70%	74%	25%	23%	5%	3%
maintain interest and become informed about the world.	78%	71%	20%	24%	2%	5%
Practically, I think that computers are introduced to schools to help children:	Pilot	Non-pilot	Pilot	Non-pilot	Pilot	Non-pilot
learn school subjects.	29%	31%	49%	48%	22%	21%
be able to manage computers when they are grown up.	46%	35%	40%	51%	14%	14%
find a better job later on.	23%	27%	35%	43%	42%	30%
deal with difficult and complex problems.	23%	30%	48%	49%	29%	21%
be able to find information they need.	59%	54%	33%	40%	8%	6%
be able to create things of their own.	46%	42%	41%	42%	13%	16%
become more active in their learning.	54%	47%	36%	44%	10%	9%
maintain interest and become informed about the world.	61%	52%	32%	37%	7%	11%

PARENTS

Ideally, I think that computers are introduced to schools to help children:	Very important	Somewhat important	Not important
learn school subjects.	60%	33%	7%
be able to manage computers when they are grown up.	76%	21%	3%
find a better job later on.	71%	22%	7%
deal with difficult and complex problems.	50%	40%	10%
be able to find information they need.	74%	23%	3%
be able to create things of their own.	65%	30%	5%
become more active in their learning.	61%	34%	5%
maintain interest and become informed about the world.	67%	27%	6%
Practically, I think that computers are introduced to schools to help children:	Very important	Somewhat important	Not important
learn school subjects.	53%	38%	9%
be able to manage computers when they are grown up.	74%	22%	4%
find a better job later on.	72%	21%	7%
deal with difficult and complex problems.	47%	39%	14%
be able to find information they need.	70%	27%	3%
be able to create things of their own.	58%	37%	5%
become more active in their learning.	58%	37%	5%
maintain interest and become informed about the world.	59%	36%	5%

STUDENTS

I think that computers are introduced to schools to help me :	Very important	Somewhat important	Not important
learn school subjects	76%	21%	3%
be able to manage computers when I grow up.	59%	37%	4%
find a better job later on.	54%	39%	7%
deal with difficult and complex problems	48%	39%	13%
be able to find information I need.	75%	22%	3%
be able to create things of my own.	40%	42%	18%
become more active in my learning	57%	36%	7%
maintain interest and become informed about the world.	58%	28%	14%

II. ANALYSIS OF VARIANCE

TEACHERS AND PARENTS

Ideally, I think that computers are introduced to schools to help children:	Means Teacher	Means Parent	F Ratio	Probability
learn school subjects.	1.60	1.47	6.31	0.01 *
be able to manage computers when they are grown up.	1.45	1.27	15.77	0.00 **
find a better job later on.	1.91	1.35	93.55	0.00 **
deal with difficult and complex problems.	1.67	1.60	1.44	0.23
be able to find information they need.	1.15	1.28	14.40	0.00 **
be able to create things of their own.	1.34	1.39	1.46	0.22
become more active in their learning.	1.32	1.44	6.15	0.01 *
maintain interest and become informed about the world.	1.29	1.39	4.97	0.03 *
Practically, I think that computers are introduced to schools to help children:	**Means Teacher**	**Means Parent**	**F Ratio**	**Probability**
learn school subjects.	1.92	1.55	38.32	0.00 **
be able to manage computers when they are grown up.	1.73	1.30	61.48	0.00 **
find a better job later on.	2.11	1.35	151.9	0.00 **
deal with difficult and complex problems.	1.99	1.66	27.98	0.00 **
be able to find information they need.	1.50	1.34	10.06	0.00 **
be able to create things of their own.	1.70	1.49	12.62	0.00 **
become more active in their learning.	1.59	1.47	4.55	0.03 *
maintain interest and become informed about the world.	1.53	1.46	1.60	0.20

1=very important 2=somewhat important 3=not important

STUDENTS SCHOOL

I think that computers are introduced to schools to help me:	Means Pilot	Means Non-pilot	F Ratio	Probability
learn school subjects.	2.64	2.72	1.39	0.23
be able to manage computers when I am grown up.	2.51	2.54	0.30	0.58
find a better job later on.	2.29	2.60	18.46	0.00 **
deal with difficult and complex problems.	2.16	2.37	5.41	0.02 *
be able to find information I need.	2.65	2.67	0.03	0.85
be able to create things of my own.	2.09	2.20	1.46	0.22
become more active in their learning.	2.41	2.46	0.51	0.47
maintain interest and become informed about the world.	2.40	2.42	0.06	0.81

TEACHERS SCHOOL

Ideally, I think that computers are introduced to schools to help children:	Means Pilot	Means Non-pilot	F Ratio	Probability
learn school subjects.	1.63	1.57	0.69	0.41
be able to manage computers when they are grown up.	1.46	1.43	0.25	0.62
find a better job later on.	1.96	1.86	1.72	0.19
deal with difficult and complex problems.	1.73	1.60	3.52	0.06
be able to find information they need.	1.12	1.17	1.31	0.25
be able to create things of their own.	1.35	1.31	0.52	0.47
become more active in their learning.	1.36	1.27	2.19	0.13
maintain interest and become informed about the world.	1.24	1.34	2.98	0.08
Practically, I think that computers are introduced to schools to help children:	Means Pilot	Means Non-pilot	F Ratio	Probability
learn school subjects.	1.94	1.89	0.36	0.54
be able to manage computers when they are grown up.	1.67	1.80	3.01	0.08
find a better job later on.	2.18	2.03	3.30	0.07
deal with difficult and complex problems.	2.05	1.91	3.18	0.07
be able to find information they need.	1.49	1.52	0.18	0.67
be able to create things of their own.	1.67	1.74	0.88	0.34
become more active in their learning.	1.54	1.63	1.66	0.19
maintain interest and become informed about the world.	1.47	1.60	3.5	0.06

PARENTS SCHOOL

Ideally, I think that computers are introduced to schools to help children:	Means Pilot	Means Non-pilot	F Ratio	Probability
learn school subjects.	1.46	1.48	0.05	0.82
be able to manage computers when they are grown up.	1.22	1.32	2.57	0.10
find a better job later on.	1.32	1.41	1.31	0.25
deal with difficult and complex problems.	1.63	1.57	0.39	0.53
be able to find information they need.	1.31	1.26	0.65	0.42
be able to create things of their own.	1.38	1.38	0.00	0.95
become more active in their learning.	1.43	1.43	0.05	0.82
maintain interest and become informed about the world.	1.42	1.37	0.42	0.51
Practically, I think that computers are introduced to schools to help children:	Means Pilot	Means Non-pilot	F Ratio	Probability
learn school subjects.	1.56	1.53	0.06	0.80
be able to manage computers when they are grown up.	1.28	1.33	0.43	0.51
find a better job later on.	1.34	1.39	0.37	0.54
deal with difficult and complex problems.	1.69	1.62	0.44	0.50
be able to find information they need.	1.36	1.33	0.07	0.78
be able to create things of their own.	1.48	1.48	0.00	0.97
become more active in their learning.	1.46	1.48	0.04	0.83
maintain interest and become informed about the world.	1.44	1.47	0.12	0.72

C. Teachers' training needs, problems, media use

FREQUENCIES

	Pilot		Not-pilot	
TRAINING AREA	*Frequency*	*Valid Percentage*	*Frequency*	*Valid Percentage*
Programming	42	24%	42	23%
Use of operating systems	61	35%	46	26%
Use of specific software	45	26%	23	13%
Multimedia	43	25%	38	21%
Telecommunications (Internet)	59	34%	49	27%
Use of computers for education	147	85%	133	74%
Other	1	0%	4	2%

	Pilot					Non-pilot				
PROBLEM	1	2	3	4	5	1	2	3	4	5
Software	26%	20%	11%	6%	37%	12%	17%	12%	6%	52%
Hardware	17%	36%	18%	5%	24%	24%	32%	13%	5%	27%
Training	46%	33%	11%	3%	7%	38%	27%	20%	6%	9%
Technical support	31%	29%	17%	5%	18%	22%	37%	17%	3%	21%
Curriculum integration	23%	39%	20%	8%	10%	28%	29%	19%	11%	13%
Supplementary material	23%	34%	22%	10%	12%	21%	35%	23%	4%	17%

1=very important 2=important 3=somewhat important
4=not important 5=I don't know

	Pilot				Non-pilot			
	slides	overh. projec	tape radio	TV video	slides	overh. projec	tape radio	TV video
Several times per week	1%	0%	21%	5%	0%	0%	22%	5%
About once a week	1%	1%	22%	4%	1%	1%	25%	2%
Once or twice a month	15%	9%	45%	65%	6%	6%	45%	57%
Not at all	83%	90%	12%	26%	93%	94%	8%	35%

IV . Instruments for data collection

In this section, questionnaires, documents and interview questions are provided for the reader.

A. Questionnaires

Questionnaires are presented in Greek as they were actually designed. There follows an appropriate English translation for each. The order in which they are presented is:

1. Questionnaire to teachers of non-pilot schools (orange cover)
2. SoC Questionnaire (attached to questionnaire of pilot school teachers)
3. Questionnaire to students (pink cover)
4. Questionnaire to parents (green cover)
5. Questionnaire to teacher coordinators (yellow cover)
6. Questionnaire to all teachers (translation)
7. SoC questionnaire
8. Questionnaire to students (translation)
9. Questionnaire to parents (translation)
10. Questionnaire to teacher coordinators (translation)

1. Questionnaire to all teachers (orange cover)

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26 Απριλίου, 1996

ΠΡΟΣ ΟΛΟ ΤΟ ΔΙΔΑΚΤΙΚΟ ΠΡΟΣΩΠΙΚΟ ΤΟΥ ΣΧΟΛΕΙΟΥ

Αγαπητέ συνάδελφε / συναδέλφισσα,

Γνωρίζω ότι ο χρόνος σας είναι πολύτιμος, όπως επίσης γνωρίζω ότι έχετε κουραστεί από τη συχνή συμπλήρωση ερωτηματολογίων τον τελευταίο καιρό. **Χρειάζομαι, όμως, πολύ τη δική σας βοήθεια** στην προσπάθεια μου για συλλογή δεδομένων για τους σκοπούς της διδακτορικής μου διατριβής.

