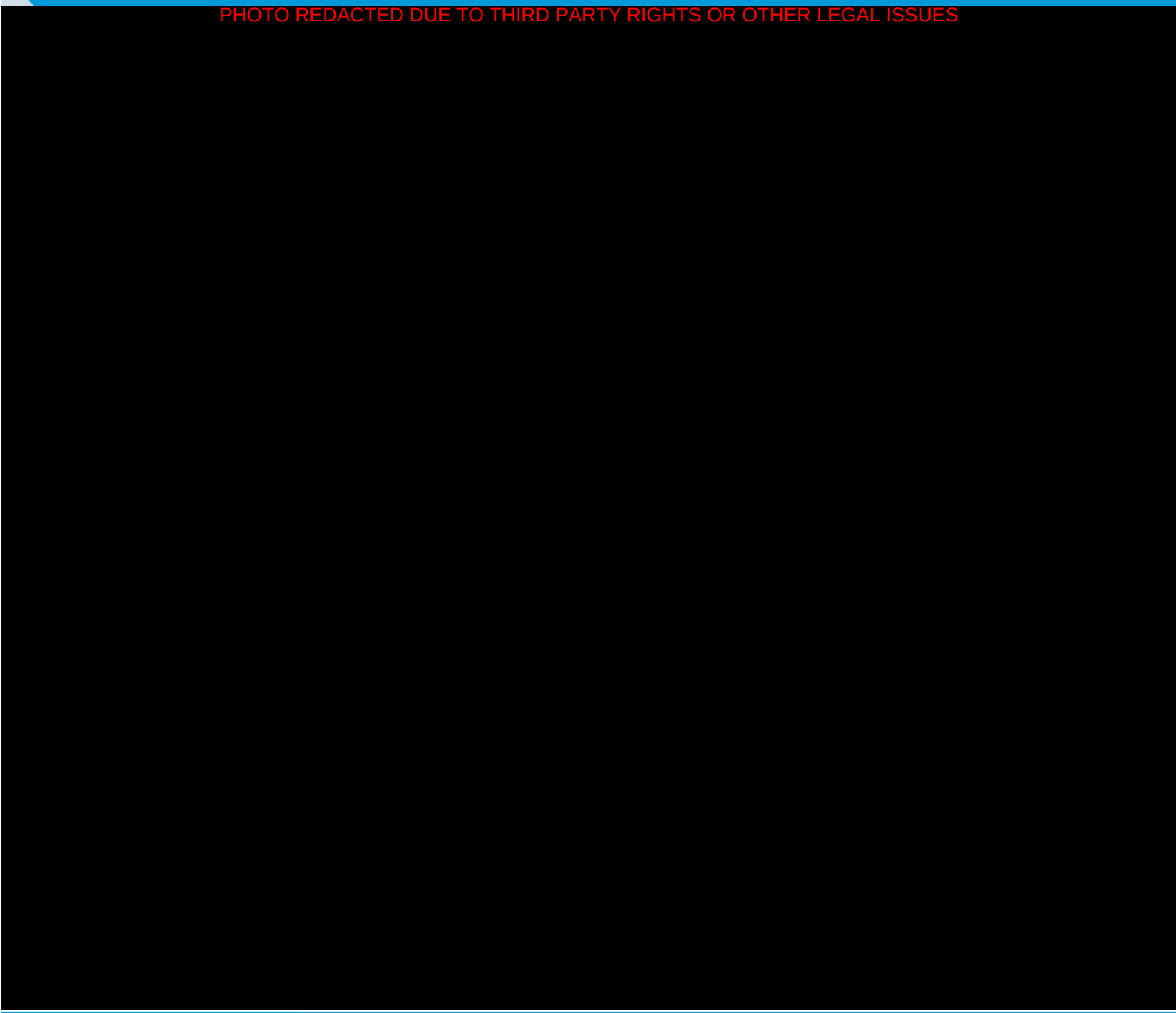
Harnessing Technology Review 2007:

Progress and impact of technology in education



Becta

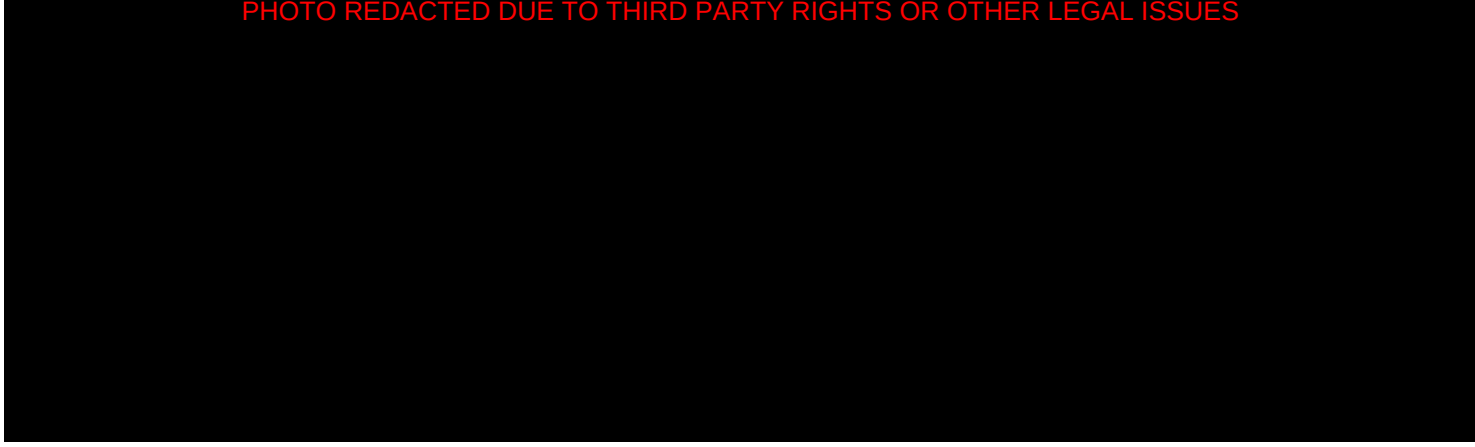


PHOTO REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

CONTENTS

PREFACE

Welcome to the *Harnessing Technology Review 2007*, a strategy-level review of what current research and evidence tells us about using technology for the benefit of learners. This publication builds on the *Becta Reviews* of 2005 and 2006, focusing discussion closely on the ambitions of the government's e-strategy, *Harnessing Technology*.

The *Review* has three parts:

- A summary which identifies the main messages drawn from the evidence
- A detailed review of the evidence and its implications
- An analysis of strategic issues and challenges.

There are many encouraging signs of progress and a growing evidence base demonstrating positive impact of technology and educational 'e-maturity' on a range of outcomes. We are now better able to understand and describe technology-related strategies which deliver benefits, and to identify priorities for the leadership of technology in education at national and local level.

Through this growing evidence base, Becta is enabled to provide strategic advice and guidance to its key stakeholders. Continuing discussions with these stakeholders and with national organisations supporting change in education and the skills sector, will help us to ensure that the use of technology supports the development of an education and skills system which is fit for the 21st century.

Stephen Crowne
Chief Executive

EXECUTIVE SUMMARY

This review provides an overview of ICT use in education based on the evidence available in 2007. Following several years of significant investment in infrastructure and connectivity, in improving learner:computer ratios and in promoting purchase of software to support learning through e-Learning Credits, the current picture is one of slower incremental growth, and a reaching of a plateau in some sectors.

Access to technology

The learner:computer ratio continues to improve, particularly in secondary schools, assisted by the growing availability of laptops and wireless networks. The use of ICT resources in lessons by teachers has continued to grow, both in schools and FE colleges, driven to a large extent by the adoption of interactive whiteboards and related technologies. Schools are also beginning to provide access to their networks from remote locations for staff and pupils. In secondary schools and FE colleges, learning platforms give practitioners and learners access to growing repositories of digital resources, increasing the range and quality of materials available.

In the FE sector, the learner:computer ratio is largely unchanged from the previous year. However, unlike the schools sector where adoption and use of learning platforms is slow, in FE the adoption and use of VLEs continues to grow, though the majority of colleges still fail to use this as their main platform. There is a noticeable increase in remote access to learning, which suggests a trend to allow learners access to their programmes at a time and place to suit them, but the primary function of learning platforms continues to be as repositories for course materials and resources.

Educational leaders are planning further investments in technology infrastructure not only to sustain existing provision but also to keep pace with constantly changing priorities and educational needs.

Use and impact

Teachers and pupils are highly positive about the impact that using technology can have on motivation and engagement. However, in the schools sector, the widespread use of interactive whiteboards and display technologies, although highly motivating for learners, has led to a focus on using technology predominantly for whole class teaching, rather than for supporting independent or small group learning. While developments in the use of technology to support more personalised learning are evident, they are at an early stage. Technology is most often used to 'push out' resources and the opportunity for learners to choose their own pathways through them is rarely offered.

Moreover, while there is increasingly strong evidence that the use of ICT helps raise educational standards, this is dependent on the context in which the technology is used. This is especially true of interactive whiteboards, where impact on attainment relates to the precise nature or amount of use, and the extent of embedding into learning and teaching practices.

Professional development

The idea of using ICT, at least in some part of the teaching and learning process, is now commonplace in most schools and colleges. Teachers and lecturers prepare lessons using ICT, exploit presentation software and word processing and may expect students to access and use online resources and course documents.

Few practitioners, however fully exploit the possibilities for learning and teaching offered by technology, especially learning platforms, and although 46 per cent of secondary schools report having one, only 24 per cent of teachers report using it.

Schools have in place a range of technologies to facilitate access to shared ICT resources, but the amount of resource sharing and collaboration within the school, and at local and regional level, is currently limited. In contrast, there is evidence of collaboration in the FE and skills sector, often encouraged by the tradition of 'in house' resource development and a more limited commercial software market.

While the growing use of ICT by teachers indicates an increase in their competence with technology, teachers continue to seek training in specific technologies and are increasingly discriminating in both the topics and format of the professional development available to them.

Integration of systems

There have been improvements in connectivity and access to the internet in both schools and colleges, with improved reliability of connection giving practitioners increased confidence to use the technology live in the classroom. ICT for administration and management has also developed considerably in both sectors. The use of electronic attendance and registration systems is high in schools and there is evidence that they reduce both the number of unauthorised absences and administrative time.

However, although schools have begun to appreciate the improved effectiveness and reduced costs that can result from centralised systems, few have achieved full integration of their curriculum and administration systems, and there is still considerable potential for further productivity gains by using ICT to support information management and assessment.

Interoperability issues still prevent further improvements in the use of technology, with schools and colleges facing the challenge of effectively integrating their management and learning systems. The effective information sharing and exchange that is needed to support child protection is still at an early stage of development in most schools and local authorities. Even when this underlying capability is in place, institutional and professional practice in using data to support learners needs to be encouraged and nurtured.

Strategic issues and challenges

A growing body of evidence demonstrates links between e-maturity and educational improvement. Building e-maturity continues to be a challenge, however, both to schools and the FE and skills sector, and there is wide variation in its development. Achieving the benefits of learning platforms, and their integration with management information systems, is still some way off for the majority of schools and colleges, and they require ongoing support in recognising and realising these benefits.

Technology issues
Technical support continues to be an issue, particularly in primary schools, and the experience of broadband access is still inadequate in many schools. Linkage between learning platforms and management information systems remains a problem.

Teaching and learning
Three quarters of teachers rarely or never use technology to support learners working together. Use of technology needs to become secondary to a larger learning and teaching agenda in which learners develop a wider range of skills and gain access to a more personalised curriculum.

Increased use of a range of technologies calls for new approaches to learner support and management, and with them, new approaches to professional development.

The challenge is that of developing the use of technology from enhancing and enriching learning to also extending and empowering it, developing a broader repertoire of practitioner skills.

Continuity of learning
Use of technology to support effective continuity of learning is still at an early stage, particularly in the schools sector. Issues of home access still need to be addressed, and both schools and colleges have some way to go in making educational information and resources accessible to learners (and their families) at times and locations that suit their learning preferences and choices.

Developing awareness and understanding of what technology-supported continuity of learning looks like for different learner groups and sectors is essential.

Partnerships
Continued investment in technology now enables schools, colleges, work-related learning and local agencies to share information and resources, and to gain better value for money in procurement. However, partnership working is still in its infancy and requires significant changes in working practices in order for the benefits to be realised.

Promoting awareness and models of maturity in the use of ICT is central to helping to increase the number of educational organisations making effective use of ICT. Continued clarity and coherence of vision and leadership is essential at all levels in the system, and Becta will continue to provide strategic co-ordination and guidance to ensure that the power of ICT is harnessed to benefit all learners.

1 INTRODUCTION

March 2005 saw the publication of the Government's e-strategy, *Harnessing Technology*, which set out a system-wide approach to the application of ICT in education, skills and children's services. It sought to apply technology to transform the way in which educational institutions operate and are managed, and the way they connect with each other and enable interaction, for the benefit of learners, parents and carers. Technology should fulfil its potential as a critical enabler of educational change, directly supporting and connected with other government strategies including the DfES's (now DCSF/DIUS) five-year strategy and the personalisation agenda.

The last 12 months have seen translation of the e-strategy into a single delivery plan (Becta, 2006a). This clarified the desired outcomes of the strategy, grouping them in a 'balanced scorecard' under the themes of:

- Fit for purpose technology, systems and resources
- Capability and capacity of the workforce, providers and learners
- Efficiency, effectiveness and value for money across the system
- Improving learner and system performance.

This review broadly follows the same structure, gauging the extent to which there has been progress in meeting these outcomes in schools and the learning and skills (post-16) sector in England. Where comparative data is available, it is provided for the UK and from work carried out by the Organisation for Economic Co-operation and Development (OECD) and the European Commission.

The analysis presented in this review draws on recent surveys and research studies including:

- national statistics and large-scale and national level surveys
- national and large-scale research studies of ICT implementation and use
- projects to evaluate national ICT programmes
- inspection data and reports from Ofsted
- systematic reviews of literature relating to ICT and education.

Figure1.1: The strategic outcomes of the e-strategy

Capability and capacity of the workforce, providers and learners

1.1 Leaders have the knowledge and skills to ensure technology for learning can be harnessed for the benefit of learners
1.2 Institutions and providers plan and manage technology for learning effectively and sustainably
1.3 Practitioners exploit technology consistently to offer engaging and effective learning experiences
1.4 Practitioners, parents and learners can share and use information and data effectively for the benefit of learners
1.5 Improved learner capability in using technology to support their learning

Outcomes and benefits for learners and children

3.1 There is greater choice in learning opportunities and modes for all learners
3.2 Learners have increased motivation for engagement in learning
3.3 Fewer learners under-perform or fail to succeed in education
3.4 An improvement in the quality of learning provision is accelerated
3.5 There is improved child safety and child protection

Fit for purpose technology and systems

2.1 All learners and practitioners have access to the appropriate technology and digital resources they need for learning
2.2 Every learner has a personalised learning space to enable them to learn when and where they choose
2.3 Technology-enabled learning environments are secure, supported and interoperable
2.4 There is a dynamic, vibrant and responsive technology for learning market that can meet the needs of the system

Efficiency, effectiveness and value for money across the system

4.1 Learning providers collaborate and share information and resources
4.2 The management and administration of learning and institutions is more efficient
4.3 There is a greater level of effective, learner-focused, assessment for learning
4.4 Practitioners collaborate and share good practice and learning resources
4.5 There is good use of information to support learner transitions between institutions and sectors

The final section charts overall progress and issues and challenges arising from this review in the context of the e-strategy and the Government's wider ambitions for the education and skills sectors.

2 FIT-FOR-PURPOSE TECHNOLOGY, SYSTEMS AND RESOURCES

Key points

Continuing investment has produced improvements in the technology infrastructure in schools, with greatest improvement in the pupil:computer ratio in secondary school. There has been particular growth in the availability of laptops, with the increase often linked to the availability of wireless networks.

While in the past colleges have had a particular challenge in maintaining the currency of their infrastructure, and the demand created by increasing student numbers, the number of FTE students has stabilised in 2006, and the student:computer ratio has remained largely the same.

In colleges, around three quarters of computers are sited in classrooms, restricting how they may be used to those times when classes are scheduled. While open-access provision allows some use out of class time, this provision has remained relatively constant over the last few years.

There have been improvements in connectivity and access to the internet in schools and colleges, with improved reliability of connection giving practitioners increased confidence to use the technology live in the classroom. There is still a need to develop practice to gain full value from broadband use in classrooms.

Schools still have a way to go in achieving full integration of their curriculum and administration systems. The integration of learning platforms with management systems remains an issue in both sectors.

The rapid growth in interactive whiteboards has continued, in all sectors, with the most marked increase being in secondary schools. They continue to be a focus of future spending and growth in schools and do not appear to have reached a plateau yet.

Learning platform availability continues to increase. However, overall levels of adoption remain relatively low, with their presence still more prevalent in secondary schools than primary. In colleges, college networks and intranets still serve as the main platforms.

While technical support remains an ongoing issue for schools, there is evidence that institutions are developing effective models for addressing the issue and seeing it as a high priority in future ICT spending. Where effective technical support is provided ICT confidence among staff is improved.

The last 10 years have seen considerable Government investment to provide a reliable and high-quality ICT infrastructure. In addition to standard technology funding to schools through capital and revenue streams, major capital investment has been made through the Building Schools for the Future (BSF) programme.

This section considers the impact of these developments in terms of:

- access to, and the development of, technology and digital resources
- effective deployment of technology and digital resources to deliver learning environments which are integrated, secure and well supported.

DEVELOPMENTS IN SCHOOLS

Access to technology

Pupil to computer ratios

The pupil-to-computer ratio continued to improve on previous years. The secondary school ratio was 3.6 pupils per computer while in primary schools the average was 6.2 pupils per computer.

Kitchen *et al.* (2007) reported an increase in the availability of laptops in both primary and secondary schools, with availability in 90 per cent of primary schools (with an average of 14 per school) and 95 per cent of secondary schools (with an average of 77 per school).

By comparison, in 2006, the pupil:computer ratio in schools in the EU was 9.9:1. There has been an increase in computer availability since the last measurement in 2001. At that time, the average

figure (measure) for 15 EU countries was 12.5:1. By 2006, the level for this group of countries was 8 pupils per computer.

While computer:pupil ratios provide an indication of potential availability, they do not give the full picture in terms of access, which needs to include location of computers, their availability to support learning and teaching and issues such as portability.

Location and availability of computers

Schools tend to deploy desktop computers mainly in ICT rooms while laptops tend to be deployed in general classrooms. In around half of primary schools, desktop computers were located mainly in ICT rooms and over three quarters of desktops in secondary schools were available in this way. In 18 per cent of primary schools and 13 per cent of secondary schools, desktops were mainly in classrooms and some in dedicated ICT rooms. (Kitchen *et al.*, 2007).

Networked classrooms and wireless networks

The improvements in networking in both primary and secondary schools, reported in the *Becta Review 2006*, have continued. However, as figure 2.4 shows, a third of all computers in primary schools are not connected to the internet (Kitchen *et al.*, 2007).

Kitchen *et al.* (2007) found that 82 per cent of secondary and 49 per cent of primary schools now have some level of wireless network. The most common reason for implementing wireless is to support the use of ICT in classrooms other than ICT suites.

Supporting technologies

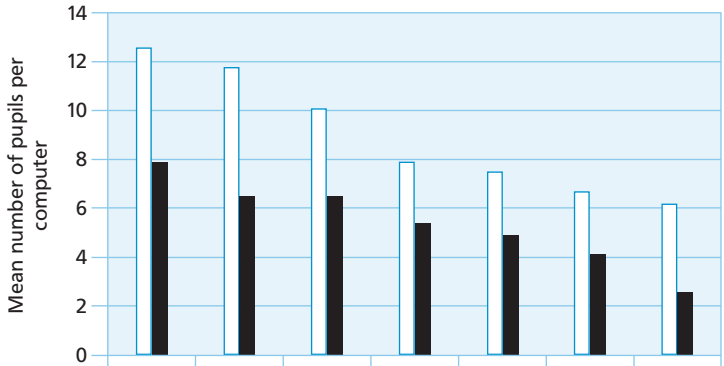
The range of supporting technologies has continued to expand and has in turn enhanced progress in embedding the use of ICT across the curriculum (Ofsted, 2005a).

Interactive whiteboards

The rapid spread of interactive whiteboards continued, with the most marked increase in secondary schools, where the average number per school has increased from 18 in 2005 to 22 in 2006 (Kitchen *et al.*, 2007). All primary schools surveyed reported that they now had an interactive whiteboard, compared with 39 per cent in 2002.

It is likely that demand in this area will continue, as 60 per cent of secondary school leaders reported display technologies as a high priority for investment in the next three years. A quarter (24 per

Figure 2.1: Number of pupils per computer used for learning and teaching 2000–2006



	2000	2001	2002	2003	2004	2005	2006
Primary	12.6	11.8	10.1	7.9	7.5	6.7	6.2
Secondary	7.9	7.1	6.5	5.4	4.9	4.1	3.6

Source: ICT in schools survey 2004 (Prior and Hall, 2004), and Computer:Pupil Ratio from Pupil Level Annual School Census 2005 and 2006

Table 2.1: Number of computers per 100 pupils in European Schools 2006 *

Country	Number of internet-connected computers	Number of computers	Overall rank for number of computers
Denmark	26.8	27.3	1
Norway	22.7	24.2	2
Netherlands	20.0	21.0	3
United Kingdom	**18.5**	**19.8**	**4**
Luxembourg	18.3	19.6	5
Sweden	16.6	17.4	6
Finland	16.2	16.8	7
Austria	14.2	16.2	8
Iceland	14.8	15.8	9
France	8.9	12.6	10
EU25 average	**9.9**	**11.3**	
EU15 average	**10.8**	**12.1**	

* Only includes computers at schools available to students for educational purposes.

Source: Benchmarking Access and Use of ICT in European Schools (Head teacher Survey), Commission Services, European Commission (2006)

cent) of primary school leaders reported this as a priority (Kitchen *et al.*, 2007).

Mobile technologies

Mobile technologies are growing in availability and have been introduced to support various educational activities, usually with a focus on communication. Pupils can gain greater control over where and when they learn and use of mobile technology is helping to blur the division between in- and out-of-school learning (Condie *et al.*, 2006).

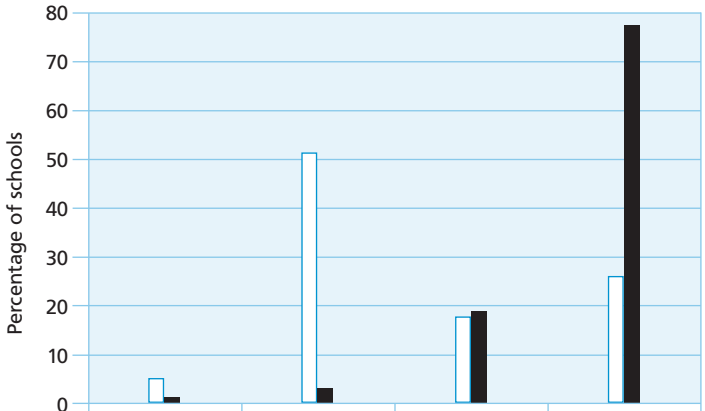
Portable devices have been effective in supporting learning for disaffected and 'hard to reach' pupils, where attending school is problematic for personal or other reasons. However, some challenges remained to the ability to deploy and integrate mobile technologies easily into educational environments. These relate in part to technical issues such as the restricted functionality of some mobile devices, the robustness of some technologies (such as PDA screens) and the battery life, in particular of Tablet PCs (Becta, 2006b).

Other supporting technologies

Supporting technologies are particularly important for pupils with special educational needs. In mainstream schools in 2004, 35 per cent of secondary and 19 per cent of primary schools had specialist equipment such as speech-recognition software and specialist peripherals (Becta, 2005a).

More recent data from Kitchen *et al.* (2007) relates to the provision of assistive technologies to support pupils with special educational needs. Some 44 per cent of primary schools reported owning one device with around a quarter having devices to support physical access and sensory access and 10 per cent having devices to support cognitive access. In secondary schools there was slightly higher availability, with around a half of schools with at least one device, a third with sensory access devices and physical access devices and a fifth with devices to support cognitive access. (Kitchen e*t al.*, 2007)

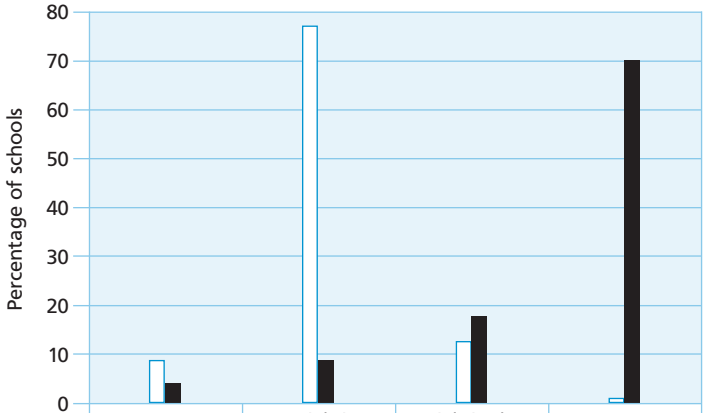
Figure 2.2: Location of computers in primary schools



	Only in dedicated ICT room	Mainly in dedicated ICT room and some classrooms	Mainly in class, but also in dedicated ICT room	In class, and not in dedicated ICT room
Desktops	5	51	18	26
Laptops	1	3	19	77

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

Figure 2.3: Location of computers in secondary schools



	Only in dedicated ICT room	Mainly in dedicated ICT room and some classrooms	Mainly in class, but also in dedicated ICT room	In class, and not in dedicated ICT room
Desktops	9	77	13	*
Laptops	4	9	18	70

* Percentage less than 0.5%

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

Access to the internet

The Government set a target that every school should have access to a broadband connection appropriate to its circumstances and requirements by the end of 2006. The DfES suggested that this typically would equate to a synchronous connection of 2Mbps for primary schools and 8Mbps for secondary schools. By the last

quarter of 2006, 99 per cent of primary and almost 100 per cent of secondary schools were connected at these speeds (Becta, 2006c).

The speed and quality of the classroom connection to the internet has a significant impact on student access. Schools reported high levels of satisfaction with the speed of the internet connection in both primary and secondary schools (see Figure 2.6), although there has been a slight dip in satisfaction in primary schools. However, though the trend is improving, the figures suggest that, while there is good connectivity to the school, experience in the classroom is still variable. This is likely to be due to the quality of networking within the school.

There is evidence that schools are not yet fully exploiting the combinations of technologies and broadband services (Ofsted, 2004; Lewis *et al.*, 2006). Reasons cited by teachers include a lack of knowledge about the services, a lack of support and difficulty in accessing the services.

Personalised learning spaces

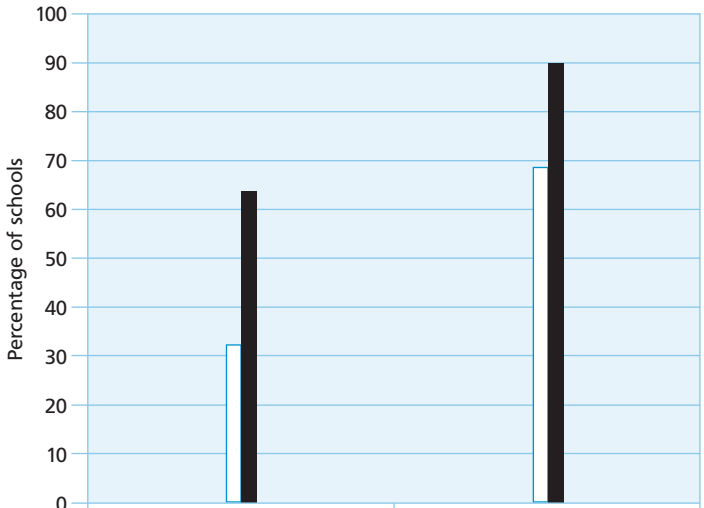
The Government's vision for education is one where every child and learner is offered personal support and advice as they progress through education sectors and on to employment and lifelong learning. By 2008, every pupil should have access to a personalised online learning space with the potential to support an e-portfolio.

Progress on a number of technology and system developments is important in achieving this vision. Common approaches are developing to the storage and transfer of personal records across education and children's services.

Learning platforms and e-portfolios

The adoption of learning platforms and e-portfolios is indicative of overall progress towards personalised online learning spaces. Learning platforms vary considerably but in general provide a range of ICT-based functions around communication and collaboration, content management, curriculum planning, and tools and services such as email, messaging, discussion forums and blogs.

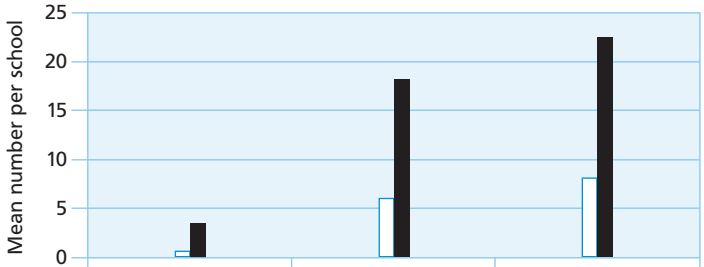
Figure 2.4: Percentages of schools with all computers networked 2002-2006



	2002	2006
Primary	32	69
Secondary	64	90

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

Figure 2.5: Number of interactive whiteboards per school (2002–2006)



	2002	2005	2006
Primary	0.7	6.1	8
Secondary	3.5	18	22.3

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

Overall levels of adoption remain relatively unchanged from that reported in the *Becta Review 2006*, with their presence more prevalent in secondary schools than primary. Kitchen *et al.* (2007) reported figures of 46 per cent for secondary and 11 per cent for primary schools. Of schools which had not acquired a learning platform, 61 per cent of secondary and 41 per cent of primary schools intended to procure a learning platform in the next 12 months (Becta, 2007a). Reasons cited for not having a learning platform yet included finance, lack of knowledge and, particularly in the primary sector, that learning platforms were not appropriate to their school needs (Ibid).

E-Portfolios are broader, personal online spaces which enable learners to store, organise and personalise information, collaborate and receive feedback. The picture in relation to e-portfolio adoption remains relatively unchanged in the primary sector, although there does appear to be progress in terms in the secondary school sector. About four-fifths (79 per cent) of secondary schools reported that they encourage use of e-portfolios in 2006. In most cases this use was said to be encouraged for 'some pupils' (55 per cent overall) rather than 'all pupils' (23 per cent) (Kitchen *et al.*, 2007).

Extended learning and remote access to resources and services

In primary schools there has only been moderate progress towards establishing remote access to the school's network. Only one per cent of primary schools allow access by pupils and nine per cent give access to senior teaching or administrative staff. There was far greater access to the school network in secondary schools for both senior staff (38 per cent) and pupils (27 per cent). (Kitchen *et al.*, 2007).

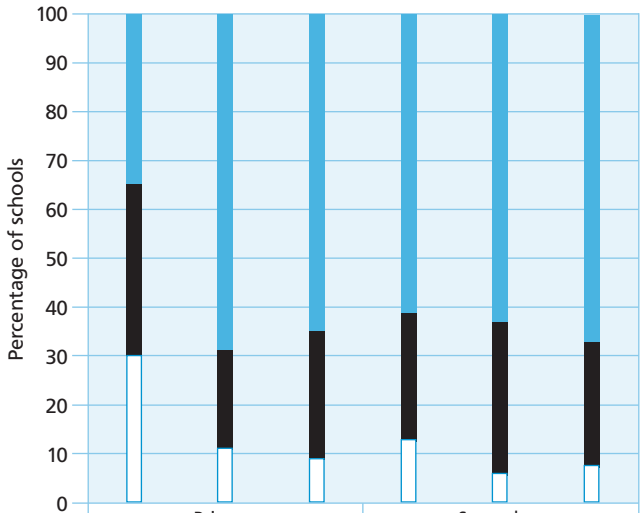
The majority of primary schools and nearly all secondary schools provided pupils with some form of access to ICT facilities outside lesson times. However, while there has been an increase in formal provision, informal provision at lunchtime and breaks has been levelling off or even declined.

Home access to ICT enabled by the school

Any form of remote access in the home generally relies on equipment provided by parents. Over half of households in Great Britain can access the internet from home, but this access varies with socio-economic group (National Statistics Survey, 2006). A national survey of 9–19-year-olds (Livingstone and Bober, 2005), found that 88 per cent of middle-class children had access to the internet at home compared to 61 per cent of working-class children. Libraries and internet cafés offer access to the internet, but they are not an effective substitute for a lack of home access to ICT (Valentine *et al.*, 2005; Somekh *et al.*, 2002).

ICT Test Bed Schools offered loans of equipment for use at home. These increased ICT skills for

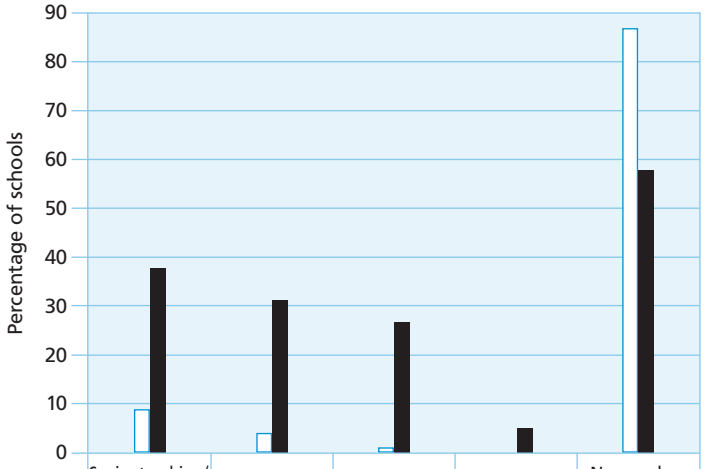
Figure 2.6: Speed of internet connections in schools 2002–2005



	Primary			Secondary		
	2002	2005	2006	2002	2005	2006
Meets none of our requirements	30	11	9	13	6	8
Meets some of our requirements	45	20	26	26	31	25
Meets all/most of our requirements	25	69	65	61	64	67

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

Figure 2.7: Schools allowing access to the network from outside the school



	Senior teaching/ admin staff	Other	Pupils	Parents/carer	No one has access
Primary	9	4	1	0	87
Secondary	38	31	27	5	58

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

both pupils and parents and help bridge the digital divide by giving the majority of students access to computers at home. Pilot schemes run by Test Bed schools suggested a number of challenges that needed to be met or managed, including:

- lack of land lines in homes
- agreeing responsibility for technical support
- meeting ongoing costs of connectivity and software
- capacity to manage the distribution of computers.

(Somekh, Lewin, Saxon *et al.*, 2006)

Access to digital resources

The number of products registered for e-learning credits continues to grow – an increase of 16 per cent from September 2005.

In addition, recent data shows considerable increase in the number of secondary school products targeted at the non-core subject areas, with greater increases in the number of products for secondary schools in the core subjects than the number for primary schools.

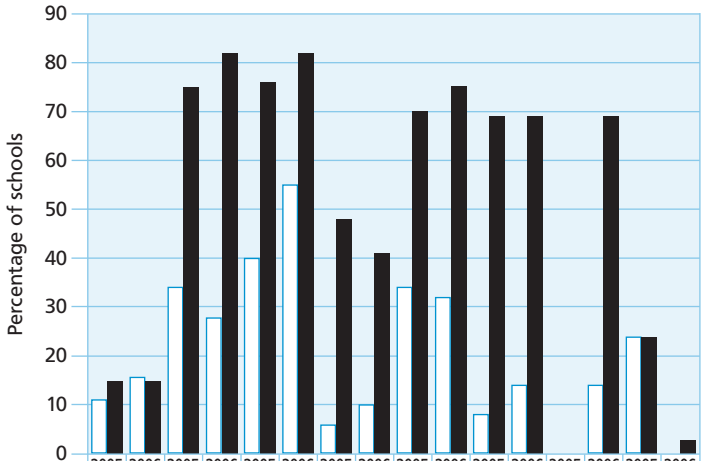
Resource availability and discovery

We have noted in previous reviews that the experience of teachers searching for resources was variable, inconsistent and often dissatisfying and that to address this required systemic improvements in the area of resource discovery. The organisation of resources was helped in Test Bed schools and colleges that had a storage and retrieval system. Individual teachers were familiar with this system which was efficiently managed and 'tidy' (Somekh, Lewin, Saxon *et al.*, 2006).

