

# **Supporting supply side reform: technology in English state education**

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## **Reform**

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We believe that by reforming the public sector, increasing investment and extending choice, high quality services can be made available for everyone.

Our vision is of a Britain with 21st Century healthcare, high standards in schools, a modern and efficient transport system, safe streets, and a free, dynamic and competitive economy.

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## Executive summary

- The direction of education policy is changing. Following two decades of emphasis on centralisation, the centre of gravity of the debate is moving towards choice, diversity and personalisation. The new education debate concerns the reform of the supply side of schooling to allow greater choice and diversity.
- The role of technology should be at the heart of the supply side debate. In schools, computers can allow different styles of learning. Outside of schools, communications technology can allow a transfer of information and knowledge that is clearly beneficial for learning. Universities and the NHS are two areas of the public sector which are being transformed by the use of broadband internet links.
- In addition technology should also be investigated as a means of increasing efficiency, given the coming period of public spending slowdown. Technology has been at the heart of the revolution in the productivity of the private sector over the last two decades.
- Most children constantly interface with technology, from using instant messaging to talk to their friends to downloading music onto their MP3 players to watching DVDs to playing computer games. In many cases they know more about how to use technology than their teachers.
- Tony Blair described the enabling role of modern technology in his speech to the 2006 Labour Party Conference: “Two thirds of the country has access to the internet. Millions of people are ordering flights or books or other goods online, they are talking to their friends online, downloading music, all of it when they want to, not when the shop or office is open. The Google generation has moved beyond the idea of 9 to 5, closed on weekends and Bank Holidays. Today’s technology is profoundly empowering.”
- The quality of English education needs transformational change. In the current system only 41 per cent of children achieve A\*-C grades at GCSE in English, maths and science. Given the transformational impact of technology on the other aspects of life, it is appropriate to consider its potential to transform the performance of the English schools system.
- There is evidence that the use of technology in education has a positive impact on learner attainment. It also has particular benefits in terms of improving student behaviour and engaging struggling students. Use of technology in teaching diversifies learning styles which is essential in the

drive to “personalise” learning.

- Technology resources in English state education have increased dramatically in this decade, including a doubling in the numbers of computers:
  - The number of primary pupils per computer has fallen from 12.6 in 2000 to 6.7 in 2005.
  - The number of secondary pupils per computer has fallen from 7.9 in 2000 to 4.1 in 2005.
  - Central (Department for Education and Skills) spending on ICT has increased from £108 million in 2000-01 to a projected £618 million in 2007-08.
  - The number of teachers in primary schools using computer packages in over half of lessons has increased from 20 per cent in 2002 to 36 per cent in 2005. In secondary schools the increase has been from 9 per cent to 19 per cent in the same period.
  - At secondary level more schools are setting homework that requires the use of a computer or the internet. Between 2002 and 2005 the numbers of schools setting homework “very” or “quite often” that required use of a computer rose from 13 to 30 per cent.
- Social inequity is a defining characteristic of the British schools system. Technology appears to be another area in which children from less privileged backgrounds enjoy worse provision. The British Educational Communications and Technology Agency (Becta) has observed: “When working with young people, we assumed they would be skilled users of ICT, but were surprised to find that many socially disadvantaged groups lacked confidence and actively avoided ICT. After our trials, though, several initiated steps back into learning in order to learn about ICT.”
- These students are also put at further disadvantage because they are less likely to have access to a computer at home. This may leave some children with no access to technology at all, a major disadvantage in a world that is increasingly engaging with technology.
- There are many practical barriers to the effective implementation of technology:
  - The costs of maintaining technology. The British Educational Suppliers

- Association (BESA) estimates that up to 2.1 million computers are in need of replacement.
- The poor and aging infrastructure of many school buildings.
  - The difficulty in training teachers and keeping them up to date with new developments in technology. This is something that is particularly the case in schools with a high turnover of staff.
- In 2005, the Department of Education released a new strategy for the implementation of technology in education: *“Harnessing Technology – Transforming Learning and Children’s Services”*. The strategy has the aim of ensuring that technology is fully embedded in all schools. It places particular emphasis on the improvement of networks between schools and the community.
  - Evaluation of this strategy has revealed several difficulties in its implementation:
    - Currently technology is very far from being embedded in schools. In many cases its effective use is limited to a few key subjects such as English and Science. This is particularly the case at primary schools.
    - The way that resources are organised makes it particularly difficult to embed technology. The concentration of computers in computer labs and the emphasis on the purchase of desktops as opposed to laptops makes current technology very inflexible.
    - Networks between schools and the community are currently very poorly developed.
    - Many school leaders do not have an effective whole school strategy for the implementation of ICT, preventing it being used efficiently.
    - Several of the new schools buildings being built in the Building Schools for the Future programme are of low quality, presenting another barrier to effective technology implementation.
  - Networks need to be further developed. Broadband provision has the potential to transform the role of schools into hubs rather than exclusive centres of learning. This will have particular benefits in terms of enabling lifelong learning, in particular giving second chances to those originally failed by the school system. Better networks will also allow closer links between schools, as has been suggested for the Government’s new “trust schools”.
  - In the majority of schools technology is used in the traditional classroom setting. In some innovative schools, this is not the case, such as Djangoly Academy in Nottingham. Schools in Sweden, including those in the Kunskapsskolan chain, are also making good use of networks, enabling

children to access a range of documents from home. Innovative use of technology is essential in order to determine its full potential.