Συγκεκριμένα, διεξάγω μια έρευνα σχετικά με τις διαδικασίες αλλαγής στην εκπαίδευση και την εμπλοκή των ατόμων σε αυτές. Επειδή το σχολείο σας περιλαμβάνεται στα σχολεία δοκιμαστικής φάσης εισαγωγής Ηλεκτρονικών Υπολογιστών του προγράμματος του Υπουργείου Παιδείας, πιστεύω ότι είστε μια σημαντική πηγή πληροφοριών σχετικά με τις διαδικασίες εμπλοκής σε καινοτομίες.

Παρακαλώ πολύ συμπληρώστε το ερωτηματολόγιο που ακολουθεί το οποίο αποτελείται από δύο μέρη. Το πρώτο μέρος (ΕΚΠΑΙΔΕΥΤΙΚΟΙ) στόχο έχει τη διερεύνηση των εμπειριών αλλά και στάσεων σας σχετικά με τους Ηλεκτρονικούς Υπολογιστές. Το δεύτερο μέρος (ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ SoC) στόχο έχει την μέτρηση του βαθμού στον οποίο η συγκεκριμένη καινοτομία (εισαγωγή Ηλεκτρονικών Υπολογιστών) σας απασχολεί.

Και πάλι, **ευχαριστώ πάρα πολύ** για τη συνεργασία σας, χωρίς την οποία η διεξαγωγή αυτής της έρευνας είναι αδύνατη.

Φιλικά,

Γιασεμίνα Καραγιώργη

ις πιο κάτω ερωτήσεις/δηλώσεις ο όρος Η.Υ. αναφέρεται στον ηλεκτρονικό υπολογιστή δηλαδή το μπιούτερ. Παρακαλώ πολύ συμπληρώστε ή βάλτε ✓ όπου ταιριάζει.

Φύλο: ΄Αντρας ( ) Γυναίκα ( )

Ηλικία: 20-29 ( ) 40-49 ( ) 30-39 ( )
50-59 ( ) 60+ ( )

Οργανική θέση: Διευθυντής/ντρια ( ) Βοηθός Διευθυντής/ντρια ( )
Δάσκαλος/α ( ) ΄Αλλη θέση ( ) *(παρακαλώ καθορίστε)* ....

Σχολείο:..

Απόφοιτος: *(σημειώστε το ψηλότερο επίπεδο μόρφωσης)* Π.Α.Κ. ( )
Πανεπιστημίου (πρώτο πτυχίο) ( )
Πανεπιστημίου (μεταπτυχιακό) ( )

΄Εχετε Η.Υ. στο σπίτι σας; ναι ( ) όχι ( )

Αν ναι, α. πόσο συχνά τον χρησιμοποιείτε; συχνά ( ) κάποτε ( ) ποτέ ( )
β. πώς τον χρησιμοποιείτε;...

Αν όχι, σκοπεύετε να αγοράσετε; ναι ( ) όχι ( )

Υπάρχουν Η.Υ. στο σχολειο σας; ναι ( ) όχι ( )

Αν ναι, α. πόσο συχνά τον/τους χρησιμοποιείτε; συχνά ( ) κάποτε ( ) ποτέ ( )
β. πώς τον/τους χρησιμοποιείτε;...

΄Εχετε οποιαδήποτε επιμόρφωση στους Η.Υ.; ναι ( ) όχι ( )

Αν ναι,

Πού παρακολουθήσατε μαθήματα;	Για πόσο καιρό;. (διάρκεια)	Τι ειδους μαθήματα; (περιεχόμενο)

Τι θεωρείτε τον εαυτό σας όσον αφορά τις ικανότητες σας να χρησιμοποιείτε Η.Υ;
έμπειρο/η ( ) αρκετά ικανό/ή ( ) λίγο ικανό/ή ( ) άπειρο/η ( )

0. Πότε πιστεύετε ότι πρέπει να αρχίσει η επαφή του μαθητή με Η.Υ.;
από την πρωτοβάθμια εκπαίδευση ( )
από τη δευτεροβάθμια εκπαίδευση (Γυμνάσιο) ( )
από τη δευτεροβάθμια εκπαίδευση (Λύκειο) ( )
από την τριτοτάθμια εκπαίδευση ( )
σε καμία βαθμίδα ( )

1. Πόσους Η.Υ. νομίζετε ότι πρέπει να έχει κάθε σχολείο;
κανένα ( )
ένα κάθε σχολείο ( )
ένα κάθε τάξη ( )
μερικούς κάθε τάξη ( )
ένα κάθε παιδί ( )

2. Ποιός νομίζετε ότι είναι ο καταλληλότερος τρόπος εισαγωγής Η.Υ;
ως ξεχωριστό μάθημα ( )
ως θέμα ενταγμένο σε υπάρχοντα μαθήματα ( )
ως βοηθητικό μέσο για τη διδασκαλία μαθημάτων ( )
σε καμία περίπτωση ( )

13. Για ποιών μαθημάτων τη διδασκαλία νομίζετε ότι μπορούν να χρησιμοποιηθούν Η.Υ.;
όλων των μαθημάτων ( )
ορισμένων μαθημάτων ( )
θετικών μαθημάτων ( )
κανενός μαθήματος ( )

14. Πιστεύετε ότι οι Η.Υ πρέπει να εισαχθούν στα δημοτικά σχολεία της Κύπρου;
ναι ( ) όχι ( )

15. Γνωρίζετε ότι οι Η.Υ. έχουν εισαχθεί σε ορισμένα δημοτικά σχολεία της Κύπρου;
ναι ( ) όχι ( )

16. Ποια είναι η γνώμη σας για την εισαγωγή Η.Υ. στα δημοτικά σχολεία; *(παρακαλώ δικαιολογήστε)*

....

....

....

Δ.
Θα θέλατε επιμόρφωση σε θέματα σχετικά με τους Η.Υ.; ναι ( ) όχι ( )

Αν ναι, σε ποιούς τομείς θα θέλατε επιμόρφωση; Χρήση λειτουργικών συστημάτων π.χ. MS DOS ( )
Χρήση λογισμικών προγραμμάτων π.χ. EXCEL ( )
Προγραμματισμός ( )
Πολυμέσα δηλ. MULTIMEDIA ( )
Τηλεπικοινωνίες π.χ. INTERNET ( )
Χρήση Η.Υ. στην εκπαίδευση ( )
Άλλα (*συμπληρώστε*)..

Ε.
Πιο κάτω υπάρχει μια σειρά περιοχών στις οποίες επισημαίνονται προβλήματα. Παρακαλούμε αναφέρετε τη γνώμη σας σχετικά με τα προβλήματα που πιθανόν να αντιμετωπίσουμε στην Κύπρο με την εισαγωγή Η.Υ. στα σχολεία. Βάλτε ✓ όπου νομίζετε ανάλογα με το τι πιστεύετε:

Προβλήματα με	*Πολύ σημαντικό πρόβλημα*	*Σημαντικό πρόβλημα*	*Κάπως σημαντικό πρόβλημα*	*Καθόλου σημαντικό πρόβλημα*	*Δεν ξέρω*
Λογισμικά προγράμματα (software)					
Μηχανήματα					
Επιμόρφωση δασκάλων					
Τεχνική υποστήριξη					
Συμπερίληψη στα Αναλυτικά Προγράμματα					
Συμπληρωματικό βοηθητικό υλικό					
Άλλα προβλήματα (*παρακαλώ προσθέστε*) α.. β..					

ΣΤ.
Παρακαλώ βάλτε ✓ στα μέσα που χρησιμοποιείτε τώρα στο σχολείο και τη συχνότητα χρήσης τους.

Χρησιμοποιώ τα εξής μέσα	*Αρκετές φορές τη βδομάδα*	*Περίπου μια φορά τη βδομάδα*	*Μια ή δυο φορές το μήνα.*	*Καθόλου*
σλάιτς				
ανακλαστικό διασκόπιο με διαφανειες				
κασεττόφωνο/ραδιόφωνο				
τηλεόραση/βιντεο				
Άλλα (*παρακαλώ συμπληρώστε*) α. .... β.				

τις πιο κάτω ερωτήσεις/δηλώσεις ο όρος Η.Υ. αναφέρεται στον ηλεκτρονικό υπολογιστή δηλαδή το ομπιούτερ. Παρακαλώ πολύ συμπληρώστε ή βάλτε ✓ όπου ταιριάζει ανάλογα με τη γνώμη σας

	Διαφωνώ πολύ	Διαφωνώ	Δεν ξέρω	Συμφωνώ	Συμφωνώ πολύ
΄Ιου αρέσει να διδάσκω με τεχνολογια.					
Ιομίζω ότι η ποιοτική διδασκαλία με τη χρήση τεχνολογίας προάγει τη διδασκαλία μου.					
κτιμώ τη διδασκαλία με χρήση τεχνολογίας.					
΄οβάμαι να αγγιξω Η.Υ.					
΄οβάμαι μήπως σπάσω ή κάνω ζημιά στον Η.Υ.					
Ιοιώθω νευρικοτητα όταν άλλο μιλάνε για Η.Υ.					
΄Ιου αρέσει να διαβάζω για Η.Υ.					
Ιοιώθω άβολα ως προς άτομα που γνωρίζουν καλά Η.Υ.					
Ιομίζω ότι οι Η.Υ. αποξενώνουν τους ανθρώπ › υς.					
΄οβάμαι ότι οι Η Υ. μπορούν να αναλάβουν μέρος κάποιας δουλειάς που μου αρέσει.					
ίμαι σίγουρος (σίγουρη) ότι μπορώ να μάθω να χειρίζομαι Η.Υ.					
ιστεύω ότι οι μαθητές θέλουν περισσότερο να μάθουν όταν χρησιμοποιούν Η.Υ.					
ιστεύω ότι η διδασκαλία με Η.Υ. είναι απλά ακόμα μια μόδα.					
ιστεύω ότι η διδασκαλία με Η.Υ. βοηθά να βελτιωθεί η απόδοση του μαθητή.					
ομίζω ότι οι δάσκαλοι συναγωνίζονται με κομψά λογισμικά προγράμματα (software) και μηχανές υψηλής τεχνολογίας.					
ταν χρησιμοποιεί Η.Υ. ο δάσκαλος διευκολύνει αντί να κατευθύνει τη μάθηση.					
Όταν χρησιμοποιεί Η.Υ. ο δάσκαλος μπορεί να εξατομικευσει τη διδασκαλία του (να ασχοληθεί με κάθε παιδί ξεχωριστά)					
Ιε τη χρήση Η.Υ. ο ρόλος του δασκάλου υποβιβάζεται.					