Teachers in the Test Bed schools also reported that it was initially very hard work to establish and find useful resources to deliver the planned curriculum, but that this was worth while in terms of the resources that they now had available and could modify for re-use. (Somekh, Lewin, Saxon *et al.*, 2006)

Commercial resources which gave structure to teacher resource development proved useful to

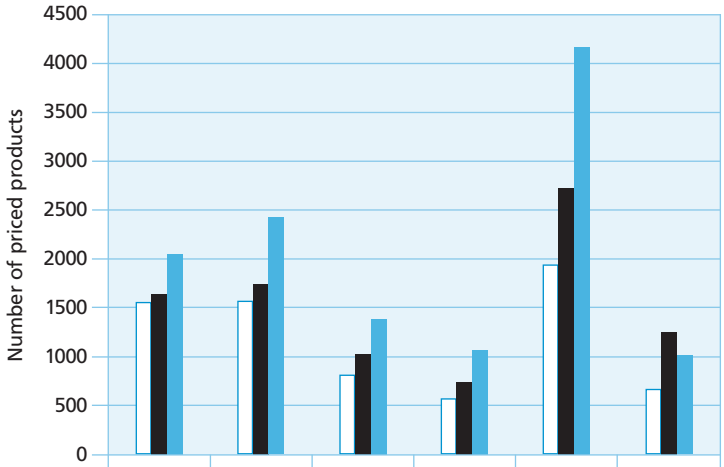
Figure 2.8: Forms of access to ICT resources outside lessons



	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
	Breakfast club		Lunchtime club		After school club		Before school (informal)		Lunchtime/ breaks (informal)		After school (informal)		Remote access		None	
Primary	11	16	34	28	40	55	6	10	34	32	8	14	0	14	24	0
Secondary	25	25	75	82	76	82	48	41	80	75	69	69	0	69	24	3

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006) and Harnessing Technology in Schools survey (Kitchen et al., 2007)

Figure 2.9: Number of priced products by major subject area



	Maths	English	Science	ICT	Other	No subject given
Feb – 04	1558	1587	824	571	1973	690
Apr – 05	1637	1737	1028	758	2737	1269
Oct – 06	2045	2455	1404	1067	4180	1007

Source: Download of Curriculum Online database of registered products, CEPA calculations (Becta, 2007b)

primary teachers. These resources included clip-art, video clips and short lesson activities for teachers to manage. School/college cluster content creation teams were also reported as useful. (Ibid)

Effective deployment of ICT

Sustainability of provision

As schools' computer stocks have increased over time, there is a parallel management issue of purchase, disposal and re-use of resources.

Test Bed schools had not planned at the start of the initiative for the continuation of projects once earmarked funding had come to an end. However, as the Test Bed project developed, it became obvious to participating schools that longer-term planning was needed to secure sustainability of ICT provision to deliver continuing benefits from the initiative. Sustainability also came to be understood as more than the replacement of equipment: it was also the long-term embedding of pedagogic change.

The final ICT Test Bed report found that schools were able, with careful planning and effective procurement strategies, to deliver sustainable provision beyond the period of project funding (Somekh, Lewin, Saxon *et al.*, 2006). However, 86 per cent of LAs expect a funding gap caused by a decrease in funding or rising costs of supporting ICT in schools (Sinclair and Mortimer, 2007).

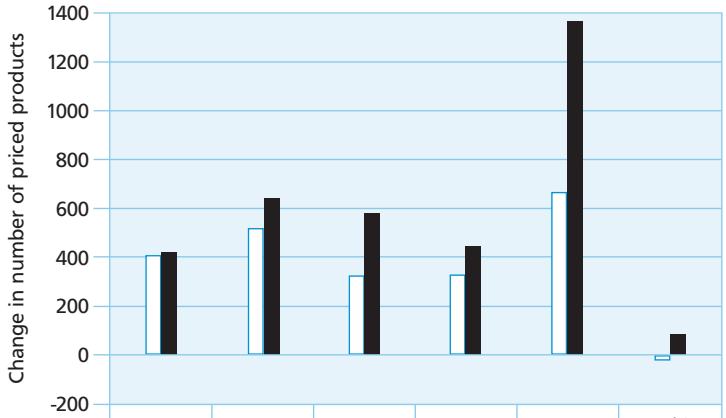
Technical support

Technical support remains an ongoing challenge for schools, with many still facing the challenge of providing a responsive yet cost-effective service. A sizeable minority of teachers reported having technical problems that prevented the delivery of lessons at least once per month (Kitchen *et al.*, 2007). Teachers in secondary schools were less likely to experience these problems than those in primary schools, presumably because they have higher levels of technical support. Problems were more likely to involve hardware in the classroom rather than network or system failure.

In both primary and secondary schools the most common area for investment over the next three years is technical support, demonstrating once again that this remains an area of concern for schools (Kitchen *et al.*, 2007).

Despite regarding technical support as a high priority, relatively few schools had implemented Becta's Framework for ICT Technical Support (FITS). In 2005 only 7 per cent of schools had implemented the FITS system and a significant proportion had no plans to do so in the near future (Becta, 2006d). The framework helps schools

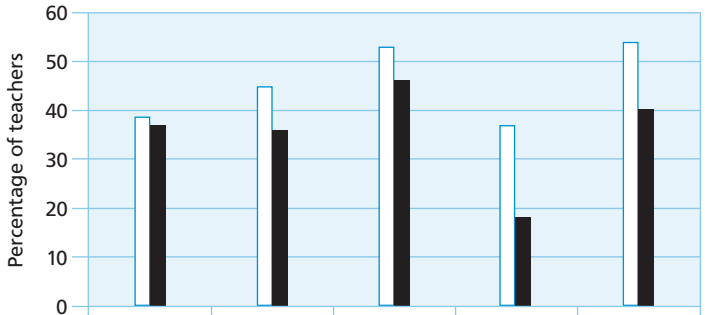
Figure 2.10: Change in the number of priced products by major subject area and school type (April 2005 to October 2006)



	Maths	English	Science	ICT	Other	No subject given
Primary	260	395	174	180	553	-11
Secondary	278	543	454	318	1354	87

Source: Download of Curriculum Online database of registered products, CEPA calculations (Becta, 2007b)

Figure 2.11: Percentage of teachers experiencing technical problems which prevent delivery of lessons at least once a month



	Network	Internet connection	Computers (pupil use)	Interactive whiteboard	Printers
Primary	39	45	53	37	54
Secondary	37	36	46	18	40

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

implement a reliable and effective ICT infrastructure and address the technical support problems that they may encounter. Where it has been implemented, it has helped school planning and budgeting and allowed schools to focus on user requirements. Teachers were also more confident that ICT services were reliable. (Becta, 2006e)

Security and integration of ICT systems

The *Becta Review 2006* noted that integration of learning platforms with management systems was an issue. The latest data suggests that this picture is largely unchanged with both the Harnessing Technology in Schools survey and the learning platforms study stating that there is still limited linkage between learning platforms and school management systems (Kitchen *et al.*, 2007; Becta, 2007a).

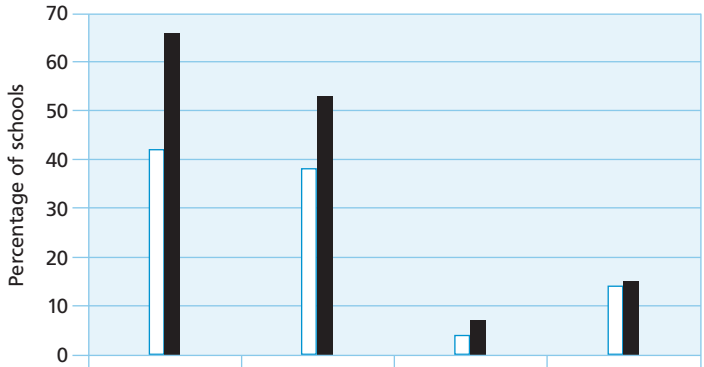
For example, few learning platforms were linked to school management systems such as pupil attendance registration. Only 14 per cent of the learning platforms in surveyed secondary schools were linked in this way. The corresponding proportion for primary schools was 2 of the 26 learning platforms found. (Kitchen *et al.*, 2007)

The school's network should also provide safe and secure, 'anytime, anywhere' access. This means protecting the user from inappropriate content, and ensuring data security and integrity. Secure log-in areas were available to staff in about half (52 per cent) of primary schools and about two thirds (66 per cent) of secondary schools. Most schools which had staff log-ins also provided log-ins for pupils (38 per cent of primary schools and 53 per cent of secondary schools overall). (Kitchen *et al.*, 2007) Schools take other technical steps to ensure the safety and security of their systems, predominantly using virus protection and firewall services.

Future priorities

Spending on ICT at school level is rising slightly on average (Kitchen *et al.*, 2007). While schools spent only between 2–5 per cent of their budget on ICT (including equipment, software, connectivity and support) in the 2005–2006 financial year, they did not expect a fall in this spend in the coming years.

Figure 2.12: Percentage of schools providing secure log-in areas for different users



	Staff	Pupils	Parents	Governors
Primary	52	38	4	14
Secondary	66	53	7	15

Source: Harnessing Technology in Schools survey (Kitchen et al., 2007)

However, BESA suggests that schools view spending on ICT as a diminishing priority with only 26 per cent of primary and 38 per cent of secondary schools expressing a view that ICT spend was to be a main focus in 2007 (BESA, 2006). This may reflect a change in spending priorities more generally, that hardware refreshment activities could run on 4- or 5-year cycles, or that with more efficient procurement processes, schools are coping better with sustainability issues.

Technology-related training remains a priority in both primary and secondary schools, and particularly the former (Kitchen *et al.*, 2007). Although there is increasing access to technology, in terms of the maturity of the workforce in adopting these technologies, training remains an issue.

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Access to technology

Access to computers and supporting technologies

Colleges have faced a particular challenge of maintaining their infrastructure while at the same time meeting greater demand created by the growing number of FTE students (Becta, 2006d). The need to respond flexibly to increasing student numbers is likely to continue in the light of proposals set out in the Leitch report. College infrastructure will need to cope not only with new levels of demand but also the ability to provide for students who may wish to learn on line, on demand and from remote locations.

The decline in improvement of student:computer ratios noted in 2005 has continued. In 2005 the decline was attributed to the success of colleges in recruiting and retaining their students, but in 2006 while the number of FTE students had stabilised, the student:computer ratio remained largely the same. It is, however, comfortably within the LSC target of 5:1, with a mean ratio of 4.5:1.

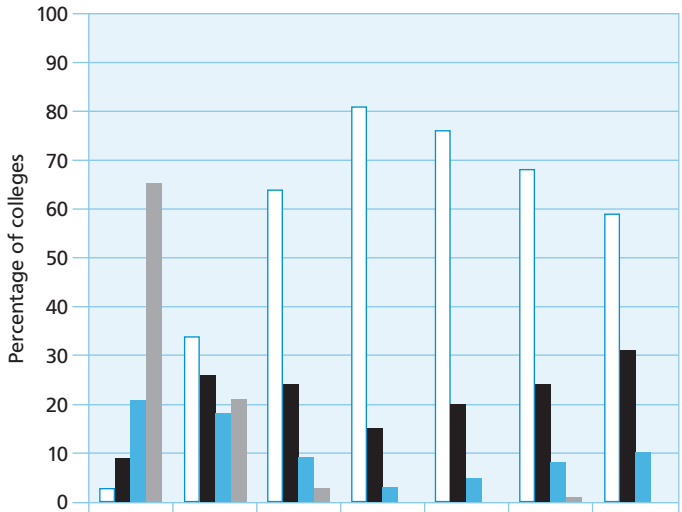
Patterns of access, location and availability of technology

As noted with schools, computer:learner ratios can mask variation both within and across institutions. Several factors affect access to technology and the subsequent experience of students. FE colleges are moving away from the use of computer labs to establish multi-purpose teaching areas equipped with fixed computers, flexible open computer areas or small sets of laptops within each teaching room (Becta, 2005b).Around three quarters of computers are sited in classrooms, which limits their use to those times when classes are scheduled. While open-access provision allows some use out of class time, this provision has remained relatively constant since 2003.

However, there is widespread use of ICT by remote access, with a clear trend for learners to be able to access some of their programmes of study at a time and place of their choosing. Colleges make considerable use of wireless LAN technologies. While only 2 per cent have a wholly wireless network, a further 10 per cent describe wireless as forming a substantial part of their college network. Nearly three quarters of colleges use wireless for a small part of their network, often to connect remote buildings or sites. Relatively few colleges allow students to connect their own devices to the college network. (Twining *et al.,* 2006)

Demand for computers by college students has always been an issue. In 1999, just under half of institutions (47 per cent) reported that they could not cope with the demand for computers. In 2006 this level stood at 30 per cent, suggesting an overall improvement. (Becta, 2006f)

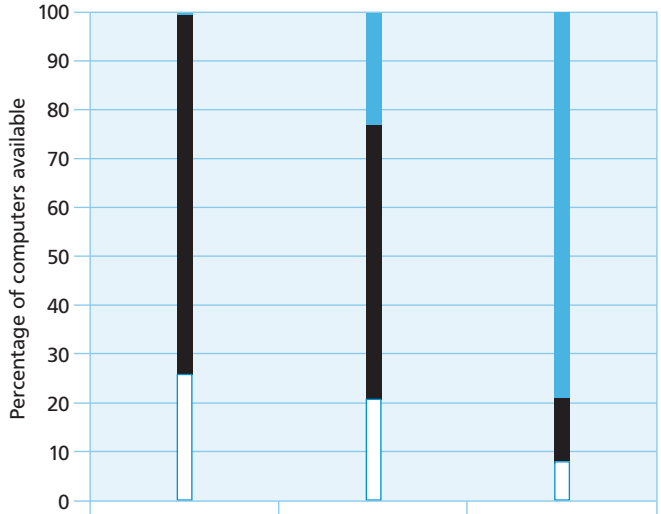
Figure 2.13: FE college ratio of FTE students to all computers



	1999	2000	2001	2003	2004	2005	2006
5:1 and better	3	34	64	81	76	68	59
6:1 to 7:1	9	26	24	15	20	24	31
8:1 to 11:1	21	18	9	3	5	8	10
12:1 and over	65	21	3	0	0	1	0

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Figure 2.14: Computer placement



	Daytime	Evening	Weekends
Open access	26	21	8
Classroom access	74	56	13
No access	1	23	79

* All percentages are rounded to the nearest 1 per cent

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Connectivity and bandwidth

The phased upgrade of college bandwidths to either 4Mbps or 10Mbps has largely taken place. Following this upgrade, 69 per cent of colleges were not planning to purchase additional bandwidth. Of those that were, 11 per cent of colleges aimed to use JANET and 8 per cent to use BT. The remaining 12 per cent of colleges identified a range of different ISPs providing them with some connectivity. (Becta, 2006f)

Networking

In 2006 there was only a relatively modest improvement in network capacity despite dramatic improvement in technical specification between 2004 and 2005. However, there has been steady improvement in network performance and ability to meet demand over the period 1999–2006. A clear majority of colleges (61 per cent) described their network performance as always smooth, and 37 per cent reported their network performance to be slow at busy times. This is almost an exact reversal of the situation in 1999. (Becta, 2006f)

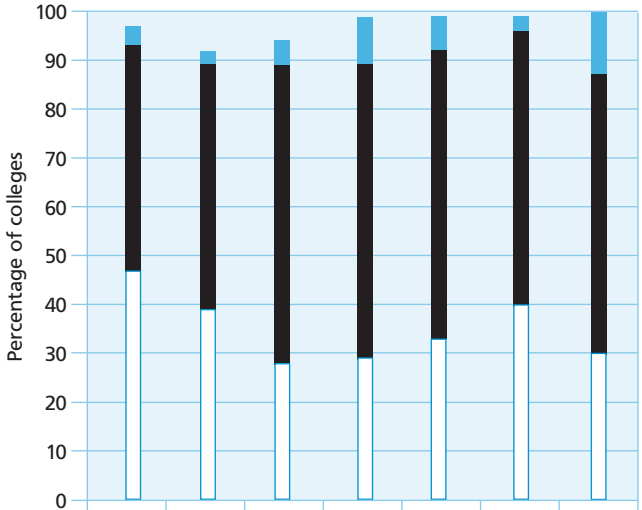
However, the increasing use of networked applications is adding to the burden on college networks. Some 70 per cent of colleges continued to identify large files as an actual or potential source of problems on the network. As a result, students whose networked learning is scheduled at busy times will face a worse experience than those who are scheduled to use the network when traffic is low (Becta, 2006f). The Leitch report recommendations that colleges must respond flexibly to student and employer demand will be a particular challenge for colleges networks.

Allowing students to connect their own devices to the college network would support flexibility, but only 12 per cent currently permit students to make a physical connection, 10 per cent permit a wireless connection, and only 1 per cent permit both (Becta, 2006f).

Effective use of supporting technologies

Display screen technologies have made significant inroads into teaching areas. Only 2 per cent of colleges stated that electronic whiteboards were not available in their college,

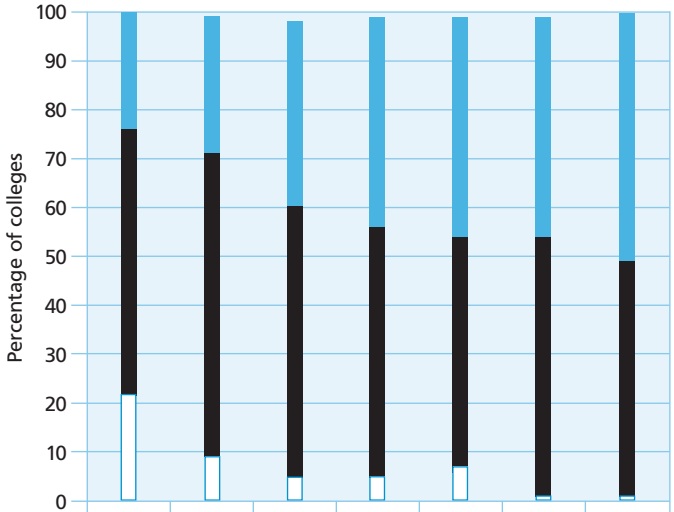
Figure 2.15: Meeting student demand for computers



	1999	2000	2001	2003	2004	2005	2006
Difficulty meeting demand	47	39	28	29	33	40	30
Sufficient capacity for demand	46	50	61	60	59	56	57
Sufficient capacity for greater demand	4	3	5	10	7	3	13

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

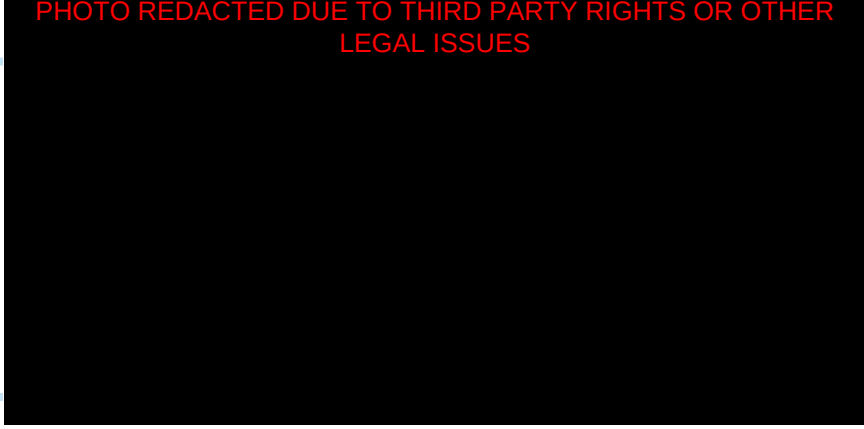
Figure 2.16: Network capability to meet demand



	1999	2000	2001	2003	2004	2005	2006
Over stretched	22	9	5	5	7	1	1
At capacity	54	62	55	51	47	53	48
Spare capacity	24	27	38	43	45	45	52

* All percentages are rounded to the nearest 1 per cent

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)



down from 4 per cent last year. While the pattern of availability has improved, with 90 per cent of colleges stating that data projectors and whiteboards were sited in at least some teaching rooms, the drive for a whiteboard in every classroom is not as strong as in the schools sector.

Learning platforms and e-portfolios

In the period 2003–2006 college networks continued to be extensively used as learning platforms, while college intranets became less widely used. The use of VLEs reached 82 per cent of colleges in 2006.

VLEs not only increased in use in colleges, they were more widely cited as a college's main platform. Some 30 per cent of colleges reported their VLE was their main platform, as opposed to 16 per cent in 2004. However, this percentage is still low in terms of delivering functionality to support personal online accounts and learning spaces.

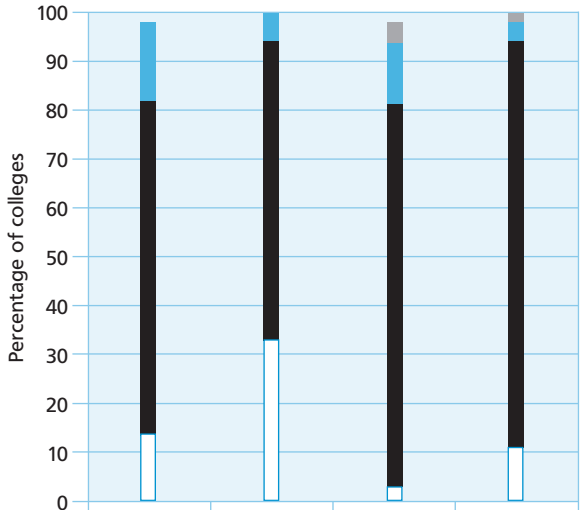
Use of e-portfolios and e-assessment has shown slow progress (Becta, 2006g). However, in some institutions, practitioners still do not use email or the Web routinely during the working day and e-portfolio development reflects the level of readiness of staff and learners (Becta, 2007c). Only 6 per cent of colleges have a learning platform which outputs to an e-portfolio (Becta, 2006f).

In work-based learning, the term Electronic Performance Support Systems (EPSS) is more familiar than e-portfolio. Almost 60 per cent of organisations currently using e-portfolios or EPSS are classed as 'innovators' (Overton *et al.*, 2007).

Access to learning beyond the institution

Some 69 per cent of colleges allow remote access to college systems to all students. A further 10 per cent allow remote access to particular groups of students and 3 per cent allow access on a case-by-case basis. The remaining 18 per cent do not allow remote access to students (Becta, 2006f).

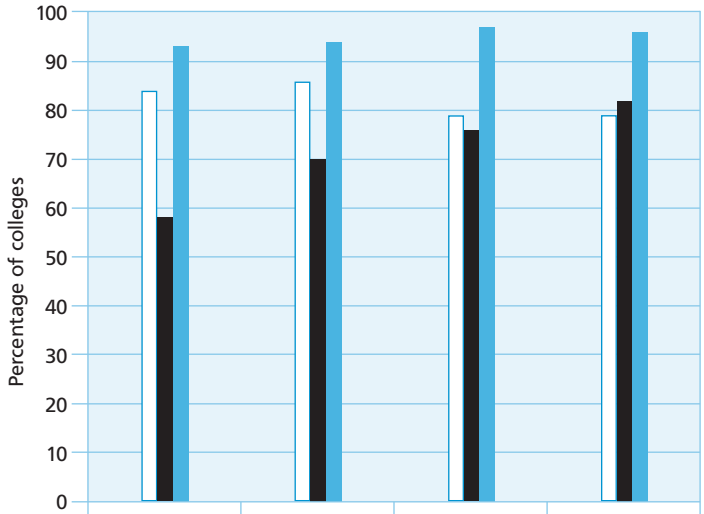
Figure 2.17: Availability of display screen technologies



	Data Projectors 2005	Data Projectors 2006	Electronic Whiteboards 2005	Electronic Whiteboards 2006
In all or most rooms	14	33	3	11
In some rooms	68	61	78	83
Bookable equipment/rooms	16	6	13	4
Not available	0	0	4	2

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Figure 2.18: College learning platforms 2003–2006



	2003	2004	2005	2006
Intranet	84	86	79	79
VLE	58	70	76	82
Network	93	94	97	96

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Widespread use of ICT for remote access to learning increased between 2005 and 2006, following more modest increases since 2003. The overall trend seems to be in the use of ICT to enable learners to access some of their programme of study at a convenient pace or time. In 2006, 48 per cent of colleges delivered learndirect courses, a significant reduction from 72 per cent in 2003. However, remote learning not delivered via learndirect was offered by 52 per cent of colleges in 2005. Some 29 per cent of colleges offered neither form of remote learning, a similar proportion to 2005 (Becta, 2006f). This would suggest that a sizeable minority of colleges will not use remote learning to achieve the flexibility required to implement the Leitch report's recommendations.

Access to digital resources

In-house resource development

There is a significant amount of practitioner-led development of electronic learning materials for use with students. In 2006 some 80 per cent of colleges offered staff development programmes to support those who wished to develop or adapt e-learning materials. Around 66 per cent offered support from e-learning 'champions' and 68 per cent offered support from technical staff. These proportions had remained broadly the same over the previous few years.

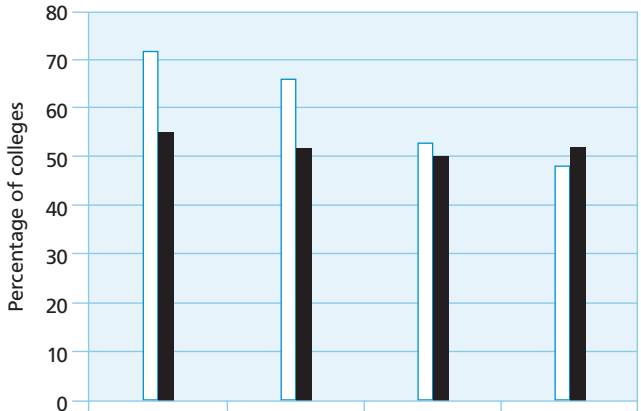
Of the 26 per cent of colleges that offered other support, a number mentioned support from other members of staff, and several colleges use a dedicated materials development team. (Becta, 2006f)

Sources of materials

The use of e-learning materials continues to be at the discretion of the individual teacher. This was the case in 52 per cent of colleges. The use of e-learning materials was directed by a college-wide plan in only 19 per cent of colleges and by a plan at department or course level in 27 per cent. These proportions have fluctuated slightly over the years, but remain at similar levels to 2003.

The most frequently used resources were college-produced materials and the internet.

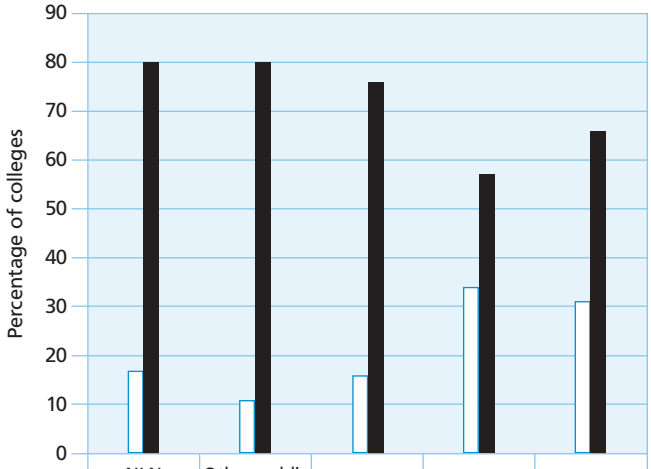
Figure 2.19: Delivery of remote learning in colleges



	2003	2004	2005	2006
Delivers learndirect programmes	72	66	53	48
Delivers other remote learning	55	52	50	52

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Figure 2.20: Source of e-learning materials used by students



	NLN materials	Other public sources	Bought-in	In-house	Internet
Common practice	17	11	16	34	31
Done by colleges	80	80	76	57	66

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Both these sources were in common use in around one third of colleges (34 per cent and 31 per cent respectively). Of the 97 per cent of colleges that used NLN materials, 17 per cent described their use as common practice. This is an increase from 4 per cent in

2003. Some 91 per cent of colleges used other publicly-funded sources of materials, and these were in common use in 11 per cent of colleges. (See Figure 2.20)

In work-based learning organisations, 24 per cent developed all their own e-learning resources in-house Despite an increasing focus on company-specific training for the majority of organisations, commercial products were still in use within 55 per cent of organisations.

ICT support and maintenance

ICT service provision

In 2006, the median number of technical staff directly employed by colleges was eight, and the median ratio of computers to employed technicians was 110:1. This is an increase from a ratio of 100:1 in 2005 and is accounted for by the increase in total numbers of computers.

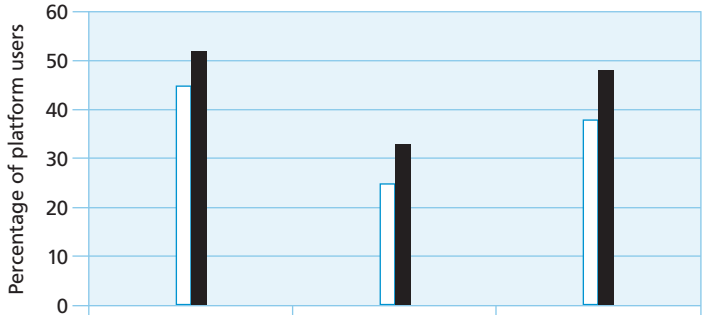
PC support, audiovisual support and technical helpdesk services were the services most often provided by in-house staff. Around 90 per cent of colleges delivered these services entirely in-house. Data services, including management information systems (MIS), and telephony support were most likely to be at least partly outsourced. Data services were handled in-house by 74 per cent of colleges, and telephony by only 49 per cent. (Becta, 2006f)

Technical support is handled well in the majority of colleges with 72 per cent of respondents reporting that technical problems were usually resolved within a reasonable time. A further 23 per cent reported that there were peak times when these problems were difficult to resolve and only 5 per cent stated that there was always a significant backlog of technical problems awaiting resolution (Ibid).

Sustainability

In colleges it was reported that 30 per cent of the current stock of computers were purchased before 2002–3. Becta (2006f) noted that between 1999 and 2006, around 460,000 computers were purchased, while around 210,000 were removed from service. This equates to colleges replacing their computer stock roughly every five years. At the same time, the total stock of computers will reach a steady-state of around 400,000 computers. The reality is that colleges have to decide on a level of ICT provision that matches the extent of access they wish to provide, for both learners and staff.

Figure 2.21: College learning platform links to MIS, 2004 and 2005



	Intranet	VLE	Network
2004	45	25	38
2005	52	33	48

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Securing and integrating ICT systems

There remains a challenge to link learner management to curriculum delivery. There has been a slight improvement since 2005 on connecting a college's learning platform to its management information system (MIS), across intranets, VLEs and networks. However, it is not yet an outstanding feature for any platform. Only 33 per cent of colleges with a VLE said that this platform was linked to the college's MIS (Becta, 2006f).

3 CAPABILITY AND CAPACITY OF THE WORKFORCE, PROVIDERS AND LEARNERS

Key points

Although there is evidence of improved levels of institutional e-maturity in recent years, wide variation in the adoption and use of technology remains. A key challenge is to ensure that all elements of an institution's ICT strategy work together for the benefit of learners.

Primary and secondary schools have taken different paths towards achieving improved levels of e-maturity. Promoting awareness and models of maturity in the use of ICT is central to helping to increase the number of educational organisations making effective use of ICT.

Courses on using ICT in teaching are among the top three CPD choices for all but the most recently qualified teachers.

Ofsted reports greater clarity is needed for schools in terms of expectations of embedding of ICT in teaching and learning across the curriculum. The best provision offered a good balance between ICT as a discrete subject and its use within other subjects.

In secondary schools there was evidence of good application of ICT across a few subjects, but subject departments continue to play a key role in the levels of ICT use.

Technology can enable the sharing of information between practitioners, parents and learners, but interoperability issues still hamper the effective transfer of data within and between institutional systems. Even when this underlying capability is in place, institutional and professional practice in using data to support learners needs to be encouraged and nurtured.

The number of colleges with specific ILT or e-learning strategies in place has declined over the last seven years. This may be a reflection of integration into broader learning and teaching strategies.

The idea of using ICT, at least in some part of the teaching and learning process, is now commonplace in most colleges. Lecturers prepare lessons using ICT, exploit presentation software and word processing and may expect students to access and use online resources and course documents. However, few practitioners fully exploit the possibilities for learning and teaching offered by technology.

Harnessing Technology has an aim to develop an integrated network for education with common systems and open standards to allow safe and easy communication (DfES, 2005b). Clearly, the way in which these technologies are applied and used depends on the capability and capacity of the institutions, workforce and learners as well as parents and carers. Each of these parties need to reach a level where such exchanges are considered desirable, feasible and effective.

Organisational 'e-maturity' can be defined as the integration of technology-based applications and processes into all key aspects of organisational practice and operation. Butt and Cebulla state that e-maturity:

...indicates the extent to which schools and their teachers make the use of ICT integral to their teaching and planning of teaching activities and provide students access to ICT inside and outside the classroom.
(Butt and Cebulla, 2006)

This section considers progress towards e-maturity at three levels: the institution, the workforce and the learner, together with data sharing between these groups and parents.

DEVELOPMENTS IN SCHOOLS

Institutional capability and capacity

Overall e-maturity

There has been significant progress in access to equipment, systems and resources, especially in secondary schools, over the last five years (Ofsted, 2005a). However, there is wide variation across the system in the adoption and use of technology and institutions are at different stages in their use of ICT.

PwC (2004a) established a set of measures of overall school e-maturity. These included ICT infrastructure, training and technical support, and institutions' stated readiness to embed ICT. In 2004 those institutions that were considered e-enabled ranged from 10 per cent for primary schools and 14 per cent for secondary schools.

Butt and Cebulla (2006) developed an index of e-maturity in primary and secondary schools using similar indicators to those in the PwC study. This index was composed of three dimensions combining measures of attitude and 'hard' data on availability and use of resources. These dimensions were:

- ICT infrastructure and resources
- organisational co-ordination of ICT resources
- engagement with learners – the use of ICT resources in a school.

There were modest but statistically significant, increases in mean score for overall e-maturity between 2002 and 2005, in both primary and secondary schools. Schools with higher levels of e-maturity in 2005 outperformed schools with lower scores on all three dimensions of the maturity index. While primary schools lagged behind secondary schools in 2002, by 2005 their levels of e-maturity were almost identical. Scores increased more for primary and secondary schools whose e-maturity scores were already higher in 2002. Not all schools improved, with 8 per cent of primary and 15 per cent of secondary schools showing a decline in overall scores over the three-year period.

Table 3.1: Spectrum of e-enablement by school type

	Late adopters (%)	Ambi-valent	Enthusi-astic	e-enabled	Sample size (N)
Primary schools	7	44	39	10	118
Secondary schools	11	41	34	14	85
Special schools	16	35	33	16	43

Source: Moving Towards E-learning in Schools and FE Colleges (PWC, 2004a)

Table 3.2: Indicators of e-maturity used in the COL secondary analysis

Infrastructure and Resources	Organisational Co-ordination and Workforce	Engaging the Learner
The school's pupil:computer ratio and pupil:interactive whiteboard ratios	Availability of subject-dedicated computers and interactive whiteboards for use in lessons	Rating of fitness for purpose of computers and interactive whiteboards
Rating of speed of school internet connection	School's rating of how important a role ICT plays in teaching for different subjects	Frequency with which computer packages, internet resources and subject-specific software are used in lessons
Proportion of computers linked to a network	Confidence of teachers in using ICT to deliver the curriculum	Teacher rating of importance of ICT teaching
How well current funding meets a school's technical support and training needs	Proportion of lesson planning done using digital resources	Pupil access to ICT resources outside lessons

Source: E-maturity and school performance – A secondary analysis of COL evaluation data. (Butt and Cebulla, 2006)

Resource allocation and management

Studies of effective schools (see for example Dodd, 2006) highlight the importance of a strong commitment to using and investing in ICT. While primary schools' overall e-maturity was similar to that for secondary schools, they lag behind in terms of their ICT infrastructure and resources. In contrast, they led secondary schools in organisational co-ordination of ICT resources.

For primary schools, increases tended to be linked to the size of school and to a higher proportion of students with special needs. In secondary schools, e-maturity scores were more likely to increase in schools that specialised in science and technology subjects. These findings illustrate how primary and secondary schools have taken different paths towards achieving improved aggregate levels of e-maturity. (Butt and Cebulla, 2006)

Leaders' e-maturity

Development of school leaders

Schools that have made best progress with ICT have senior managers who are involved in developing a whole-school strategy, focused on how ICT enhances teaching and learning (Ofsted, 2004). Professional development for school leaders is a key factor in developing institutional e-maturity and implementing new ways of working with ICT (Ofsted 2004; PwC, 2004a). Programmes such as NCSL's Strategic Leadership in ICT (SLICT) have trained over 10,000 school leaders, including 2,390 head teachers in 2005–2006 and 1500 school leaders in 2006–2007, and are developing the competencies of those involved. Comber *et al.* (2006) found that headteachers reported their progress in their schools in relation to vision, policy development and teaching, and considered that developments resulted from SLICT. Schools moved on average over one level up on the continuum from 'Pre-emergent', 'Emergent,' 'Established' through to 'Advanced', from their pre-SLICT rating. However, improvements to learning were mainly attributed to other sources.

School leaders face a range of priorities for continuing professional development which compete with a commitment to developing competencies relating to ICT. Hutchings *et al.* (2006) found that primary school heads and assistant heads/deputies prioritise school self-evaluation over CPD in ICT. Secondary heads rate school self-evaluation, personalisation and promoting social and emotional development as their top three priorities.

Training in change management was a key lesson to emerge from ICT Test Bed schools in helping to integrate and embed technology. Timing was a critical factor for this training, as it came at the start of the initiative and gave a sense of ownership to staff. Funding for change agents and giving staff time to meet regularly for planning and training was also found essential in changing practices. With good leadership, this high level of support can be reduced over time without making the innovative ICT initiative unsustainable. (Somekh, Lewin *et al.*, 2006)

Table 3.3: Summary of e-maturity mean scores in primary schools

Indicators (mean scores)	2002	2003	2005	Change 2002-05
Overall e-maturity	20.4	22.1	24.8	4.4*
Infrastructure	7.2	7.9	8.4	1.2*
Organisational/co-ordination	6.4	7.1	8.2	1.8*
Engaging the learner	6.7	7.2	8.1	1.4*
Base	271	202	182	

* statistically significant difference 2002-2005 at 5 per cent level.