1

Πιο κάτω υπάρχει μια σειρά στόχων εισαγωγής Η.Υ. στα σχολεία. Θέλουμε να μάθουμε τη γνώμη σας για τη σημαντικότητα αυτών των στόχων. Παρακαλώ βάλτε ✓ όπου νομίζετε ανάλογα με το τι πιστεύετε:

ΙΔΑΝΙΚΑ (ΑΝ ΟΙ ΣΥΝΘΗΚΕΣ ΤΟ ΕΠΕΤΡΕΠΑΝ)

Πιστεύω ότι οι Η.Υ. εισάγονται στα σχολεία:

	Πολύ σημαντικό	*Κάπως σημαντικό*	*Καθόλου σημαντικό*
Για να βοηθήσουν τα παιδιά να μάθουν διάφορα μαθήματα.			
Για να βοηθήσουν τα παιδιά να μάθουν να χρησιμοποιούν Η.Υ. όταν μεγαλώσουν.			
Για να βοηθήσουν τα παιδιά να βρουν μια καλή δουλειά αργότερα.			
Για να βοηθήσουν τα παιδιά σε δύσκολα και πολύπλοκα προβλήματα.			
Για να βοηθήσουν τα παιδιά να μάθουν να βρίσκουν πληροφορίες που χρειάζονται.			
Για να βοηθήσουν τα παιδιά να δημιουργούν.			
Για να βοηθήσουν τα παιδιά να είναι πιο ενεργητικά στην μάθηση τους.			
Για να κρατούν το ενδιαφέρον των παιδιών για μάθηση ψηλό.			

ΠΡΑΚΤΙΚΑ (ΛΑΜΒΑΝΟΝΤΑΣ ΥΠΟΨΗΝ ΤΙΣ ΠΡΑΓΜΑΤΙΚΕΣ ΣΥΝΘΗΚΕΣ)

Πιστεύω ότι οι Η.Υ. εισάγονται στα σχολεία:

	Πολύ σημαντικό	*Κάπως σημαντικό*	*Καθόλου σημαντικό*
Για να βοηθήσουν τα παιδιά να μάθουν διάφορα μαθήματα.			
Για να βοηθήσουν τα παιδιά να μάθουν να χρησιμοποιούν Η.Υ. όταν μεγαλώσουν.			
Για να βοηθήσουν τα παιδιά να βρουν μια καλή δουλειά αργότερα.			
Για να βοηθήσουν τα παιδιά σε δύσκολα και πολύπλοκα προβλήματα.			
Για να βοηθήσουν τα παιδιά να μάθουν να βρίσκουν πληροφορίες που χρειάζονται.			
Για να βοηθήσουν τα παιδιά να δημιουργούν.			
Για να βοηθήσουν τα παιδιά να είναι πιο ενεργητικά στην μάθηση τους			
Για να κρατούν το ενδιαφέρον των παιδιών για μάθηση ψηλό.			

2. SoC Questionnaire (attached to questionnaire of pilot school teachers)

Το ερωτηματολόγιο αυτό κατασκευάστηκε από τους Hall, George και Rutherford (1977) και μεταφράστηκε στα ελληνικά. Στόχος του είναι να καθορίσει τι απασχολεί τους ανθρώπους που χρησιμοποιούν ή σκέφτονται να χρησιμοποιήσουν διάφορα προγράμματα σε διαφορετικές περιόδους εφαρμογής καινοτομιών. Τα στοιχεία καθορίστηκαν από διάφορες τυπικές απαντήσεις δασκάλων και καθηγητών που κυμαίνονται από άγνοια για διάφορες καινοτομίες μέχρι πολύχρονη εμπειρία με αυτές.

Παρακαλώ ακολουθήστε τις πιο κάτω οδηγίες για συμπλήρωση των δύο σελίδων που ακολουθούν:

α) Είναι πολύ σημαντικό για σκοπούς συνέπειας επεξεργασίας δεδομένων να έχουμε ένα αριθμό που μπορείτε να θυμάστε. Παρακαλούμε αναφέρετε **τους τελευταίους 4 αριθμούς της ταυτότητας σας** _ _ _ _

β) Φράσεις όπως "αυτή η καινοτομία", "αυτή η προσέγγιση" και "καινούργιο σύστημα" αναφέρονται όλες στους **Ηλεκτρονικούς Υπολογιστές (Η.Υ) στην εκπαίδευση**.

γ) Στις δηλώσεις που ακολουθούν υπάρχουν **αριθμοί από το 0 μέχρι το 7.** Βάλτε σε κύκλο ένα αριθμό ανάλογα με το κατά πόσο η δήλωση ισχύει για σας τώρα (ακολουθήστε την κλίμακα στο πάνω μέρος των σελίδων).

δ) Πολλές δηλώσεις μπορεί να φαίνονται άσχετες για σας αυτή την στιγμή. Για τα στοιχεία του ερωτηματολογίου που δεν εφαρμόζονται σε σας, **βάλτε σε κύκλο το 0 στην κλίμακα.**

Για παράδειγμα:

0 1 2 3 4 5 6 7 **Αυτή η δήλωση ισχύει για μένα αυτή τη στιγμή.**
0 1 2 3 4 5 6 7 **Αυτή η δήλωση ισχύει κάπως για μένα αυτή τη στιγμή**
0 1 2 3 4 5 6 7 **Αυτή η δήλωση δεν ισχύει καθόλου για μένα αυτή τη στιγμή.**
0 1 2 3 4 5 6 7 **Αυτή η δήλωση είναι άσχετη με μένα.**

Ευχαριστώ και πάλι για τη συνεργασία.

0	1	2	3	4	5	6	7
Δεν ισχύει για μένα τώρα			Ισχύει κάπως για μένα τώρα			Ισχύει πολύ για μένα τώρα	

0 1 2 3 4 5 6 7 Με απασχολούν οι στάσεις των παιδιών έναντι στην καινοτομία.

0 1 2 3 4 5 6 7 Τώρα ξέρω ότι άλλες προσεγγίσεις μπορεί να δουλεύουν καλύτερα.

0 1 2 3 4 5 6 7 Δεν γνωρίζω καν τι είναι αυτή η καινοτομία.

0 1 2 3 4 5 6 7 Με απασχολεί πολύ που με την καινοτομία αυτή δεν θα έχω αρκετό χρόνο να οργανώνομαι κάθε μέρα.

0 1 2 3 4 5 6 7 Θα ήθελα να βοηθήσω το υπόλοιπο προσωπικό να εφαρμόσει την καινοτομία αυτή.

0 1 2 3 4 5 6 7 Έχω πολύ περιορισμένες γνώσεις για την καινοτομία αυτή.

0 1 2 3 4 5 6 7 Θα ήθελα να ξέρω τις επιδράσεις της αναδιοργάνωσης αυτής στην επαγγελματική μου εικόνα (status).

0 1 2 3 4 5 6 7 Με απασχολεί η σύγκρουση ανάμεσα στα ενδιαφέροντα μου και στις ευθύνες μου.

0 1 2 3 4 5 6 7 Με απασχολεί η αναθεώρηση του τρόπου με τον οποίο εφαρμόζω αυτή την καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα πολύ να δημιουργήσω σχέσεις συνεργασίας με το προσωπικό τόσο του σχολείου μου όσο και άλλων σχολείων που εμπλέκονται στη χρήση της καινοτομίας αυτής.

0 1 2 3 4 5 6 7 Με απασχολεί πώς η καινοτομία αυτή επηρεάζει τα παιδιά.

0 1 2 3 4 5 6 7 Δεν με απασχολεί καθόλου αυτή η καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα να γνωρίζω ποιος θα παίρνει τις αποφάσεις σε αυτό το καινούργιο σύστημα.

0 1 2 3 4 5 6 7 Θα ήθελα να συζητήσω την πιθανότητα να εφαρμόσω αυτή την καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα να γνωρίζω τι μέσα θα υπάρχουν στην διάθεση μου αν αποφασίσουμε να υιοθετήσουμε αυτή την καινοτομία.

0 1 2 3 4 5 6 7 Με απασχολεί το ότι δεν είμαι ικανός/ ικανή να χειριστώ όλα αυτά που απαιτεί η καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα να γνωρίζω πώς υποτίθεται ότι θα αλλάξει το διδακτικό ή διοικητικό μου έργο με την καινοτομία αυτή.

0 1 2 3 4 5 6 7 Θα ήθελα να ενημερώσω άλλους συναδέλφους ή σχολεία για την πρόοδο που συντελείται με αυτή τη νέα μέθοδο.

0	1	2	3	4	5	6	7
Δεν ισχύει για μένα τώρα			Ισχύει κάπως για μένα τώρα			Ισχύει πολύ για μένα τώρα	

0 1 2 3 4 5 6 7 Με απασχολεί η αξιολόγηση του έργου μου με τους μαθητές μου.

0 1 2 3 4 5 6 7 Θα ήθελα να αναθεωρήσω την διδακτική εφαρμογή της καινοτομίας.

0 1 2 3 4 5 6 7 Είμαι τελείως απασχολημένος/απασχολημένη με άλλα πράγματα.

0 1 2 3 4 5 6 7 Θα ήθελα να προσαρμόσω τη χρήση αυτής της καινοτομίας στις εμπειρίες των μαθητών μου.

0 1 2 3 4 5 6 7 Παρόλο που δεν γνωρίζω αρκετά για αυτή την καινοτομία, με απασχολούν διάφορα στοιχεία της.

0 1 2 3 4 5 6 7 Θα ήθελα να κεντρίσω το ενδιαφέρον των μαθητών μου για τον ρόλο τους σε αυτή την προσέγγιση.

0 1 2 3 4 5 6 7 Με απασχολεί ο χρόνος που θα σπαταλώ σε προβλήματα (μη ακαδημαϊκά) που έχουν σχέση με αυτή την καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα να ξέρω τι θα απαιτεί η εφαρμογή αυτής της καινοτομίας στο άμεσο μέλλον.

0 1 2 3 4 5 6 7 Θα ήθελα να συντονίσω τις προσπάθειες μου με άλλους για να μεγιστοποιήσω τις επιδράσεις αυτής της καινοτομίας.

0 1 2 3 4 5 6 7 Θα ήθελα να έχω περισσότερες πληροφορίες για τον χρόνο και την ενέργεια που απαιτούνται για αυτή την καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα να ξέρω τι κάνουν άλλοι δάσκαλοι σε αυτό τον τομέα.

0 1 2 3 4 5 6 7 Αυτή τη στιγμή, δεν με ενδιαφέρει να μάθω για αυτή την καινοτομία.