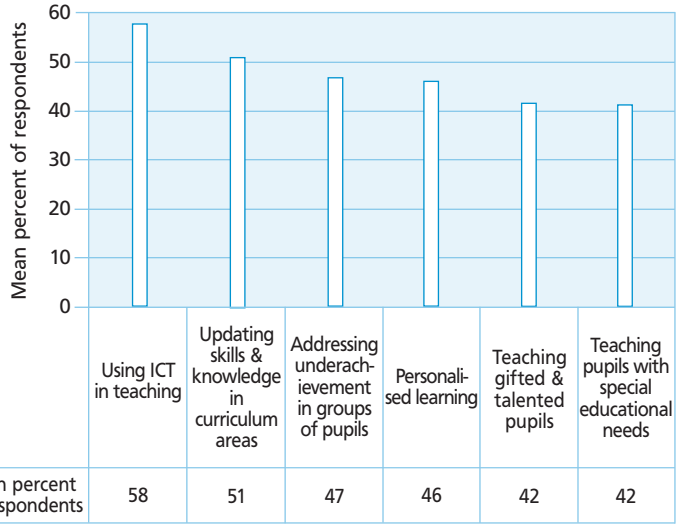
Table 3.4: Summary of e-maturity mean scores in secondary schools

Indicators (mean scores)	2002	2003	2005	Change 2002-05
Overall e-maturity	22.3	23.0	24.9	2.6*
Infrastructure	8.4	8.7	8.9	0.5*
Organisational/co-ordination	6.6	6.9	7.7	1.1*
Engaging the learner	7.2	7.4	8.3	1.1*
Base	265	172	154	

* statistically significant difference 2002-2005 at 5 per cent level.

Source: E-maturity and school performance – A secondary analysis of COL evaluation data (Butt and Cebulla, 2006)

Figure 3.1: Mean frequencies of respondents' training needs per CPD topic calculated over two years 2005-2006



Source: General Teaching Council for England Survey of Teachers 2004-06. Report on trend data (Ashby, 2007)

Features of effective ICT leadership

Schools that saw ICT as a tool for raising standards were generally those where senior managers had a clear overview of the quality of provision across the school. Managers ensured there was an ongoing debate about how ICT was used, and how it engaged learners and benefited learning and teaching. They also involved subject leaders or heads of department to ensure that ICT played a full part in the teaching and learning of each subject. In the most effective practice, new staff are inducted and supported as they develop an understanding of the school's expectations of ICT. (Ofsted, 2005a)

A complex set of changes is needed to implement ICT effectively. School leaders consulted in 2006 regarded their role as a change manager, addressing the 'human factors' associated with the implementation of ICT (Twining *et al.*, 2006).

The way in which ICT leadership is complemented by effective co-ordination of ICT is also critical (Ofsted, 2005a). However, the quality of ICT co-ordination is variable, being good or better in 60 per cent of secondary and special schools and 50 per cent of primary schools. Primary ICT co-ordinators rarely have designated time for their role and their responsibilities are wide-ranging and could include making purchasing decisions, organising training and troubleshooting technical problems. In secondary schools there is more likelihood of designated time and strategic support from senior management and ICT strategy groups (Kitchen, Dixon, McFarlane, Roche and Finch, 2006).

Practitioner e-maturity

ICT development for teachers

The majority of teachers have received training in the use of ICT in recent years. However, ICT is still a major professional development need, and one they would wish to develop voluntarily rather than something they have been selected for (Sturman *et al.*, 2005; Kitchen et al., 2007).

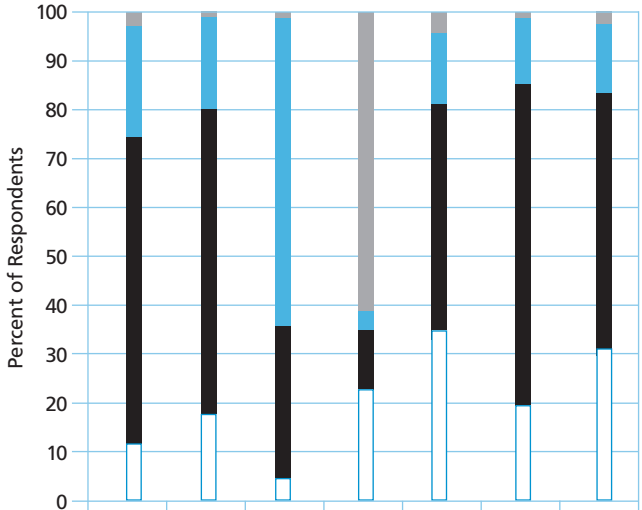
'Using ICT in teaching' has remained the most frequently selected topic for Continuing

Table 3.5: Ways in which teachers accessed ICT training

	Primary (%)	Secondary (&%)
Formal training courses in person	83	35
Informal training in person	76	39
Reading books or manuals	38	23
Formal training courses online	14	5
Finding information online	52	27
DVDs or CD-ROMs	53	20
Self-taught (spontaneous)	1	4
Other	4	4
Base: all teachers	621	1200

Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)

Figure 3.2: Primary teachers' perceived need for development in ICT



	Software	Using with Pupils	Internet	Learning Platform	Creating Material	Support-ing Pupil Use	Digital / Video Camera
Need a lot	12	18	5	23	35	20	31
Need a little	64	62	31	12	46	65	52
Don't need any	23	20	63	4	15	14	15
Not applicable	2	1	1	62	4	1	2

* All percentages are rounded to the nearest 1 per cent

Base: all primary teachers answering (566-609)

Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)

Professional Development in the General Teaching Council survey and is among the top three topics for all but the most recently qualified teachers. 'Strengthening and/or updating skills and knowledge in curriculum subject areas' and 'addressing underachievement in groups of pupils' featured in the 'top five' in both years. (Hutchings *et al.*, 2006)

Almost twice as many primary teachers (98 per cent) had attended some form of ICT training compared to secondary school teachers (55 per cent). Some 75 per cent of primary teachers rated the quality of internal ICT training as 'very good' or quite good', while the figure for secondary teachers was lower at 56 per cent. This echoes earlier findings from the COL evaluation that also indicated that teachers rate training more highly when provided internally.

Ofsted identified some examples of good quality training (Ofsted, 2005a) which included demonstration lessons provided by schools' own staff or consultants from the national strategies, and making time for staff to observe each other's practice. This was particularly the case in the introduction of interactive whiteboards, where relevant training and support has had a favourable impact on the quality of teaching and learning in all types of schools.

Workforce skills

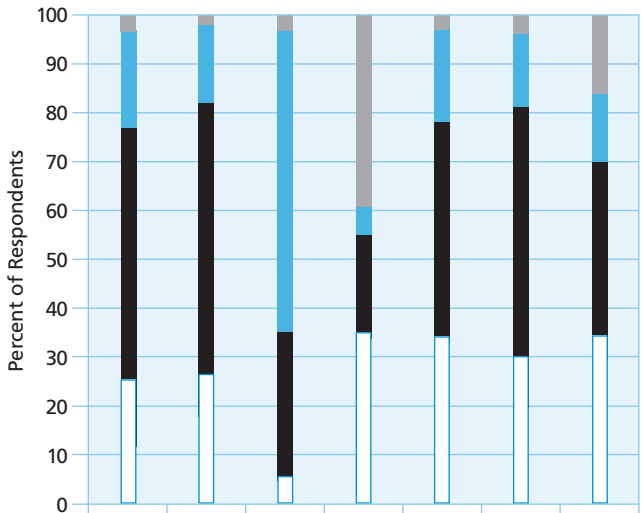
Schools reported that over three quarters of teachers (76 per cent of primary and 78 per cent of secondary teachers) were at least 'quite confident' in using ICT to deliver the curriculum (Kitchen *et al.*, 2007). This contrasts with a high expressed need for CPD in ICT to support learning and teaching (GTC survey, ibid.), where, regardless of sector, supply teachers, class teachers and those with cross-school roles selected ICT as the most common topic for CPD.

Related findings from Kitchen *et al.* (2007) show high levels of stated need for development in using classroom technology with pupils. While most were confident in using the internet, around three quarters felt they needed 'a little' or 'a lot' of development in using particular software packages.

A further area where teachers state that they require training is in the analysis of performance data using technology. Teachers' confidence has changed little in the past year (Hutchings *et al.*, 2006).

According to Ofsted, a particular area for development is the ability of teachers to use ICT and the resources at their disposal effectively to improve standards. In some subjects, teachers are still unaware of the web-based support materials now available (Ofsted, 2005a, 2006). However, the ICT competence levels of British teachers appear well above the European average (Korte and Hüsing *et al.*, 2007).

Figure 3.3: Secondary teachers' perceived need for development in ICT



	Software	Using with Pupils	Internet	Learning Platform	Creating Material	Support-ing Pupil Use	Digital / Video Camera
Need a lot	26	27	6	35	34	30	34
Need a little	51	55	29	20	44	51	36
Don't need any	20	16	62	6	19	15	14
Not applicable	3	2	4	39	3	4	17

Base: all secondary teachers answering (1135-1172)

Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)

Table 3.6: Teachers' confidence in the use of performance data: comparison of the 2005 and 2006 responses

I am confident in the use of:	2005 Strongly agree, agree	2005 Other*	2006 Strongly agree, agree	2006 Other*
ICT for analysing performance data	54%	46%	53%	47%
Performance data for supporting pupil progress and/or school improvement	69%	31%	69%	31%
Performance data in reporting to parents or management	69%	31%	65%	35%

* Those who neither agree or disagree, disagree and strongly disagree.

Source: General Teaching Council for England Survey of Teachers 2006 (Hutchings et al., 2006)

Teachers' attitudes towards ICT

Consistently positive attitudes towards the use of ICT in teaching and learning by teachers have been found by Kitchen, Mackenzie and Butt (2006) and Kitchen *et al.* (2007) with respect to:

- the use of material on the internet for lesson planning
- the role of ICT in differentiating on the basis of pupils' abilities
- the use of subject-specific software, computer packages, internet-based resources and interactive whiteboards in half or more of lessons.

In terms of European indicators of 'embedding' – access, competence and motivation – the UK performs well. However, a proportion of teachers report lack of one or two of these aspects (Empirica, 2006). Motivation seems to be the critical factor in embedding ICT since 14 per cent with access lack both the motivation and competence, and another 10 per cent lack motivation despite their competence and access to ICT. Clearly access alone is by no means a sufficient condition for uptake of ICT use in schools.

Development of support staff

The Becta Review 2006 reported concerns about the ICT development needs and progress of support staff. Careful planning as part of the ICT Test Bed enabled success in developing the skills of staff to work in ICT-rich learning and teaching environments. The majority of support staff in ICT Test Bed schools no longer felt that they needed to be taught how to use a computer: 64 per cent in 2006 compared to 7 per cent in 2003 (Somekh, Lewin *et al.*, 2006). Experienced classroom assistants can support supply teachers and new staff in these ICT-rich schools. It was also found that ICT innovations placed pressure on technical support staff and that retraining or the updating of skills is essential for technical support staff ahead of the installation of any new equipment, along with clearly defined lines of management responsibility (Somekh, Lewin *et al.*, 2006).

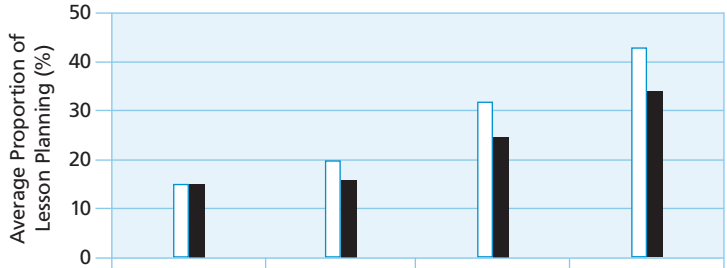
Table 3.7: European comparisons of embedding of ICT

Country	VIII No access, competence & motivation	VII Access but no competence & motivation	VI Competence but no access & motivation	V Motivation but no access & competence	IV Access & competence but no motivation	III Access & motivation but no competence	II Competence, motivation but no access	I Access, competence & motivation	Score*
United Kingdom	**0.7**	**1.2**	**5.6**	**1.8**	**11.0**	**2.7**	**16.8**	**60.2**	**250**
Netherlands	1.1	2.6	7.3	1.5	17.3	2.9	11.7	54.7	241
Slovakia	2.0	4.7	4.2	2.4	10.0	9.2	15.2	52.2	237
Denmark	1.6	1.2	7.0	1.7	19.3	2.2	18.5	48.6	235
Portugal	1.9	2.6	3.1	6.9	5.4	7.4	22.9	49.9	234
Norway	2.6	2.6	7.6	1.5	14.2	2.2	20.2	49.1	232
NMS10**	3.2	4.0	5.6	6.4	9.2	7.2	22.6	42.0	220
Malta	2.7	1.1	6.6	2.6	6.0	2.0	44.5	34.4	219
Slovakia	3.1	1.7	6.6	6.0	9.3	4.9	32.3	36.0	215
Germany	4.8	5.5	8.4	3.5	14.1	4.6	18.1	41.0	214
Estonia	3.9	4.2	6.3	5.9	10.0	7.8	23.5	38.3	214
Czech Republic	4.3	3.9	9.7	4.9	13.7	4.8	20.7	38.0	211
EU 25	4.3	3.9	9.7	5.0	13.7	4.8	20.7	37.9	211
EU 25+2	2.7	2.6	11.0	3.9	14.3	5.2	26.9	33.4	211
Cyprus	3.7	1.8	8.1	6.9	6.2	3.9	35.6	33.8	210
EU15	4.6	3.9	10.6	4.7	14.7	4.3	20.3	37.0	209

* Score = 3*I + 2* (II + III + IV) + V + VI + VII
** New member states

Source: Empirica (2006), Benchmarking Access and Use of ICT in European Schools 2006

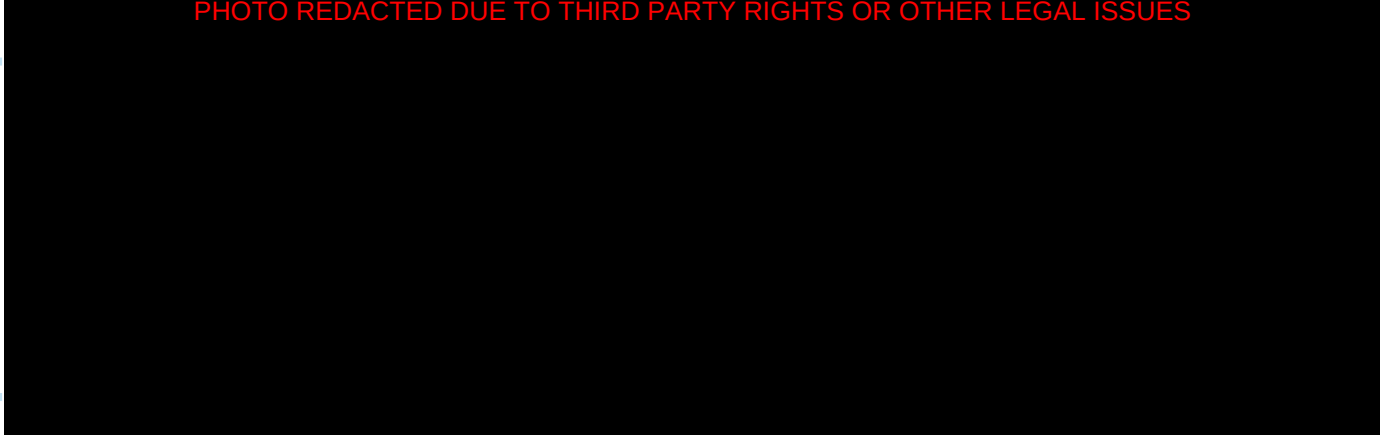
Figure 3.4: Average proportion of lesson planning using digital sources 2002-2006



	2002	2003	2005	2006
Primary teachers	15	20	32	43
Secondary teachers	15	16	25	34

Base: all teachers answering (Primary: 599, Secondary: 1181)

Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)



Use of ICT in teaching and learning

Primary teachers made proportionately greater use of digital resources in lesson planning than secondary teachers. Digital sources accounted on average for 43 per cent of primary teachers' lesson planning and 34 per cent of secondary teachers' lesson planning.

There has also been a substantial increase in the proportion of teachers in both primary and secondary schools using digital resources of all kinds during lessons.

Overall, primary teachers tended to make the most frequent use of ICT resources in lessons, and interactive whiteboards are still the most frequently used resource in both sectors. In primary schools, 86 per cent of teachers reported that they used display technologies in at least half of lessons, with half saying that they used them in 'all or most lessons'.

Kitchen *et al.* (2007) found the following differences between subjects in secondary schools in the extent to which ICT resources were used:

- Geography teachers were *more* likely to use internet-based resources frequently with 51 per cent doing so in half or more lessons
- Music and English teachers were *less* likely to use display technologies frequently with 49 per cent and 51 per cent doing so in half or more lessons
- Music, science and maths teachers were *more* likely to use subject-specific software in half or more lessons (62, 57 and 53 per cent respectively).

In Europe as a whole, 74 per cent of teachers report that they have used ICT in class in the last year. However, there are large variations between countries, with only 35 per cent of teachers in Latvia and 36 per cent in Greece who used computers recently compared with 96 per cent of teachers in the UK. There was also little variation across British school types and between urban and rural areas: British teachers were the most frequent and intensive ICT users compared to other EC countries. A majority (65 per cent) of teachers using computers used them in more than a quarter of their lessons, of which there were 21 per cent using it in

Table 3.8: Frequency of using ICT resources in lessons by primary teachers (% half or more lessons)

Resources	2002	2003	2005	2006
Computer packages	20	25	36	56
Internet-based resources	10	14	38	54
Interactive whiteboards	6	13	69	86
Subject-specific software	20	20	38	49
Base: all teachers	1038	733	650	601-613

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie, Butt and Finch, 2006) and Harnessing Technology schools survey 2007 (Kitchen et al., 2007)

Table 3.9: Frequency of using ICT resources in lessons by secondary teachers (% half or more lessons)

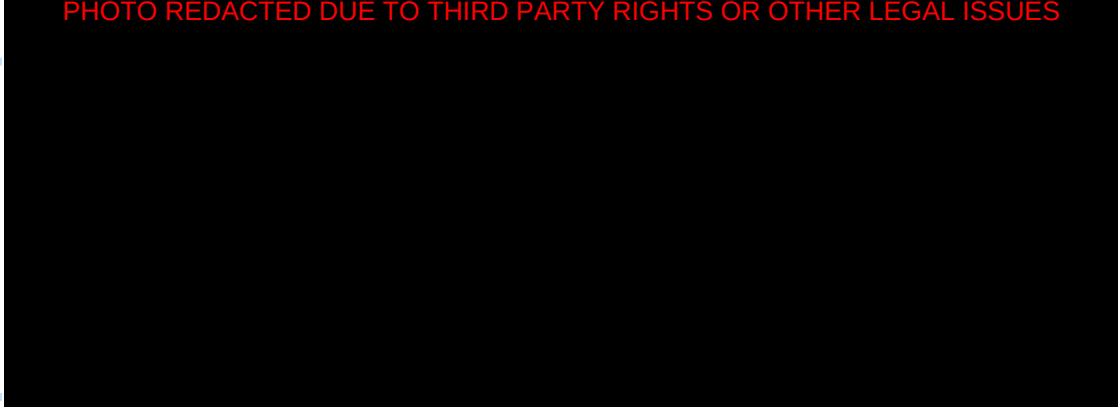
Resources	2002	2003	2005	2006
Computer packages	8	14	19	36
Internet-based resources	5	10	21	33
Interactive whiteboards	5	11	42	64
Subject-specific software	10	14	30	41
Base: all teachers	1741	1212	954	1180-1185

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie, Butt and Finch, 2006) and Harnessing Technology schools survey 2007 (Kitchen et al., 2007)

Table 3.10: Percentage of teachers having used the computer in class during the last 12 months

Country	2006	Rank
United Kingdom	**96.4**	**1**
Denmark	94.6	2
Sweden	90.9	3
Netherlands	90.0	4
Norway	89.4	5
Austria	87.9	6
Finland	85.1	7
Ireland	81.7	8
Germany	78	11
Italy	72.4	14
Spain	68.2	19
EU25 average	**74.3**	

Source: Benchmarking Access and Use of ICT in European Schools (Classroom teacher Survey), European Commission, 2006



more than half of their lessons. Again, this was the top score in Europe.

Quality and type of use in the classroom

Progress is being made in the quality of use of technology to support learning. Ofsted has reported that technology is increasingly used to enhance the curriculum in imaginative and creative ways that would be impossible without the technology (Ofsted, 2005a and 2006).

The main uses of ICT across the curriculum were word processing, internet access and presentations. Inspection data confirms that almost all schools had installed interactive whiteboards and more teachers were using them effectively to teach new skills, to provide good models and to introduce a broader range of source material directly from the internet. Teachers were adept in their use of interactive whiteboards and there was a general improvement in teachers' use and teaching of ICT. (Ofsted, 2005a)

However, relatively few teachers are using technology to support learning in a range of ways (Kitchen *et al.*, 2007). Fairly limited numbers of teachers, for example, use ICT in lessons to support creativity and collaboration.

Wide variations in the quality of pupils' ICT experience still exist. Ofsted (2005a) reported that in none of the schools surveyed had ICT been embedded to the extent that it was an everyday aspect of pupils' learning. One factor is the role played by subject departments in secondary schools. On average only two in six departments make some effective use of ICT with little ICT use in the rest. Ofsted concluded that government needs to further clarify its expectations of schools with regard to the embedding of ICT in teaching and learning across subjects, and to make clear what provision for embedded ICT looks like.

Learner e-maturity

Definitions of learner e-maturity are still emerging and learner-level data is limited, so detailed analysis relating to learner digital literacy is not possible in this review. However, indications of learner capability are possible from some of the data collected in national and other studies.

Table 3.11: Primary teachers' use of ICT in lessons for helping pupils learn in different ways

	Gathering information (%)	Analysing information (%)	Being creative (%)	Problem solving (%)	Working with others (%)
All or most lessons	2	*	0	1	*
More than half of lessons	6	2	2	4	2
Around half of lessons	19	8	8	12	3
Less than half of lessons	56	60	46	54	19
Rarely/Never	17	29	44	30	75
Base: all primary teachers answering	612	612	610	607	605

Table 3.12: Secondary teachers' use of ICT in lessons for helping pupils learn in different ways

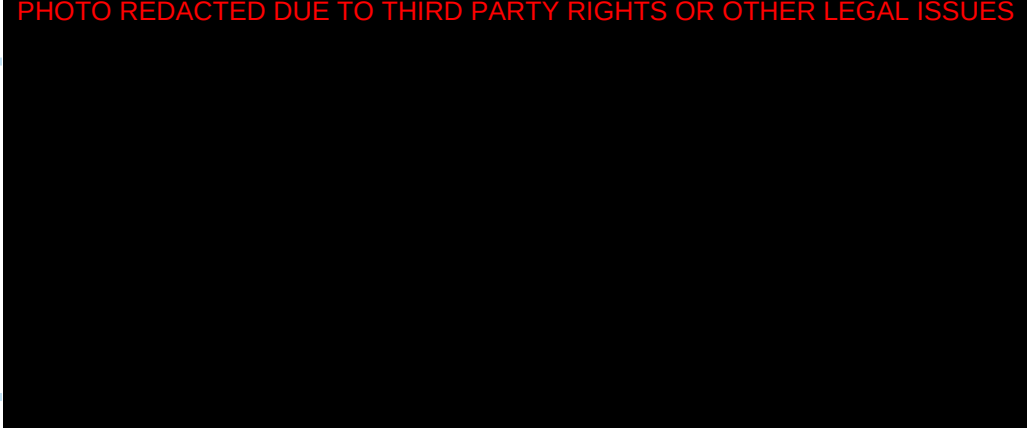
	Gathering information (%)	Analysing information (%)	Being creative (%)	Problem solving (%)	Working with others (%)
All or most lessons	1	*	1	*	*
More than half of lessons	3	2	3	1	1
Around half of lessons	8	4	4	5	2
Less than half of lessons	58	39	24	25	13
Rarely/Never	31	55	68	69	84
Base: all secondary teachers answering	1192	1190	1190	1185	1186

* Indicates the percentage value of less than 0.5 per cent

Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)

Home use of ICT

The Becta Review 2006 reported that access to ICT at home varied with socio-economic group. Families in social classes AB were more likely to own three or more computers. Children from these classes, and those in Year 11, were significantly more likely to have individual access. A national survey of 9–19-year-olds (Livingstone and Bober,



2005), found that 88 per cent of middle-class children had access to the internet at home compared to 61 per cent of working-class children. While libraries and internet cafés offer access to the internet, they are not an effective substitute for a lack of home access to ICT (Valentine *et al.*, 2005; Somekh *et al.*, 2002). This can reinforce and reproduce existing inequalities in the education system. If we are to create personalised learning, access to, and skills in using digital technologies and resources, will need to be universal (Green *et al.*, 2005).

Research by Livingstone and Bober (2005) into the use of ICT in the home found that of the 90 per cent of 9–19-year-olds who used the internet to do school or college work, 72 per cent went online daily or weekly. The research also noted that girls were more likely than boys to use a computer at home for school work. This was considered to reflect a more conscientious attitude to study rather than a preference for ICT.

Learners' ICT skills

Ofsted assesses learners' ICT skills indirectly through overall figures for school ICT achievement. In primary schools (Ofsted, 2005b), 23 per cent of primary schools were assessed as good or better in 1998. This figure had risen to 59 per cent in 2005. Over the same period, ICT achievement in secondary schools rose from 25 per cent to 64 per cent.

Performance in national tests and GCSE results provides a further indirect indicator of pupils' ICT skills and capability in secondary schools. The percentage of pupils achieving level 5 and above at Key Stage 3 had risen from around 62 per cent in 2000 to 69 per cent in 2005. Over the same period the proportion achieving level 6 had declined from 27 per cent to 24 per cent. For GCSE ICT, some 55 per cent of students gained grades A* to C in 2006. (DfES, 2007a)

National qualifications and tests give some measure of learner e-maturity. However, the ability to apply and use ICT in a range of subject contexts is a more potent indicator of learners' e-maturity as technology becomes more pervasive in learning and society.

Table 3.13: Percentage of ICT Test Bed KS2 students undertaking different ICT activities at school and home

	School			Home		
	03	06	Weighted (Raw) % Change 03-06	03	06	Weighted (Raw) % Change 03-06
Internet	84	98	**8 (+17)**	76	82	**3 (+8)**
Presentations	50	85	**23 (+70)**	63	74	**7 (+17)**
Word processing	84	93	**5 (+11)**	72	72	**0 (0)**
Drawing/painting	88	90	**1 (+2)**	64	63	**-1 (-2)**
Databases	61	76	**9 (+25)**	44	61	**12 (+39)**
Spreadsheets	42	58	**11 (+38)**	44	59	**10 (+34)**
Email	31	63	**24 (+103)**	47	58	**7 (+23)**
Chat room	7	16	**8 (+129)**	21	38	**14 (+81)**
CD-Rom	56	39	**-11 (-30)**	45	37	**-6 (-82)**
Make web page	11	23	**11 (+109)**	24	33	**7 (+38)**
Digital camera	38	65	**20 (+71)**	31	31	**0 (0)**
Scanner	17	32	**13 (+88)**	31	27	**-3 (-13)**

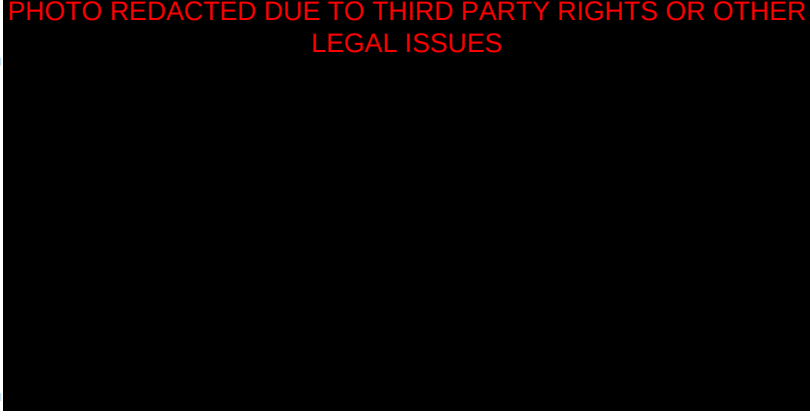
Source: Evaluation of the ICT Test Bed Project Questionnaire Data: Summary of Findings - Year 4, 2006 (Underwood, Dillon and Twining, 2007)

Ofsted (2005b) reports that pupil capability is improving. Pupils' use of text and graphics to communicate was rated as good, but the use of computer modelling remained under-developed. A small minority of primary lessons involving ICT did not contribute to raising standards. This was mainly due to an over-reliance on the technology to provide the teaching as opposed to using ICT as a tool to support learning and reinforce what was being taught. (Ofsted, 2005a)

Ofsted data also offers an insight into how pupils' ICT skill may be improved. Assessment of ICT was weak in one fifth of schools at Key Stage 3 and in one eighth at Key Stage 4. In many cases teachers were too easily impressed with mediocre application of ICT by pupils. Even where ICT work was assessed, pupils generally received insufficient feedback on how they could improve their work. In many schools teachers did not evaluate how well pupils applied and used their ICT skills across the curriculum. (Ofsted, 2005a)

Students at all levels in ICT Test Bed schools showed a year-on-year improvement in ICT competence and confidence. Over the years 2003–2006, digital technologies had become an 'everyday' tool for most students at home and school, including for children at Key Stages 1 and 2. All KS1 children reported using a computer at home for playing computer games, typing and printing drawings (Underwood, Dillon and Twining, 2007).

In Test Bed schools, self-reported computer competence was high with 89 per cent of Key Stage 2 pupils reporting that they were able to use a computer to do most things by themselves. For



secondary students the figure was 91 per cent. The greatest increases in use at school between 2003 and 2006 were in the use of email, presentation software and digital cameras, with use of CD-ROMs being the only decrease.

For secondary school pupils, daily use of home computing facilities continued to be higher than daily use in school. The internet dominated computer use at home (71 per cent) and at school (81 per cent). At home, this was followed by creating/listening to music (70 per cent), leisure/games (69 per cent) and email (58 per cent). In school, internet use was followed by word processing (62 per cent), email (58 per cent) and presentations (50 per cent).

Young people were able use digital technologies in the home and outside school to access resources to tailor their informal learning to their own interests. They were able to access information of relevance to them, to communicate with people who could support their learning and to share ideas and expertise within informal learning communities (Gee, 2003; Williams and Facer, 2003).

The 2003 PISA study looked at the extent to which 15-year-old students used computers and felt comfortable using them. Young people in the UK are among the most experienced ICT users in the world, alongside those in Australia, Canada, USA, Korea, Iceland, Finland, Denmark and Sweden. Home use was higher than average on every activity. The report concluded that there is not a general problem with young people's ability and willingness to use a computer as a basic learning tool to find information or write up a project, for example. (OECD, 2005)

This is especially the case for social software (online discussion, personal websites, blogs and wikis) and other internet and Web 2.0 technologies. These have encouraged sharing and a new set of digital skills. Green and Hannon (2007) describe a generation of young people seeking and finding recognition for their skills and achievements outside school and without the support of parents and teachers. They developed their own websites, used Internet Relay Chat, MSN and MySpace (a social networking site). These activities involved designing forums for debate and using blogs to share views on a range of issues.

Safe use of electronic environments

Where pupils were taught about e-safety, all breaches of e-safety were reduced (Barrow, 2006). This was especially important in preparing learners for using technology unsupervised and in the home. Condie *et al.* (2006) also identify the importance of pupils learning how to ensure their own safety and security in electronic environments and acting in a socially responsible way. However, pupils should also be aware of the potential for inaccurate and misleading information on the internet and gain the skills to discern that which is valid and reliable.

The UK Children Go Online survey (2005) found that 30 per cent of children aged 9 to 19 reported that they had received no training at all in using the internet, although most acknowledged that they had been taught something. While 87 per cent considered that they 'were good at' finding information online, many lacked key skills in evaluating online content. Only 33 per cent of daily or weekly users reported having been taught how to judge the reliability of online information and 38 per cent stated that they trusted most of the information on the internet.

E-safety continued to be an issue across Europe. Some 57 per cent of young people made their online social network profiles public and disclosed a great deal of personal information. Almost a third of young people indicated that they didn't know what to do about making information public or private. Richardson and Joyce (2007) believe that providers of social platforms need to do more to enable young people to make parts of or whole profiles private. The under-ten age group seemed to have relatively little awareness of the dangers of meeting someone they have been chatting with online. More than a third indicated hypothetically they would go to meet online contacts without telling parents. Although awareness of risks increased greatly for 10-13-year-olds, a pattern of risk-taking from age 14 to 17 was identified in a detailed analysis of the survey results, underlining the need to tailor awareness-raising campaigns to target these age groups.

More than 35 per cent of children under ten said they would use their mobiles to forward photos of classmates being beaten up. This is particularly concerning as under-tens were the heaviest users of multimedia messaging services (MMS) for sending photographs, with almost 23 per cent sending and receiving more than 10 photographs per week. This indicates that under-tens are early adopters of advanced mobile services and probably need specific education in safe and ethical use of them. (Richardson and Joyce, 2007)

Data sharing between leaders, practitioners, parents and learners

In the Government's vision for education, every learner is offered personal support and advice as they progress through education sectors and on to employment and lifelong learning. Clearly e-maturity has a key role to play in this. It is embodied in the collaboration between children's services and education typified by the ambitions of *Every Child Matters* (DfES, 2003). Parents and professionals will need access to information and data to help them understand and support learners' needs.

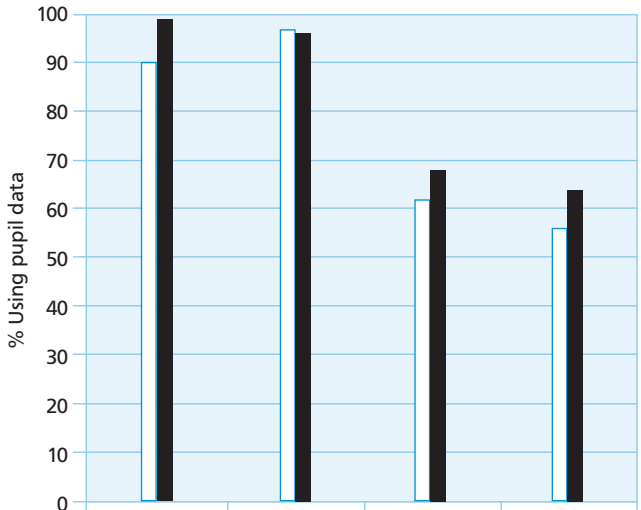
Some 72 per cent of primary and 92 per cent of secondary schools reported that they had a website (Kitchen *et al.*, 2007). Uses of the websites provided some indication of type of information sharing, although this is very limited. Some 88 per cent of primary and 94 per cent of secondary schools used them for this purpose. Just under half mentioned facilitating access to documents. Some 42 per cent of primary and 48 per cent of secondary used their website for resources for parents and 27 per cent of secondary schools used it to facilitate uploading or downloading homework.

Using websites to facilitate email access was quite common, though less so for primary schools than secondary (19 per cent and 41 per cent respectively). However, more than half of primary schools (53 per cent) and most secondary schools (92 per cent) made at least occasional use of email communications between teachers and pupils. Some 10 per cent of primary and 23 per cent of secondary schools used email 'always' or 'often.'

General use of data in schools supported by technology

The Becta Review 2006 reported clear evidence that some institutions used technology to deliver enhanced information about institutional performance and individual learners. This included using ICT to use data to allocate staff and resources, improve management of performance, support monitoring, and set targets. Kitchen *et al.* (2007) found that schools used data about their

Figure 3.5: Percentage of schools using pupil data for different purposes

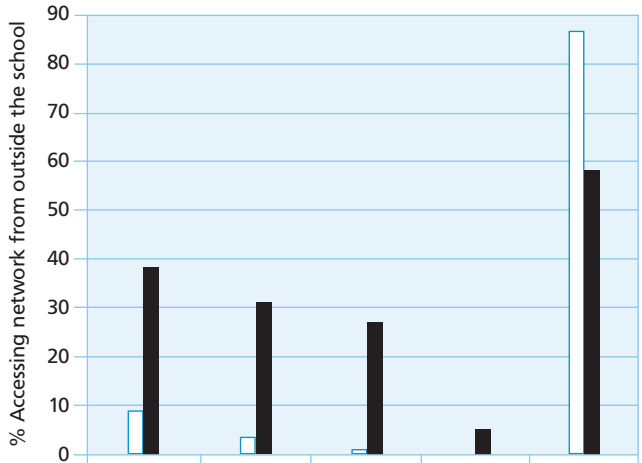


	Setting performance	Measuring progress	Staff performance	Managing finance
Primary schools	90	97	62	56
Secondary schools	99	96	68	64

Base: Primary headteachers (208), Secondary headteachers (181)

Source: Harnessing Technology schools survey 2007 (Kitchen et al., 2007)

Figure 3.6: Percentage of different groups having access to the school's network from outside the school



	Senior teaching	Other teachers	Pupils	Parents or carers	No-one
Primary schools	9	4	1	0	87
Secondary schools	38	31	27	5	58

Base: Primary ICT respondents (234), Secondary ICT respondents (258)

Source: Harnessing Technology schools survey 2007 (Kitchen et al., 2007)

pupils for a range of management functions: setting targets, measuring progress, staff performance reviews and managing finance. Heads reported that they used pupil data in at least one of these ways. The most common were to set performance targets (90 per cent of primary schools and 99 per cent of secondary) and to measure pupil progress.

A report by Becta (2005c) suggests MIS can facilitate a more individualised learning approach by matching curriculum resources to particular teaching and learning activities or by making a range of assessment and analysis tools available to teachers so they can better understand the attainment of pupils.

The effective use of data supports and promotes teaching and learning activities in a variety of ways across all types of school (Kirkup *et al.*, 2005). Impact was evident at two levels: directly by means of interventions targeted at individual pupils, and indirectly by means of whole-school approaches.