0 1 2 3 4 5 6 7 Θα ήθελα να καθορίσω πώς στηρίζω, ενισχύω ή αντικαθιστώ την καινοτομία αυτή.

0 1 2 3 4 5 6 7 Θα ήθελα να χρησιμοποιήσω επανατροφοδότηση από τους μαθητές για να αλλάξω το πρόγραμμα εφαρμογής της καινοτομίας αυτής.

0 1 2 3 4 5 6 7 Θα ήθελα να ξέρω πώς θα διαφοροποιηθεί ο ρόλος μου όταν χρησιμοποιήσω αυτή την καινοτομία.

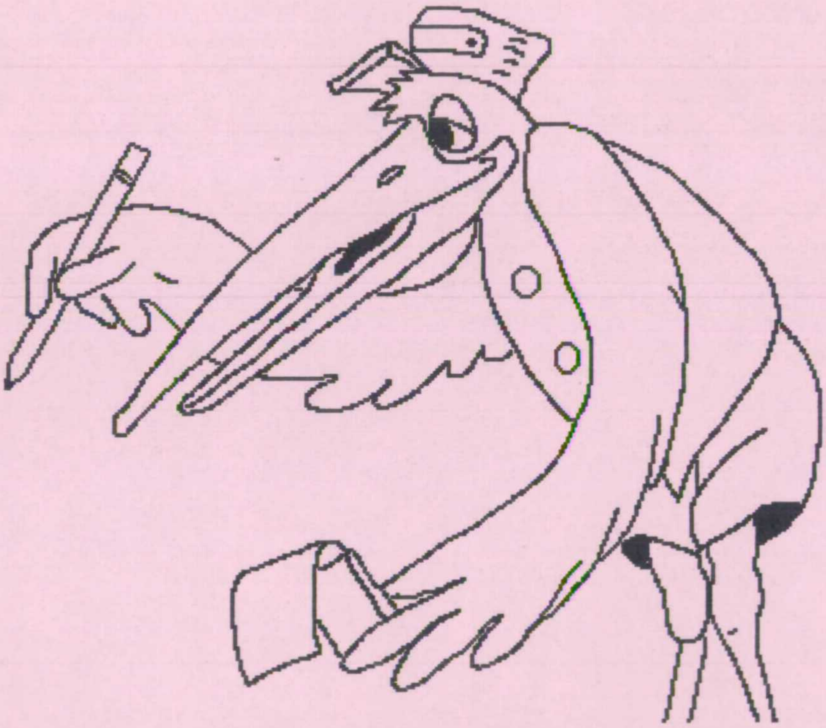
0 1 2 3 4 5 6 7 Ο συντονισμός διαφόρων προγραμμάτων και ανθρώπων παίρνει πάρα πολύ χρόνο.

0 1 2 3 4 5 6 7 Θα ήθελα να ξέρω με ποιό τρόπο αυτή η καινοτομία είναι καλύτερη από ό, τι έχουμε τώρα στα σχολεία μας.

3. Questionnaire to students (pink cover)

Αρ. ....

ΠΡΟΣ ΟΛΟΥΣ ΤΟΥΣ ΜΑΘΗΤΕΣ ΚΑΙ ΤΙΣ ΜΑΘΗΤΡΙΕΣ ΕΝΟΣ ΤΜΗΜΑΤΟΣ Ε' ΤΑΞΗΣ



*** *Παιδιά, συμπληρώστε τις επόμενες σελίδες πολύ προσεκτικά. Όταν τελειώστε επιστρέψετε τα φυλλάδια στο δάσκαλο ή τη δασκάλα σας.*

Παρακαλώ πολύ συμπλήρωσε ή βάλε✓ όπου ταιριάζει:

A.

1. **Είμαι** αγόρι ( ) κορίτσι ( )

2. **Ηλικία:** Είμαι .... χρονών

3. **Σχολείο:** ....

B.

Εδώ υπάρχει ένας κατάλογος γιατί τα δημοτικά σχολεία της Κύπρου πρέπει να έχουν κομπιούτερ. Διάβασε τους λόγους προσεκτικά και βάλε ✓ όπου νομίζεις. Για παράδειγμα, αν νομίζεις ότι τα κομπιούτερ μπαίνουν στα σχολεία για να σε βοηθήσουν να μάθεις διάφορα μαθήματα και αυτό είναι πολύ σημαντικό, βάλε ✓ στην πρώτη στήλη (πολύ σημαντικό).

Πιστεύω οτι τα κομπιούτερ μπαίνουν στα σχολεία:

	Πολύ σημαντικό	*Κάπως σημαντικό*	*Καθόλου σημαντικό*
για να με βοηθήσουν να μάθω διάφορα μαθήματα.			
για να σε βοηθήσουν να μάθω να χρησιμοποιώ κομπιούτερ όταν μεγαλώσω.			
για να με βοηθησουν να βρω μια καλή δουλειά αργότερα.			
για να με βοηθήσουν σε δύσκολα και πολύπλοκα προβλήματα.			
για να με βοηθήσουν να μάθω να βρίσκω πληροφορίες που χρειάζομαι.			
για να με βοηθήσουν να δημιουργήσω.			
για να με βοηθήσουν να μαθαίνω με πιο δραστήριο τρόπο και να ανακαλύπτω.			
για να κάνουν το μάθημα πιο συναρπαστικό και ενδιαφέρον.			

Γ.

ΒΑΛΕ ✓ ΣΤΑ ΠΙΟ ΚΑΤΩ. ΑΚΟΛΟΥΘΗΣΕ ΤΑ ΤΟΞΑ ΑΝΑΛΟΓΑ ΜΕ ΤΗΝ ΑΠΑΝΤΗΣΗ ΣΟΥ

1. Εχεις κομπιούτερ στο σπίτι σου;

ναι ( ) **όχι ( )**

Αν ναι,

α. πόσο συχνά το χρησιμοποιείς;

συχνά ( )
κάποτε ( )
ποτέ ( )

β. τι κάνεις με αυτό;

(μπορείς να βάλεις ένα ή περισσότερα ✓)

παίζω παιγνίδια ( )
κάνω σχέδια ( )
γράφω ( )
λύνω προβλήματα ( )
άλλα πράγματα που κάνω.....................
....

Αν όχι,

α. θα ήθελες να έχεις κομπιούτερ στο σπίτι;

ναι ( ) όχι ( )

β. έχεις χρησιμοποιήσει κομπιούτερ πουθενά;

ναι ( ) όχι ( )

Αν ναι,
πού;..
....
τι έκανες με αυτό;..
....

ΒΕΒΑΙΩΣΟΥ ΟΤΙ ΕΧΕΙΣ ΣΥΜΠΛΗΡΩΣΕΙ ΤΗ ΜΙΑ ΑΠΟ ΤΙΣ ΔΥΟ ΣΕΛΙΔΕΣ ΤΟΥ ΒΙΒΛΙΟΥ

ΒΑΛΕ ✓ ΣΤΑ ΠΙΟ ΚΑΤΩ. ΑΚΟΛΟΥΘΗΣΕ ΤΑ ΤΟΞΑ ΑΝΑΛΟΓΑ ΜΕ ΤΗΝ ΑΠΑΝΤΗΣΗ ΣΟΥ

2. Υπάρχει/υπάρχουν κομπιούτερ στο σχολείο σου;

ναι ( ) **όχι ( )**

Αν ναι,

α. πόσο συχνά το χρησιμοποιείς;

συχνά ( )
κάποτε ( )
ποτέ ( )

β. τι κάνεις με αυτό;

(μπορείς να βάλεις ένα ή περισσότερα ✓)

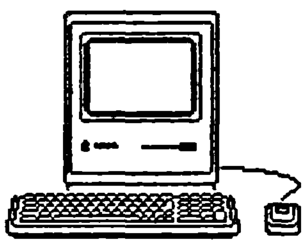
παίζω παιγνίδια ( )
κάνω σχέδια ( )
γράφω ( )
λύνω προβλήματα ( )
άλλα πράγματα που κάνω.....................
....

γ. τι σου αρέσει περισσότερο να κάνεις στο κομπιούτερ του σχολείου σου;...
....

Αν όχι,

α. θα ήθελες να έχεις κομπιούτερ στο σχολείο σου;

ναι ( ) όχι ( )



ΒΕΒΑΙΩΣΟΥ ΟΤΙ ΕΧΕΙΣ ΣΥΜΠΛΗΡΩΣΕΙ ΤΗ ΜΙΑ ΑΠΟ ΤΙΣ ΔΥΟ ΣΕΛΙΔΕΣ ΤΟΥ ΒΙΒΛΙΟΥ

Δ

Παρακαλώ πολύ βάλε ✓ όπου νομίζεις. Για παράδειγμα, αν συμφωνείς ότι φοβάσαι να αγγίξεις κομπιούτερ, βάλε ✓ στην τέταρτη στήλη (Συμφωνώ). Βεβαιώσου ότι διάβασες όλες τις προτάσεις και έχεις βάλει ✓ όπου πιστεύεις.

	Διαφωνώ πολύ	*Διαφωνώ*	*Ούτε συμφωνώ ούτε διαφωνώ*	*Συμφωνώ*	*Συμφωνώ πολύ*
Φοβάμαι να αγγίξω κομπιούτερ.					
Φοβάμαι μήπως σπάσω ή κάνω ζημιά στο κομπιούτερ.					
Νοιώθω νευρικότητα όταν άλλοι μιλάνε για κομπιούτερ.					
Μου αρέσει να διαβάζω για κομπιούτερ.					
Είμαι σίγουρος/σίγουρη ότι μπορώ να μάθω κομπιούτερ.					
Νομίζω ότι τα μαθήματα με κομπιούτερ είναι διασκεδαστικά.					
Θα ήθελα να πειραματιστώ με ένα κομπιούτερ.					
Τα σχολεία θα έπρεπε να έχουν κομπιούτερ.					
Τα κομπιούτερ δεν με ενδιαφέρουν καθόλου.					
Θα ήθελα (μου αρέσει) να έχω κομπιούτερ στο σπίτι.					
Κάποια μέρα, θα ήθελα να έχω κομπιούτερ στη δουλειά μου.					
Θα ήθελα (μου αρέσει) να μαθαίνω με κομπιούτερ.					
Είναι πιο συναρπαστικό και ωραίο να μαθαίνω με κομπιούτερ.					
Νομίζω ότι μαθαίνω καλύτερα με κομπιούτερ.					