Sharing sensitive or confidential data between schools and parents may be judged from the extent to which a secure log-in is offered to resources on a school website, intranet or extranet and if so, to which users. Secure log-in was provided to about a half of primary and two thirds of secondary school staff, and to a lesser degree to pupils. It was far less common for governors (15 per cent for primary and secondary) and rarely provided for parents (4 per cent of primary and 7 per cent of secondary schools). In a significant number of schools no one had remote access. No parents or carers had access to primary schools' networks and only 5 per cent of secondary schools provided access for parents. (Kitchen *et al.*, 2007)

Emerging practice in data sharing and information exchange

Capability and capacity are growing across institutions, within the workforce and among learners. This potentially allows for practitioners, parents and learners to share and use information and is becoming a reality. Case study evidence of practice among learners, practitioners and parents, along with pilot projects from schools where ICT is already well embedded, can give us an early glimpse of this developing practice.

A case study evaluation by Underwood *et al.* (2005) showed that increased use of intranets contributed to sharing administrative information and resources. Selwood and Visscher (2007) reported that teachers found electronic systems helpful in alerting other teachers, parents and pupils to the need for intervention or support.

Some ICT Test Bed schools used their learning platforms to provide general information for parents such as newsletters, information about school uniform, as well as resources to support continuing education. One secondary school allowed access to attendance, achievement and behaviour data and achieved greater parental usage of the learning platform. In schools where parents engaged fully with the opportunities for access that were offered, staff perceived a positive impact, for example on ICT skills and awareness of how parents might support children's learning. However, developments were still at an early stage, particularly in relation to use in primary schools. There were some concerns that linking school and home through ICT would lead to some families having less need to visit primary schools, thus reducing personal contact. However, the schemes that were established to train families in ICT skills and the learning platform served to strengthen existing home–school links. Contact via electronic means had increased, and though this was only a small increase it was significant over the four years of the evaluation.

Electronic communication still appeared to be focused on 'push' technology and on information provision, rather than an information interchange between home and school. It was unclear whether the lack of development was the result of school practice or levels of home technology (Underwood *et al.*, 2007).

Integrated e-registration systems automatically link attendance recording, monitoring and reporting. The National Audit Office (2005) reported that education welfare officers welcomed such systems as a way of giving local authorities access to up-to-date records. Band *et al.* (2005) noted how e-registration helped support parental contact and involvement. Pilot studies at four schools enabled them to send automatically generated phone calls, text messages and emails to parents, in some cases directly from the school's management information system. Where the school had a 'merits and demerits' system for monitoring and recording behaviour, information about performance, good or bad, could be communicated directly to parents.

The development of e-portfolios is a further vehicle for data sharing between practitioners and learners, although the level of uptake in the context of a personal online space where learners can store their work, record achievement and access personal course

timetables, is at an early stage of development. A study by Busuttil-Reynaud, Winkley *et al.* (2006), identified four broad types of portfolio from an analysis of existing practice:

- *Transition e-portfolio:* containing salient information about the learner, both administrative and educational, this is transferred from one institution to another as a learner progresses
- *Assessment e-portfolios:* these are concerned with the individual producing information and evidence about work undertaken and achievements for assessing or matching against specified criteria, as in the case of coursework submission to an Awarding Body
- *Presentation e-portfolios:* involving the selection and presentation of personal information or achievements, here the information is selected and structured broadly by the learner's preference
- *Learning e-portfolios:* these are a much broader and general resource which can support whatever the individual wants to do and which could form the basis of any of the previous portfolios if desired.

The first three are developing quickly, particularly in the institutions which are potentially the main beneficiaries. The fourth is both the hardest to define and the one with the most promise of transforming teaching and learning. E-portfolios are particularly useful in recording a range of achievements in a range of digital formats, supporting personal organisation and planning in a pastoral context and collaborating on curriculum projects with other learners (Becta, 2007c).

Development and use of integrated data systems

There are a number of barriers to realising these potential benefits for data sharing. Adoption rates for learning platforms are lower among primary schools, and even in schools with learning platforms, developing the capability for sharing and transferring information electronically is not automatic. Schools report that it is difficult to link transfer data within institutional systems, especially linking management information systems to learning platforms (Somekh, Underwood *et al.*, 2006; Twining *et al.*, 2006). Other research (Becta, 2006i) and Becta's own work on developing frameworks for learning platforms have highlighted the ongoing issue of interoperability between these systems.

There is some way to go to realise an underpinning infrastructure for integrating learner and data services that allows learner data to flow effectively through the system. There are also challenges based on existing practice and systems as may be seen from the move to electronic returns of the Common Transfer File and Pupil Level Annual Schools Census (PLASC) data which has placed a strain on schools, local authorities and MIS providers.

The Becta Review 2006 highlighted an important message from Kirkup *et al.*, (2005) and other studies, that while the provision of data made possible through the use of technology is important, this needs to be accompanied by embedding appropriate practices to enhance learning and personalisation. The lack of appropriate practice has an impact on the effective two-way interaction between the home and institutions and has the potential to be a barrier to opening up provision and allowing institutional partnerships to operate effectively.

Competing priorities have resulted in many schools struggling with the policies and processes associated with home–school links and parental relationships. A recent survey of schools and colleges found that 90 per cent identified the home as being of 'some' or 'a lot' of importance for their organisation's vision of learning. However, only 24 per cent viewed parents as being of primary importance, although this did vary across respondent groups (Twining *et al.*, 2006). Improving communication with parents was not a high priority for technology for the majority of primary school leaders. Some 34 per cent rated it as a high priority and 17 per cent said it was a low priority. Under half of secondary school leaders (45 per cent) rated it as a high priority (Kitchen *et al.*, 2007).

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Institutional e-maturity

Overall e-maturity

Becta's *ICT and e-learning in FE survey* (2006f) shows continuing improvement in levels of e-maturity, or 'e-enablement', based on indicators developed by PwC (2004a). A model of e-learning implementation was constructed using five dimensions: ICT access; workforce ICT; ICT deployment in teaching and learning; e-learning resources; and ICT use for management information.

The FE sector has moved steadily towards e-enablement. By 2006, 75 per cent of colleges were e-enabled or enthusiastically embedding ICT, an increase from half of all colleges in 2003. However, at the level of individual colleges, or even within particular colleges, the picture was more variable. In 2005 it was noted that only one college had maintained its position in the 'e-enabled' category since 2003, suggesting sustaining progress all five dimensions is a challenge for institutional leaders.

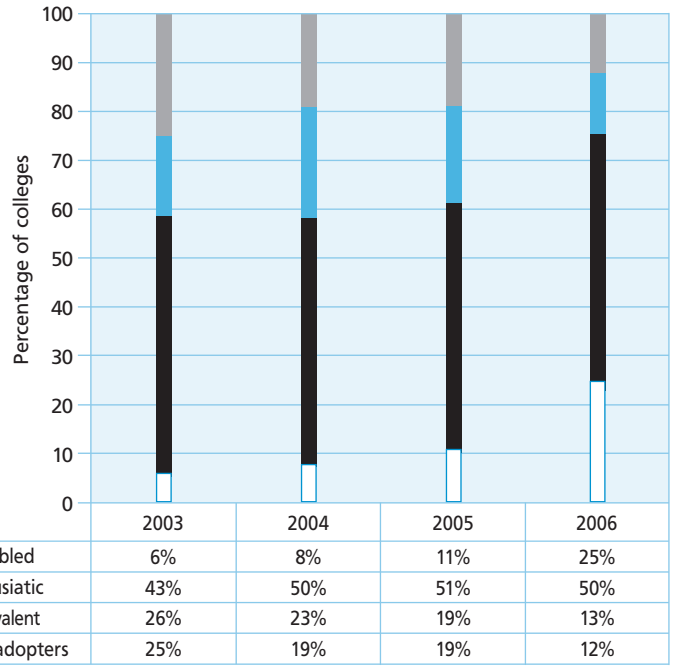
Much of the e-maturity evidence available relates to the FE college system. Research in the Adult Continuing Learning (ACL) sector suggests that while providers made significant progress from a low base, most were 'on the lower rungs of the e-maturity ladder' (Crisp *et al.*, 2006). In the Work Based Learning sector, 27 per cent of providers stated that they were embedding e-learning or had been using it for some time. One third said that they would be piloting it or were planning to do so (Mackinnon Partnership, 2005). Overton *et al.* (2007) found that 61 per cent of the work-based learning organisations they surveyed considered that they where either novice, sporadic or developing users of e-learning. Only 22 per cent considered their organisations to be highly e-embedded or innovators.

Resource allocation and management

The greatest improvements in the more e-enabled colleges occur in the resources and management areas. Students' access to ICT shows the least improvement between e-enablement categories, similar to the 2005 picture. The greatest change was among 'late adopter' colleges, in the area of management. The most e-enabled colleges increased significantly in the areas of access and e-learning, but decreased in the area of management. The researchers offered two observations on these findings: that late-adopting colleges were beginning to engage with ICT and e-learning, and that for e-enabled institutions, as ICT and e-learning became increasingly self-sustaining, less direct management input may be required.

Finlayson *et al.* (2006) confirmed a similar trend in implementation and integration of ICT in the FE colleges they studied, involving a complex process of leadership commitment, technology provision and support, and professional development. They also noted a change in vision as the colleges matured. The least e-mature colleges focused on the management of learning, promoting ILT for creating variety and interest in teaching to motivate learners. In the most e-mature colleges, the strongest emphasis was on embedding ILT within teaching and learning to improve student understanding and involvement in learning and in how to learn.

Figure 3.7: Spectrum of e-enablement



	2003	2004	2005	2006
E-enabled	6%	8%	11%	25%
Enthusiatic	43%	50%	51%	50%
Ambivalent	26%	23%	19%	13%
Late adopters	25%	19%	19%	12%

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Table 3.14: Categories of e-enablement vs dimensions

	Late adopters	Ambivalent	Enthusiatic	E-enabled
Access	13.3 (0)	14.2 (+0.4)	15.8 (+1.3)	16.7 (+1.7)
Resources	6.3 (-0.4)	9.2 (-1.2)	11.9 (-0.6)	15.2 (-0.6)
Workforce	9.8 (-0.2)	11.3 (+0.8)	11.7 (-0.4)	13.5 (-0.1)
E-learning	8.4 (+0.1)	10.9 (+0.3)	11.5 (+0.1)	14.2 (+0.9)
Management	9.6 (+2.9)	10.2 (+0.3)	12.9 (+0.4)	15.6 (-0.7)

(Figures in brackets indicate change from 2005 data)

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Strategy and planning activities

Since 2000 colleges have completed ILT strategies and revised them on a yearly basis. By 2006, 83 per cent of colleges reported that they had a strategy for ICT and e-learning (Becta, 2006f). A further 14 per cent stated that this strategy had been incorporated in the college's teaching and learning strategy. These strategies were reviewed annually in 65 per cent of colleges and every two years in a further 21 per cent. Some 34 per cent set targets for using ICT across all programmes, the same level as 2003 following a slight fall in the intervening years. The figure for those institutions setting them where they consider them appropriate dropped from 46 to 36 per cent and more worryingly, those with no targets increased from 16 to 26 per cent.

The most effective e-learning strategies involved all staff in their development and ICT was implemented in phases to give staff time to accommodate change (PwC, 2004a).

Overton *et al.* (2007) identified broadly similar factors in the work-based learning sector that contributed to e-maturity and e-learning success. These included:

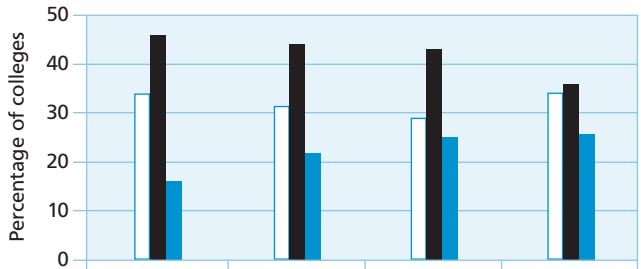
- a strategy for e-learning which had been agreed at senior/Board level
- an inclusive approach which involved managers and learners across the organisation, not just in the training department
- a reliable IT infrastructure and technical support
- the required training capability was available to implement e-learning effectively
- access to appropriate e-learning resources.

Leaders' e-maturity

Leadership of ICT and e-learning

The Becta Review 2006 reported on the role played by senior management in ICT developments. Clearly defined and stable senior management teams that invest their time, support and interest are important for the effective leadership of change in major ICT innovations. The Becta FE survey found 43 per cent of respondents stating that their principal

Figure 3.8: Extent to which formal targets are set for e-learning



	2003	2004	2005	2006
All programmes	34	32	29	34
Where appropriate	46	44	43	36
No targets	16	22	25	26

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

was a vocal advocate of e-learning, with a further 42 per cent having a strong ICT champion at senior management level. A small minority, 7 per cent, reported that ICT was driven forward by department heads and a further 7 per cent reported it was the domain of small groups and enthusiasts (Becta, 2006f). Successive ICT Test Bed reports identified the important role of senior managers in driving forward ICT developments (Somekh, Lewin *et al.*, 2006). Furthermore, the ability of middle managers to either facilitate or block ICT developments should not be underestimated, and gaining their involvement in organisational strategy is important (Finlayson *et al.*, 2006).

In ICT Test Bed schools and colleges leaders played a key role in developing a vision; reorganising management structures; allocating new roles and responsibilities; and 'carrying staff with them' as partners in change. It was essential that strong leadership was already in place, and where it was not, the investment had only a superficial impact. Whole organisational change was found to have greater impact. ICT investment in Test Bed colleges only took place in selected areas, and this had far less impact when compared to approaches in schools, where investment was across all departments. Some of the selected curriculum areas that received ICT Test Bed funding transformed their teaching methods and members of their staff have become models for innovative practice. However, they also became 'islands of innovation' which may not be sustainable.

ICT development for college leaders

Evidence about the training needs of leaders and managers of ICT initiatives in FE colleges, or their participation in training equivalent to the SLICT programme for school leaders, is limited. The Becta FE survey 2005 (Becta, 2005b) found that colleges were somewhat less likely to offer ICT development programmes to managers than

to teaching staff. However, development activities that addressed baseline ICT competences and confidence were also offered to managers in almost all colleges. One in eight colleges did not offer manager development in using ICT for financial control or planning, and over one-fifth did not offer development for using ICT for quality assessment.

Findings from ICT Test Bed colleges (Somekh, Lewin *et al.*, 2006) showed that project management for a large ICT initiative, involving curriculum and pedagogical renewal, as well as greater organisational efficiency, is a complex and challenging job. It required specialist skills that were different from commercial project management practices. Project managers who lacked these skills learned them on the job – and found this professionally fulfilling – but also experienced considerable stress in the process.

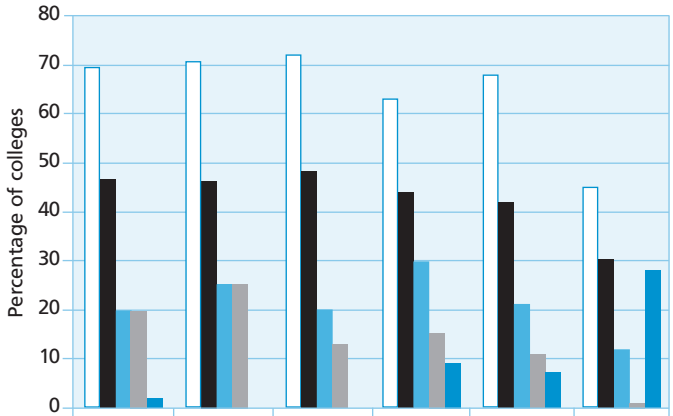
Practitioner e-maturity

ICT training for lecturers and college staff

Generic ICT skill training necessary to build baseline competence and confidence in personal use of ICT was available in 99 per cent of all colleges. Programmes in using classroom technologies, learning platforms and the development of learning materials remained at a similar level to the 2005 findings, at over 90 per cent of colleges. Development opportunities in online learning and related skills had improved slightly, with such training not available in only 32 per cent of colleges in 2005 and 28 per cent in 2006. These opportunities were not limited to colleges which offered remote learning programmes to learners but were spread across the whole sector (Becta, 2006f).

ICT training of all kinds was predominantly face-to-face, with blended learning the next most commonly deployed. As in schools, findings show that FE staff considered the most effective training to be informal through team work and mutual support. The latter was particularly effective in building personal confidence with ICT (LSDA, 2006). The most effective learning in making best use of technology appeared to take place after training sessions, as staff saw what colleagues were doing, took part in more informal team learning and practised with the equipment on their own. This approach was particularly effective in training secondary and FE teachers to use the VLE. (Somekh, Lewin *et al.*, 2006)

Figure 3.9: ICT skills development offered to teaching staff



	Generic skills	Using particular packages	Using classroom technology	Using learning platform	Developing materials	Teaching online
Face-to-face courses	70	71	72	63	68	45
Blended learning	47	46	48	46	42	30
Self-study by e-learning	20	25	20	30	21	12
Low-tech self study	20	25	13	15	11	1
Not offered	2	0	0	9	7	28

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Ofsted gathered evidence on initial training of FE teachers at 30 colleges and 13 HE institutions. They reported that the arrangements for ensuring that trainees received appropriate support to develop their literacy, numeracy and ICT skills were largely ineffective. While literacy skills were assessed prior to course entry, numeracy and ICT skills were rarely evaluated. Few providers offered additional certification opportunities in ICT. ICT was acknowledged as an important key skill, but was not always successfully embedded in the training (Ofsted, 2006a).

Workforce skills

The 2006 Becta *ICT and e-learning survey* asked respondents to rate the general skills levels of staff in their colleges. A distinction was made between IT skills such as the personal use of IT for administration, and e-learning skills which related to the application of a lecturer's ICT knowledge and skills for use in the classroom. There is a continuing, upward trend in reported levels of

teaching staff ICT and e-learning competence. Colleges overall considered that 62 per cent of staff had reached the level of 'competent' and 'advanced' in e-learning skills, up from 59 per cent a year before and 42 per cent in 2000. However, the survey noted that the lack of a commonly agreed and well understood set of definitions of e-learning competences, together with the uncertainty about what constitutes good practice and effective e-learning pedagogy, may have resulted in respondents overestimating the e-learning skill levels of staff.

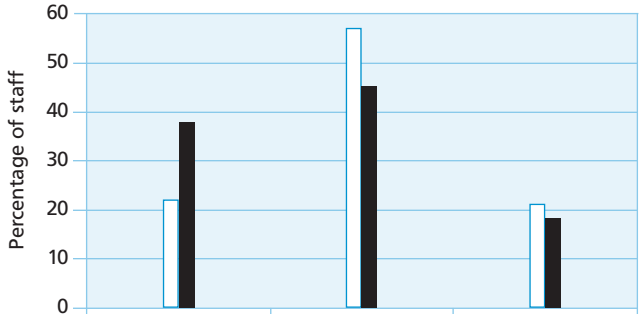
Finlayson *et al.* (2006) noted the contrast in technical ICT skills and the ability to apply these in a teaching context. Tutors had a wide range of technical and other skills, but lacked those specifically required to use ICT effectively in teaching, especially when it came to understanding how ICT could contribute towards learning and teaching in their subject area. Twining *et al.* (2006) found that when ICT was used in a teaching context, it tended to support traditional teaching approaches rather than innovative ones. There was also a universal and unfounded assumption that teachers' existing pedagogic skills transferred unproblematically to different technologies, media and delivery systems, which in reality was clearly not the case (LSDA, 2006).

Lecturers' attitudes towards ICT

Recent studies (Becta, 2006i; Finlayson *et al.*, 2006 and Golden *et al.*, 2006), indicate that the majority of teaching staff in colleges are broadly positive towards ICT and recognise the contribution that technology can make to teaching and learning. However, this is not yet reflected in measures such as staff confidence and competence with ICT or in effective professional practice with learners.

A number of studies provide insight into staff confidence and use of ICT. The majority of lecturers were expected to be using e-learning in their teaching and learning. This expectation came from college management (87 per cent), but also from learners (56 per cent) (Golden *et al.*, 2006). Nearly two thirds were determined to use e-learning to its full potential, although 7 per cent of respondents admitted that they

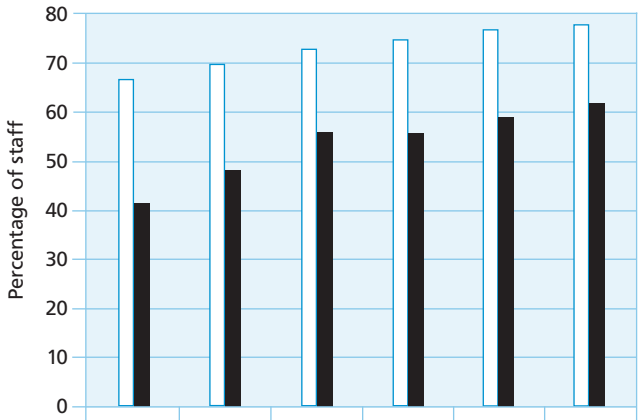
Figure 3.10: Teaching staff ICT and e-learning competence



	Beginner	Competent	Advanced
IT skills	22	57	21
E-learning skills	38	45	18

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Figure 3.11: Teaching staff considered competent and advanced at ICT / e-learning



	2000	2001	2003	2004	2005	2006
IT skills	67	70	73	75	77	78
E-learning skills	42	48	56	56	59	62

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

didn't know where to start with e-learning and 15 per cent felt that e-learning had little impact on them. The report concluded that the majority of respondents were positive and proactive in their use of e-learning and intention to use it. However, a notable minority were less confident and may reflect the experience of a wider cohort of lecturers who did not respond to the survey.

In the ICT Test Bed FE colleges, personal laptops proved to be a major factor in helping staff acquire skills and confidence to make effective use of ICT. Nearly all staff in Test Bed areas had laptops

for their personal use and their increased skills and confidence with ICT were clearly in evidence in the classroom (Somekh, Lewin *et al.*, 2006). Several staff took on new and enhanced roles within their college, becoming e-learning champions, and others gained promotion to new posts. In all three colleges, staff were motivated to spend time over and above that which was funded by ICT Test Bed in creating and developing resources.

Most lecturers used e-learning extensively for teaching preparation (Golden *et al.*, 2006). Over half used e-learning to present and communicate to learners, but use was more variable with regard to administration and management and in the interaction between lecturers and learners.

Twining *et al.* (2006) identified curriculum areas that were high and low users of ICT. Four of the nine areas most often cited as high users of ICT also appeared among the most frequently cited low users. The survey notes that this reflects practitioners' attitudes and commitment to ICT and its role in teaching and learning.

Becta (2006f) found that enthusiasm was the most important factor in teaching staff making high use of ICT, but equally, lack of confidence or competence was the greatest factor accounting for low use. Golden *et al.* (2006) also found subject-related variability in ICT use. Lecturers in health and social care were generally more negative in their attitudes and business lecturers appeared to be the most committed to, and determined to use e-learning in teaching and learning.

Ofsted reported good progress in most colleges in the use of ILT. They highlighted better use of interactive whiteboards, presentation software and college intranets for English for speakers of other languages (ESOL). Further development was needed in engineering, where ILT is not used enough, and in science and mathematics where presentations are relatively common but interactive ILT use was rarely interesting or imaginative. (Ofsted, 2006b)

Table 3.15: Curriculum areas making highest use of ICT and e-learning

	Percentage of colleges
Information and communications technology	56%
Business administration and law	38%
Health, public services and care	35%
Arts, media and publishing	31%
Science and mathematics	29%
Engineering and manufacturing technology	18%
Preparation for life and work	16%
Construction, planning and the built environment	11%
Leisure, travel and tourism	11%

Table 3.16: Curriculum areas making lowest use of ICT and e-learning

	Percentage of colleges
Health, public services and care	22%
Arts, media and publishing	20%
Languages, literature and culture	18%
History, philosophy and theology	15%
Construction, planning and the built environment	12%
Leisure, travel and tourism	11%

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Adoption of e-learning in the recent LSDA Transformation projects was helped by:

- e-learning being part of a strategic, institutional and curriculum approach
- staff participating in and owning e-learning development
- connecting curriculum development to expertise and changes in technology
- time opportunities and willingness to explore and reflect upon related developments
- specialist IT staff being involved in development to allow teachers to concentrate on curriculum issues
- a collaborative approach by staff to produce materials including in a 'virtual staff room'
- easy availability or adaptability of e-learning materials
- involvement of subject specialists in development so that materials are usable in standard ways
- a catalyst such as a project or an existing VLE that could be the focus for encouraging staff to get involved in ILT. (LSDA, 2006)

Learner e-maturity

Learners' access to and use of ICT for learning

There is very little evidence about learners' access to and use of ICT in the learning and skills sector, although the Becta FE learners' survey to be published in autumn 2007 (GfK NOP 2007) provides some indications of learner experiences to compare with a practitioner and organisational perspective. Initial findings indicate that over 77 per cent of learners had used computers at their college and among these, 82 per cent had accessed the internet whilst at college. A high proportion (42 per cent) of students used computers more often in their own time than in timetabled classes, while this was the reverse for 26 per cent; 28 per cent used computers equally in their own time and timetabled lessons. Only learners studying ICT used computers more often in timetabled classes (41 per cent). (GfK NOP, 2007)

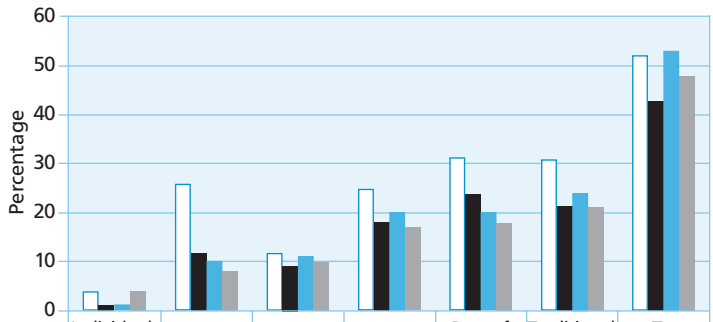
Learners report that they use technology most frequently for presenting written work or data (44 per cent said 'all the time' and 38 per cent said 'occasionally') and researching topics (41 per cent said 'all the time' and 45 per cent 'occasionally'). Computers were least likely to be used to catch up with sessions missed (32 per cent said 'never'), communicating with the tutor or other learners (31 per cent said 'never') while 29 per cent said that they never participated in group projects using technology. (GfK NOP, 2007)

These were using ICT as a traditional classroom tool; using e-learning with traditional learning resources to produce blended learning; and using ICT for remote access. The report noted that the overall trend seemed to be for ICT to enable learners to access some or all of their programmes at a convenient pace or time. The noticeable rise in remote learning may in part be linked to the remote use of learning platforms and VLEs, which have shown a steady rise over several years.

Home and remote access to learning

The National Statistics Survey (2006) showed that 57 per cent of households in Great Britain could access the internet from home in the spring of 2006. This is an increase of 2.9 million households (26 per cent) since 2002, and 0.6 million (5 per cent) over the previous year. Internet use continued to vary by age but remained unchanged from 2005. It was highest in the 16 to 24 age group (83 per cent) and lowest in the 65 and older age group (15 per cent). Only 10 per cent of the 16 to 24 age group claimed that they have never used the internet, compared to 82 per cent of the over-65 age group.

Figure 3.12: Use of ICT in all or most mainstream college programmes



	Individual-ised prog-ramme	Remote access	Learners' own pace	Learners' own time	Part of blended learning	Traditional classroom tool	To support learning
2006	4	26	12	25	31	34	52
2005	1	12	9	18	24	21	43
2004	1	10	11	20	20	24	53
2003	4	8	10	17	18	21	48

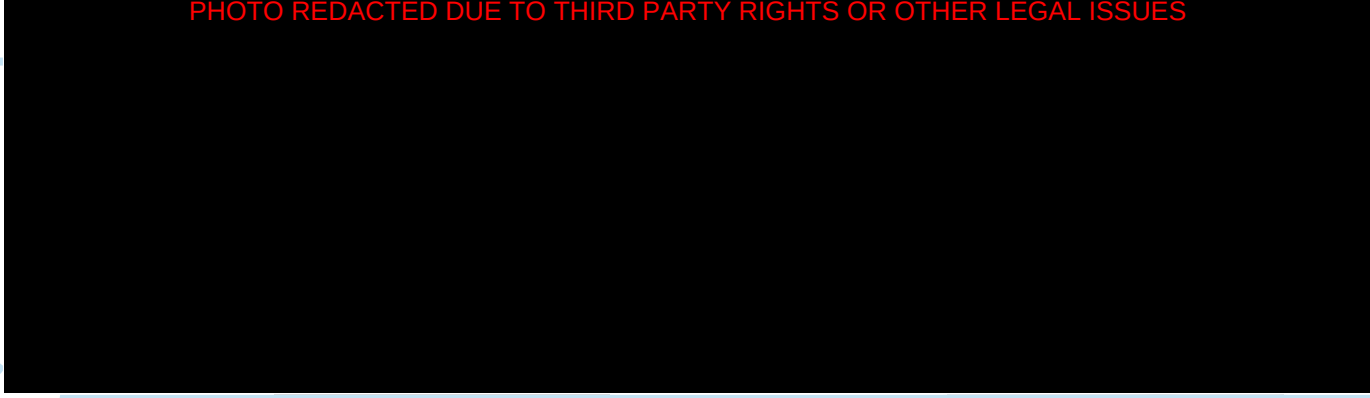
Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

The extent to which home use of ICT involves learning and educational activities is difficult to assess due to lack of data. One proxy measure of ICT use is the extent to which colleges provide remote access to courses and to support learning programmes. In 2006, less than half of colleges (48 per cent) delivered learndirect courses, a clear decline from 2003. Other forms of remote learning have remained relatively constant at just over 50 per cent.

The ICT Test Bed colleges show how VLEs were used for remote access to support college programmes, along with the perceived benefits of their use. Lecturers found they could upload resources to the VLE for their students to use. Students could access resources from outside the college and were able to use them for consolidation or revision. Some teachers expected their students to do work on the VLE between classes.

Digital literacy and learner ICT skills

Thirty-five per cent of FE college learners considered themselves very confident in using computers for a wide range of tasks, whilst four in ten described themselves as quite confident. However, men were significantly more likely than women to be very confident



about using computers; 45 per cent described themselves in this way compared with 29 per cent of women. Age was also an important factor, with a quarter of learners in the 25+ category (25 per cent) stating they were very confident in their use of computers compared with nearly half of 16–18-year-olds and 44 per cent of 19–24-year-olds. (GfK NOP, 2007)

Learner ICT confidence in computer use varied by subject of study. Those studying business, administration, management and professional subjects, engineering, technology and manufacturing, sciences and mathematics, visual and performing arts and media and humanities were amongst the most confident in their use of computers. (GfK NOP, 2007)

Pass rates in standard ICT qualifications provide some measure of learners' ICT skills. Ofsted (2005b) reported that pass rates in European Computer Driving Licence (ECDL) and Computer literacy and information technology (CLAIT) were a key strength in around one third of colleges inspected between 2001 and 2005. However, these rates were too low in many colleges. Retention rates were low in about one third of colleges and this figure had not improved since the beginning of the inspection cycle.

For specific ICT skills, four in ten considered themselves expert in communicating with other people and finding information on the internet. Over a quarter considered themselves expert in word processing or adding visual information/decoration to their work. Expertise levels were lowest for analysing numerical information, with 38 per cent rating themselves as beginners. (GfK NOP, 2007)

Case study and interview evidence from Test Bed colleges, together with ICT use data, found that in 2005, students had increased confidence and competence in using the internet rather than books to locate information (67 per cent in 2005 compared to 51 per cent in 2003). The internet was their favoured research tool and the most daily used application in colleges. In interviews students rated word processing and the internet as the most useful technologies, although daily use of word processing actually dropped (14 per cent down compared to 38 per cent in 2004) and shifted from being used mostly in college to being used mostly at home.

The 2006 Test Bed qualitative report (Somekh, Lewin *et al.*, 2006), states that the ability to access materials from outside college helped specific groups of students such as NVQ plumbing students. These were mainly self-employed and could not always get to college if they had a job to do. One student had a long stay in hospital but was able to continue with her course by accessing the course materials from the hospital.

Table 3.17: Percentage of employees with ICT user skills

Country	2003	2004	2005	2006	Rank
United Kingdom	24.3	24.1	24.6	24.7	1
Denmark	22.9	22.6	23.2	23.0	2
Malta	19.9	20.5	20.4	20.8	3
Finland	19.0	19.8	19.9	20.5	4
Hungary	19.5	19.9	20.0	20.1	5
Italy	22.9	17.6	17.6	19.0	11
Germany	18.8	18.7	19.1	18.8	15
France	17.1	16.8	16.6	16.3	20
Spain	15.3	15.7	15.6	15.7	21
EU25 average for 2006				**18.5**	

Source: i2010 Annual Report 2007 the Eurostat Labour Force Survey (Eurostat, 2007)

Table 3.18: Percentage of employees with ICT specialist skills

Country	2003	2004	2005	2006	Rank
Sweden	4.7	4.4	4.9	4.9	1
Norway	4.6	4.5	5.1	4.7	2
Finland	4.2	4.0	4.3	4.3	3
Netherlands	4.5	4.2	4.3	4.1	4
Czech Republic	3.8	3.9	3.9	4.0	5
Denmark	4.2	4.0	3.5	3.9	6
Germany	3.1	3.0	3.2	3.4	7
Slovakia	2.7	3.0	3.2	3.3	8
Slovenia	2.6	2.6	2.8	3.2	9
United Kingdom	**3.2**	**3.2**	**3.2**	**3.2**	**10**
Latvia	3.0	3.3	3.3	3.1	11
Austria	3.8	2.9	3.0	3.0	12
Bulgaria	2.6	2.7	3.1	2.9	13=
France	2.9	3.1	2.9	2.9	13=
Spain	2.4	2.7	2.6	2.7	16
Italy	2.8	2.8	2.9	2.7	18
EU25 average for 2006				**3.1**	

Source: i2010 Annual Report 2007 the Eurostat Labour Force Survey (Commission of the European Communities, 2007)

Learners were expected to learn new ICT skills but were also asked to work in different ways. Many students had a traditional view of education and found it difficult to interact effectively with resources within a learning platform for example. However, in general, students appreciated being able to access their course materials online. They could take more responsibility for their own learning and even to take control of the learning.

A very small minority expressed a general reluctance to use ICT and these tended to be more mature students, female students and students for whom English is not their mother tongue. More mature learners have generally used ICT less than younger learners, and language problems can make using ICT more difficult for some learners.

The UK ranks the highest in Europe for combined basic and advanced level user ICT skills, but for specialist ICT skills (those involved in developing or maintaining ICT systems) it does less well, being just above the EU average.

Data sharing between leaders, practitioners and learners

Use of integrated data systems

As in the schools sector, there is limited data about the extent to which data exchange is taking place. The need to communicate with parents is clearly not an issue in post-compulsory education, but communication been split-site locations and the workplace are an important consideration.

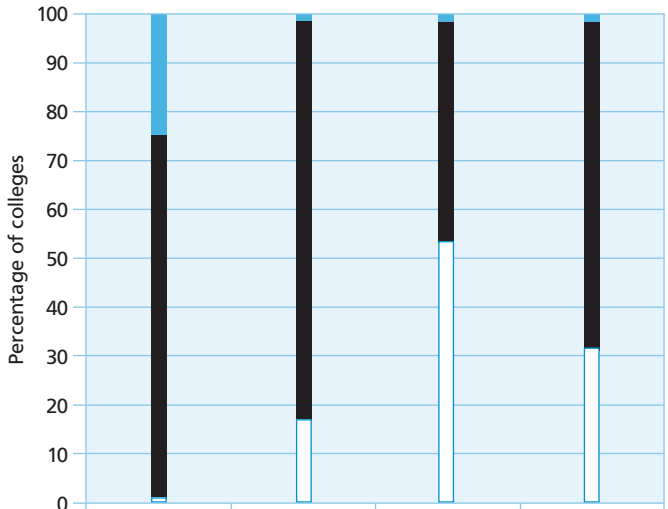
Learning platforms can be the key to this kind of data exchange, providing remote access by learners and staff, student tracking, links to the college management information system and access to digital resources and course documents. VLEs have become more widespread over the last three years and are the most common vehicle for resource access and student tracking, but they are the least well linked to the college MIS. Only 33 per cent were used in this way in 2006. Networks and intranets are used more to link to the MIS but less to access resources, for remote access or for tracking student activity.

Table 3.19: Use of learning platforms compared with links to MIS

Country	2005			2006		
	Intranet	VLE	Network	Intranet	VLE	Network
Remote access by learners	50	73	37	43	88	31
Remote staff access	50	73	37	54	87	41
Track student activity	9	71	17	20	76	24
Store course docs	61	72	84	55	84	85
Access to digital resources	61	72	84	66	84	70
Link to MIS	45	25	40	52	33	48

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Figure 3.13: Use of e-communications with learners

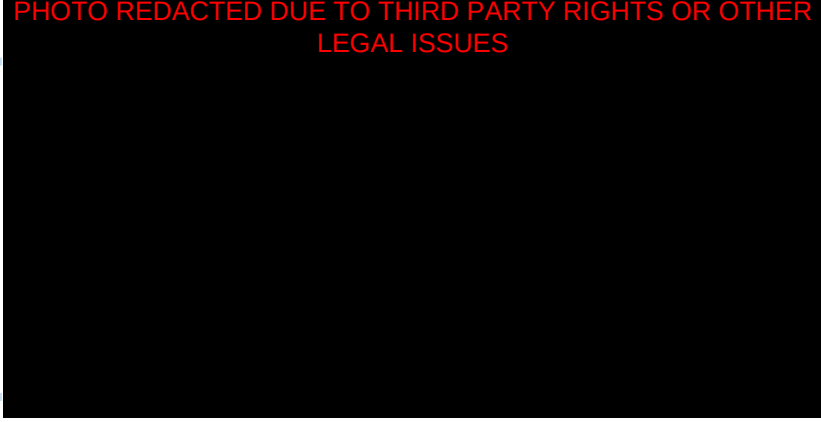


	Email between learner and tutor	Tutor-monitored learner online discussion	Unmonitored learner online discussion	Learner makes us of personal websites, blogs
Not used	1	17	53	32
Some or few progs	74	81	45	66
All or most progs	25	2	2	2

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Less than one quarter of these other platforms are used to track student activity, while around a half offer links to the college MIS (Becta, 2006f).

The ability to track progress and link to the MIS are the type of activities which could facilitate the sharing and use of information for the benefit of the learner. However, lack of evidence about the specific activities behind these uses make it difficult to assess the



nature and impact of these developments. Electronic communication such as email, online discussion and the use of personal websites and blogs provide other measures of potential data exchange. While email was used as a tool for staff communication, it was not used as widely for communications between staff and learners.

A further indicator of data sharing may be ICT collaboration with other organisations (Becta, 2006f). The most common sharing is with other colleges, schools and employers. Curriculum development projects were, however, a more common form of collaboration than information sharing in collaboration with schools or colleges, and overall patterns remained the same as for 2005.

Table 3.20: Types of ICT collaboration with other organisations

Partner organisations	Joint curriculum development	Joint infrastructure development	Data / information sharing
Schools	36%	8%	32%
Other FE colleges	40%	16%	34%
Adult and community learning providers	17%	8%	24%
Specialist colleges	8%	0%	11%
Training providers	12%	7%	20%
Employers	26%	6%	31%
Others	9%	4%	10%

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Emerging practice in data sharing and information exchange

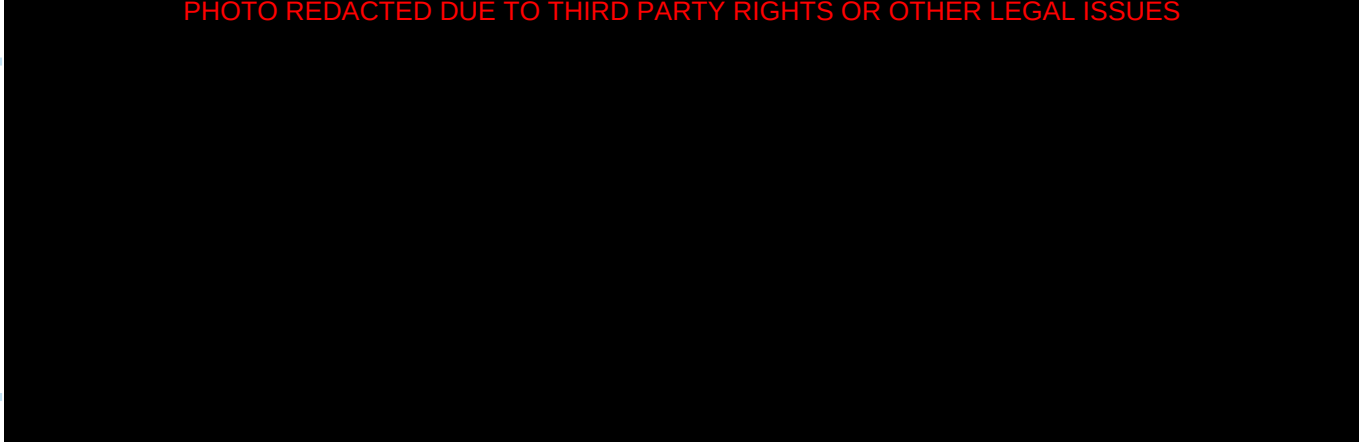
As in schools, the lack of integrated functions within learning platforms has created barriers to the efficient flow of learner data around the system. The problem is complicated by many colleges being located on multiple sites, and learners may not attend full time or may spend part of their courses at work placements away from the college. Ofsted identified that the collection of information about young people's achievement, progress and attendance in FE colleges had improved. However, the information is used effectively in only a small number of institutions. Young people's individual learning plans were not used successfully to plan their work or to monitor their progress. This would suggest that general issues of information collection, use and practice will need attention alongside the particular support that technology can offer (Ofsted, 2006b).

The ICT Test Bed colleges made greater use of MIS data and improved communications with college staff, learners, the community and work placement providers. All colleges installed new or upgraded MIS during the project. They created e-portals to the MIS so that a wider range of staff could access the data held in the system. Managers could access the system to monitor the performance of their curriculum areas, while teachers could obtain data about their classes or individual students. Data required by agencies such as the DfES and Learning and Skills Council (LSC) was more readily produced.

Senior managers also used the improved availability of accurate and up-to-date information to facilitate college management. Data was perceived as more accurate than previously and managers had greater confidence in the data when taking strategic decisions. In two colleges, curriculum managers were made accountable for the performance of their area, which would not have been possible without the enhanced MIS.

External ICT links were strong in the three FE colleges. They all had facilities for students to access the learning platform and download resources from outside the college. By the autumn of 2005 the college learning platforms were regularly used and well integrated into the course structure and materials.

One FE college had developed a learning platform for its students that included auto-marked assignments but it had no communication facilities. In spite of this, it was perceived as being useful for students who had missed classes as they could access the teaching materials retrospectively. Some students accessed the learning platform from home and 'fast-tracked' through the course. Others submitted work electronically and there was some development of digital portfolios. In this college students could also access the intranet from outside the campus which, for example, facilitated communication with students in outreach centres.



4 EFFICIENCY, EFFECTIVENESS AND VALUE FOR MONEY ACROSS THE SYSTEM

Key points

Schools have in place a range of technologies to facilitate access to shared ICT resources but the amount of resource sharing and collaboration within the school, and at local and regional level, is currently limited.

Learning platforms and virtual learning environments are increasingly a key vehicle for sharing and collaboration, currently performing the role of learning content repositories. Effective implementation to meet local needs is a challenge.

A number of issues are holding back the use of technology for sharing and collaborative activities. Schools will only invest in local development if the costs do not differ much from that for commercial products.

Successful cross-sector collaboration projects are those with a clear purpose, an ethos of sharing, well defined roles and responsibilities across the various partnerships, and effective stakeholder engagement with the planning process, supported by initial leadership.

In contrast to schools, there is greater evidence of collaboration in the learning and skills sector, often encouraged by the tradition of 'in house' resource development and a contrasting and restricted market for commercial software.

ICT for administration and management has developed considerably in both sectors. Schools in particular have begun to appreciate the improved effectiveness and reduced costs that can result from centralised systems.

The use of electronic attendance and registration systems is high in schools and there is evidence that they reduce both the number of unauthorised absences and administrative time. They also provide mechanisms for efficient parental notification.

Interoperability issues still prevent further improvements in the use of technology, with schools and colleges facing the challenge of effectively integrating their management and learning systems.

Technology enables achievement of productive time efficiencies most where it is embedded effectively across the institution.

Teachers are reporting time savings using technology in lesson planning and in lesson delivery. Overall efficiencies relate mainly to quality improvement and improved use of time, rather than time and cost savings.

Further productivity gains are possible using ICT to support lesson planning and preparation, information management and assessment.

There has been an increase in data transfer between schools and greater use of ICT to support communication between colleges and employers. However, there is still little evidence of student-focused information transfer.

Across all sectors of Government there is a drive to improve efficiency in the public sector, including education.

This section considers the role of technology in delivering improved efficiency and whether the use of technology for collaboration among learning providers and cross-institutional sharing of information and resources can reduce unnecessary burdens on practitioners and streamline management and administrative processes.

DEVELOPMENTS IN SCHOOLS

Collaboration and sharing of information and resources between schools

The use of technology to support sharing of information between schools is still at its early stages. Twining *et al.* (2006) identified few schools or colleges from the 125 who responded to an online survey reporting that they shared pupil data (such as on transition, for example). A small number claimed they were working with their local authority to align the network and security infrastructures being used by schools and other LA services. However, the overall picture was one of cross-sector working being embryonic, at best.

Sharing resources in the same local authority or region

Though practice is limited, there are successful examples of resource sharing. In one cluster of Test Bed schools, science co-ordinators developed a suite of resources for use across local schools. This idea has since been taken up by geography and reception teachers. These resources are usually used as a stimulus and bank of ideas rather than being used as they stand (Somekh, Lewin, Saxon *et al.*, 2006). Local support for content development involved teaching staff and allowing resources to be tailored to individual and local needs. The support team also provided a source of expertise enabling teaching staff to become more skilled and take ownership as and when appropriate. Schools will not invest in local development if the costs do not differ much from commercial products.

One Regional Broadband Consortium (RBC) is working with teams of teachers and developers to produce digital resources for all the schools in its area. The approach is to bring together a team of teachers for several days to plan resources. The teachers come from a variety of schools across the region, and have different interests and perspectives. Working in groups, teachers identify what is needed and how it relates to the curriculum. This process usually results in ideas that suit most practitioners' needs within the region. The teachers' ideas are then turned into digital resources by developers based in City Learning Centres. The RBC co-ordinates the work and helps ensure its quality. It also pays for teachers' and developers' time. These resources complement commercial products already available, and are released to schools in the region free of charge. As Twining *et al.* (2006) point out: 'Given the scale of distribution of the resources, the relative cost of their development per user is very low, provided the resources appeal and are used widely. Since the resources are closely linked to the expressed needs of the teachers in the region, this is likely to be the case. The RBC can thus focus on resources that would be a much higher risk for commercial suppliers to develop.'

Table 4.1: Primary schools' use of technology for collaboration

	Joint curriculum and resource development (%)	Joint learning and teaching activities (%)	Continuing professional development (%)
With schools	34	20	20
With Local Authority/RBC	34	12	22
With professional organisations	13	6	23

Base: all primary school leaders (210)

Source: Harnessing Technology in Schools Survey 2007 (Kitchen et al., 2007)

Table 4.2: Secondary schools' use of technology for collaboration

	Joint curriculum and resource development (%)	Joint learning and teaching activities (%)	Continuing professional development (%)
With schools	46	34	31
With FE colleges	8	5	9
With Local Authority/RBC	29	10	25
With professional organisations	10	3	20

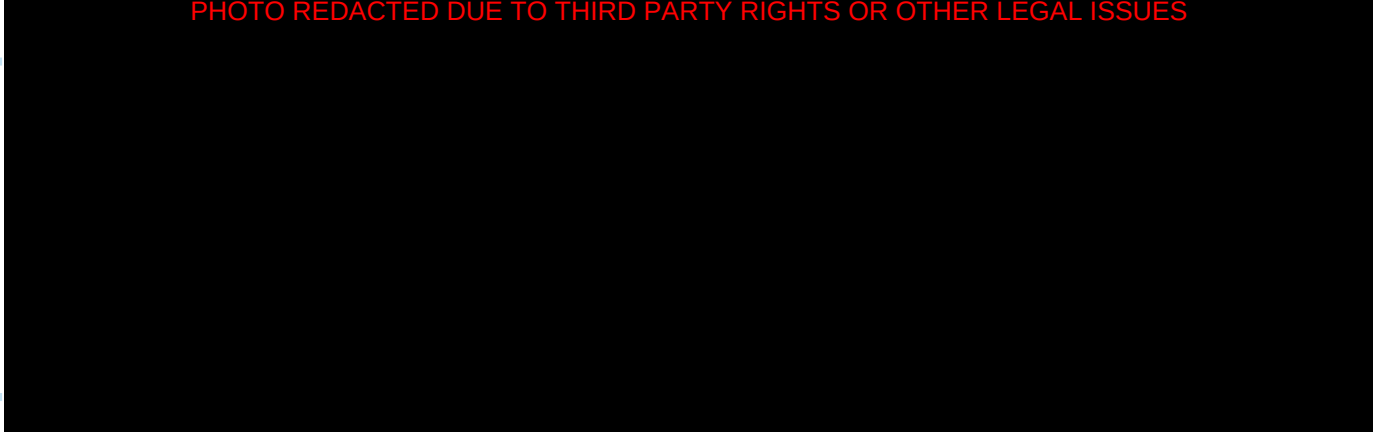
Base: all secondary school leaders (183)

Source: Harnessing Technology in Schools Survey 2007 (Kitchen et al., 2007)

Collaborative delivery of education

Now that almost all schools have broadband access and are linked to the National Education Network, significant elements in an underlying infrastructure are in place to enable the growth of collaborative education provision.

Half of primary schools indicated that they had some form of collaboration for joint curriculum and resource development. More than a third (34 per cent) collaborated in this way with the local authority or RBC, while the same proportion collaborated with



other schools. Some 13 per cent of primary schools used technology to collaborate with professional associations for joint curriculum and resource development.

For secondary schools, using technology to collaborate with other organisations was more common for curriculum and resource development than for joint learning and teaching activities or for continuing professional development. Nearly three fifths (58 per cent) of secondary schools used technology for some form of collaboration on joint curriculum or resource development. The majority of these collaborations were with other schools with nearly half saying they used technology to collaborate in this way. (Kitchen *et al.*, 2007)

In order to achieve and sustain cross-sector collaboration there needs to be a clear purpose. It needs to be managed and roles and responsibilities need to be clearly identified. Gatliffe and Wendl (1998) also highlighted the importance of involving all stakeholders in planning and establishing clear leadership initially. This is particularly important if the collaboration is between colleges and schools, since they are under different governance arrangements. Geographical barriers and tensions between the benefits gained from pooling knowledge and expertise can present additional challenges, as can the need for local control and ownership (Somekh, Lewin, Saxon *et al.*, 2006).

Collaborative provision accessible to a range of institutions

It is increasingly common for local authorities to host authority-wide learning platforms (Kitchen *et al.*, 2007). In the case of one authority (cited by Twining *et al.*, 2006), there is a portal that enables widespread use of digital resources from diverse commercial sources. The portal provides one central log-in to around 40 suppliers' systems. The user can access and cross-search all the resources from any supplier that their school has paid for. The system has been very successful both in saving schools money through aggregated procurement arrangements and in delivering increased product usage levels. Around half the schools in the LA are regular users of the system. However, there have been challenges in developing successful implementation of the portal, including the development of log-on IDs and permissions and embedding the use by learners as well as practitioners.

Nine secondary schools in the West Midlands are collaborating with a VLE. Teachers can share lesson plans and best practice, and pupils, parents and teachers have access to a personal online space. Teachers can allocate individual tasks for pupils, pupils can access resources and ask for online support from teachers from home, and parents can check progress and homework.

Practitioner collaboration

There is evidence of time saved and productivity gains from practitioners sharing resources and practice. Workload reduction is achieved through shared lesson development and 'corporate' resource building, but there is a big change management task to be addressed if significant benefits are to be realised. (Somekh, Underwood, Convery *et al.*, 2005).

Sharing learning and teaching practice

There is evidence that the internet serves as a useful general resource to allow teachers to share approaches to practice (Facer and Owen, 2005).

In the ICT Test Bed (Somekh: Underwood *et al.*, 2007) ICT increased the availability of information for teachers and helped the sharing of this with other teachers and with parents. Over time, ICT was used to formalise planning and make it easily available to colleagues and managers. There were clear time savings in planning. Most primary schools shared easily-updateable plans across the whole school. In secondary schools this planning was usually done within the departments, although two of the schools had a more co-ordinated cross-school interface.

Educational management was also supported. There were clear advantages in monitoring by having the departmental plans available on the shared areas. In all schools the ability to link resources with plans had made them more explicit and usable (Somekh, Lewin, Saxon *et al.*, 2006).

Lewis *et al.* (2006) found that 75 per cent of teachers within the East Midlands Broadband Consortium agreed that connectivity made it easier to share examples of good practice and to encourage innovation in teaching and learning. Eighty per cent of students surveyed agreed that connectivity enabled access to a greater range of digital resources and 60 per cent thought that connectivity increased opportunities for collaborative learning.

Twelve small primary schools in rural Shropshire increased headteachers' contact with other schools through e-communications (National College of School Leadership, 2006). This led to greater sharing of planning and policies, a greater feeling of belonging and decreased feelings of isolation. However, unless leaders embrace the ethos of sharing, they find e-communication a challenge. For networks to succeed there must be a willingness to participate and to involve all members of the community.

Internationally, broadband is a major factor in increasing collaboration between teachers. Embedded, reliable and high-capacity broadband in the classroom increases the quality and quantity of educational activities that can be undertaken (Balanskat, Blamire and Kefala, 2006). However, teachers do not yet exploit the creative potential of ICT and engage students more actively in the production of knowledge. Their use of ICT for communication with and between pupils is still in its infancy. ICT is under-exploited to create learning environments where students are more actively engaged in the creation of knowledge rather than just being passive consumers (Kessel *et al.*, 2005; Ramboll Management 2005 and 2006). Many countries have attempted to set up good-practice sharing schemes, such as ideas banks, with varying degrees of success (Blamire, 2006).

Using technology to share teaching and learning resources

Most teachers have experience of creating their own digital resources (58 per cent of primary and 65 per cent of secondary). Many also share them with other teachers in the school, with secondary teachers more likely than primary teachers to do this (86 per cent compared with 75 per cent) (Kitchen *et al.*, 2007).

Schools facilitate access to shared ICT resources in a number of ways. Some 81 per cent of schools provide a repository or shared area for learning objects and teaching resources on the local area network. A further 8 per cent made them publicly available on the school website. Intranets in schools, primary and secondary, support a range of administrative activities and also facilitate and encourage sharing of information and learning resources between staff (Condie, 2006). Over 95 per cent of schools made use of at least one external repository of teaching resources, such as a school or regional cluster repository, or one provided by the local authority. These were used by 66 per cent of primaries and 48 per cent of secondary schools in the survey. (Becta, 2006h)

Evidence from the Test Bed Project (Somekh, Lewin, Saxon *et al.*, 2006) suggests that the establishment of shared network access was a major factor for staff sharing resources and ideas. A good resource bank supports teachers when they teach new groups and helps to develop their new portfolio supported by existing resource provision. The resource is also invaluable in providing continuity when employing supply teachers.

Nearly all Test Bed primary schools established shared folders to organise learning materials. Materials were normally organised by year group. Shared areas on the server encouraged collaboration between teachers and extended the variety and quality of the resources. In all the primary schools, resources stored in shared areas rapidly became extensive and it was necessary to increase server space and to reorganise and tidy these areas. This was most effective where managers made clear decisions and supported staff with training, building the development of resources and quality assurance into school development plans. (Somekh, Lewin, Saxon e*t al.*, 2006)

Learning platforms have yet to be adopted in great numbers by primary schools, although greater numbers of secondary schools have adopted them, and the numbers are rising (Kitchen *et al.*, 2007). Where schools have a learning platform, resource sharing is a major focus:

- Locating digital resources through a search facility: 68 per cent of primary teachers and 59 per cent of secondary teachers had done this (43 per cent and 41 per cent respectively at least once a month)
- Uploading and storing digital learning resources: 74 per cent of primary teachers and 73 per cent of secondary teachers had ever done this (41 per cent and 46 per cent respectively at least once a month)
- Creating digital resources: 70 per cent of primary teachers and 65 per cent of secondary had ever done this (38 per cent and 42 per cent respectively at least once a month)
- Creating and managing lesson plans: 68 per cent of primary and 53 per cent of secondary teachers had ever done this (37 per cent and 34 per cent respectively at least once a month).

According to Condie *et al.* (2006), learning platforms can make a significant contribution towards personalising the learning and teaching experience, for both pupils and teachers. Installing and

embedding a learning platform, however, is a major management task. A key lesson of ICT Test Bed is that very careful planning is necessary in advance of purchase. Many of the problems experienced by schools early in the project were due to the stage of development of relatively early approaches and systems. Schools can now purchase a learning platform with greater confidence, knowing that it has already been used successfully by other schools (Somekh, Lewin, Saxon *et al.*, 2006).

There are greater challenges in delivering platforms across institutions to deliver shared resources and tools. Though successful in terms of its original aims, the e-Learning South Yorkshire (e-SY) programme found difficulties in mainstreaming innovative practices beyond enthusiastic and tolerant early-adopting schools. Later adopters tended to be less enthusiastic. (SQW Ltd, 2006)

Technology supporting efficient management and administration

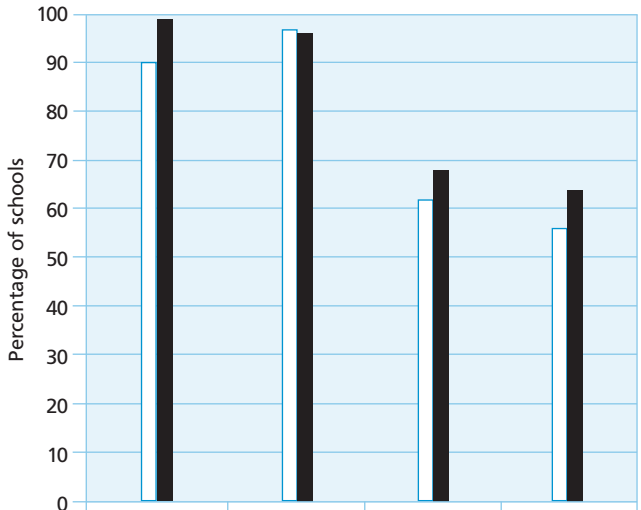
ICT offers a way of streamlining the use of information within institutions. *The Becta Review 2006* indicated that technology is being used to support a range of institutional, management and administrative activities. Data about efficiency savings from such operations is only available from a small number of schools but, where it exists, there is evidence about the potential of technology to support these processes by saving time for managers and practitioners and allowing higher quality work to be achieved in the time. However, across the system as a whole such efficiencies and benefits have yet to be fully realised.

Using ICT for administration and management

Nearly all schools use some form of electronic system for financial management. Only 3 per cent of primary schools and less than one per cent of secondary schools said that they had not used electronic systems for accounting and financial management or their most recent annual accounts (Kitchen *et al.*, 2007).

An increasing number of institutions use ICT to support better use of data to allocate staff and resources, improve attendance, develop

Figure 4.1: Percentage of schools using pupil data for different purposes



	Setting performance targets	Measuring progress	Staff performance reviews	Managing finance
Primary schools	90	97	62	56
Secondary schools	99	96	68	64

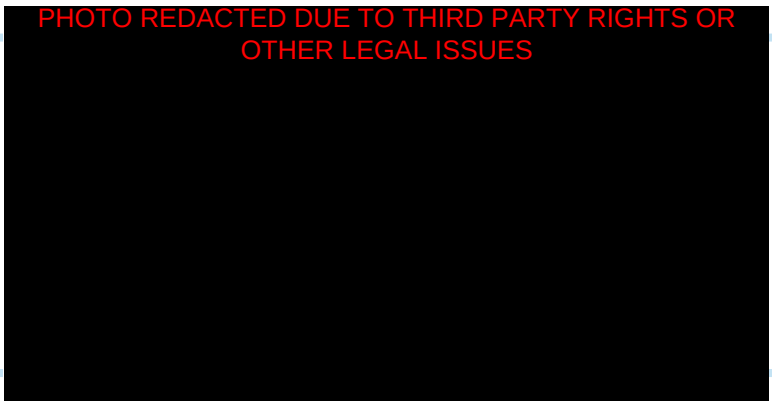
Base: Primary headteachers (208), Secondary headteachers (181)

Source: Harnessing Technology schools survey 2007 (Kitchen et al., 2007)

management of performance, and support monitoring, target setting and challenge to staff, pupils, parents and others.

Many schools are developing centralised, computer-supported systems for record-keeping, assessment data and reporting to parents, although this is more a feature of secondary schools than primaries (Condie *et al.*, 2005). Broadly speaking, schools recognise that centralised systems can improve effectiveness and reduce costs. For example, Granville *et al.* (2005) found that teachers believed that better connectivity improved access to the curriculum, offered secure means of storing confidential information, improved communications, made collaborative work easier and enabled access for people outside the school. In particular, they agreed that administration was easier with regard to accounts, attendance data and the sharing of confidential information. There were better communications between staff and local authority and it was easier to develop collaborative work between schools. Unsurprisingly, school staff were most enthusiastic where broadband was available (Condie, Munro, Seagreaves *et al.*, 2006).

Pupil data was most commonly used to set performance targets (90 per cent of primary schools and 99 per cent of secondary schools) and to measure pupil progress (97 per cent of primary schools and 96 per cent of secondary schools). More than half of schools used pupil data



for staff performance reviews or in managing their finances. Some 86 per cent of primary and 73 per cent of secondary heads reported that they used data in at least three of these ways (Kitchen *et al.*, 2007).

To date relatively few schools have integrated their management and learning systems, although many are planning to do this. Poor legacy standards of interoperability are a barrier to setting up and using an integrated network at present. Realising the value of MIS and learning system investment is dependent on a combination of effective leadership, training and technical support, as well as access to a suitable technical infrastructure. Only one in seven of the learning platforms in secondary schools were linked in this way; the corresponding proportion for primary schools was 2 of the 26 learning platforms found. (Kitchen *et al.*, 2007)

At least two international studies (Kessel, 2005 and Ramboll Management, 2006) have established that effective exploitation of information management systems leads to increased and formalised co-operative planning between teachers, and this has a positive impact on teaching practices. Learning management systems or virtual learning environments are predominantly used for administrative purposes. In Estonia, the e-Diary scheme is proving popular. A common platform for pupil data, attendance and performance, it is accessible to parents and teachers in clusters of schools (in the Baltic States, almost all schools are 5–19 so there are no transition issues). As broadband penetration is high in Estonia, much access is from home.

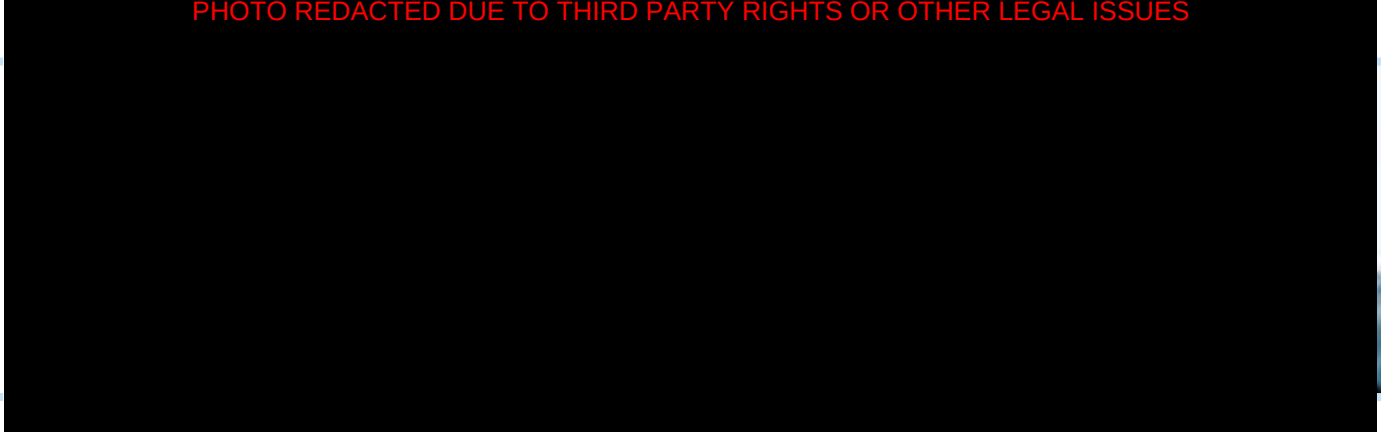
E-registration systems

Some 53 per cent of primary schools used some form of electronic system to record pupil attendance while 47 per cent still used paper systems, suggesting that there is still need for further development in this area. Secondary schools have made much greater progress towards implementing electronic systems for monitoring pupil attendance. Overall, 86 per cent of secondary schools used some form of electronic system. About half reported having a fully integrated electronic registration system allowing registration by session or lesson, linked to a management information system, while 35 per cent used optical mark readers. Only 14 per cent of secondary schools still used a paper system (Kitchen *et al.*, 2007).

Electronic registration improved attendance in ICT Test Bed schools. This included lesson-by-lesson registration in secondary schools, revealing patterns of 'selective attendance'. In some primary schools 'same day calling' of parents/guardians had a major impact on attendance. Better access to behaviour records greatly assisted pastoral managers in supporting students and their parents. To use the behaviour management system effectively, teachers required protocols to ensure that all relevant information is recorded. In one school, Key Stage 1 teachers used online registration as an opportunity to develop numeracy skills – the children could see the registration screen and the teacher involved them in talking about numbers of absences, and odd and even numbers (Lindsay, Muijs, Hartas, and Band, 2006).

Attendance recording via e-registration was increasingly used in all secondary Test Bed schools. This had major benefits in reducing administrators' time at a busy period of the day and provided up-to-date data for teachers and senior staff to track down missing students. Another key factor was that the students were very aware that the school now had the information and would act on it. Schools reported that attendance was improved when e-registration was introduced. In some schools parents were able to access the attendance information and this had a further beneficial effect on attendance. Teachers and personal tutors were able to get print-outs of individual attendance and use these in tutorials and personal interviews. While most schools agreed there were benefits from quick and easy notification to parents of their child's absence and two thirds considered e-registration was good value for money, the most effective factors were considered to be the creation of a positive school climate and developing a relevant curriculum (Ibid).

E-registration enabled schools to change the way students are registered. In some schools, registration happens in every session so there is no requirement for students to go to their 'form' room at the start of the day. Some schools have moved away from the form structure to smaller groupings based on personal tutor groups. In one school software is used to record attendance in particular lessons, and is valuable in following student attendance and subject avoidance more carefully, enabling Heads of Year and SEN leaders to locate pupils rapidly. Printing out a lesson-by-lesson attendance report for a week gave parents evidence that their child was attending lessons selectively (Somekh, Lewin, Saxon *et al.*, 2006).



Use of teacher time and ICT

Evidence from a range of sources has indicated that technology can contribute to a reduction in teacher workloads (Ofsted, 2005a and Prior and Hall, 2004). Teachers can save time in lesson preparation through the re-use of learning objects. However, owing to hardware limitations and the time expended on evaluating digital materials and embedding them in practice, significant time savings from the use of educational content may be hard to achieve. Practitioners do not necessarily save time by using digital resources, but tend to use time freed to produce more or better quality outputs – so that a productivity gain, rather than a time saving, is the predominant pattern.

At an institutional level a range of factors are beginning to emerge which can support efficiency such as an institutional strategy oriented towards delivering productive time benefits and practitioners who are confident in using ICT. (PwC, 2004b)

Record keeping and report writing

Most teachers produce pupil reports electronically. Just five per cent of primary teachers and six per cent of secondary teachers said that they only produced handwritten reports. Almost half (49 per cent) of primary teachers and 58 per cent of secondary teachers modified or re-used electronic templates that had been pre-prepared, while more than a quarter of primary teachers (27 per cent) and 16 per cent of secondary teachers created their own electronic templates (Kitchen *et al.*, 2007).

Teachers report benefits in managing, storing and maintaining information and other work such as preparing reports, with the time saved reinvested in planning and lesson preparation. Some teachers felt that it took longer to complete some of their administrative tasks, however (PwC, 2004b). At the school level, the absence of an ICT strategy that addressed workload explicitly and ineffective networks were significant negative factors. Positive factors in addressing workload issues were identified as good leadership, appropriate training and technical support and effective networks, including connectivity (Condie *et al.*, 2006).

Table 4.3: Time currently saved or lost by using online resources

	Online Resources	
	Primary (%)	Secondary (%)
Save more than 2 hours	15	11
Save 1-2 hours	16	13
Save up to 1 hour	27	25
Does not make a difference	30	35
Lose up to 1 hour	10	7
Lose 1-2 hours	1	5
Lose more than 2 hours	1	3
Total: save time	**58**	**49**
Total: lose time	**12**	**15**
Base: All teachers who used each resource	564	1054

Source: Harnessing Technology in Schools Survey 2007 (Kitchen et al., 2007)

What teachers do with time saved in recording and reporting progress and lesson planning, according to a survey of 400 staff and 280 heads in 20 schools, showed that:

- 12 per cent reduced the working week
- 31 per cent increased core tasks (mainly additional preparation and planning)
- 47 per cent performed new tasks or performed existing tasks to a higher standard.

(PwC, 2004b)

Digital content

Once teachers have mastered the technicalities involved with classroom-related hardware and software resources, they can enhance their teaching by delivering content and concepts more effectively and efficiently and release time (Condie *et al.*, 2006). In a study carried out by PricewaterhouseCoopers (2005), teachers creating a lesson from scratch using digital resources saved on average 26.5 minutes compared to those who did not. Time saved can be used to create additional teaching resources or identify in-depth pupil activities – even simply to provide additional support and scaffolding to learning. In the *Harnessing Technology in Schools Survey* (Kitchen *et al.*, 2007), 58 per cent of primary teachers who used online resources felt that this saved them time, with 16 per cent reporting that they saved more than two hours per week and 15 per cent between one and two hours. Almost half (49 per cent) of secondary teachers who used online resources reported that using these resources saved them time, with 11 per cent reporting that they saved more than two hours per week.

Teachers recognised that the use of digital sources for lesson planning could lead to savings in time, commenting that over time it would be

possible to build up a bank of easily adaptable ICT-based resources and this would eventually free up time for teaching. Teachers also described how some ICT tools could shortcut activities such as searching the internet for information and pictures or creating exercises (Bixon *et al.*, 2005).

Practitioners in schools making use of learning platforms projected efficiencies from their use. Reported time savings were:

- 41 minutes per week from lesson time spent orienting learners to the curriculum
- 34 minutes per week processing pupil marks and related analysis as a result of electronic submission of work
- 24 minutes in lesson preparation from additional sharing of lesson plans and resources.

(Lindsay, Muijs, Hartas, and Band, 2006)

Interactive whiteboards

More than half of primary teachers who used online resources and interactive whiteboards felt that they saved time using these resources. Interactive whiteboards were felt to save time by 55 per cent of primary teachers, with 16 per cent reporting saving more than two hours; however, 13 per cent felt they lost time. Secondary teachers were less likely than primary teachers to report time savings. Forty-four per cent of secondary teachers felt they saved time by using interactive whiteboards, with 16 per cent saying they saved more than two hours, while 17 per cent felt that they lost time by using interactive whiteboards (Kitchen *et al.*, 2007).

The majority of primary teachers in the *Harnessing Technology Schools Survey* (Kitchen *et al.*, 2007) expected to save time by using online resources and interactive whiteboards in the next twelve months. Secondary teachers were less likely to expect to save time in this way.

Assessment for learning

Developments in the use of e-assessment

The majority of primary school teachers (63 per cent) currently do not make electronic assessment information available to enable pupil self-assessment, and only 15 per cent do so at least once a term.

Table 4.4: Time currently saved or lost by using interactive whiteboards

	Interactive Whiteboard	
	Primary (%)	Secondary (%)
Save more than 2 hours	16	16
Save 1-2 hours	17	12
Save up to 1 hour	23	16
Does not make a difference	33	39
Lose up to 1 hour	8	7
Lose 1-2 hours	3	7
Lose more than 2 hours	2	4
Total: save time	55	44
Total: lose time	12	17
Base: All teachers who used each resource	561	842

Source: Harnessing Technology in Schools Survey 2007 (Kitchen et al., 2007)

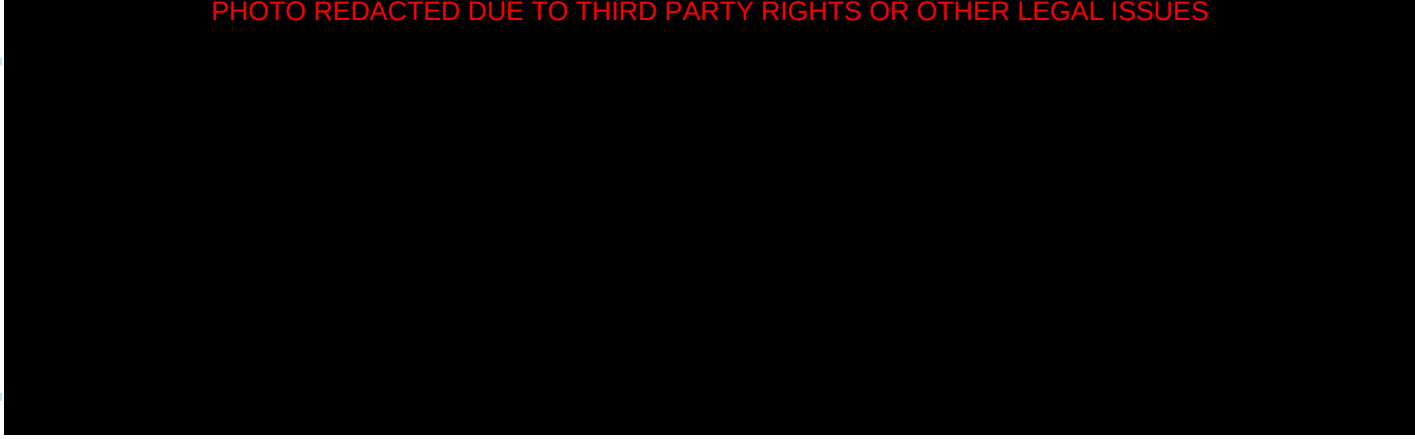
Table 4.5: Expectation of time saved or lost by using ICT resources in the next 12 months

	Interactive Whiteboards		Online Resources	
	Primary (%)	Secondary (%)	Primary (%)	Secondary (%)
Save more than 2 hours	26	17	24	17
Save 1-2 hours	17	12	19	14
Save up to 1 hour	19	12	22	22
Does not make a difference	23	24	23	27
Lose up to 1 hour	7	3	6	6
Lose 1-2 hours	3	4	1	3
Lose more than 2 hours	2	3	1	3
Do not plan to use	4	25	4	8
Total: save time	62	41	64	53
Total: lose time	11	10	9	12
Base: All teachers answering	596	1160	587	1146

Source: Harnessing Technology in Schools Survey 2007 (Kitchen et al., 2007)

Evidence from the ICT Test Bed project indicates that improvements in the detail and efficiency of learner assessments afforded by electronic systems resulted in improved target setting for students (Somekh *et al.*, 2006). Kirkup *et al.* (2005) support this view, confirming that use of data informs accurate curricular targets for individual pupils. Approximately three quarters of primary school respondents agreed that data analysis simplified the process of setting targets.