Πριν προχωρήσεις στην επόμενη σελίδα , μέτρησε τα ✓ που έχεις βάλει πιο πάνω. Αν δεν είναι 14, σημαίνει ότι άφησες κάποια δήλωση πίσω. Ξαναδιάβασε τις προτάσεις και βάλε ✓ εκεί που ξέχασες.

Πιο κάτω υπάρχουν διάφορα ζευγάρια λέξεων. Χρωμάτισε ή μαύρισε με το μολύβι σου από τις δύο λέξεις τη λέξη που νομίζεις. Για παράδειγμα, αν πιστεύεις ότι το κομπιούτερ είναι περισσότερο καλό παρά κακό στην πρώτη γραμμή χρωμάτισε ή μαύρισε τη λέξη "καλό". Παρακαλώ πολύ διάβασε προσεκτικά όλα τα κουτιά, και χρωμάτισε τη μία από τις δύο λέξεις σε κάθε ζευγάρι.

Πιστεύω ότι το κομπιούτερ είναι:

καλό	κακό
έξυπνο	χαζό
ανιαρό	ενδιαφέρον
εύκολο	δύσκολο
φιλικό	εχθρικό
γρήγορο	αργό
ακριβό	φτηνό
παλιό	καινούργιο
διαφορετικό	καθόλου διαφορετικό
ξεχωριστό	συνηθισμένο

κατανοητό (το καταλαβαίνω)	συγχυσμένο (δεν το καταλαβαίνω)
μικρό	μεγάλο
απλό	πολύπλοκο
άχρηστο	χρήσιμο
εργατικό	τεμπέλικο
οργανωμένο (συγυρισμένο)	ανοργάνωτο (ακατάστατο)
σημαντικό	ασήμαντο
πολύχρωμο	μονόχρωμο
δημιουργικό	χωρίς φαντασία
διασκεδα-στικό	χωρίς ενδιαφέρον

4. Questionnaire to parents (green cover)

Είμαι δασκάλα και διεξάγω μια έρευνα για τις απόψεις σας για τους Ηλεκτρονικούς Υπολογιστές (κομπιούτερ) και την εισαγωγή τους στα δημοτικά σχολεία. Θα σας ήμουν ευγνώμων αν συμπληρώνατε το ερωτηματολόγιο αυτό και το επιστρέφατε με το παιδί σας στο σχολείο. Ξέρω ότι ο χρόνος σας είναι πολύτιμος, γι' αυτό ευχαριστώ πάρα πολύ.

Με εκτίμηση

Γιασεμίνα Καραγιώργη

Στις πιο κάτω ερωτήσεις/δηλώσεις ο όρος Η.Υ. αναφέρεται στον ηλεκτρονικό υπολογιστή δηλαδή το κομπιούτερ. Παρακαλώ πολύ συμπληρώστε ή βάλτε όπου ταιριάζει.

A.

1. Φύλο: Άντρας ( ) Γυναίκα ( )

2. Ηλικία: 20-29 ( ) 40-49 ( ) 30-39 ( ) 50-59 ( ) 60+ ( )

3. Επάγγελμα:..

4. Απόφοιτος (*σημειώστε το ψηλότερο επίπεδο μόρφωσης*):
Δημοτικού Σχολείου ( ) Γυμνασίου ( ) Λυκείου ( )
Κολλεγίου ( ) Πανεπιστημίου ( )
Άλλου ιδρύματος (*παρακαλώ καθορίστε*) ( ) ....

5. Το σχολείο του παιδιού μου είναι το :..

B.

6. Έχετε Η.Υ. στο σπίτι σας; ναι ( ) όχι ( )

Αν ναι α. πόσο συχνά τον χρησιμοποιείτε; συχνά ( ) κάποτε ( ) ποτέ ( )

β. πώς τον χρησιμοποιείτε; ....

Αν όχι, σκοπεύετε να αγοράσετε; ναι ( ) όχι ( )

7. Έχετε Η.Υ. στη δουλειά σας; ναι ( ) όχι ( )

Αν ναι α. πόσο συχνά τον χρησιμοποιείτε; συχνά ( ) κάποτε ( ) ποτέ ( )

β. πώς τον χρησιμοποιείτε; ....

8. Τι θεωρείτε τον εαυτό σας όσον αφορά τις ικανότητες σας να χρησιμοποιείτε Η.Υ;
Έμπειρο ( ) Αρκετά ικανό ( ) Λίγο ικανό ( ) Άπειρο ( )

Γ.

9. Πότε πιστεύετε ότι πρέπει να αρχίσει η επαφή του μαθητή με Η.Υ.;
από την πρωτοβάθμια εκπαίδευση (Δημοτικό Σχολείο) ( )
από τη δευτεροβάθμια εκπαίδευση (Γυμνάσιο) ( )
από τη δευτεροβάθμια εκπαίδευση (Λύκειο) ( )
από την τριτοβάθμια εκπαίδευση (Κολλέγιο ή Πανεπιστήμιο) ( )
σε καμία βαθμίδα ( )

10. Πόσους Η.Υ. νομίζετε ότι πρέπει να έχει κάθε σχολείο;
κανένα ( )
ένα κάθε σχολείο ( )
ένα κάθε τάξη ( )
μερικούς κάθε τάξη ( )
ένα κάθε παιδί ( )

11. Ποιός νομίζετε ότι είναι ο καταλληλότερος τρόπος εισαγωγής Η.Υ;
ως ξεχωριστό μάθημα ( )
ως θέμα ενταγμένο σε υπάρχοντα μαθήματα ( )
ως βοηθητικό μέσο για τη διδασκαλία μαθημάτων ( )
σε καμία περίπτωση ( )

12. Για ποιών μαθημάτων τη διδασκαλία νομίζετε ότι μπορούν να χρησιμοποιηθούν Η.Υ.;
όλων των μαθημάτων ( )
ορισμένων μαθημάτων ( )
θετικών μαθημάτων ( )
κανενός μαθήματος ( )

13. Πιστεύετε ότι οι Η.Υ πρέπει να εισαχθούν στα δημοτικά σχολεία της Κύπρου;
ναι ( ) όχι ( )

14. Γνωρίζετε ότι οι Η.Υ. έχουν εισαχθεί σε ορισμένα δημοτικά σχολεία της Κύπρου;
ναι ( ) όχι ( )

15. Ποια είναι η γνώμη σας για την εισαγωγή Η.Υ. στα δημοτικά σχολεία; *(παρακαλώ δικαιολογήστε)*

....

....

....

Δ

Στις πιο κάτω ερωτήσεις/δηλώσεις ο όρος Η.Υ. αναφέρεται στον ηλεκτρονικό υπολογιστή δηλαδή τα κομπιούτερ. Παρακαλώ πολύ συμπληρώστε ή βάλτε √ όπου ταιριάζει ανάλογα με τη γνώμη σας

	Διαφωνώ πολύ	*Διαφωνώ*	*Δεν ξέρω*	*Συμφωνώ*	*Συμφωνώ πολύ*
Φοβάμαι να αγγίξω Η.Υ.					
Φοβάμαι μήπως σπάσω ή κάνω ζημιά στον Η.Υ.					
Νοιώθω νευρικότητα όταν άλλοι μιλάνε για Η.Υ.					
Μου αρέσει να διαβάζω για Η.Υ.					
Νοιώθω άβολα ως προς άτομα που γνωρίζουν καλά Η.Υ.					
Νομίζω ότι οι Η.Υ. αποξενώνουν τους ανθρώπους.					
Φοβάμαι ότι οι Η.Υ. μπορούν να αναλάβουν μέρος κάποιας δουλειάς που μου αρέσει.					
Είμαι σίγουρος (σίγουρη) ότι μπορώ να μάθω να χειρίζομαι Η.Υ.					
Πιστεύω ότι οι μαθητές θέλουν περισσότερο να μάθουν όταν χρησιμοποιούν Η.Υ.					
Πιστεύω ότι η διδασκαλία με Η.Υ. είναι απλά ακόμα μια μόδα.					
Πιστεύω ότι η διδασκαλία με Η.Υ. βοηθά να βελτιωθεί η απόδοση του μαθητή.					
Όταν χρησιμοποιεί Η.Υ. ο δάσκαλος διευκολύνει αντί να κατευθύνει τη μάθηση.					
Όταν χρησιμοποιεί Η.Υ. ο δάσκαλος μπορεί να εξατομικεύσει τη διδασκαλία του (να ασχοληθεί με κάθε παιδί ξεχωριστά)					
Με τη χρήση Η.Υ. ο ρόλος του δασκάλου υποβιβάζεται.					

Ε.

Πιο κάτω υπάρχει μια σειρα στόχων εισαγωγής Η.Υ. στα σχολεία. Θέλουμε να μαθαίμε τη γνώμη σας για τη σημαντικότητα αυτών των στόχων. Παρακαλώ βάλτε √ όπου νομίζετε ανάλογα με το τι πιστεύετε:

ΙΔΑΝΙΚΑ (ΑΝ ΟΙ ΣΥΝΘΗΚΕΣ ΤΟ ΕΠΕΤΡΕΠΑΝ)

Πιστεύω ότι οι Η.Υ. εισάγονται στα σχολεία:

	Πολύ σημαντικό	*Κάπως σημαντικό*	*Καθόλου σημαντικό*
για να βοηθήσουν τα παιδιά να μάθουν διάφορα μαθήματα.			
για να βοηθήσουν τα παιδιά να μάθουν να χρησιμοποιούν Η.Υ. όταν μεγαλώσουν.			
για να βοηθήσουν τα παιδιά να βρουν μια καλή δουλειά αργότερα.			
για να βοηθήσουν τα παιδιά σε δύσκολα και πολύπλοκα προβλήματα.			
για να βοηθήσουν τα παιδιά να μάθουν να βρίσκουν πληροφορίες που χρειάζονται.			
για να βοηθήσουν τα παιδιά να δημιουργούν.			
για να βοηθήσουν τα παιδιά να είναι πιο ενεργητικά στην μάθηση τους.			
για να κρατούν το ενδιαφέρον των παιδιών για μάθηση ψηλό.			