ICT is increasingly being used for the analysis of performance data. In secondary schools, it is common for pupils to be set targets in ICT, often based on their attainment in core subjects as shown by



Year 6 SATs, and by CATS testing. However, regular feedback on progress towards targets is rare. More emphasis is needed on the use of target levels and the tracking of pupils' progress towards these and there is a need for pupils themselves to be more involved in the process. (Ofsted, 2005a)

Technology-supported transition between sectors

ICT can provide information to support learner transition between institutions and so reduce the administrative burden on institutions. *The Becta Review 2006* reported that the move to electronic returns, such as the DfES Common Transfer File and Pupil Level Annual School Census (PLASC) has placed a strain on schools, local authorities and MIS providers. Even when information can be effectively shared or made available, institutional practice in using it to support learners tends to be limited. Thus the development of professional practices in this area is as important as solving the technical problems in sharing and transferring information. (Cabinet Office, 2007)

Sharing information about learners

There is evidence from small-scale projects where it has been possible to use ICT to manage data across schools to facilitate more effective handling of transitions and transfers of pupils. For example, the eAdmissions National Project, led by Hertfordshire County Council, has made available online school admissions to 1.5 million children and their parents, making applications to over 21,000 schools. Although all applications, whether paper or online, are processed in the same time, high take-up of the online service delivered significant benefits to parents, schools and local authorities. Parents, for example, are able to easily retrieve and amend the application as many times as necessary right up to the deadline date. Additionally, parents are also able to enjoy the peace of mind that comes with receiving an immediate confirmation of receipt via email when the application is completed (Hertfordshire County Council, 2006).

The Schools Online Admissions System (SOLA) is separate from the public online admissions system but allows schools to interact with the public online admissions system, and with the local authority. Schools use SOLA to access online applications from and to their school. Schools need less administrative time, in checking and preparing application forms for collection and delivery to local services and in checking sibling claims. Parents and carers were very positive in their response to the introduction of the online system. (Hertfordshire County Council, 2006)

Emerging practice from pilot e-portfolio projects indicates that they can play an important role in facilitating learner transition between different phases of education, and promote lifelong learning. For example, on primary to secondary transfer, the availability of information about previous education and achievement of children can enable a more effective transition. In secondary schools, the transfer of learner information via the UCAS application process is a further example. (Busuttil-Reynaud, Winkley *et al.*, 2006 and Becta 2007c)

However, for e-portfolios to be effective:

- institutions across all phases need to work together in a regional approach to make the learner's pathway relatively straightforward and share the knowledge they are gaining from current implementation
- both creators and audiences need to understand the purpose of using e-portfolios
- audiences such as secondary teachers need to use the evidence from transition e-portfolios to plan appropriate curriculum activities for incoming students. (Becta, 2007c)

Integration of learners into the new institution

There is little evidence of widespread use of ICT to support integration of learners into the new institution, or one key stage to another. However, in one local authority, learners took part in projects which spanned the final term at one school and the initial term at their next (Twining *et al.*, 2006). The projects were managed and supported through a dedicated stand-alone website. So, for example, Year 2 students did a project on seaside holidays of the past which linked into a Year 3 project on weather around the world. For students moving from Key Stage 2 to Key Stage 3 in this project, learners began their work in Year 6 and carried it on in the first term of Year 7. There has been a high take-up of the system by primary schools in the authority, with around 85 per cent integrating it into their schemes of work. The impact on students' learning has been positive, judged by feedback received from students. 'Receiving teachers' recognised the high levels of ICT skills that students had at the start of the year, which they could then build upon.

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Collaboration between learning providers

We know from survey evidence that there is a significant amount of in-house supply of practitioner-led development of learning materials for use with students in FE institutions. Over half of work-related learning providers develop their own resources and 19 per cent produce resources in partnership with another organisation. We also know that colleges' learning platforms are heavily used as repositories for course documents and there is a higher expectation that in schools students should be able to access online materials off-site (Becta, 2006d). Taken together these factors indicate a resource development culture within institutions which can provide a strong basis on which to build wider and broader collaboration and sharing.

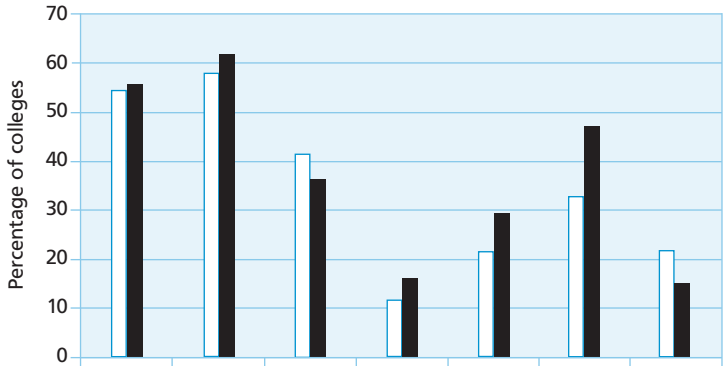
Over 85 per cent of colleges collaborated with other organisations on ICT-related activities in 2006. While colleges most frequent collaborated with each other, collaboration was almost as frequent with schools. (Becta, 2006f)

Two clusters in the ICT Test Bed Project set up content development teams, to share the development of resources. In one cluster, the content development team was set up in the FE college to develop materials for teachers in cluster schools and the college. Teachers specified what they required by creating storyboards and the team worked with the teachers to develop the idea into high-quality learning materials. (Somekh, Lewin, Saxon *et al.*, 2006)

Efficient management and administration

In colleges the use of electronic information to support teaching and learning has progressed. Information from tutorials is recorded electronically in a growing minority of colleges, while a quarter maintain digital student portfolios or records of achievement. A survey of workplace-based providers shows the same broad pattern. Colleges are also moving towards better integration of ICT and e-learning within all areas of study. However, this is clearly a challenging process and requires major leadership commitment and resource deployment.

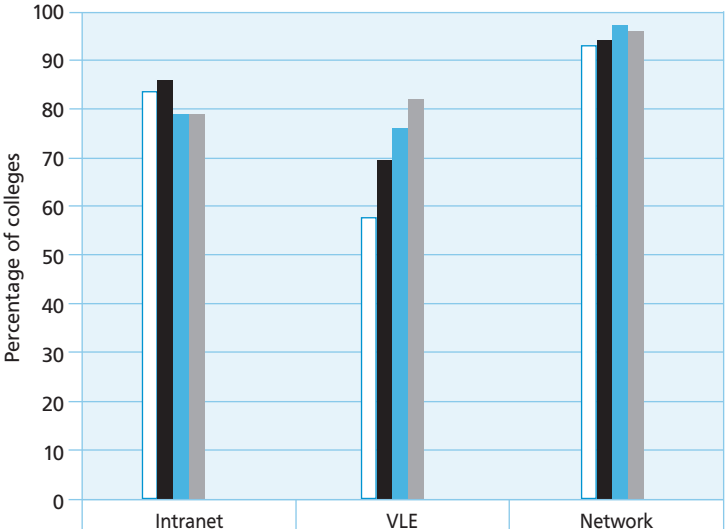
Figure 4.2: Colleges in collaboration with various institutions



	Schools	Other FE colleges	ACL providers	Specialist colleges	Training providers	Employers	Others
2005	55	58	42	12	22	33	22
2006	56	62	36	16	29	47	15

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta 2006f)

Figure 4.3: College learning platforms



	Intranet	VLE	Network
2003	84	58	93
2004	86	70	94
2005	79	76	97
2006	79	82	96

Base: Primary headteachers (208), Secondary headteachers (181)

Source: Harnessing Technology schools survey 2007 (Kitchen et al., 2007)

Colleges make considerable use of learning platforms as repositories for course documents and digital resources. The college network was the most widely used platform for sharing resources by tutors, but VLE use showed the strongest growth, now In use in over 80 per cent of colleges.

The ability of a learning platform to link with a college's management information system improved on 2005 for all three platform types. However, this key element is not an outstanding feature for any platform. The difficulty of linking to an MIS remained a significant weakness for VLEs. Only 33 per cent of colleges with a VLE said that this platform was linked to the college's MIS (Becta, 2006f).

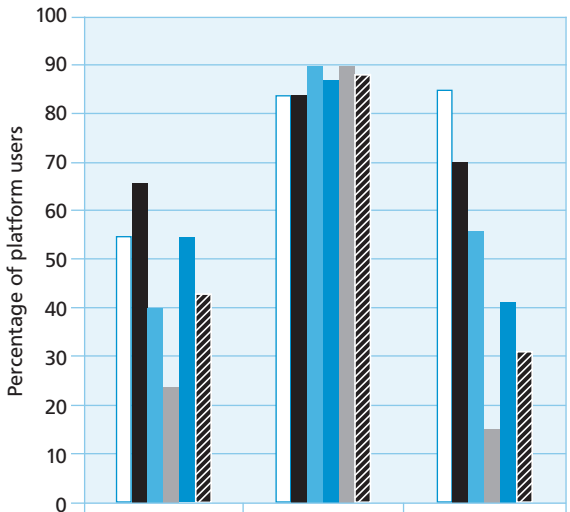
Over 81 per cent of teaching staff agreed that the use of ICT would reduce their workload, a large increase from 2005, when only half agreed (Underwood, Dillon and Twining, 2006).

Upgraded MIS helped Test Bed colleges streamline business processes. It was easier for staff and students to find out about courses and enquiries were processed faster and more comprehensively. Tutors were much more aware of student needs and the progress they were making. Improvements in MIS have allowed major changes in enrolment processes and the traditional delays and long queues are largely a thing of the past. Business support teams have been restructured and retrained to become multi-skilled teams who ensure benefits are realised from the MIS. Staff were much more aware of data and its role in what they do. Managers made regular use of data to help them manage the curriculum and their staff and to monitor performance. Tutors used data to manage their student cohorts and their progress. (Somekh, Lewin, Saxon *et al.*, 2006)

Supporting learner-focused assessment for learning

Some colleges use ICT to personalise learning, using the features offered by some learning platforms and e-portfolios for managing evidence of learning. However, the use of ICT to support personalisation is at an early stage and still has a long way to go (Becta, (2006f).

Figure 4.4: Use of college learning platforms



	Intranet	VLE	Network
Store course docs	55	84	85
Access to digital resources	66	84	70
Deliver learning activity	40	90	56
Discussion	24	90	15
Remote staff access	54	87	41
Remote learner access	43	88	31

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Online assessment was a widespread activity in 12 per cent of colleges, twice as many as in the previous year. The most extensive use of ICT remained the storage and recording of outcomes of assessment, which occurred in 83 per cent of colleges. However, only 22 per cent described this as common practice. The use of ICT for assessment activities that lead to formal certification remained the least widespread type of activity. Just less than a third of colleges use ICT for accrediting prior learning, and only three per cent describe this as common practice (Becta, 2006f).

One example is an FE college that uses an e-portfolio system as part of its VLE to help students to document their achievements in subject areas such as construction. The system allows students to upload digital photographs as an easy and practical way of recording progress. However, the system has drawbacks, including problems with the file size of digital images. A particular limitation with this e-portfolio system is that the students' work has to be printed out and sent away for marking rather than being marked online. This aspect is one that the college is keen to improve (Twining *et al.*, 2006).

The development of online individual learning plans and digital portfolios changed the landscape of summative assessment in Test

Bed colleges. ICT was used to assist in the collection, marking and return of student work and assignments. In one college, work-based assessors used Personal Digital Assistants to record the achievement of competence as the student in the workplace demonstrated it in several curriculum areas, including craft and childcare. Hairdressing students used digital cameras to take photographs and video clips to provide evidence on CD or DVD for their portfolios (Somekh, Lewin, Saxon *et al.*, 2006).

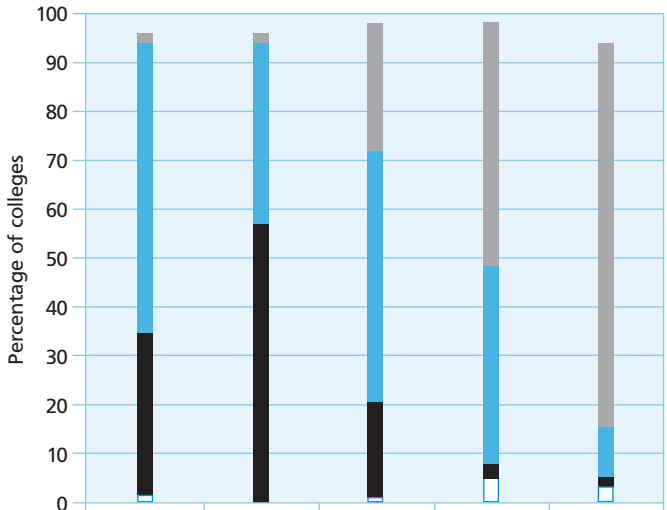
Sharing of practice and learning resources

Sharing occurs most often within teaching groups, where almost all respondents described this type of sharing as happening frequently or sometimes. Sharing or marketing materials beyond the college was a relatively rare occurrence, with only a few respondents saying this happened frequently (Becta, 2006f).

ICT Test Bed colleges spent some time arriving at successful learning platform solutions (Somekh, Lewin, Saxon *et al.*, 2006). Whatever the chosen solution, there was a considerable challenge in managing and supporting the platform and the online resources. The three Test Bed colleges all had an identified individual to support this. In all three colleges, curriculum leaders worked with colleagues to plan how to use the VLE and establish devolved responsibilities for the production of resources. In two of the colleges, teachers were supported by specialist resource developers, and this required curriculum leaders to liaise with these specialists.

In terms of learning resources, all three colleges had a mix of resources and staff were able to combine their own materials with commercially developed materials. Staff were skilled in adapting and customising materials to meet the needs of their learners and made good use of internet resources to supplement learning materials and ensure that information was up to date. In practice, it was most common to see teachers creating and using their own materials with professionally developed materials taking a secondary but specialist role. (Somekh, Lewin, Saxon *et al.*, 2006)

Figure 4.5: Sharing of e-learning materials in FE



	Used only by individual tutors	Shared within teaching groups	Shared across the college	Shared within a consortium	Marketed outside the college
Don't know	2	0	1	5	3
Happens frequently	33	57	20	3	2
Happens sometimes	53	37	51	40	11
Rare/never happens	8	2	26	50	78

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

Technology-supported transition between post-16 education, work and HE

Use of ICT to support college induction and initial assessment has shown steady progress since 2003. While other induction activities have increased since that time, there has been no significant change from 2004 to 2006. Other figures indicate that some of the initial enthusiasm for some of these activities is on the wane. (Becta, 2006f).

In the Test Bed FE colleges ICT enabled changes in communications with employers and facilitated work-based assessment supported by PDAs and digital cameras. There have been considerable savings of time and money by using email to communicate with employers and set up work placements. (Somekh, Lewin, Saxon *et al.*, 2006)

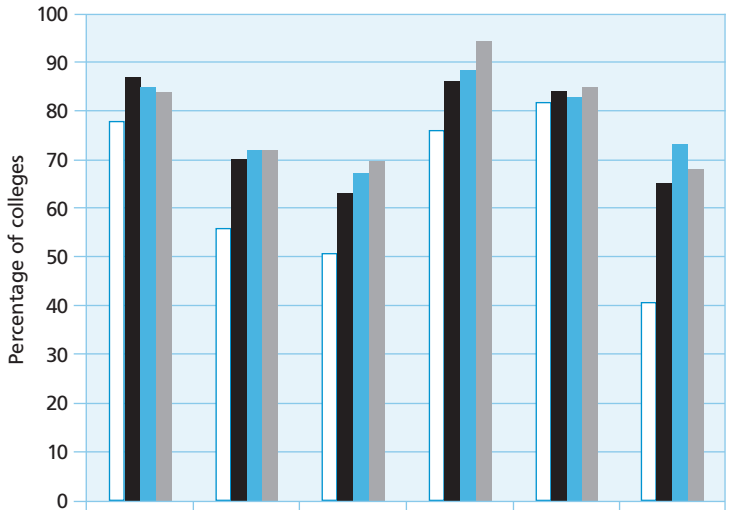
One FE college (Twining *et al.*, 2006) described how it was collaborating with employers – particularly small businesses in the areas of beauty, hairdressing and floristry – in order to provide work-based training. The college has created a website for work-based learning linked with the main college site. This provides access to schemes of work with links to relevant e-learning

materials. Employers and students are given their own passwords so that they can log in and access the site. Where an employer does not have internet access, the college provides the website content on CD or DVD. College staff who visit the students in their workplace can access the schemes of work and associated resources via their laptops.

The design and content of the work-based learning website were developed in collaboration with employers and college staff, including web developers and lecturers. Members of the college team work closely with employers and visit them, particularly when new employers join the scheme. The college collects student and employer feedback on a termly basis, and is finding that employers are becoming more confident and demanding in identifying resources that they feel the site should include.

This approach has enabled small employers, who would otherwise struggle to release staff for training, to work effectively with the college. One key indicator of the success of the approach is that the number of partner employers in the target subject areas has doubled since the scheme started.

Figure 4.6: Total use of ICT in student induction



	Learning resources	Subject Induction	College induction	Initial assessment	IT/ICT skills	Learning styles
2003	78	56	51	76	82	41
2004	87	70	63	86	84	65
2005	85	72	67	88	83	73
2006	84	72	70	94	85	68

Source: ICT and e-learning in Further Education: management, learning and improvement (Becta, 2006f)

5 IMPROVING LEARNER AND SYSTEM PERFORMANCE

Key points

ICT is currently used more frequently for whole-class activities in schools than by small groups or pupils working on their own. Developments in the use of technology to support more personalised learning are evident, but are at an early stage.

Schools are beginning to provide access to their networks from remote locations for staff and pupils.

Communications technologies provide obvious opportunities for collaboration and sharing, but practice is at an early stage. Schools have yet to make significant use of Web 2.0 and social networking technologies to support learning.

Learning platforms in secondary schools give practitioners and learners access to repositories of digital resources, increasing the range and quality of materials available. However, technology is most often used to 'push out' resources and the opportunity for learners to choose their own pathways through the resources is rarely offered.

There is increasing evidence that the use of ICT can help raise educational standards, although this is influenced by the context in which the technology is used. Links between e-maturity, performance and school attendance have been demonstrated.

Schools have technical solutions and policies in place to ensure the safety of staff and pupils. Breaches of e-safety tend to be among older pupils. Educating learners about acceptable and safe use of the internet can help reduce these breaches.

Technology integration can support child protection through effective information sharing and exchange. However, this is still at an early stage of development in most schools and local authorities.

Teachers and pupils are highly positive about the impact that using technology can have on motivation and engagement. This is especially true of interactive whiteboards. Impact on attainment relates to the precise nature or amount of use, and the extent of embedding into learning and teaching practices.

There is little statistical evidence to link technology use in the FE sector with improved progression and achievement. However, the ICT Test Bed project and other studies report a positive impact on the learning experience and learning outcomes.

In FE the adoption and use of VLEs continues to grow as the main learning platform in colleges. However, their primary function continues to be as repositories for course materials and resources. There is a noticeable increase in remote access to learning which suggests a trend to allow learners access to their programmes at a time and place to suit them.

The Gilbert Review, *2020 Vision* (2006) presents a vision for personalising learning for children and young people aged 5 to16. It sees a near-universal access to personal, multi-functional devices, smarter software integrated with global standards and increasing amounts of information being available to search on line (with faster search engines). Using ICT will be natural for most pupils and for an increasing majority of teachers.

In this section we examine the use of technology to provide learners with greater choice and chances to learn, both inside and outside formal education. We consider what this means at an institutional level and the impact that technology has had on the quality of learning, including issues of child safety and protection and the impact on attainment and standards for a range of learners in schools and the learning and skills sector.

DEVELOPMENTS IN SCHOOLS

Greater choice, opportunities and modes of learning

Views about choice, opportunity and modes of learning are related to the broader perspective of personalisation and personalising learning. The *2020 Vision* report defines personalising learning and teaching as:

...taking a highly structured and responsive approach to each child's and young person's learning, in order that all are able to progress, achieve and participate. It means strengthening the link between learning and teaching by engaging pupils – and their parents – as partners in learning.
(Gilbert, 2006)

According to Green *et al.* (2005), the role of digital technologies and institutional change can enable personalisation in four key areas:

- Choices (learner voice and choice)
- Skills and knowledge (curriculum)
- Learning environments (pedagogies and institutions)
- Feedback (assessment and recognition).

Pupils will need a wide range of opportunities to learn different things, and another range of ways to learn. Also, if education is to be a partnership between educators, pupils and parents, then choice will be a key element in this relationship.

Attitudes towards ICT and personalised learning

A study of personalising learning with technology (Underwood, Baguley *et al.,* 2007), found that teachers are committed to the personalising learning agenda, believe ICT is strongly associated with personalising learning, but find it difficult to put the concept into practice. There were sector differences, with primary staff more positive than their secondary peers in their response to ICT and personalising learning.

The *Harnessing Technology in Schools* survey found teachers considered that ICT was useful for responding to different pupil abilities (94 per cent of primary teachers and 90 per cent of secondary teachers). However, teachers were less positive about the role of ICT in giving individualised feedback (38 per cent of primary teachers compared to 45 per cent in 2005). Some 56 per cent of secondary teachers were positive about ICT and individualised feedback, with maths and science teachers more likely than other subject teachers to agree (71 per cent and 65 per cent respectively). (Kitchen *et al.*, 2007)

Kitchen *et al.* asked school leaders the priority they gave to different ways of using technology to support learning in their school. Using technology in relation to independent learning was a priority for most primary school leaders, with 53 per cent saying it was a high priority for promoting independent learning and 44 per cent a medium priority. Just under a half (48 per cent) rated using technology to support personalised learning a high priority, with 43 per cent considering it a medium priority. The figures were higher in secondary schools, with almost three quarters of school leaders rating the promotion of independent learning (74 per cent) and supporting personalised learning (73 per cent) as high priorities for technology.

Headteachers were also far more likely to prioritise personalised learning in comparison to class teachers, who gave greater emphasis to curriculum subjects and teaching groups of pupils with particular needs (Hutchings *et al.*, 2006). Allowing content choice is the most frequent way of personalising the learning experience, with learner goal-setting and self-monitoring being far less prevalent. Pupils' experiences of the personalising learning process, at primary and secondary level, were associated with greater opportunities to use ICT. (Underwood, Baguley *et al.,* 2007)

There is clear evidence in the literature that ICT can make the learning experience more personalised and targeted at the needs of the individual learner. Condie's review of the evidence in the schools sector demonstrated that combinations of technology and applications gave greater choice in relation to what, when and where to study, with the potential to allow selection according to interests, learning styles and need. The evidence showed that such systems can give the pupil more autonomy and independence with regard to learning and a range of sources of information to draw on. (Condie *et al.*, 2006)

Developing ICT practice and pedagogy

ICT is used more frequently for whole-class activities rather than for pupils working on their own or in small groups. Some 80 per cent of primary and 53 per cent of secondary teachers used ICT activities involving the whole class in half or more of lessons.

Commenting on the quality of use of ICT in the classroom, Ofsted notes that teachers need to consider the circumstances in which independent learning using ICT can flourish. Tasks involving ICT can often be overstructured, yet ICT can be very effective in motivating pupils to learn and to take this learning forward on their own. (Ofsted, 2005a)

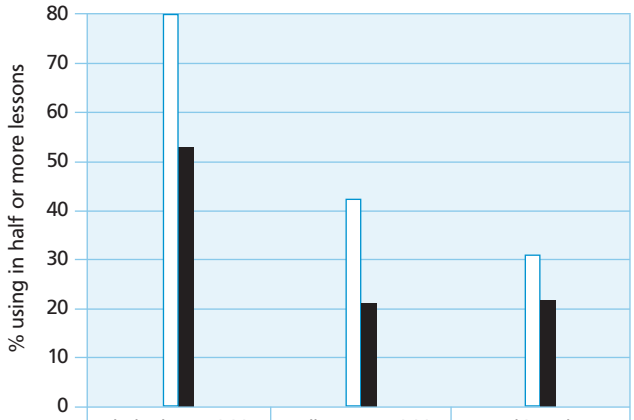
The Becta Review 2006 noted that the use of portable and handheld devices supported by the provision of wireless connections has extended the range of locations where pupils can work, learn and access centrally held resources (Becta, 2006h). In supporting mobile access, there are increasing reports of these technologies being used to support learners' real-time and independent use of the internet for research (Ofsted, 2004). The use of PDAs improves ICT capability and collaborative working as well as improving learning opportunities (Perry, 2005; Davitt, 2005) and tablet PCs can foster general ICT use across the curriculum and for fieldwork, collaboration and cross-curriculum and extended learning beyond school (Becta, 2005d).

Collaborative learning

The use of technology for social interaction, sharing and communications is often driven more by use outside the classroom and in the home. These uses have yet to be fully appreciated in the formal context of learning. Recent studies into the use of technology in the home provide evidence of the extent to which young people play online games (Livingstone and Bober, 2005, and Pratchett, 2005). In an educational context, the outcomes from gaming activity can be refined through reflection into transferable knowledge and skills. Games can, according to Kirriemuir and McFarlane (2004), promote communication, working with others and problem solving and have the potential to support maths learning and thinking skills.

Studies of protected online communities (Intuitive Media, 2006) illustrate how children readily share ideas through email, take part in group discussion in forums and share ideas through their own and school web pages. Children's motivations were making friends and having fun rather than

Figure 5.1: Teachers' use of ICT in lessons for different activities (proportions using in half or more lessons)



	Whole class activities	Small group activities	Working alone
Primary teachers	80	43	31
Secondary teachers	53	21	22

Base: all teachers answering (Primary: 609-613, Secondary: 1188-1192)
Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)

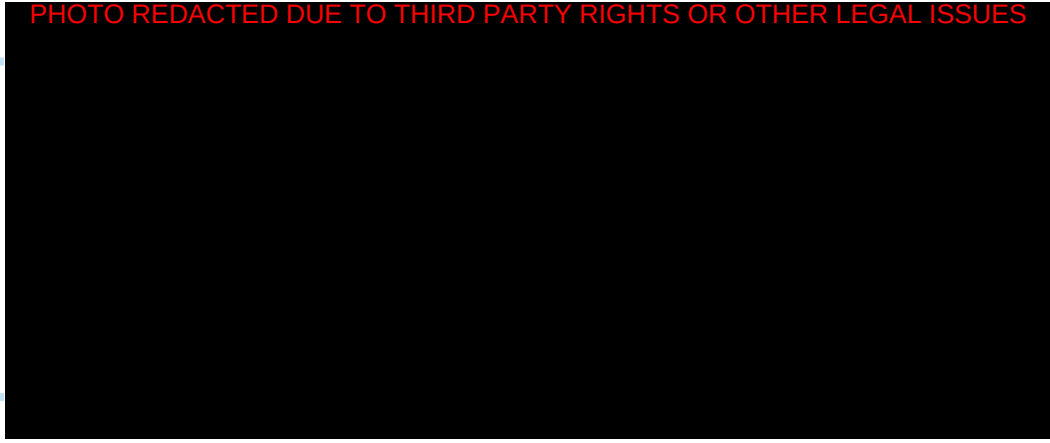
learning and achievement. However, collaborative learning, brainstorming, building on the ideas of others, collaboration and sharing resources were key features of these communities. Green and Hannon (2007) studied the ways that a small group of very digitally literate young people are using ICT outside school for online, multi-player gaming and Web 2.0. They argue that these technologies are creating a generation that is comfortable with collaborating on a continuous, casual basis. They also note that young learners are developing skills not currently developed in schools.

Using technology to extend the boundaries of learning beyond the school

Kitchen *et al.* (2007) found that 43 per cent of primary and 62 per cent of secondary school leaders felt that using technology to extend learning beyond the classroom was a high priority. This indicated a desire, among secondary schools in particular, to develop and realise the opportunities for independent learning afforded by technology.

The Becta Review 2006 described the range of ways in which schools use technology to improve access to learning beyond the school, including providing:

- external, remote access to the school network, learning platforms and VLEs
- mobile devices such as laptops and PDAs, to use within and beyond the boundaries of the school, including in the home



- access to learning via the school website
- equipment loan schemes for pupils and staff
- access to lunchtime, after-school and breakfast clubs where ICT is available
- the provision of email accounts.

A technology infrastructure to support personalised learning beyond the institution is at a relatively early stage, although developing rapidly in certain areas. Schools are beginning to offer access to their networks from remote locations for staff and pupils. The use of learning platforms, home–school email links, handheld devices and podcasting are indicators of progress towards access and availability of learning opportunities beyond the institution.

Some ICT Test Bed schools made significant progress in many aspects of learning platform use, such as day-to-day school management, homework management, and communication. Researchers noted that in order to truly support personalised learning, the curriculum management system needs to enable students to choose their own pathway through resources, rather than the situation at present where they are only able to undertake resources and activities assigned or 'pushed out' to them. (Somekh, Lewin *et al.*, 2006)

Modes of learning: online courses and e-learning

While a number of commercial companies are providing modules and full GCSE courses online, as may be seen from the Curriculum Online database, schools, colleges, local authorities and other partnerships have collaborated in the provision of online courses, extending the learning opportunities and modes of learning. In Merseyside, St Helen's College is using e-learning to support secondary pupils aged 14–16 engaged in vocational studies. This has helped secondary schools without relevant specialist expertise in particular vocational areas to offer a broader curriculum to their students. Pupils attend college for some of their vocational classes but take others at the school, using the college e-learning resources running over a virtual learning environment. Some course elements are assessed online and can be done at the school as well as the college. (QCA, 2007)

Individual institutions have also developed online courses. Thomas Telford School has developed an online ICT and maths curriculum which is commercially available to over 1,000 schools who subscribe via an annual licence agreement. Sheffield College has developed an online GCSE English course, which gives students access to online resources and online tutors from the college, supported in the classroom by learning mentors in their secondary schools. The blend of classroom and online learning helped to re-engage disaffected learners, and youngsters who were generally disruptive seemed to be able to concentrate when the teaching was put online. SCHOLAR, a Scottish online programme designed to support pupils working towards national examinations in science and mathematics, was evaluated by Livingstone and Condie (2003) and demonstrated a positive impact of e-learning on attainment.

Facilitating learning for learners with special needs and those unable to attend school

In most special schools, Ofsted (2004) found there were particular challenges for developing the effective use of ICT in learning and teaching. The potential for ICT to raise pupils' achievements across the curriculum had yet to be fully realised. The availability of specific software was limited and ICT provided additional work rather than challenging pupils and extending their achievement. As in mainstream schools, inspectors saw examples of good practice with ICT, but found considerable variation in ICT-enhanced teaching and learning in special schools.

Condie *et al.*, (2006) noted that most studies regarding pupils with additional or special educational needs were relatively small scale and essentially qualitative. However, they did have common impact themes of improved communication, participation and self-esteem. They found that measures of technological capacity such as computer:pupil ratios tended to be higher in special compared to mainstream schools. There was also a greater range of assistive technologies linked to or supported by computer technology. In terms of teaching and learning, measures such as access to email or the internet were more broadly similar to primary than secondary schools.

ICT can also facilitate access to education for school-age learners who are unable to attend school. An example of this is the implementation of a virtual learning environment in the West Midlands Regional Broadband Consortium area. This enables a teacher to teach learners simultaneously in a number of settings (connected by broadband). The system was used to teach lessons simultaneously to pupils in diverse out-of-school locations – for example, a hospital school, a maternity unit and a medical recovery unit (Passey, 2005). Other examples include 'not.school.net,' providing an online community offering alternative education to young people who are disaffected, excluded and reluctant to learn (Duckworth, 2005).

Impact of technology on the quality of learning provision

E-maturity and school performance

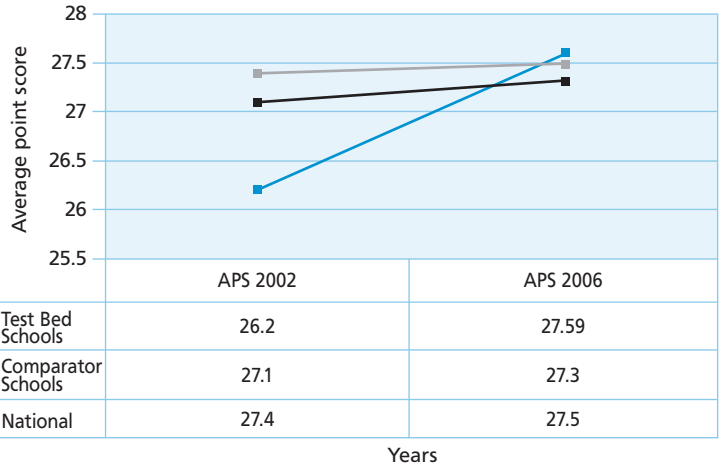
Butt and Cebulla (2006) compared schools' e-maturity scores with a number of performance indicators. They found no evidence of a positive association between performance measures and increased e-maturity in primary schools. However, increases in primary schools' e-maturity between 2002 and 2005 were associated with lower levels of authorised absence during the first year, but not with absences in the final year.

A recent study by Underwood, Baguley *et al.,* (2007) investigated personalising learning with technology. It found that e-maturity was linked to greater 'investment in learning' by pupils, including improvements in work ethos, self-efficacy, motivation and engagement, and higher school performance.

Butt and Cebulla (2006) found that secondary schools exhibiting strong development in e-maturity over the four years demonstrated a statistically significant decrease in absence rates compared to other schools. They also displayed statistically significant improvements linked to higher KS3 average points scores and in the percentage of A* – C grades at Key Stage 4. The researchers concluded that the results suggest a link between performance and e-maturity, although it cannot be concluded with certainty that this link is direct and causal. The link between e-maturity and performance varied over time and further intermediate factors, such as managerial style and the ethos of the school, which the study did not capture, may be important.

Similar associations were investigated for schools in the ICT Test Bed local authorities which had received support to accelerate 'e-maturity'. Local authorities participating in the project are in areas of significant socio-economic disadvantage. At the start of the project in 2002, they were performing below the national average in key stage assessments. The national test results of the schools in Test Bed local authorities improved between 2002 and 2006

Figure 5.2: Comparison of Test Bed schools with the national picture and comparator schools in core subjects



Source: Evaluation of the ICT Test Bed Project Final Report (2007) (Somekh, Underwood et al., 2007)

and the rate of improvement was faster than in equivalent comparator schools in core subjects at Key Stage 2. When the performance on the Key Stage test scores was considered in the form of the average point scores, the Test Bed schools moved from being under-performing schools to matching or bettering the national average. (Somekh, Underwood *et al.*, 2007)

The researchers noted that once technology was embedded, improvement in schools' and colleges' national test outcomes mirrored their e-maturity development. Institutions that were becoming more e-mature improved their performance levels at a faster rate than those which were not. However, innovative and integrated ICT initiatives take considerable time to implement. The final evaluation (Somekh, Underwood *et al.*, 2007) reported that it was at least a year before new infrastructures were in place and at least two years before any impact on students' achievement and standards could be expected. It was also essential that strong leadership was already in place. Where it was not, investment had a more limited impact.

Ofsted judgements about ICT and the quality of learning provision

The impact of technology on the quality of provision is dependent on how it is planned and managed by the institution. Few schools built ICT into their strategic planning as a tool for raising standards (Ofsted, 2005a). Where this did happen, senior managers had a clear overview of the quality of provision across the school. They ensured that there was an ongoing debate about how ICT was used, the way in which it engaged learners and the gains that could be made in learning and teaching.

In these cases subject leaders or heads of department were all involved in ensuring that ICT played a full part in teaching and learning in their subject. ICT was effectively monitored and included how staff used ICT and the use pupils made of the ICT opportunities available. Improvements in teaching, learning and standards were quantified and the outcomes in professional practice and pupil learning were explicitly stated. Ofsted concludes that the issue remains one of inconsistent application of ICT within schools and between subjects and individual teachers.

Inspection data provides further evidence of impact on motivation and engagement. ICT made an indirect impact on standards through improved opportunities for collaboration, creativity and problem solving (Ofsted, 2005a). Pupils were interested, enthusiastic and curious about ICT and this contributed to their engagement and motivation. This drove them to explore the potential of ICT, helped them to sustain their concentration and promoted their independent learning. Pupils' engagement was overwhelmingly good in ICT lessons (Ofsted, 2006). ICT generally impinged on standards in other subjects in indirect ways. However, this was dependent on being part of a well-planned broader context such as appropriate teacher input and support to enable learners to use ICT independently and successfully. (Ofsted, 2005a)

Improving child safety, child protection and well-being

E-safety

As learners spend increasing amounts of time online, both in school and outside, schools are increasingly managing risks relating to inappropriate content or contacts which may put young people's well-being at risk.

Educational establishments adopt a range of policies and procedures to reduce the risk that pupils are exposed to through their use of ICT. The majority of educational establishments (85 per cent) had an Acceptable Use Policy (AUP) in place and 95 per cent had internet filtering systems in place (Barrow, 2006). In some schools, pupils were not allowed to use the internet unless an adult was present. Other schools undertook a risk assessment and required parents and/or pupils to sign an 'acceptable use' agreement (Ofsted, 2006).

Schools and local authorities were better equipped to deal with e-safety breaches if they had in place both an Acceptable Use Policy and an Internet Safety Co-ordinator. Half of schools surveyed had a designated internet safety co-ordinator but many had not reviewed their AUPs recently (Barrow, 2006). Breaches of e-safety were more likely to occur:

- among the older pupils in both primary and secondary schools, most commonly the viewing of unsuitable online material
- where pupils were allowed to bring their own personal equipment on to the premises, such as laptops, or portable storage devices.

The research found that where pupils were taught about e-safety, all breaches of e-safety were reduced.

Teachers' ability to deal with breaches of e-safety depended on the training and support they received, the policies and procedures in place in schools and the effectiveness of technical systems. In many cases schools required more up-to-date information and advice on e-safety issues from local authorities and national agencies.

Child safety and protection

As the previous section noted, systems for enabling professionals (for example, school, police, social care services) to share data and information at a local level are in relatively early stages of development and use.

In a recent survey of local authorities (Sinclair and Mortimer, 2007) respondents were asked to asses the impact that the Every Child Matters agenda has had on the local authority's capacity to provide ICT support to schools. Forty per cent of respondents reported that there had been no impact on their capacity to provide ICT support. A similar proportion (49 per cent) felt that there had been a positive impact (either small or significant) and one in ten felt there had been a negative impact (either small or significant). Only 24 per cent reported that they had a fully operational database for the collection of ECM indicator data from schools. The majority, 71 per cent, reported that while they did not have one at present, planning was under way. However, 5 per cent said they did not have one and had no plans to provide one, suggesting that there are a small number of LAs unconvinced that ICT can support this aspect of the ECM agenda.

Impact on learning

The Becta Review of 2005 and 2006 reported findings from a range of large-scale studies, indicating that ICT use has a positive, if small,

impact on learner attainment and other outcomes. We also know from an extensive review of the literature on ICT and attainment by Cox *et al.*, (2003), that there are positive effects for specific uses of ICT on attainment in almost all National Curriculum subjects. The most marked were in the core subjects of English, mathematics and science at all key stages, where there had been greater investment in the development of subject-specific resources to support teaching and learning. Additional, recent evidence from large-scale studies is now reported, first on intermediate outcomes such as motivation and behaviour, and then impacts on attainment.

ICT, motivation and learner engagement

The *Harnessing Technology in Schools* survey provides a recent picture of teachers' views of the impact of technology on motivation and attainment (Kitchen *et al.*, 2007). Teachers were very positive about the impact that ICT could have on motivation.

In the ICT Test Bed project, student motivation and engagement in learning and education were greatly increased by access to ICT (Somekh, Lewin *et al.*, 2006). Exceptional gains in writing standards by pupils in year 4 and year 5 of the project were considered by teachers to be mainly due to gains in the motivation and hard work of boys. This was considered a result of the support that ICT gave boys (as well as girls) in the writing process and their consequent gains in self-esteem. Secondary students expressed positive views about learning using technology on the basis of the extent to which they were given autonomy and choice in using ICT. ICT also had a positive impact on enjoyment of school. For example, secondary school students who reported 'always' enjoying school increased from below 20 per cent in 2002 to 34 per cent in 2004. (Somekh and Underwood *et al.*, 2005)

Motivational effects of specific technologies and applications

Interactive whiteboards

Condie *et al.* (2006) identified a considerable number of studies, large and small, relating to the impact of interactive whiteboards. The outcomes were universally positive, particularly when they were used in conjunction with other technologies.

In the evaluation of the Schools Whiteboard Expansion of secondary schools in London, researchers noted that in the most effective whiteboard lessons pupils were actively engaged in the learning tasks. Some teachers reported that pupil behaviour had improved through using whiteboards in class (Moss *et al.*, 2006). In primary schools they can act as a focus of pupils' attention and increase their engagement in whole-class teaching, and young children who have yet to acquire writing skills and older pupils with special educational needs, are highly motivated by being able to demonstrate their skills and knowledge with the tapping and dragging facilities of the board. (Somekh, Haldane *et al.*, 2007)

Table 5.1: Primary teachers' views of impact of ICT (percentage agreeing ICT can have a positive impact on the groups listed)

	Motivation		Attainment		Base (all primary teachers answering)
	Agree Strongly %	Agree %	Agree Strongly %	Agree %	
Key Stage 1 pupils	49	45	26	48	539/535
Key Stage 2 pupils	56	42	27	52	559/552
Girls	43	53	24	53	594/580
Boys	59	39	29	50	595/580
Able or gifted & talented pupils	53	42	29	49	598/586
Pupils with special educational needs	58	39	32	51	600/586

Source: Harnessing Technology in Schools survey 2006 (Kitchen et al., 2007)

Table 5.2: Secondary teachers' views of impact of ICT (percentage agreeing ICT can have a positive impact on the groups listed)

	Motivation		Attainment		Base (all primary teachers answering)
	Agree Strongly %	Agree %	Agree Strongly %	Agree %	
Key Stage 3 pupils	42	49	20	47	1184/1174
Key Stage 4 pupils	38	51	23	47	1162/1150
Girls	30	52	19	47	1167/1156
Boys	47	45	23	48	1153/1143
Able or gifted & talented pupils	39	47	23	45	1179/1173
Pupils with special educational needs	45	46	26	47	1173/1163

Source: Harnessing Technology in Schools survey 2006 (Kitchen et al., 2007)

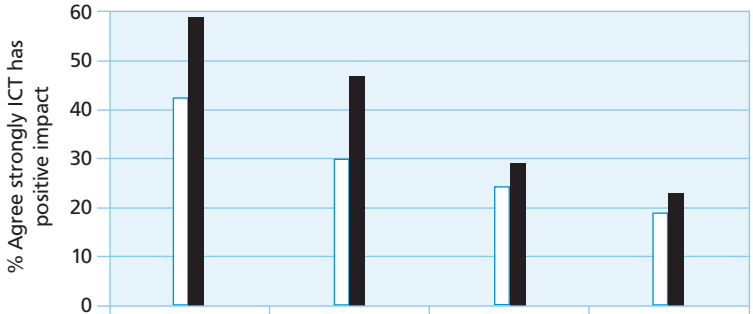
Learners respond positively to the range of media that can be used with the interactive whiteboard (Somekh *et al.*, 2005; Higgins *et al.*, 2005, and Somekh, Haldane *et al.*, 2007). The motivational effect of the technology has been attributed to the 'stepped learning' that characterises much interactive teaching with whiteboards. New concepts can be presented in a logical way, minimising leaps of understanding; learners are provided with new challenges and offered frequent assessment of achievement as a stimulant to further involvement (Miller *et al.*, 2005). However, these impacts can be mitigated if pupils experienced frustration when technical difficulties arose, and if the teacher was not skilled in using the interactive whiteboard (Higgins *et al.*, 2005). Moss *et al.* (2006) found that while secondary school pupils initially welcomed the newness of the technology, any boost in motivation could be short-lived.

Moss *et al.* (2006) also stressed that the benefits of whiteboards would only be realised through an effective learning and teaching strategy supported by appropriate continuing professional development. Some teachers were not using the boards in ways that were pedagogically productive, privileging the use of technological features ahead of any clear pedagogical intentions. This is important too because the pedagogical potential differs according to the subject and curriculum topic being taught.

Games technologies

The Becta Review 2006 highlighted a number of studies which described the way in which young people play online games as part of their use of ICT in the home and how games might be adapted for use in schools (Becta Computer Games in Education Project, 2001 and Sandford and Williamson, 2005). The motivational potential for educational games through role-based, goal directed and challenging play was identified by Facer (2005). Games may have potential to support the development of new cognitive abilities and problem solving, promote communication, working with others, and have potential to support maths learning and thinking skills (Kirriemuir and McFarlane, 2004).

Figure 5.3: Teachers' views of impacts of ICT on girls and boys (percentage agreeing strongly that ICT can have a positive impact)



	Primary Motivation	Secondary Motivation	Primary Attainment	Secondary Attainment
Girls	43	30	24	19
Boys	59	47	29	23

Base: all teachers answering (Primary: 580/595, Secondary: 1143/1167)

Source: Harnessing Technology in Schools Survey 2006 (Kitchen et al., 2007)

Table 5.3: Pupils' reports of the effect of interactive whiteboards at secondary level

Positive Pupil Statements	Agress / strongly agree
IWBs make it easy for the teacher to repeat and summarise	87
I think teachers' lessons are more prepared and organised when they use an IWB	85
IWBs make learning more interesting and exciting	81
It is easier to understand the work when my teacher uses an IWB	77
I think IWBs make teachers' drawings and diagrams easier to see	76
I prefer lessons which are taught with an IWB	74
I learn more when the teacher uses an IWB	70
We get to join in lessons more when my teacher uses an IWB	64

Source: The interactive whiteboards, pedagogy and pupil performance evaluation: An evaluation of the Schools Whiteboard Expansion (Moss et al., 2006)

ICT and learner attainment

The ICT Test Bed project was successful in delivering significant improvements to the attainment outcomes of pupils in the project. Performance on all KS2 tests was found to have significantly improved between 2002 and 2006.

Apart from studies of literacy and numeracy, evidence of positive impact has been reported in mathematics, modern foreign languages, science, history, geography, physical education and creative arts (Condie *et al.*, 2006). However, much of the evidence is from small-scale studies and it is unclear how replicable it might be and the extent to which results would be persistent over time.

The impact of specific technologies on learner attainment

The recent evaluation of the Primary School Whiteboard Expansion project (SWEEP) (Somekh, Haldane *et al.*, 2007) concluded that the length of time pupils were taught with interactive whiteboards was a major factor in pupil attainment across core subjects at Key Stage 2. The study found positive impacts on standards of literacy and mathematics at Key Stages 1 and 2. In particular, at KS2 mathematics, the average and higher attaining pupils of both sexes made greater progress, with more exposure to interactive whiteboards in maths lessons as measured against prior attainment in KS1 national tests. This equated to an increased rate of progress of between 2.5 months for girls of average prior attainment, to 5 months for boys of high prior attainment.

At Key Stage 2 science there were clear benefits for all pupils except high-attaining girls, with the most marked effect for low-attaining boys who made some 7.5 month additional progress when they had two years of exposure to interactive whiteboards compared to no exposure. At Key Stage 1 there was a positive impact in maths and English once teachers had experienced sustained use and the technology had become embedded in pedagogical practice.

A study of secondary school use of whiteboards (Moss *et al.*, 2006) did not identify a significant attainment effect. However, pupils reported that their teaching and learning was better with the use of interactive whiteboards.

Investigations into the use of laptops in and out of school, personal digital assistants (PDAs), mobile phones and tablet PCs are becoming more numerous and advocates are citing evidence of a range of potential benefits (Condie *et al.*, 2006). A study of the Learning 2Go project (Perry, 2005) investigated the use of handheld devices with primary school pupils. Significant gains were recorded across a range of indicators, including general ICT capability, a positive impact on motivation and enthusiasm for learning, attendance (especially for boys) and collaborative working. Gains in attainment were noted, with time spent reading by boys increasing (notably e-books).

Impact of home use of ICT

A study of data from the British Household Panel Survey between 1991 and 2001 by
Schmitt and Wadsworth (2004), found a significant positive association between computer ownership and the number of GCSEs obtained and the probability of passing five or more GCSEs, even controlling for proxies for household wealth and associated effects. Computer ownership was also associated with a significant increase in the probability of passing at least one A level and an increase in the probability of successfully completing three or more A levels.

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Greater choice, opportunities and modes of learning

Personalising learning

The Becta Review 2006 identified a number of indicators that suggest an increasing recognition within colleges of the value of e-learning. The 2006 findings concluded that ICT remains more widely used for learning support and independent learning than for formal delivery. However, the measures of e-learning implementation have become more widespread over the last year, and were more pronounced in the more e-enabled colleges. In particular, the deployment of ICT for teaching and learning in areas such as induction, assessment, teaching and supporting learners, which had largely stalled in 2005, has increased. The number of colleges with no central strategy or policy for ICT in learning and teaching remained largely unchanged at 26 per cent, a rise of 1 per cent on 2005.

Developing ICT practice and pedagogy in the classroom and across the institution

There is widespread expectation among FE lecturers that they will use ICT to support learning and a belief that technology has value in supporting personalising student learning (Crisp, Crawford and Daar, 2006). However, we also know that the majority see ICT as one teaching tool among many and that the implementation of technology varies greatly between subjects and departments

(Harris *et al.*, 2004; LSDA, 2006). Lecturers also need professional development to attain the required pedagogic skills to effectively embed ICT generally into their practice. When these issues are taken into account, it is easy to see why the specific applications of ICT to support personalised learning, through the provision of different modes of learning, choice and opportunity, are likely to be more complex and challenging to implement.

The Becta FE survey identifies how e-learning is used in mainstream college programmes. Use of ICT to support learning remained clearly the most frequent use, being used extensively in 52 per cent of colleges. It represents activity which takes place outside the scheduled learning to complement the main programme and includes the use of the internet for research and the use of technology to support revision or practice, which requires little formal input from the college.

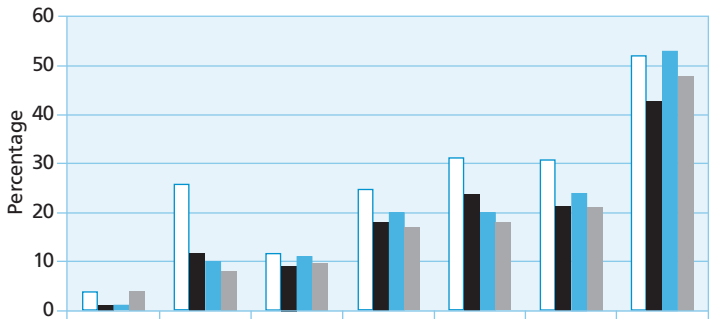
Learning platforms and personalised learning

In terms of the role of learning platforms in supporting personalised learning, the most common features allow them to associate individual learners with particular courses, and with particular preferences (Becta, 2006f). Less common features remember the point in a particular course that a given student has reached and recognise the student's prior learning. The least common feature was the ability to output to a student's e-portfolio. The type of learning platform had a bearing on the features available with colleges that used a VLE as their main platform listing an average of 2.8 features.

Collaborative learning and communication

While the use of email as a tool for staff communication is well established, electronic communication with learners is less common (Becta, 2006f). Nearly all colleges make some use of staff–student communication. However, this is used on all or most college programmes in only 25 per cent of colleges. While there is some use of other electronic communications with learners such as unmoderated learner online discussions, personal websites and blogs,

Figure 5.4: Use of ICT in all or most mainstream college programmes



	Individual-ised programme	Remote access	Learners' own pace	Learners' own time	Part of blended learning	Traditional classroom tool	To support learning
2006	4	26	12	25	31	34	52
2005	1	12	9	18	24	21	43
2004	1	10	11	20	20	24	53
2003	4	8	10	17	18	21	48

ICT Use

Source: ICT and e-learning in further education (Becta, 2006f)

Table 5.4: Platform features that support personalisation

Platform features	Percentage of colleges
Recognises which course(s) the learner is studying	52
Automatically remembers accessibility settings	44
Desktop can be personalised by the learner	41
Recognises prior learning	19
Knows where each learner has got to in a course	18
Outputs to an e-portfolio	6

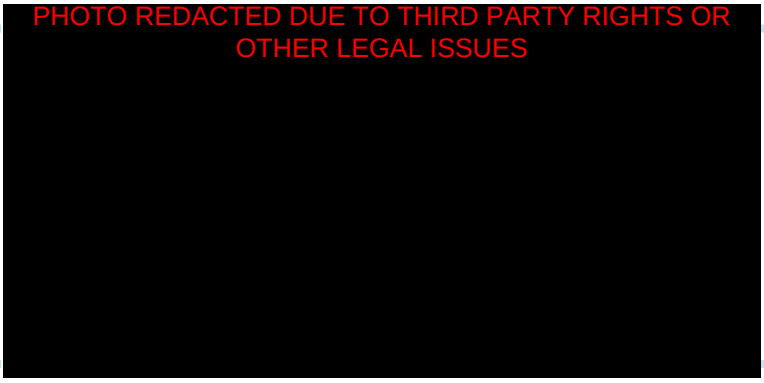
Source: ICT and e-learning in further education (Becta, 2006f)

these are not widespread. Data on the use of learning platforms suggests that over 90 per cent of colleges are using their VLE for discussion.

There is very little evidence beyond individual college case studies about the particular ways in which these technologies are being used within college programmes and the extent to which they offer both new modes of learning and increased learning opportunities.

Continuity of learning and remote access

Technology can enable access to education where this might not otherwise be possible. Deployment of ICT for remote access to learning doubled from 12 to 26 per cent between 2005–2006, indicating a general trend to allow learners access to their



programme at a time and place to suit them. The noticeable rise in remote learning may in part be linked to the remote use of learning platforms and VLEs, noted earlier in Section 3. An example of this type of provision outside the classroom may be seen in the three ICT Test Bed colleges. All had established a VLE and reported increasing use of the VLE for making learning materials available to students. Lecturers found the VLE beneficial for the ease with which they could upload resources for their students. Some teachers expected their students to do work on the VLE between classes.

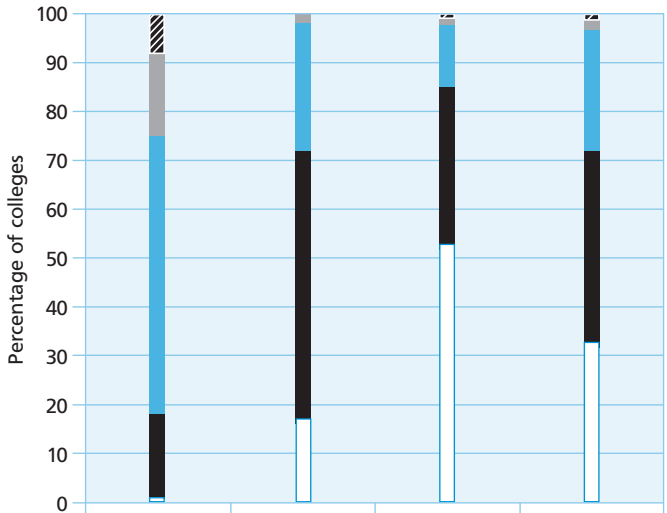
Students found it beneficial as they could access resources from outside the college when it suited them to do so and were able to use them for consolidation or revision. Researchers noted that despite availability, student use of the VLE was patchy. The ability to access materials from outside college helped specific groups of students such as NVQ plumbing students who were mainly self-employed and sometimes could not get into college if they had a job to do.

Evidence from the work-based learning sector suggests that while organisations provide many places for learners to access e-learning opportunities, the number of potential locations differs with the e-maturity of the organisations. Novice organisations, on average, offer less than two locations with more mature organisations offering up to 3.5 locations. The most popular location is at the desk but that is often supported by opportunities to move away from the desk to a quiet study area or an in-house learning centre. Some 76 per cent of learners prefer to study at their desk while 16 per cent prefer home (Overton *et al.*, 2007).

Impact on learning

The Becta Review 2005 stated that the learning and skills sector does not have the same tradition of investigation into the impact of ICT on attainment as the schools sector. Current evidence continues to be limited, local, small in scale and primarily based on the perceived benefits of practitioners and learners. FE impact

Figure 5.5: Use of e-communications with learners



	Email between learner and tutor	Tutor-moderated learner online discussion	Unmoderated learner online discussion	Learner makes use of personal websites / blogs
None	1	17	53	32
Few	17	55	32	40
Some	57	26	13	25
Most	17	2	1	2
All programmes	8	0	1	1

Source: ICT and e-learning in further education (Becta, 2006f)

studies have focused mainly on the evaluation of specific e-learning projects (for example the LSDA Transformation Projects). In addition the literature suggests that positive impact on learner outcomes is achieved when technology is deployed in a planned way in order to address priority issues at an institutional or local level. Where this is the case, benefits are realised. Objective assessments of impact in the FE sector beyond those which are case-specific have been difficult to conduct, because of the range of curricula and assessment in this sector. The main measures of impact in FE generally relate to participation, attainment (as defined by success in a recognised qualification), progression and retention.

ICT, motivation and learner engagement

Findings reported in the *Becta Review 2006* linking the use of technology in FE to student motivation (Golden *et al.*, 2006; Harris *et al.*, 2004) are echoed in a recent survey of post-16 learners in which two thirds recognised the benefits of using computers because they did better in assignments (65 per cent) and had more choices about where and when to study (66 per cent). Men, learners aged 16-18 and learners from ethnic minorities were more inclined to recognise the perceived benefits of using computers than other learners. Also, learners with a disability or learning

difficulty were more likely than those without to agree that computers gave them more choice about where and when to study. (GfK NOP, 2007)

Technology can also attract adult learners who might not otherwise have taken up learning. A study found that of the learners enrolled on learndirect courses in 2005, 65 per cent had not undertaken any learning in the last three years and 25 per cent stated that they would not have undertaken any learning without learndirect (National Audit Office, 2005).

ICT and attainment

There was evidence of a positive impact on learning and motivation in the three FE college departments taking part in ICT Test Bed. The study was not able to identify improvements to progression and attainment, due to changes in college programmes and qualifications. However, student satisfaction with learning rose considerably (from 50 per cent to 99 per cent) during the project, and learners reported being engaged more actively in their learning and in setting their own learning goals.

Golden *et al.* (2006) looked at FE programmes where retention and/or achievement had improved in the last three years. Some 41 per cent reported that use of e-learning had led to improvements in retention (compared to 19 per cent of lecturers overall) and 54 per cent reported that use of e-learning had led to improvements in attainment (compared to 31 per cent of lecturers overall).

In a study of six colleges by Finlayson *et al.* (2006), only in a few cases was there objective evidence that ILT enhanced retention and achievement rates. Where it did, it was noted that e-learning uses were aligned with specific pedagogic purposes and this led to positive outcomes such as increase in students' concentration, confidence and cognition. In these cases excellent teaching was observed as critical to adding value to learning from the use of ICT.

Crisp, Crawford and Daar (2006) concluded in their analysis of recent post-16 e-learning evidence, that there are no studies which establish a robust link between learner retention or achievement and ICT-based interventions. They consider that there are a number of reasons why this may be the case, including study design and the fact that many findings are from surveys which do not collect student impact data. Furthermore, many do not employ research methods likely to yield robust quantifiable evidence on student impact and new approaches are required to test the relationship between ICT or e-learning and student outcomes.

Mackinnon (2007) surveyed the views of work-based learning providers about the benefits of e-learning. Over 80 per cent considered that it would improve the quality of learning, provide a more tailored experience (73 per cent) and as a result increase completion (66 per cent), achievement (68 per cent) and retention (64 per cent). The main benefits were seen as improved learner satisfaction (67 per cent) and outcomes (67 per cent). Other drivers for e-learning adoption in the workplace are flexibility and accessibility. (Overton *et al.*, 2007)

Users of work-based learning also claimed benefits for e-learning, with 65 per cent claiming that it empowered them to take control of their own learning and development. Only 13 per cent would not recommend e-learning to their colleagues.

6 PROGRESS, IMPACT AND STRATEGIC CHALLENGES

PROGRESS AND IMPACT

Overall access and provision

This review has confirmed that learners' access to technology in terms of computer:learner ratios is improving at a slower rate than previous years, and is reaching a plateau in some sectors. However, there is strong growth in the adoption of laptops and other portable devices, indicating potential for greater flexibility of use which may lead to improvements to learners' experience of access to technology. There are also indications of continuing improvements to connectivity, and the UK compares well with other EU countries in terms of a range of indicators of access.

Educational leaders report that they are planning further investment in technology infrastructure. This will be necessary, for it appears unlikely that current needs and priorities will remain stable. For example, the Leitch report suggests that colleges will need to respond flexibly not only to increasing numbers of students but also to the requirement to provide access to learning at a time and place to suit the learner. *2020 Vision* highlighted the need for greater personalising of learning across education, supported by technology. Furthermore, developments in technology continually reveal opportunities for enhancement and enrichment of the learning experience.

It is difficult within a rapidly changing context to predict future technology investment needs of learning providers, something made more complex by a rapidly developing domestic technology market, which is increasingly important in supporting formal learning. There are now greater opportunities for technology to support links between formal and informal learning, home and educational environments and other approaches including remote and online learning. The focus for infrastructure and technology investment is likely to develop rapidly in this context, requiring fresh thinking by education providers and those who support them, and increased agility to respond to developing opportunities and needs.

Rapid adoption of technology and practice in some areas

The use of ICT resources in lessons by teachers has continued to grow in schools and FE colleges. For example, over 40 per cent of teachers now report using subject-specific software regularly in lessons, up from 10 per cent in 2002. Similarly, regular use of the internet in lessons has risen from 5 per cent of teachers to nearly a third.

This sharp rise in use of ICT resources in the curriculum has been driven to a large extent by the adoption of interactive whiteboards (IWBs) and related technologies. Interactive whiteboards are a popular technology, in heavy demand by schools and practitioners. They offer transparent benefits to learning and teaching. That is, it is easy for institutions and teachers to recognise how IWBs enrich and enhance learning and teaching – something which may not always be so immediately transparent to practitioners in the case of other technologies.

An example of similarly-led change is the adoption of integrated e-registration systems, which, again, offer transparent benefits in terms of efficiencies and greater effectiveness in attendance recording, reporting and alerting.

What characterises these technologies is that they link closely to, and support, current educational practice. Adoption of technologies which enable educational practice to develop and change follows a very different pattern, requiring culture change and focused local leadership and management to drive adoption and embedded use.

Delivering change to ensure technology supports the extension and empowering of learning, as well as enhancing and enriching it, is challenging. For this reason, demonstrating transparent benefits from related technologies, and bridging the 'natural' use of technologies which support current practice with those which challenge it, are likely to be important strategies.

Slow adoption of technology and practice in others

Adoption and use of learning platforms is relatively slow in the schools sector. And, while FE colleges are more likely to use learning platforms, use of virtual learning environments (VLEs) as the main platform is the case in a minority of colleges. It is interesting also to note that while 46 per cent of secondary schools report having a learning platform, only 24 per cent of teachers report using one.

Relatively slow adoption can also be seen with other technologies such as video conferencing, use of data loggers (for example in science), and use of creative and collaborative web-based technologies. All these bring potential benefits, but link less easily to established practice than, for example, interactive whiteboards.

While specialist technologies such as video conferencing could be utilised more widely, they do not represent as much cause for concern as learning platforms, which are a central enabling technology linked to a range of technology-supported processes. Learning platforms are central to providing a range of benefits and functions not easily attained without the use of technology. These include enabling learners, parents and carers to access educational information and resources on demand, supporting practitioners in sharing lesson and learning resources, and streamlining a range of educational management processes, including assessment and reporting.

Even where adopted, the main pattern of current use of learning platforms across all sectors is as repositories for lesson and learning resources. It is likely that progress in fuller embedding of technology to support learning will be limited without stronger progress in the adoption and learning platforms and broader use of their functionality.

Educational institutions are likely to require ongoing support in recognising and realising the benefits of learning platforms, and practitioners will require support and time to develop a related repertoire of skills. If adoption and use are to grow at a stronger pace, it is also likely that other levers are needed to stimulate demand for their use. Greater need to provide information to parents and the development of online learning spaces are pressing examples.

Outcomes for learners – good evidence of benefit

Where technology is used to support learning, even if utilised purely to enhance existing practice, we can now be confident there is a positive general impact on learning outcomes. Since the 2003 ImpaCT2 study, an increasing body of evidence has identified statistical links between the use of technology and learning outcomes, ranging from studies of home use of ICT by learners, to studies of the impact of specific technologies (for example, IWBs) on learning, and analysis of the relationship between the development of school e-maturity and school improvement. In the FE and skills sector, robust evidence of impact on outcomes is limited. However, the ICT Test Bed evaluation identified strong improvement through the project to FE learners' reports of engagement in and satisfaction with learning, which improved as the use of technology to support learning increased.

However, positive impact is by no means guaranteed. Technology does not deliver automatic benefits. In the school sector, for example, there is strong evidence of a link between 'embedded' use of IWBs and learner outcomes, but less evidence of a link between use *per se* and improvement to learning. Benefits identified in the recent primary IWB evaluation were stronger in a teacher's second cohort than the first. That is, beyond the first year of using the technology, after a period during which practitioners' confidence and expertise can develop.

Becta evidence also indicates that institutional or provider-level change and related leadership are critical in realising benefits for learners. That is, a learner may benefit to a degree from enhanced learning through technology, but if this experience is 'joined-up' across the institution there is far more chance of benefit to learning outcomes. Impact is most effective where ICT is an integral and embedded part of the day-to-day learning experience.

The body of impact evidence continues to grow and we have a clearer view of the context factors that influence how ICT can be an effective tool in raising standards. Studies relating institutional e-maturity to attainment and other performance measures, show that results have improved faster than in equivalent schools in core subjects. Impact evidence generally remains weakest in the FE and skills sector and often is heavily reliant on case study and individual institution evaluations.

Efficiency and effectiveness

The use of technology to support educational business processes, and to enable practitioners to deliver learning and teaching, is already delivering greater efficiency and effectiveness in education.

We know, for example, that the increased use of electronic registration systems is beginning to show reductions in unauthorised absences, particularly from individual lessons in the secondary sector. Other evidence demonstrates that it saves time for schools and practitioners in recording and reporting on attendance. We also know that, where used, digital resources in

lesson planning, preparation and delivery offer significant value, enabling the development of higher quality learning and teaching resources, and greater scope to share these with others, both with and beyond the institution. It seems that, currently, we are seeing most value gained where technology can automate or enhance existing practice.

However, while there are clearly some easy wins in terms of efficiency and effectiveness resulting from greater use of technology, adoption and use is variable, so not all practitioners and institutions are gaining this value. In addition, in other areas where there is apparent potential for delivering greater efficiency (in terms of greater value for the same effort or resource applied) there is very little progress at present. Notable examples include the relatively untapped potential for technology to enable learning providers to collaborate and share resources, to enable a greater level of assessment for learning, and to support the use of information across and between institutions and sectors.

Sharing data, learning resources or whole courses, whether within a local authority, between institutions, or through regional consortia, is still at an early stage. This kind of value, based as it is in transforming practices and models of educational delivery, is particularly challenging to realise. However, where it is delivered there is evidence of real and long-term benefit in terms of efficiency and effectiveness. In many cases technology implementation in itself does not represent a significant barrier to progress. What is required is wider acceptance of the planned transformation, co-ordination and planning, development time, training and other resources to enable these sometimes complex projects to become a reality.

Co-ordination between educational institutions, whether schools, FE providers or both, is best achieved where there is clear mutual benefit. Current 14–19 partnerships between FE providers and schools represent one example of an opportunity for delivering education provision in different ways to enable efficiencies and improved effectiveness. This may be via, for example, common platforms and administrative systems or shared resources and tools for learners. What is required at this early stage is effective promotion of lessons from projects of this kind, and other collaborative projects, so that learning can take place across the system.

STRATEGIC CHALLENGES

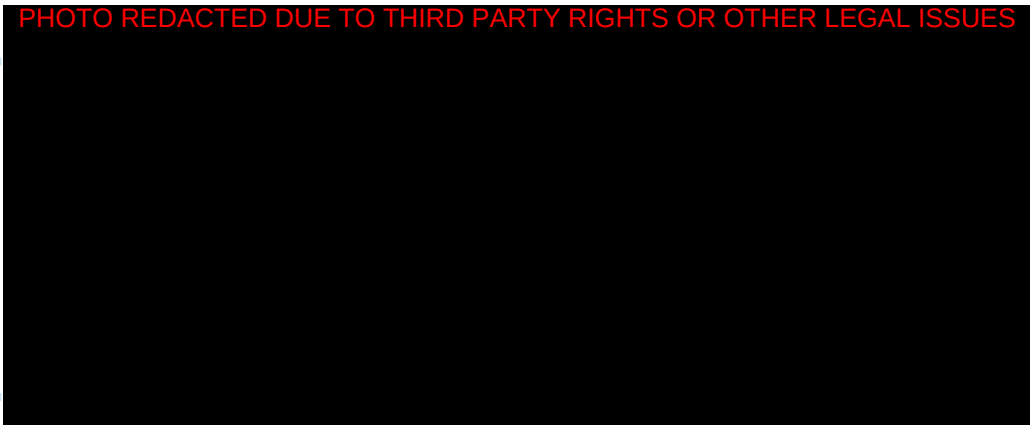
Technical barriers

This review tells us that, despite significant progress in the adoption and use of technology to support learning over recent years, schools and providers are still struggling with a range of technical and technology-related challenges.

Primary schools, for example face continuing issues in ensuring adequate technical support, with a member of teaching staff providing the main technical support in 27 per cent of cases. In addition, despite good broadband links to schools, the evidence tells us that the broadband experience in the classroom and elsewhere is not always perfect, with 33 per cent of schools reporting that their internet connection does not meet all their requirements.

In addition, and as reported in previous reviews, linkage between learning platforms and management information systems remains a problem. Very few schools with learning platforms have a link to the school MIS, and numbers are also low (33 per cent) for FE colleges. This does not necessarily reflect problems with interoperability of data. Though this is often the case, interoperability issues are increasingly addressed by common supplier standards and specifications. It is likely that the failure to link these systems is due to relatively poor technical planning and support, coupled with network limitations and senior managers being unaware of the potential benefits afforded by these systems.

These issues, where they exist, represent barriers to further embedding of technology to support learning, although none of them are particularly difficult to address. However, planning, capability and capacity to address them are not always in place to do so. Smaller institutions especially require ongoing support and help to recognise and address technical and technology-related issues. There is a strong argument for promoting more 'wrap-around' services to schools, possibly linked to local partnerships and/or contractual arrangements with the commercial ICT sector. These should not only aim to lift the burden of technology implementation and support from institutions or providers with limited capacity, but also integrate technology planning with more general business and improvement planning.



Institution and provider e-maturity

A key issue for the education system in realising the value of technology investment in education, also identified in the 2005 and 2007 reviews, is that of developing institutional or provider-level e-maturity. This is the capability of institutions to resource, lead and manage technology-related change and to develop a workforce to utilise technology effectively to deliver technology-supported learning across the curriculum.

Becta has monitored progress in this area since 2004 when PwC estimated that only 10 per cent of primary schools, 14 per cent of secondary schools and 8 per cent of FE colleges were 'e-enabled'. Based on matching Becta data to PwC's indicators, progress in developing e-mature schools is fairly slow.While there has been progress, the large majority of schools are not yet e-enabled. Overall, change at this level is proving difficult, far more so than that based on 'simple' adoption of specific technology by practitioners such as IWBs. In the learning and skills sector, some 25 per cent of colleges are now e-enabled. However, much of the change that is happening in the FE sector is still enthusiast-led, rather than based in mainstream leadership and management.

There are many sources of support in this area for leaders and managers, including advice, support tools such as Becta's Self Review Framework and training through NCSL's programmes, including, now, aspects of the mandatory National Professional Qualification for Headship (NPQH). In the FE and Skills sector, the new Leadership Standards and qualification developed by LLUK includes effective use of new and emerging technologies in the standards. The qualification will be mandatory for all new principals from September 2007 and taken together with the eQuIP e-learning quality improvement programme for senior managers, has the potential to encourage ICT strategy development, and support the wider embedding agenda in colleges.

However, support and guidance, while important, represent just one strategy for delivering change in the education system. Public policy needs to develop further strategies to drive the required change. Many education leaders recognise the need for technology to support learning more effectively in order to deliver the ambitions of the education and skills system, and at a system level there are compelling reasons to modernise educational delivery for the benefit of learners entering a rapidly changing knowledge economy. But institutions and providers have few compelling reasons to invest resources and effort in delivering the change.

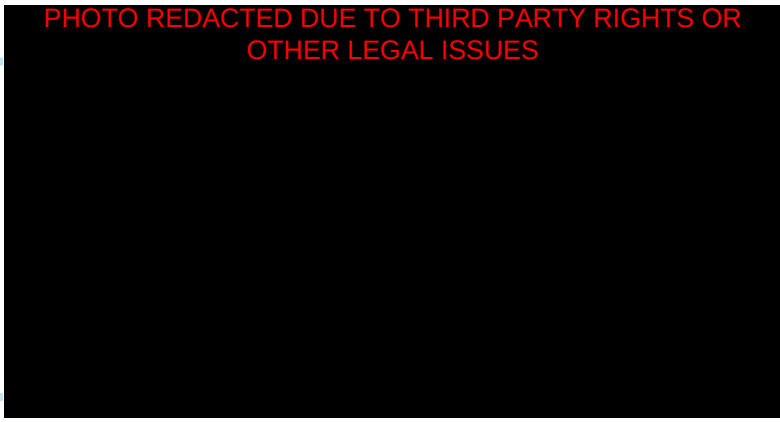
Given compelling reasons for change, but the genuine challenge of delivering change at this level, it may be that new incentives and levers, for example new accountabilities for schools, are required to drive it.

Pedagogical change

Though there is evidence of significant integration of technology across curriculum delivery, the type of use remains fairly limited, focused in schools primarily on whole-class technologies and the use of office tools and internet search tools by learners.

For example, 75 per cent and 80 per cent of primary and secondary teachers respectively report they rarely or never use technology to support learners working together. Practice in using technology with learners for analysing information, problem solving, collaboration and creativity is also more limited than in the primary sector. This may be constrained by secondary school timetables, which commonly limit time spent focusing on a particular subject. It may also be limited by the demands of the curriculum, or skills and confidence of teachers.
Whatever the reasons, the use of technology to support curriculum-based learning in schools often situates learners in a passive role in the process of knowledge creation, which represents a very different position from learners' use of technology outside of education. The pedagogical approach most commonly adopted is unlikely to encourage the range of competencies increasingly demanded by employers and the economy more generally. It also potentially presents risks of further dislocation between learners' informal experiences at home and those in education, possibly at the expense of learners' enthusiasm for educational experiences. This is at a time when personalisation debates increasingly recognise the need for closer links between formal and informal learning.