ΠΡΑΚΤΙΚΑ (ΛΑΜΒΑΝΟΝΤΑΣ ΥΠΟΨΗΝ ΤΙΣ ΠΡΑΓΜΑΤΙΚΕΣ ΣΥΝΘΗΚΕΣ)

Πιστεύω ότι οι Η.Υ. εισάγονται στα σχολεία:

	Πολύ σημαντικό	*Κάπως σημαντικό*	*Καθόλου σημαντικό*
για να βοηθήσουν τα παιδιά να μάθουν διάφορα μαθήματα.			
για να βοηθήσουν τα παιδιά να μάθουν να χρησιμοποιούν Η.Υ. όταν μεγαλώσουν.			
για να βοηθήσουν τα παιδιά να βρουν μια καλή δουλειά αργότερα.			
για να βοηθήσουν τα παιδιά σε δύσκολα και πολύπλοκα προβλήματα.			
για να βοηθήσουν τα παιδιά να μάθουν να βρίσκουν πληροφορίες που χρειάζονται.			
για να βοηθήσουν τα παιδιά να δημιουργούν.			
για να βοηθήσουν τα παιδιά να είναι πιο ενεργητικά στην μάθηση τους.			
για να κρατούν το ενδιαφέρον των παιδιών για μάθηση ψηλό.			

5. Questionnaire to teacher coordinators (yellow cover)

Γιασεμίνα Καραγιώργη
Δασκάλα
Ικάρου 3 Αγλαντζιά
2107 Λευκωσία

26 Απριλίου, 1996

ΠΡΟΣ ΤΟΥΣ ΥΠΕΥΘΥΝΟΥΣ ΔΑΣΚΑΛΟΥΣ
για το πρόγραμμα εισαγωγής Ηλεκτρονικών Υπολογιστών

Αγαπητέ συνάδελφε / συναδέλφισσα,

Χρειάζομαι συνοπτικά ορισμένες πληροφορίες σχετικά με τον εξοπλισμό του σχολείου σας σε μηχανήματα και λογισμικά, τα προβλήματα και τις ανάγκες σας καθώς και τη χρήση Ηλεκτρονικών Υπολογιστών.

Θα ήμουν ευγνώμων αν μπορούσατε να διαθέσετε λίγο από τον πολύτιμο χρόνο σας για να συμπληρώσετε το ερωτηματολόγιο που επισυνάπτεται.

Σας ευχαριστώ εκ των προτέρων για την πολύτιμη βοήθεια σας.

Φιλικά,

Γιασεμίνα Καραγιώργη

I. ΓΕΝΙΚΕΣ ΠΛΗΡΟΦΟΡΙΕΣ

Όνομα σχολείου:...

Αριθμός παιδιών:..

Αριθμός δασκάλων:...

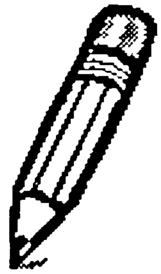
II. ΜΗΧΑΝΙΚΟΣ ΕΞΟΠΛΙΣΜΟΣ

Α. *Παρακαλώ συμπληρώστε τον πιο κάτω πίνακα. Στις κατηγορίες "Τρόπος Απόκτησης" και "Έτος Απόκτησης" συμπληρώστε με ένα από τους αριθμούς που δίνονται για σκοπούς κωδικοποίησης.*

	Συνολικός Αριθμός συσκευών	Μοντέλα Συσκευών	Τρόπος Απόκτησης 1=Αποστολή από Υπουργείο Παιδείας 2= Αγορα από το σχολείο σας 3= Δωρεά στο σχολειο 4= 'Αλλος τρόπος απόκτησης	'Ετος Απόκτησης 1= 1990 η πριν 2= 1991 ή 1992 3= 1993 ή 1994 4= 1995 ή 1996
Ηλεκτρονικοί Υπολογιστές				
Εκτυπωτές				
CD-ROM				
Άλλα σχετικά μηχανήματα *(παρακαλώ προσδιορίστε)*:				

Β. *Παρακαλώ σημειώστε τον αριθμό των Ηλεκτρονικών Υπολογιστών (Η.Υ.) που βρίσκονται στους ακόλουθους χώρους του σχολείου σας:*

	Αριθμός Η.Υ.
Τάξεις	
Ειδική αίθουσα για Η.Υ.	
Γραφείο Διευθυντή	
Γραφείο Δασκάλων	
Σε άλλο χώρο *(παρακαλώ προσδιορίστε)*	....



III. ΛΟΓΙΣΜΙΚΑ

Παρακαλώ συμπληρώστε τον πιό κάτω πίνακα με τα λογισμικά προγράμματα τα οποία διαθέτει το σχολείο σας.

Όνομα λογισμικού προγράμματος	Τρόπος Απόκτησης 1=Αποστολή από Υπουργείο Παιδείας 2= Αγορα απο το σχολείο σας 3= Δωρεά στο σχολείο 4= 'Αλλος τρόπος απόκτησης	'Ετος Απόκτησης 1= 1990 ή πριν 2= 1991 ή 1992 3= 1993 ή 1994 4= 1995 ή 1996	Θέμα *(όπου ισχύει)*

IV. ΠΡΟΒΛΗΜΑΤΑ

Τι προβλήματα αντιμετωπίζετε; Παρακαλώ αναφέρετε τα προβλήματα που σας απασχολούν και στην συνέχεια σημειώστε με ✓ την συχνότητα εμφάνισης τους:

Κατάλογος προβλημάτων	αποτελεί πάντοτε πρόβλημα	αποτελεί πρόβλημα σε μερικές περιπτώσεις	σπάνια αποτελεί πρόβλημα αλλά εξακολουθεί να σας απασχολεί

V. ΧΡΗΣΗ

Α. *Πόσο συχνά χρησιμοποιούνται οι Η.Υ. από κάθε τάξη του σχολείου σας; Παρακαλώ σημειώστε με √ τη συχνότητα τον παρακάτω πίνακα:*

	Ποτέ	Τουλάχιστον μια φορά το χρόνο	Τουλάχιστον μια φορά το μήνα	Τουλάχιστον μια φορά τη βδομάδα	Σχεδόν κάθε μέρα
Α' τάξη					
Β' τάξη					
Γ' τάξη					
Δ' τάξη					
Ε' τάξη					
Στ' τάξη					

Β. *Πώς χρησιμοποιούνται οι Η.Υ. από κάθε τάξη του σχολείου σας; Παρακαλώ συμπληρώστε τον πιο κάτω πίνακα, μόνο για τις τάξεις που χρησιμοποιούν Η.Υ. :*

	Μάθημα *(όπου ισχύει)*	Δραστηριότητες
Α' τάξη		
Β' τάξη		
Γ' τάξη		
Δ' τάξη		
Ε' τάξη		
Στ' τάξη		

Γ. *Ποιοί είναι οι στόχοι χρήσης Η.Υ. στο σχολείο σας; Παρακαλώ σημειώστε με √ όπου ισχύει:*

Ο Η.Υ. χρησιμοποιείται:	Συχνά	Κάποτε	Ποτέ
- Για ανάπτυξη γενικών δεξιοτήτων χρήσης Η.Υ.			
- Για ενίσχυση ειδικών θεμάτων του Αναλυτικού Προγράμματος (π.χ. Γεωγραφία)			
- Ως μέσο (π.χ.επεξεργαστής κειμενου).			
- Για ανάπτυξη του ενδιαφέροντος των παιδιών.			
- Για προώθηση ενεργητικής μάθησης.			
- Για ανάπτυξη συνεργατικής μάθησης (ομάδες εργασίας).			
- Για ανάπτυξη εξατομικευμένης εργασίας.			
- Για ανάπτυξη διαθεματικής μάθησης.			
- Άλλος τρόπος χρήσης *(συμπληρώστε)*			

VI. ΑΝΑΓΚΕΣ

Ποιές είναι οι ανάγκες του σχολείου σας στους ακόλουθους τομείς:
Παρακαλώ συμπληρώστε, επεξηγώντας τον παρακάτω πίνακα:

	Έχετε ανάγκες; *(θάλτε σε κύκλο ότι ισχύει)*	Τι είδους ανάγκες; *(παρακαλώ εξηγήστε)*
ΛΟΓΙΣΜΙΚΑ ΠΡΟΓΡΑΜΜΑΤΑ	ναι όχι	
ΜΗΧΑΝΙΚΟΣ ΕΞΟΠΛΙΣΜΟΣ	ναι όχι	
ΕΠΙΜΟΡΦΩΣΗ ΠΡΟΣΩΠΙΚΟΥ	ναι όχι	
ΣΥΜΠΛΗΡΩΜΑΤΙΚΟ ΒΟΗΘΗΤΙΚΟ ΥΛΙΚΟ	ναι όχι	
ΤΕΧΝΙΚΗ ΥΠΟΣΤΗΡΙΞΗ	ναι όχι	
ΑΛΛΕΣ ΑΝΑΓΚΕΣ *(παρακαλώ προσδιορίστε)*		

VII. ΣΧΟΛΙΑ/ ΕΙΣΗΓΗΣΕΙΣ

Παρακαλώ σημειώστε σχόλια ή εισηγήσεις που έχετε σχετικά με την εισαγωγή Η. Υ. στο σχολείο σας ή γενικά στα δημοτικά σχολεία της Κύπρου:

....

....

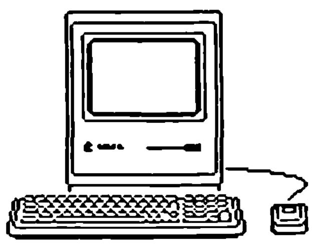
....

....

....

....

....



6. Questionnaire to all teachers (translation)

Please put a √ to whatever applies to you and fill the information:

A.

1. Gender: Male ( ) Female ( )

2. Age: 20-29 ( ) 40-49 ( ) 30-39 ( ) 50-59 ( ) 60+ ( )

3. Position: Principal ( ) Principal Assistant ( ) Teacher ( ) Other (please specify) ( )......................................

4. School: ....

5. Graduate of: (*note the highest level of education attained*:) CPA ( ) University (first degree) ( ) University (postgraduate) ( )

B.

6. Do you have a computer at home? yes ( ) no ( )

   If yes, a. how often do you use it? very often ( ) sometimes ( ) never ( )
   b. how do you use it?..

   If no, do you intend to buy one? yes ( ) no ( )

7. Do you have computers at your school? yes ( ) no ( )

   If yes, a. how often do you use them? very often ( ) sometimes ( ) never ( )
   b. how do you use them?..

8. Have you had any training in computers? yes ( ) no ( )

If yes,

Where did you have training?	For how long?	What kind of training? (content)

9. How would you rate yourself on computer proficiency?
   Very Proficient ( ) Proficient ( ) Limited proficiency ( ) Unskilled ( )

C.

10. When do you think computers should be introduced?
    from elementary education ( )
    from secondary education (Gymnasium) ( )
    from secondary education (Lyceum) ( )
    from tertiary education ( )
    at no level of education ( )

11. How many computers do you think schools should have?
    none ( )
    one per school ( )
    one per classroom ( )
    some per classroom ( )
    one per child ( )

12. Which is the best way for computer introduction?
    as a separate subject ( )
    as a topic within existing subjects ( )
    as a medium for instruction ( )
    in no case ( )

13. **For which subjects should computers be introduced?**
all subjects ( )
some subjects ( )
positive subjects (Maths, Science) ( )
no subjects ( )

14. **Do you believe that computers should be introduced to Cyprus elementary schools?**
yes ( ) **no ( )**

15. **Are you aware that computers have been introduced to some elementary schools?**
yes ( ) **no ( )**

16. **What is your opinion about computer introduction in elementary schools?** *(please justify your opinion)*..

....

....

<u>D.</u>
Would you like to have training related to computers? yes ( ) no ( )
If yes, in which areas would you like training?
Use of operating systems ie. MS DOS ( )
Use of specific software ie. EXCEL ( )
Programming ( )
Multimedia ( )
Telecommunications ie. INTERNET ( )
Use of computers in education ( )
Other *(complete)*......................................

<u>E.</u>
Here is a list of kinds of areas in which problems have been encountered. Please indicate your opinion about problems we are likely to face in Cyprus with the introduction of educational computing in elementary schools. Please put a √ according to what you believe:

Problems with:	*Very important problem*	*Somewhat important problem*	*Important problem*	*Not important problem*	*I don't know*
Software					
Hardware					
Teacher Training					
Technical Support					
Curriculum Integration					
Supplementary Material					
Other *(please indicate)* a... b...					

<u>F.</u>
Please put a √ to the media you use now in school and the frequencies of their use:

<u>I use the following media:</u>	*several times per week*	*about once a week*	*once or twice a month*	*not at all*
slide projector				
overhead projector				
tape recorder/ radio				
T.V./ video				
Other *(please indicate)* a................................. b................................				

G.

.Please put a √ to each statement according to your opinion:

	Strongly Disagree	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
• I like to teach with computer technology.					
• I think quality instruction using technology will only enhance my teaching.					
• I value teaching with technology.					
• I feel afraid to touch a computer.					
• I feel afraid that I might break or damage a computer.					
• I feel tense when people talk about computers.					
• I enjoy reading about computers.					
• I feel intimidated by people who know something about computers.					
• I think computers are dehumanising.					
• I fear that computers may take over some parts of a job that I enjoy.					
• I feel confident that I can learn how to use a computer.					
• I think students are more motivated when hey can learn using computer technology.					
• I think instruction by computer technology is just another fad.					
• I think that using instruction via computer technology will help improve students' performance.					
• I think teachers compete with slick packages and high tech machines.					
• When utilising computers, the teacher becomes guide/ facilitator.					
• When utilising computers, the teacher is able to further individualise instruction.					
• When utilising computers, the teachers' role is diminished.					

H.

Here are some possible goals for introducing computers into schools. We want to know your opinion about the importance of these goals. Please put a √ in the following lists:

IDEALLY (IF CONDITIONS MAKE IT POSSIBLE)

I think that computers are introduced to schools to help children:

	Very Important	*Somewhat Important*	*Not Important*
learn school subjects.			
be able to manage computers when they are grown up.			
find a better job later on.			
deal with difficult and complex problems.			
be able to find information they need.			
be able to create things of their own.			
become more active in their learning.			
maintain interest and become informed about the world.			

PRACTICALLY (CONSIDERING THE REAL CONDITIONS)

I think that computers are introduced to schools to help children:

	Very Important	*Somewhat Important*	*Not Important*
learn school subjects.			
be able to manage computers when they are grown up.			
find a better job later on.			
deal with difficult and complex problems.			
be able to find information they need.			
be able to create things of their own.			
become more active in their learning.			
maintain interest and become informed about the world.			

7. SoC Questionnaire

A.2 SoC QUESTIONNAIRE ITEMS

1	2	3	4	5	6	7
lot true of me now			Somewhat true of me now			Very true of me now

Scale	Item
1 2 3 4 5 6 7	I am concerned about students' attitudes toward this innovation.
1 2 3 4 5 6 7	I now know of some other approaches that might work better.
1 2 3 4 5 6 7	I don't even know what the innovation is.
1 2 3 4 5 6 7	I am concerned about not having enough time to organize myself each day.
1 2 3 4 5 6 7	I would like to help other faculty in their use of the innovation.
1 2 3 4 5 6 7	I have a very limited knowledge about the innovation.
1 2 3 4 5 6 7	I would like to know the effect of reorganization on my professional status.
1 2 3 4 5 6 7	I am concerned about conflict between my interests and my responsibilities.
1 2 3 4 5 6 7	I am concerned about revising my use of the innovation.
1 2 3 4 5 6 7	I would like to develop working relationships with both our faculty and outside faculty using this innovation.
1 2 3 4 5 6 7	I am concerned about how the innovation affects students.
1 2 3 4 5 6 7	I am not concerned about this innovation.
1 2 3 4 5 6 7	I would like to know who will make the decisions in the new system.
1 2 3 4 5 6 7	I would like to discuss the possibility of using the innovation.
1 2 3 4 5 6 7	I would like to know what resources are available if we decide to adopt this innovation.
1 2 3 4 5 6 7	I am concerned about my inability to manage all the innovation requires.
1 2 3 4 5 6 7	I would like to know how my teaching or administration is supposed to change.
1 2 3 4 5 6 7	I would like to familiarize other departments or persons with the progress of this new approach.

1	2	3	4	5	6	7
true of me now		Somewhat true of me now			Very true of me now	

2 3 4 5 6 7	I am concerned about evaluating my impact on students.
2 3 4 5 6 7	I would like to revise the innovation's instructional approach.
2 3 4 5 6 7	I am completely occupied with other things.
2 3 4 5 6 7	I would like to modify our use of the innovation based on the experiences of our students.
2 3 4 5 6 7	Although I don't know about this innovation, I am concerned about things in the area.
2 3 4 5 6 7	I would like to excite my students about their part in this approach.
2 3 4 5 6 7	I am concerned about time spent working with nonacademic problems related to this innovation.
2 3 4 5 6 7	I would like to know what the use of the innovation will require in the immediate future.
2 3 4 5 6 7	I would like to coordinate my effort with others to maximize the innovation's effects.
2 3 4 5 6 7	I would like to have more information on time and energy commitments required by this innovation.
2 3 4 5 6 7	I would like to know what other faculty are doing in this area.
2 3 4 5 6 7	At this time, I am not interested in learning about this innovation.
2 3 4 5 6 7	I would like to determine how to supplement, enhance or replace the innovation.
2 3 4 5 6 7	I would like to use feedback from students to change the program.
2 3 4 5 6 7	I would like to know how my role will change when I am using the innovation.
2 3 4 5 6 7	Coordination of tasks and people is taking too much of my time.
2 3 4 5 6 7	I would like to know how this innovation is better than what we have now.

8. Questionnaire to children (translation)

Please put a √ to whatever applies to you or fill the information:

A.

1. I am a boy ( ) girl ( )

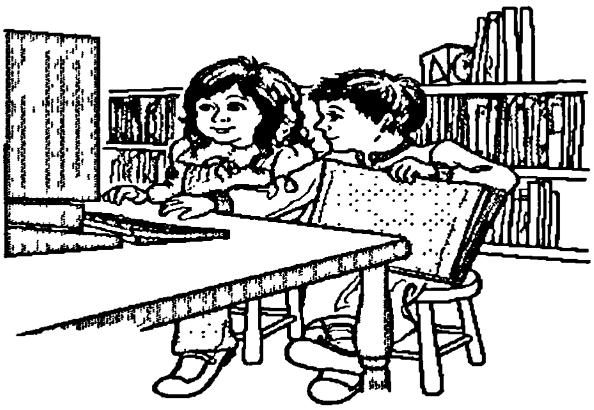
2. Age: I am .... years old

3. School: ....

B.

Here is a list of why computers should be introduced to elementary schools in Cyprus. Read them one by one and put a √ under the phrase that best expresses your opinion. For example if you think that computers are introduced to help you learn school subjects and that is very important to you, put a √ under column 1 (very important).

Computers are introduced to school to help me :	*Very Important*	*Somewhat Important*	*Not Important*
learn school subjects			
be able to manage computers when I am grown up.			
find a better job later on.			
deal with difficult and complex problems.			
be able to find information I need.			
be able to create things of my own.			
become more active in my learning.			
maintain my interest and become informed about the world.			



C. (This part has been changed to HyperCard before given to the students. See Greek version)

Please put a √ to the following:

1. Do you have a computer at home?

<table>
<tr>
<td>

yes ( )

If yes,

a. how often do you use it?
often ( )
sometimes ( )
never ( )

b. how do you use it?
(you can put more than one √)
I play games ( )
I make drawings ( )
I write ( )
I solve problems ( )
Other tasks I do ....
....

</td>
<td>

no ( )

If no,

a. would you like to have one?
yes ( ) no ( )

b. have you used a computer elsewhere?
If yes,
where?...
....
what did you do with it?.............
....

</td>
</tr>
</table>

MAKE SURE YOU HAVE COMPLETED ONE OF THE TWO SIDES ABOVE

Please put a √ to the following:

2. Do you have computers at your school?

<table>
<tr>
<td>

yes ( )

If yes,

a. how often do you use them?
often ( )
sometimes ( )
never ( )

b. how do you use them?
(you can put more than one √)
I play games ( )
I make drawings ( )
I write ( )
I solve problems ( )
Other tasks I do ....
....

c. what is your favourite task on the school computers?.............................
....
....

</td>
<td>

no ( )

If no,

a. would you like to have?
yes ( ) no ( )

</td>
</tr>
</table>

MAKE SURE YOU HAVE COMPLETED ONE OF THE TWO SIDES ABOVE

D.

Please put a √ under the statement which expresses your opinion. If for instance you agree that you feel afraid to touch a computer you put a √ under column "Agree"

	Strongly Disagree	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
• I feel afraid to touch a computer					
• I feel afraid that I might break or damage a computer					
• I feel tense when people talk about computers.					
• I enjoy reading about computers.					
• I can learn to use a computer					
• Computer lessons are fun					
• I would like to experiment on the computer					
• Schools should have computers					
• I would like to use a computer at home					
• Computers are not interesting to me					
• Someday, I would like to have a job working with computers					
• I like to learn with a computer					
• It is more exciting to learn with a computer					
• I can learn "better" using a computer					

*******Before you move to the next page, count the √ you have put in the table above. If they are not 14, it means you left a statement behind. Read the statements again and put √ where you forgot.***

You will notice there are 20 pairs of words. Please colour the one of the two opposite words that best expresses your opinion. For example if you think that the computer is more good than bad colour the word "good". Please read carefully all the pairs and colour one of the two words.