Clearly there is a significant 'pedagogical agenda' to pursue if uses of technology are to be developed effectively. In terms of advice and other support to the front line, the focus needs to be on the development and transformation of learning and teaching for the 21st century. Technology must become secondary to a larger learning and teaching agenda.



Professional development

In recognising that practitioners' uses of technology to support learning are relatively immature, there necessarily follows a discussion of the challenge of supporting effective professional development. Professional development of teaching practitioners is a complex area, and effective approaches for enabling practitioners to develop the repertoire of skills and approaches required are likely to be equally complex.

Currently much practitioner professional development is supported by institutions and learning providers, but its timing and its format often fail to fulfil expectations. When institutions plan technology developments, practitioners' skills and competencies should be developed as part of the overall strategy, but frequently they are not. However, this cannot be guaranteed, and particularly in the case of teachers, strong professional affiliations and identities also exist which affect professional development. These extend across institutional boundaries, for example at the level of sector or subject specialism.

We also need to develop a more sophisticated understanding of the ways in which teachers develop their professional practices to better meet the challenges of workforce development. Training, though playing a role, is not necessarily the answer to current professional development needs, which require a profound change in cultures of practice.

There is a paradox that both headteachers and teachers consider that teachers have adequate skills to use technology in teaching and learning, but teachers' most often expressed CPD need is exactly this. It indicates both a confidence in the *context* of current practice, and an awareness of the continuing need for development. This paradox provides an opportunity to raise the debate about exactly what repertoire of skills and approaches are required by teachers, and other groups in the education workforce, in a modern education system.

Personalised learning requires new pedagogical approaches, and new approaches to learner support and management. This review has offered examples of approaches which support greater personalisation. Clarifying the vision and the implications of personalised learning, and discussing exemplars of practice in relevant professional forums, will be critical to developing the right culture to support improved professional development.

Continuity of learning

One of the weakest areas of progress is the use of technology to support continuity of learning, especially in the school sector. Technology offers opportunities, for example, for parents and carers to participate more fully in children's learning – a key factor in educational success – and for young people to access learning resources and tools to support learning at home and enable collaboration with their peers. Access to and use of learning platforms enables this, but delivering this in an effective way is a challenge. This goes beyond simply providing information and learning resources online, to include support, advice and collaborative and constructive tools.

A key issue still, despite statistics demonstrating generally high levels of access to the internet by young people, is ensuring all learners have access to technology-based learning resources and tools at home. There are still many young people who lack internet access, and, as the ICT Test Bed has demonstrated, developing sustainable models for ensuring all young people have access to this, and to relevant tools and resources, is difficult for schools and local authorities for a range of reasons. These include software licensing constraints, administrative burdens and lack of phone line access in some homes. The current Ministerial 'Home Access Taskforce' is currently considering approaches for achieving access, bringing together industry, educators and other relevant organisations to address this problem.

But the main issue is the same as that raised already in this chapter. It is one of technology-enabled change to current educational practice. This is something which is challenging and which requires change to cultures of practice as well as leadership, resourcing and careful management. Use of technology to support effective continuity of learning is clearly at an early stage. It is more likely to be seen in Higher and Further education contexts, and in work-based sectors where learners lead and direct much of their learning, and where remote learning is a necessity in many cases. Understanding what continuity of learning, supported by technology, looks like for different learner groups and sectors is essential. Developing greater intelligence on related models and approaches to implementation is also essential, and is a key role for organisations like Becta who have a role in supporting change.

Partnerships for business efficiency and effectiveness

Many of the issues and challenges discussed in this section represent challenges because there are inevitable limits to what educational institutions and providers are able to achieve in their own right. There may be limitations, for example, in relation to purchasing the right technologies and resources at the right price, managing technical support services, providing access for learners and practitioners to online resources and assets, delivering efficient educational services such as a broad curriculum suited to the needs of different learners, or providing extended support for learners in the context of increased 'any time, anywhere' learning.

Clearly, increased partnership working at local, regional or national level is an important factor in delivering technology-related benefits and realising greater value from technology assets which are currently in place. There are examples of this already, including local and regional learning platforms, resource repositories and portals, aggregated local purchasing of technology infrastructure and services and centrally-provided online learning support procured by local authorities (for example, for children of Travellers).

As with the challenge of supporting greater continuity of learning, national-level action in this area must include promoting exemplars and models of effective and efficient educational delivery supported by technology. Offering incentives and refining accountabilities for delivering business efficiencies with the support of technology is also important. But it is also important to recognise that local needs have local solutions and that, though there may be effective general approaches identified as part of this process, there should not be an assumption that 'one size fits all'.

CONCLUSION: MEETING THE CHALLENGE OF CHANGE

The Harnessing Technology Review 2007 has reported progress and impact in many aspects of the development of technology's role in the school and FE and skills sectors. Though this section has mainly focused on strategic challenges, this is not to underplay the significant technology-related change already being delivered by educational institutions and providers and the educational workforce for the benefit of learners.

However, the main concluding message from this review is the continuing need to find effective ways to deliver the change so clearly required in order to realise the full benefits of technology for the education system. This review tells us something about the complexity of that change, including the factors and barriers, and roles and actions required to delivering it effectively. It adds up to a challenging agenda which can only be delivered in partnership across the education and skills system. The need for continued clarity and coherence of vision and leadership at all levels in the system, from institutional to local and national, is essential. Becta will continue to play a central leadership and co-ordination role, linking up partners and providing strategic co-ordination and guidance for all.

7 REFERENCES

Ashby, J., (2007), *General Teaching Council for England Survey of Teachers 2004-06 Report on trend data. April 2007.* General Teaching Council for England http://www.gtce.org.uk/shared/contentlibs/126795/93128/126346/207305/trend_rpt.pdf

Balanskat, A., Blamire, R., Kefala, S., (2006), *The ICT Impact Report*, Brussels: European Schoolnet http://ec.europa.eu/education/doc/reports/doc/ictimpact.pdf

Band, S., Muijs, D., and Lindsay, G., (2005), *Evaluation of Capital Modernisation Funding for Electronic Registration in Selected Secondary Schools: 2nd interim report.* Coventry: University of Warwick http://www.dfes.gov.uk/schoolattendance/uploads/EREG%202ND%20INTERIM%20REPORT%20JAN05.doc

Barrow, C. (2006), *E-safety: the experience in English educational establishment.* Coventry: Becta http://becta.org.uk/page_documents/research/esafety.pdf

Becta (2005a), *The Becta Review 2005. Evidence on the progress of ICT in education. Becta ICT Research.* Coventry: Becta http://www.becta.org.uk/page_documents/research/becta_review_feb05.pdf

Becta (2005b), *ICT and E-learning in Further Education: the challenge of change. A report to Post-16 E-Learning Policy and Project Board.* Coventry: Becta http://ferl.qia.org.uk/content_files/ferl/pages/surveys/ICTandelearning2005/ICT_in_FE_report.pdf

Becta (2005c), *School management information systems and value for money.* Coventry: Becta http://publications.becta.org.uk/display.cfm?resID=25917&page=1835

Becta (2005d), *Tablet PCs in Schools. A review of the literature and selected products.* Coventry: Becta http://partners.becta.org.uk/index.php?section=rh&catcode=_re_rp_ap_03&rid=11279

Becta (2006a), *Harnessing Technology – Delivery Plan.* Coventry: Becta http://publications.becta.org.uk/display.cfm?resID=28223&page=1835

Becta (2006b), *Emerging Technologies for Learning.* Coventry: Becta http://partners.becta.org.uk/page_documents/research/emerging_technologies.pdf

Becta (2006c), *Broadband data collection tool.* http://bdct.becta.org.uk/

Becta (2006d), *The Becta Review 2006: Evidence on the progress of ICT in education.* Coventry: Becta http://partners.becta.org.uk/page_documents/research/The_Becta_Review_2006.pdf

Becta (2006e), *Evaluation of the Framework for ICT Technical Support (FITS): A study of the implementation and impact of FITS in secondary schools.* Becta ICT Research series. Coventry: Becta http://partners.becta.org.uk/page_documents/research/evaluation_fits_jan06.pdf

Becta (2006f), *The ICT and e-learning in FE survey 2006: Management, learning and improvement. A report on the further education sector's engagement with technology.* Coventry: Becta http://publications.becta.org.uk/display.cfm?resID=28534&page=1835

Becta (2006g). *School and college improvement through ICT.* Coventry: Becta http://publications.becta.org.uk/display.cfm?resID=25928&page=1835

Becta (2006h), *Survey of LAN Infrastructure and ICT Equipment in Schools 2005. Main Report.* A report by Atkins Management Consultants for Becta. Coventry: Becta http://partners.becta.org.uk/page_documents/research/survey_of_lan_infrastructure0306v2.pdf

Becta (2006i), *The ICT and e-learning in FE survey 2006: key findings.* Coventry: Becta http://publications.becta.org.uk/download.cfm?resID=25964

Becta (2007a), *Learning platform research study: Final report.* Coventry: EdExel on behalf of Becta, March 2007, Coventry: Becta (Unpublished report)

Becta (2007b), Download of Curriculum Online database of registered products. CEPA calculations for Becta.

Becta (2007c): *The impact of e-portfolios on learning.* Coventry: Becta

BESA (2006), *Resources in Independent Schools: Benchmarking report.* London: BESA

Blamire, R., (Ed.), (2006), *Peer reviewing for school development: The experiences of P2P project practice strand.* Brussels: European Schoolnet http://insight.eun.org/shared/data/insight/documents/school-practice.pdf

Busuttil-Reynaud, G., Winkley, J., Roads, M., Burke, P., Jeram, K., Hammond, J., Bolton, D., Collett, M., Caselton-Bone, S., Norman, J., Smith, B., and Whitelock, D. (2006), *Report for Becta scoping and evaluating E-Portfolios. April, 2006,* Coventry, Becta. An unpublished report by 3 Square Solutions for Becta and JISC.

Butt, S., and Cebulla, A. (2006), *E-maturity and school performance – A secondary analysis of COL evaluation data.* London: National Centre for Social Research

Cabinet Office (2007), *Transformational Government: Enabled by technology. Annual Report 2006.* CM 6970. London: TSO http://www.cio.gov.uk/transformational_government/strategy/

Comber, C., Lawson, T., Barker B., and Hingley, P., (2006), *NCSL/Becta Strategic leadership in ICT Programme (SLICT). Phase III Final Report*, October 2006. University of Leicester: School of Education

Commission of the European Communities (2007), i2010 - Annual Information Society Report, Brussels, 2007

Condie, R., Munro, B., Muir, D. and Collins, R. (2005), *The Impact of ICT Initiatives in Scottish Schools: Phase 3.* Edinburgh: Scottish Executive Education Department http://www.scotland.gov.uk/Resource/Doc/46932/0023988.pdf

Condie, R., and Munro, B. with Seagraves, L. and Kenesson, S. (2006), *The impact of ICT in schools – a landscape review.* Coventry: Becta http://publications.becta.org.uk/display.cfm?resID=28221&page=1835

Cox, M., Abbott, C., Blakeley, B., Beauchamp, T., and Rhodes, V. (2003), *ICT and Attainment , A review of the Research Literature*, ICT in Schools Research and Evaluation Series No. 17, Becta/DfES, Coventry/London. http://partners.becta.org.uk/page_documents/research/ict_attainment_summary.pdf

Crisp, P., Crawford, G. and Daar, Z. (2006), *Post-16 Strategic Analysis: Analysis of recent post-16 e-learning evidence.* Coventry: Becta (Unpublished report)

Davitt, J (2005), *The future looks palm-sized.* Guardian Unlimited, March 7, 2005 http://education.guardian.co.uk/elearning/story/0,,1724604,00.html

DfES (2003), *Every Child Matters,* Cm 5860, Norwich: TSO http://www.everychildmatters.gov.uk/_files/EBE7EEAC90382663E0D5BBF24C99A7AC.pdf

DfES (2007a), *GCSE and Equivalent Examination Results in England 2005/06* (Revised) http://www.dfes.gov.uk/rsgateway/DB/SFR/s000702/index.shtml

DfES (2007b), Computer:pupil ratios from PLASC 2006. http://www.teachernet.gov.uk/wholeschool/ictis/facts/

Dixon, J., Farrell, C., and Barnard, M. (2005), *Evaluation of Curriculum Online: Report of the qualitative study of schools.* Coventry: Becta http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/curriculum_online/col_exec_summary.pdf

Dodd, A. (2006), *Investigating the Effective Use of Resources in Secondary Schools.* DfES Research Report RR799. London: DfES. http://www.dfes.gov.uk/research/data/uploadfiles/RR799.pdf

Duckworth, J. (2005), *Notschool.net Evaluation.* Exmouth: Julia Duckworth Ltd http://www.thecademy.net/inclusiontrust.org/IT-media-papers_files/NS_eval_01.pdf

EdComs (2005), *Headspace national survey of headteachers.* Guardian Newspapers Ltd and EdComs Ltd

Edcoms (2006a), *Headspace national survey of headteachers. Wave 5: Report of findings.* Guardian Newspapers Ltd and EdComs Ltd

Edcoms (2006b), *Headspace national survey of headteachers. Wave 4: Primary and secondary data.* Prepared by ICM Research. Guardian Newspapers Ltd and EdComs Ltd

Empirica (2006), *Benchmarking Access and Use of ICT in European Schools.* http://ec.europa.eu/information_society/eeurope/i2010/docs/studies/final_report_3.pdf

European Commission (2006), *Benchmarking access and use of ICT in European schools 2006: Final report from Head Teacher and Classroom Teacher surveys in 27 European countries.* Bonn: European Commission. http://europa.eu.int/information_society/eeurope/i2010/docs/studies/final_report_3.pdf

Facer K. (2005), *Why do we think it's worth talking about computer games and learning in the same breath?* Bristol: Nesta Futurelab http://www.nestafuturelab.org/research/discuss/02discuss01.htm

Facer K. and Owen M. (2005), *The potential role of ICT in modern foreign languages learning 5–19, Discussion Paper.* Bristol: Nesta Futurelab http://www.nestafuturelab.org/research/discuss/03discuss01.htm

Finlayson, H., Maxwell, B., Caillau, I and Tomalin, J. (2006), *Impact of e-learning in Further Education: the impact on student intermediate and endpoint outcomes.* Sheffield Hallam University, Centre for Education Research. Final Report: DfES http://www.dfes.gov.uk/research

Gatliffe, B. and Wendl, F. (1998), 'Inter-institutional collaboration and team-teaching' in *American Journal of Distance Education* 12(1), 26-37.

GfK NOP (2007), *FE Learner Survey.* Coventry: Becta

Gee,J. (2003), *What Computer games can teach us about learning and literacy.* New York: Palgrave Macmillan

Gilbert, C. (2006), *2020 Vision. Report of the Teaching and Learning in 2020 Review Group.* London: DfES http://publications.teachernet.gov.uk/eOrderingDownload/6856-DfES-Teaching%20and%20Learning.pdf

Golden, S., McCrone, T., Walker, M. and Rudd, P. (2006), *Impact of e-learning in Further Education: Survey of Scale and Breadth.* National Foundation for Educational Research/DfES Research Report RR745. London: DfES http://www.dfes.gov.uk/research/data/uploadfiles/RR745.pdf

Green, H., Facer, K., Rudd, T., Dillon, P. and Humphreys, P. (2005), *Personalisation and Digital Technologies.* Bristol: Futurelab http://www.futurelab.org.uk/download/pdfs/research/Personalisation_Report.pdf

Green, H., and Hannon, C. (2007), *Their Space: Education for a digital generation.* London: Demos
http://www.demos.co.uk/files/Their%20space%20-%20web.pdf

Granville, S, Russell, K and Bell, J. (2005), *Evaluation of the Masterclass initiative.* Glasgow: The Scottish Executive Social Research Unit
http://www.scotland.gov.uk/Publications/2004/09/19963/43200

Harris, R., Hall, J., Muirhead, A., McAteer, E., Schmoller, S., and Thorpe, G., (2004), *Impact of e-learning on learner participation, attainment, retention and progression in Further Education: report of a scoping study.* Research Report RW15. London: DfES
http://www.dfes.gov.uk/research/data/uploadfiles/RW15.pdf

Hertfordshire County Council, *Experiences of Online School Admissions at Hertfordshire County Council*, 2006
http://bip.rcoe.gov.uk/rce/aio/27221

Higgins, S., Falzon, C., Hall, I., Moseley, D., Smith, H. and Wall, K. (2005), *Embedding ICT in the Literacy and Numeracy Strategies.* Newcastle: University of Newcastle
http://www.becta.org.uk/page_documents/research/univ_newcastle_evaluation_whiteboards.pdf

Hutchings, M., Smart, S., James, K., and Williams, K., (2006), *General teaching Council for England Survey of Teachers 2006.* Institute for Policy Studies in Education, London Metropolitan University
http://www.gtce.org.uk/research/tsurvey/tsurvey06/

Intuitive Media (2006), *Sharing Ideas: Learners as Content Providers,* November 2006. A report by Intuitive Media for Becta

Jervis, A. and Gkolia, C. (2006), *Productive time follow-up studies: Study 1 - Learning Platforms.* Manchester. School of Education, University of Manchester

Kessel, van N. et al. (2005), *ICT Education Monitor: Eight years of ICT in schools.* The Netherlands, Ministry of Education, Culture and Science.

Kirkup, C., Sizmur, J., Sturman, L. and Lewis, K. (2005), *Schools' Use of Data in Teaching and Learning*, NFER/DfES, London: DfES
http://www.dfes.gov.uk/research/data/uploadfiles/RR671.pdf

Kirriemuir, J. and McFarlane, A. (2004), *Literature Review in Games and Learning.* Report 8. Bristol: Nesta Futurelab
http://www.nestafuturelab.org/research/lit_reviews.htm#lr08

Kitchen, S., Mackenzie, H., Butt, S. and Finch, S. (2006), *Evaluation of Curriculum Online Report of the third survey of schools.* Coventry: Becta
http://publications.becta.org.uk/download.cfm?resID=25949

Kitchen, S., Dixon, J., McFarlane, A., Roche, N. and Finch, S. (2006), *Curriculum Online: Final Report.* Coventry: Becta
http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/curriculum_online/curriculum_online_final_report.pdf

Kitchen, S., Finch, S and Sinclair, R. (2007), *Harnessing Technology schools survey 2007.* Coventry: Becta
http://partners.becta.org.uk/index.php?section=rh&catcode=_re_rp_02&rid=14110

Korte, W. B. and Hüsing, T, (2007). *Benchmarking Access and Use of ICT in European Schools 2006: Results from Head Teacher and A Classroom Teacher Surveys in 27 European Countries.* eLearning Papers, vol. 2 no. 1.
http://www.elearningeuropa.info

Lewis, K., Kendall, L. and Teeman, D. (2005), *Evaluation of the East Midlands Broadband Consortium. Connectivity in Schools. Findings from an Online Survey.* Slough: NFER
http://www.nfer.ac.uk/publications/pdfs/downloadable/EMC.PDF

Lewis, K., Teeman, D. and Kendall, L. (2006). *Evaluation of the East Midlands Broadband Consortium. Final Report.* Slough: NFER
http://www.nfer.ac.uk/publications/pdfs/downloadable/emc2.pdf

Lindsay, G., Muijs, D., Hartas, D., and Band, S., (2006), *Evaluation of Capital Modernisation Funding for Electronic Registration in Selected Secondary Schools.*
http://www.dfes.gov.uk/research/programmeofresearch/projectinformation.cfm?projectid=13713&resultspage=1

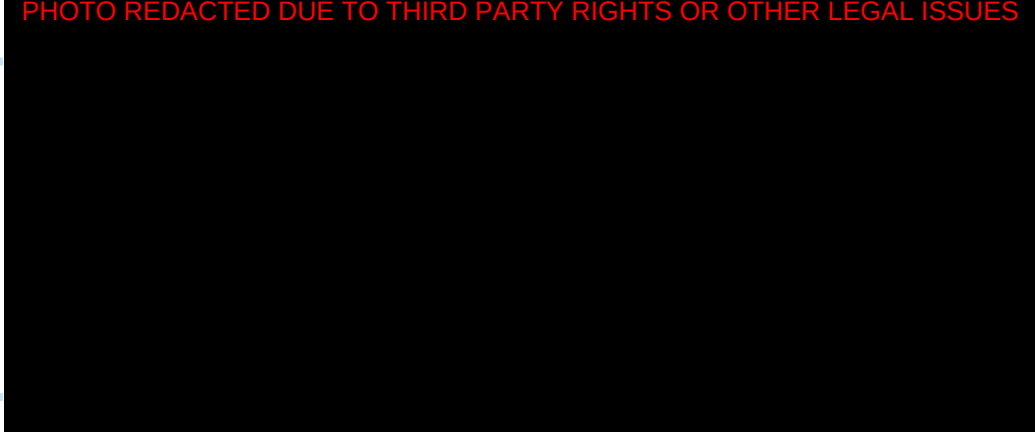
Livingstone, K. and Condie R. (2003), *Evaluation of the SCHOLAR programme. Final report for the Scottish Executive Education Department.* Edinburgh: Scottish Executive
http://www.flatprojects.org.uk/evaluations/evaluationreports/scholarreport.asp

Livingstone, S. and Bober, M. (2005), *UK Children go Online.* Media@LSE, Department of Media and Communications. London: London School of Economics
http://www.children-go-online.net

LSDA (2006): *Transformation Projects: what works and why? Final evaluation report to the steering committee, September 2005.* E-learning and technology programme. London: Learning and Skills Development Agency
http://www.learningtechnologies.ac.uk/transformation/default.asp?area=45

MacKinnon Partnership (2005), *A survey of the use of ICT and e-learning for work-based learning in the skills sector.* Coventry: Becta
http://www.becta.org.uk/page_documents/research/wbl_literature_review.doc

Mackinnon Partnership (2007), *The use of ICT and e-learning by work-based learning providers. 2006 Survey, Waves 1 and 2. A final report to Becta and the Association of Learning Providers, September, 2006.*
http://www.elearningproviders.org/HTML/images/cms/2006wbl_provider_e-learning_survey1and2finalreport.pdf



Miller, D., Averis, D., Door, V., Glover, D. (2005), *How can the use of an interactive whiteboard enhance the nature of teaching and learning in secondary mathematics and modern foreign languages?* Becta ICT Research. Coventry: Becta
http://partners.becta.org.uk/page_documents/research/bursaries05/interactive_whiteboard.pdf

Moss, G., Jewitt, C., Levacic, R., Armstrong, V., Cardini, A. and Castle, F. (2006), *The interactive whiteboards, pedagogy and pupil performance evaluation: An evaluation of the Schools Whiteboard Expansion (SWE).* London, DfES
http://www.dfes.gov.uk/research/programmeofresearch/projectinformation.cfm?projectId=14213&type=5&resultspage=1

National Audit Office (2005), *Improving school attendance in England*. London: NAO/The Stationery Office.
http://www.nao.org.uk/publications/nao_reports/04-05/0405212.pdf

National College of School Leadership (2006), *Annual review of research 2004–05.* Nottingham: NCSL
http://www.ncsl.org.uk/media/1CA/A8/annual-review-of-research-2004-05.pdf

OECD (2005), *Are Students Ready for a Technology-Rich World? What PISC studies tell us.* OECD Programme for International Student Assessment. France: OECD
http://www.sourceoecd.org/education/9264036083

Ofsted (2004), *ICT in Schools: The Impact of Government Initiatives Five Years On,* HMI 2050. London: Ofsted
http://www.ofsted.gov.uk/publications/index.cfm?fuseaction=pubs.displayfile&id=3652&type=pdf

Ofsted (2005a), *Embedding ICT in schools – a dual evaluation exercise.* Ofsted, December 2005, HMI 2391. London: Ofsted
http://www.ofsted.gov.uk/publications/index.cfm?fuseaction=pubs.summary&id=4128

Ofsted (2005b), A*nnual report of Her Majesty's Chief Inspector of schools 2004/5.* London: Ofsted
http://www.ofsted.gov.uk/publications/annualreport0405/

Ofsted (2005c), *Primary National Strategy. An evaluation of its impact in primary schools 2004/05.* Ofsted, December 2005, HMI
2396.http://www.ofsted.gov.uk/publications/index.cfm?fuseaction=pubs.displayfile&id=4117&type=pdf

Ofsted (2006a), The initial training of further education teachers. Findings from 2004/05 inspections of courses leading to national awarding body qualifications. Ofsted, February 2006, HMI 2485. London: Ofsted.
http://www.ofsted.gov.uk/publications/index.cfm?fuseaction=pubs.summary&id=4153

Ofsted (2006b), *The Annual Report of Her Majesty's Chief Inspector of Schools 2005/06.* London: Ofsted
http://www.ofsted.gov.uk/assets/Internet_Content/Shared_Content/Files/annualreport0506.pdf

Overton, L., Hills, H. and Dixon, G. (2007), *Towards maturity: Looking at the impact of e-learning in the workplace.* London: E-skills UK
http://www.e-skills.com/Work-based-e-learning/1411

Passey, D. (2005), *E-learning: An evaluation review of practice across the West Midlands Regional Broadband Consortium.* Lancaster: Department of Educational Research, Lancaster University
http://www.wmnet.org.uk/wmnet/custom/files_uploaded/uploaded_resources/874/2005report.pdf

Perry, D (2005), *Wolverhampton LEA "Learning2go" mobile learning: PDAs in Schools project.* Painswick, Gloucs: David Perry Associates
http://wgfl.wolverhampton.gov.uk/

Pratchett, R. (2005), *Digital play, digital lifestyles.* London: BBC.
http://crystaltips.typepad.com/wonderland/files/bbc_uk_games_research_2005.pdf

PricewaterhouseCoopers (2004a), *Moving Towards e-Learning in Schools and FE Colleges - Models of Resource Planning at the Institution Level*, DfES Research Series Ref No. RR601. London: DfES
http://www.dfes.gov.uk/research/data/uploadfiles/RR601.pdf

PricewaterhouseCoopers (2004b), *Using ICT in Schools: Addressing Teacher Workload Issues,* DfES Research Series Ref No.RR595. London: DfES
http://www.dfes.gov.uk/research/data/uploadfiles/RR595.pdf

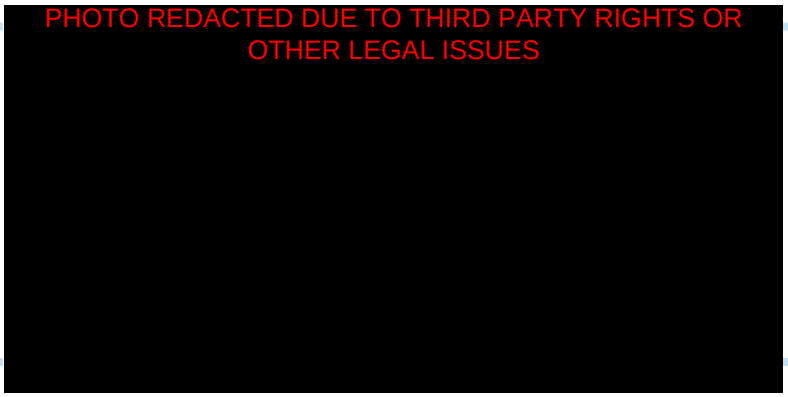
PricewaterhouseCoopers (2005), *Impact of ICT on Productive Time. Final Report, September 2005.* Coventry: Becta (unpublished report)

Prior, G. and Hall, L. (2004), *ICT in Schools Survey 2004*, ICT in Schools Research and Evaluation Series No. 22. Coventry/London: Becta/DfES
http://www.becta.org.uk/page_documents/research/ict_in_schools_survey_2004.pdf

QCA (2007), *14–19 learning: E-learning with St Helen's College.*
http://www.qca.org.uk/14-19/6th-form-schools/index_ s7-6-e-learning.htm

Ramboll Management (2005), *Evaluation of ITMF: Overall Results*, Denmark: UNIoC
http://enis.emu.dk/spredning/itmf/finalreport_itmf.pdf

Ramboll Management (2006), *Elearning Nordic 2006: Impact of ICT on Education.* Denmark: Ramboll Management
http://www.skolutveckling.se/skolnet/english/pdf/English_eLearning%20Nordic_Print.pdf#search=%22Elearning%20Nordic%202006%22.



Richardson, J., and Joyce, A., (2007), 'Young people struggle to maintain their privacy online' in *Insafe Newsletter*, April 2007
http://www.saferinternet.org/ww/en/pub/insafe/news/insafe_survey.htm

Sandford R., and Williamson, B. (2005), *Games and Learning. Bristol.* Nesta Futurelab
http://www.futurelab.org.uk/research/index.htm

Schmitt, J. and Wadsworth, J. (2004), *Is there an impact of household computer ownership on children's educational attainment in Britain?* CEP Discussion Paper No. 625, London School of Economics.
http://cep.lse.ac.uk/pubs/download/dp0625.pdf

Selwood, I. and Visscher, A. (2007 in Press), 'The potential of school information systems for enhancing school improvement' in N. Soguel and P. Jaccard (eds) *Educational Systems and the Challenge of Improving Results.* New York: Springer

Sinclair, R. and Mortimer, E. (2007), *Local Authority Study 2007.* Coventry: Becta. (In press)

Somekh, B. Lewin, C., Mavers, D., Fisher, T., Harrison, C., Haw, K., Lunzer, E., McFarlane, A., and Scrimshaw, P.,(2002): *ImpaCT 2: Pupils' and tecahers' perceptions of ICT in the Home, School and Community.* ICT in Schools Research and Evaluation Series No. 9, Becta/DfES, Coventry/London

Somekh, B., Underwood, J., Convery, A., Dillion, G., Lewin, C., Mavers, D., Saxon, D. and Woodrow, D. (2005), *Evaluation of the DfES ICT Test Bed Project Annual Report 2004.* Coventry: Becta
http://www.evaluation.icttestbed.org.uk/reports

Somekh, B., Underwood, J., Convery, A., Dillion, G., Harber Stuart, T., Jarvis, J., Lewin, C., Mavers, D., Saxon, D., Twining, P. and Woodrow, D. (2006), *Evaluation of the DfES ICT Test Bed Project Annual Report 2005.* Coventry: Becta
http://www.evaluation.icttestbed.org.uk/reports

Somekh, B., Lewin, C., Saxon, D., Woodrow, D. and Convery, A. (2006), *Evaluation of the ICT Test Bed Project. Final Report: Section 4 – The Qualitative Report 2006.* Coventry: Becta

Somekh, B., Underwood, J., Convery, A., Dillon, G., Jarvis, J., Lewin, C., Mavers, D., Saxon, D., Sing, S., Steadman, S., Twining, P. and Woodrow, D. (2007), *Evaluation of the ICT Test Bed Project Final Report.* Coventry: Becta

Somekh, B., Haldene, M., Jones, K., Lewin, C., Steadman, S., Scrimshaw, P., Sing, S., Bird, K., Cummings, J., Downing, B., Harber Stuart, T., Jarvis, J., Mavers, D., and Woodrew, D. (2007), *Evaluation of the Primary Schools Whiteboard Expansion Project. Report to the Department fro Education and Skills.* Centre for ICT, Pedagogy and Learning Education & Social Research Institute, Manchester Metropolitan University. April 2007.

SQW Ltd (2006), *Evaluation of the South Yorkshire e-Learning Programme: Final Report Year 3.* Sheffield: e-sys.info

Sturman, L., Lewis, K, Morrison, J., Scott, E., Smith, Style, B., Taggart, T. and Woodthorpe A. (2005), *General Teaching Council Survey of Teachers 2005, Final Report, June 2005.* Slough: NFER
http://www.gtce.org.uk/shared/contentlibs/126795/93128/126346/1301321/teachersurvey05.pdf

Twining, P., Broadie, R., Cook, D., Ford, K., Morris, D., Twiner, A. and Underwood, J., (2006), Educational change and ICT: an exploration of Priorities 2 and 3 of the DfES e-Strategy in schools and colleges: The current landscape and implementation issues. Coventry: Becta
http://partners.becta.org.uk/page_documents/research/educational_change_and_ict.pdf

Underwood, J., Ault, A., Banyard, P., Bird, K., Dillon, G., Hayes, M., Selwood, I., Somekh, B., and Twining, P. (2005), *The Impact of Broadband in Schools.* Coventry: Becta
http://www.becta.org.uk/page_documents/research/ntu_broadband_full.pdf

Underwood, J., Dillon, G. and Twining, P. (2007), *Questionnaire Data: Summary of Findings. Year 4*, 2006. Coventry: Becta

Underwood, J. and Dillon, G. (2007), *Test Bed Project Evaluation: Additional maturity model analyses: Technical Report.* Coventry: Becta

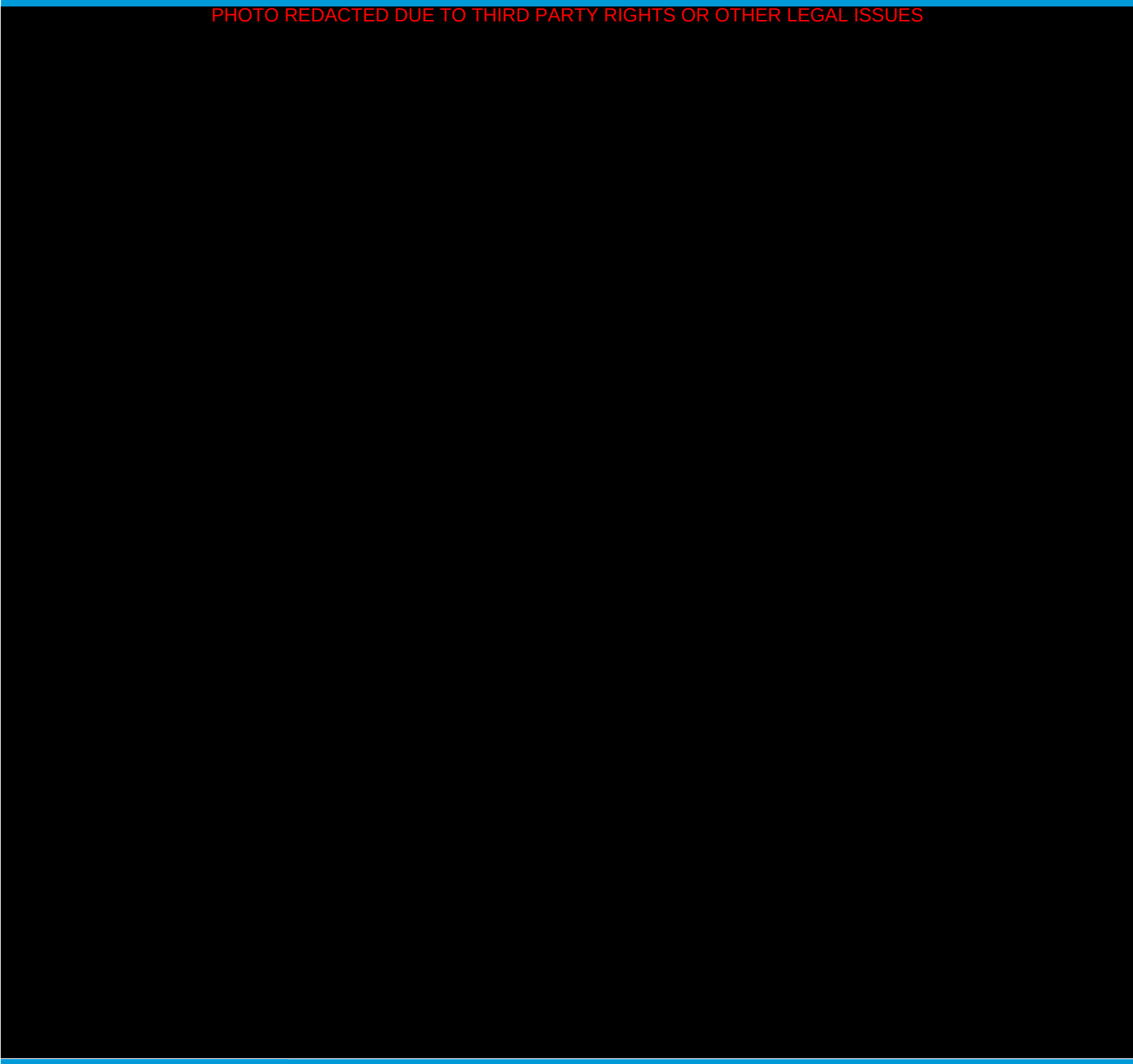
Underwood, J., Baguley, T., Banyard, P., Coyne, E., Farrington Flint, L., and Selwood, I. (2007), I*mpact 2007: Personalising learning with technology. July 2007.* Coventry: Becta

Valentine, G., Marsh, J. and Pattie, C. (2005), *Children and Young People's Home Use of ICT for Educational Purposes: The impact on attainment at key stages 1–4*, Research Report 672. Nottingham: DfES
http://www.dfes.gov.uk/research/data/uploadfiles/RR672.pdf

ACKNOWLEDGEMENTS

Becta acknowledges with thanks the contributions of Roger Blamire, Fiona Colligan, Carolyn Gifford, Peter Scrimshaw and Dennis Bancroft and staff in the Becta Evidence and Evaluation Directorate in the writing of this publication.


PHOTO REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES



Becta

Millburn Hill Road
Science Park
Coventry CV4 7JJ

Tel: 024 7641 6994
Fax: 024 7641 1418

Email: becta@becta.org.uk
URL: http://www.becta.org.uk

09/DD07-08/65/MP/300