I think that computers are:

good	bad
smart	stupid
boring	interesting
easy	hard
friendly	scary
fast	slow
expensive	cheap
old	new
different	same
special	ordinary

understandable	confusing
small	big
simple	complicated
useless	useful
hardworking	lazy
organised	disorganised
important	unimportant
colourful	dull
creative	unimaginative
fun	uninteresting

9. Questionnaire to parents (translation)

Please put a √ to whatever applies to you and fill the information:

A.

1. Gender: Male ( ) Female ( )

2. Age: 20-29 ( ) 40-49 ( ) 30-39 ( ) 50-59 ( ) 60+ ( )

3. Occupation:...

4. Graduate of: *(note the highest level of education attained)*
   Elementary School ( ) Gymnasium ( ) Lyceum ( )
   College ( ) University ( )
   Other Institution (*please specify*) ( )..

5. My child's school is: ....

B.

6. Do you have a computer at home? yes ( ) no ( )
   If yes, a. how often do you use it? very often ( ) sometimes ( ) never ( )
   b. how do you use it?...
   If no, do you intend to buy one? yes ( ) no ( )

7. Do you have computers at work? yes ( ) no ( )
   If yes, a. how often do you use them? very often ( ) sometimes ( ) never ( )
   b. how do you use them?...

8. How would you rate yourself on computer proficiency?
   Very Proficient ( ) Proficient ( ) Limited proficiency ( ) Unskilled ( )

C.

9. When do you think computers should be introduced?
   from elementary education ( )
   from secondary education (Gymnasium) ( )
   from secondary education (Lyceum) ( )
   from tertiary education ( )
   at no level of education ( )

10. How many computers do you think schools should have?
    none ( )
    one per school ( )
    one per classroom ( )
    some per classroom ( )
    one per child ( )

11. Which is the best way for computer introduction?
    as a separate subject ( )
    as a topic within existing subjects ( )
    as a medium for instruction ( )
    in no case ( )

12. For which subjects should computers be introduced?
    all subjects ( )
    some subjects ( )
    positive subjects (Maths, Science) ( )
    no subjects ( )

13. Do you believe that computers should be introduced to Cyprus elementary schools?
    yes ( ) no ( )

14. Are you aware that computers have been introduced to some elementary schools?
    yes ( ) no ( )

15. What is your opinion about computer introduction in elementary schools? *(please justify your opinion)*...

....

....

D.

Please put a √ under the statement which best expresses your opinion:

	Strongly Disagree	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
• I feel afraid to touch a computer.					
• I feel afraid that I might break or damage a computer.					
• I feel tense when people talk about computers.					
• I enjoy reading about computers.					
• I feel intimidated by people who know something about computers.					
• I think computers are dehumanising.					
• I fear that computers may take over some parts of a job that I enjoy.					
• I feel confident that I can learn how to use a computer.					
• I think students are more motivated when they can learn using computer technology.					
• I think instruction by computer technology is just another fad.					
• I think that using instruction via computer technology will help improve students' performance.					
• When utilising computer, the teacher becomes guide/facilitator.					
• When utilising computers, the teacher is able to further individualise instruction.					
• When utilising computers, the teachers' role is diminished.					

E.

Here are some possible goals for introducing computers into schools. We want to know your opinion about the importance of these goals. Please put a √ in the following lists:

IDEALLY (IF CONDITIONS MAKE IT POSSIBLE)

I think that computers are introduced to schools to help children:

	Very Important	*Somewhat Important*	*Not Important*
learn school subjects.			
be able to manage computers when they are grown up.			
find a better job later on.			
deal with difficult and complex problems.			
be able to find information they need.			
be able to create things of their own.			
become more active in their learning.			
maintain interest and become informed about the world.			

PRACTICALLY (CONSIDERING THE REAL CONDITIONS)

I think that computers are introduced to schools to help children:

	Very Important	*Somewhat Important*	*Not Important*
learn school subjects.			
be able to manage computers when they are grown up.			
find a better job later on.			
deal with difficult and complex problems.			
be able to find information they need.			
be able to create things of their own.			
become more active in their learning.			
maintain interest and become informed about the world.			

10. Questionnaire to teacher coordinators (translation)

I. GENERAL INFORMATION

Name of school:...

Number of children:...

Number of teachers:...

II. HARDWARE

A. Please complete the following table. In the categories "Way of acquisition" and "Year of acquisition" complete with one of the numbers given (codes)

	Total number of equipment	**Models of equipment**	**Way of acquisition** 1=M.Ed 2-Bought by your school 3=Donated to your school 4=Other way of acquisition	**Year of acquisition** 1=1990 or before 2=1991 or 1992 3=1992 or 1993 4=1993 or 1994
Computers				
Printers				
CD-ROM				
Other (*please specify*)				

B. Please indicate the number of computers that are located in the following school areas:

	Number of computers
In classrooms	
In special labs	
In headmaster's office	
In teachers' office	
In other places (*please specify*)	

III. SOFTWARE

A. Please list the software that your school has in the following table:

Title of software	**Way of acquisition** 1=M.Ed 2=Bought by your school 3=Donated to your school 4=Other way of acquisition	**Year of acquisition** 1=1990 or before 2=1991 or 1992 3=1992 or 1993 4–1993 or 1994	**Subject (wherever applicable)**

IV. PROBLEMS

What kinds of problems do you face? Please report the problems that concern you and then indicate their frequency

List of problems	**is always a problems**	**is sometimes a problem**	**is rarely a problem but still concerns you**

V. USE

A. How often are computers used in each class of your school? Please indicate frequency of use in the following table:

	Never	At least once a year	At least once a month	At least once a week	Almost every day
Class A					
Class B					
Class C					
Class D					
Class E					
Class St					

B. How are computers used by each class of your school? Please explain for only the classes that use computers:

	Subject (wherever applicable)	Activities
Class A		
Class B		
Class C		
Class D		
Class E		
Class St		

C. What are the goals for computer use in your school?

The computer is used:	Often	Sometimes	Never
*for development of general computer use skills			
*for support of special subjects of the curriculum (i.e. Geography)			
*as a medium (i.e. word-processing)			
*for development of student interest (motivation)			
*for promotion of active learning			
*for development of cooperative learning			
*for development of individualised learning			
*for development of interdisciplinary learning			
*for other purposes (please identify) as a database for recreation (games)			

VI. NEEDS

What are your school needs? Please complete the following table and explain:

	Do you have needs? (*circle*)	What kind of needs? (*please explain*)
SOFTWARE	YES NO	
MACHINES AND EQUIPMENT	YES NO	
TRAINING	YES NO	
SUPPLEM. MATERIAL	YES NO	
TECHNICAL SUPPORT	YES NO	
OTHER (*please list*)	YES NO	

VII. COMMENTS/SUGGESTIONS

Please use this space to add any comments that you may have about the introduction of computers to your school or to the elementary schools of Cyprus in general:

....

....

....

....

....

....

....

B. Other documents

The letter to the Director of Primary Education asking for approval for research is provided.

Γιασεμίνα Καραγιώργη
Π. 5939
Ικάρου 3 Αγλαντζιά
2107 Λευκωσία

28 Απριλίου 1996

Κον
Διευθυντή Δημοτικής Εκπαίδευσης
Υπουργείο Παιδείας
Λευκωσία

Αξιότιμε Κύριε,

Είμαι δασκάλα στο Δημοτικό Σχολείο Λυθροδόντα και παράλληλα φοιτώ στο Institute of Education του University of London για απόκτηση διδακτορικού πτυχίου.

Η έρευνα μου αφορά την εφαρμογή καινοτομιών στο χώρο της εκπαιδευτικής τεχνολογίας στα σχολεία της Κύπρου. Για σκοπούς συλλογής δεδομένων, κρίνεται αναγκαία στο παρόν στάδιο η χορήγηση ερωτηματολογίου που σχετίζεται με στάσεις έναντι στους Ηλεκτρονικούς Υπολογιστές και την εισαγωγή τους στα δημοτικά σχολεία τόσο σε δασκάλους όσο και σε παιδιά και γονείς.

Θα παρακαλούσα πολύ να μου παραχωρηθεί άδεια διεξαγωγής μιας τέτοιας έρευνας. Επισυνάπτω τα ερωτηματολόγια για σκοπούς δικής σας ενημέρωσης.

Ευχαριστώ πολύ.

Με εκτίμηση

Γιασεμίνα Καραγιώργη

Εγκρίνεται/ ~~Δεν εγκρίνεται~~ το πιο πάνω αίτημα.

Διευθυντής Δημοτικής Εκπαίδευσης
α/α.

Κοιν.: - Π.Λ.Ε. Λ/σίας
- Οικείο Επιθεωρητή
- Δ/ντή Δημ. Σχολείου Λυθροδόντα

C. Interview questions (computing)

Individual

- When did you first encounter computers?
- What were your first impressions? Have your views changed since?

School

- How did your school get involved in the experimental program (story: how, when, why, from whom, with what goals?)
- How did you personally get involved in this process (why? role and responsibilities?)
- How did the process develop since the initiation of the innovation? (training, ways of use). Have there been any changes? (positive or negative) What do you think of the innovation?

Elicit comments on
clarity and complexity
consensus and conflict
quality and practicality

Classroom

- When did you first use computers in the classroom? Can you recall the story?
- Can you tell me a story of success[1] using computers in the classroom?
- Can you tell me a story of failure using computers in the classroom? (what did you feel? what happened? what were you doing? what were the children doing?)

Elicit comments on
classroom organisation
children's learning
children's behaviour (discipline)
teacher's role
teaching styles
teacher responsibilities (before class, during class, after class)
learning results

Social environment

- What are your views on reactions/behaviour concerning computing of:
  other teachers at your school
  the principal
  the inspectorate
  the CDU
  the Ministry of Education
  the community

Elicit comments on
process of implementation
principals' leadership
professional development and assistance
central office direction/commitment
implementation monitoring and problem solving
environmental stability
community support

[1] Bliss J and Ogborn J. (1977). Students' Reactions to Undergraduate Science. London: Heinemann.