- For these schools technology clearly aids the development of modern personalised choice-based learning. The implication of this study is that the last period of English schools policy – top-down, inputs-led and centralised – has not realised technology’s potential benefits.
- As all political parties move away from a centralised approach towards a focus on the individual pupil and on supply side reform, it is likely that the beneficial role of technology will increase. Key themes in this new environment will be devolved, pupil number-led budgets and both competition and co-operation between groups of schools.
- *Reform* will develop these findings in a major new study of the reform of the supply side of state education – also covering teaching and capital infrastructure – in early 2007.

## 1. Technology and education

There is growing debate about the role of technology in schools. It forms part of the wider debate about how to reform the supply side of education, which also covers improving the quality of teaching and capital infrastructure. Education reform will mean greater flexibility, choice and personalisation, with an emphasis on tailoring the learning experience to individual needs. This is an idea that has been championed by all of the major political parties.

“We need education that values the individual, that encourages achievement, that fosters independence.”<sup>1</sup>

“Greater personalisation and choice, with the wishes and needs of children’s services, parents and learners centre-stage.”<sup>2</sup>

“We want to see more setting in schools and personalised learning could make this possible.”<sup>3</sup>

New technologies will play an essential role in achieving this transformation of the learning environment and improving results.

A key element of supply side reform is the movement away from a centrally controlled education system. Decisions about where money should be spent, where new schools should be built and whether and how teachers should be employed should be made by schools, not central government. New proposals in the recent Education and Inspection Bill and other legislation suggest that in a small way the Government is moving more towards this. There is an increasing emphasis on devolution of education, with the creation of trust schools and academies, after a period of central control.

This period of centralisation has been characterised by high spending increases on education. Spending has increased by nearly a third since 1999-00, from £22.5 billion to £30.6 billion in 2003-04. These spending increases have not however led to productivity gains, with improvement in results not keeping pace with the increase in spending. The Education and Skills Select Committee has observed that:

“The increase in GCSE grades in this period of rising expenditure is

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<sup>1</sup> Sarah Teather, Liberal Democrats Education Spokesperson, Party conference speech, 2006.

<sup>2</sup> *Five Year Strategy for Children and Learners – putting people at the heart of public services*, Department for Education and Skills, 2004.

<sup>3</sup> David Willetts, Shadow Secretary of State for Education and Skills, Speech to the Politics Society of St. John’s College, Portsmouth, 2006.

almost exactly the same as that achieved in the years 1994-95 to 1998-99, when spending barely increased in real terms.”

This poor use of resources has also been reflected in the use of technology. Despite the massive increase in spending on both hardware and software in schools, the overall provision and implementation of technology throughout the schools system remains poor. Increasing spending is no longer an option. Now that the Government is entering a period of fiscal tightening it has to ensure that money spent on technology fits with in with what has to be the new agenda of increasing productivity and efficiency in schools.

The other major problem in the education system is social inequity:

- The worst performing primary schools, where no more than half of 11 year-olds achieve the required level in English, are exclusively in deprived areas;<sup>4</sup>
- Pupils who are eligible for free school meals are less than half as likely to get five or more GCSEs at grades A\*-C compared to children who are not eligible for free school meals;<sup>5</sup>
- 1 in 10 children on free school meals leave school without a single qualification.<sup>6</sup>

If technological provision is poor in areas that are already deprived, it adds to children’s disadvantage. If these children lack access to technology at home as well they are unlikely to succeed in an economy that increasingly demands people to be technologically literate.

### **Role of technology**

Advances in technology have always affected education, from pens and paper taking over from slates and chalk to the now ubiquitous use of TV and video in schools. Computers now play a role in all schools to some degree, even if it is primarily to assist the work of school administrators.

Different children learn best in different ways. The use of multimedia technologies allows teachers to diversify learning styles, enabling those children that struggle with traditional learning methods to also succeed. This is particularly the case for children who struggle with concentration, or who have learning disabilities of some kind. Multimedia also enables the expertise of one good teacher to be available to many more students.

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<sup>4</sup> *Five Year Strategy for Children and Learners – putting people at the heart of public services*, Department for Education and Skills, 2004.

<sup>5</sup> *Ibid.*

<sup>6</sup> Alan Johnson, Speech to the Fabian Society, 25 May 2006.

Communication technologies are also revolutionising the way that education is delivered. In order to access learning students no longer need to be at school or be of school age. Older people can now use online resources to gain the qualifications that they need. At university level technology has now become fully integrated. At an international level networks allow sharing of resources, leading to closer co-operation between world class universities. At an everyday level university life is organised by email and the internet. Online assessment is used to evaluate students, lecturers and courses. Networks have huge potential to revolutionise learning in schools as well, allowing schools to have closer links with their local communities as well as other schools.

### **Technology in society**

Technology is changing society and the way that people live their lives. In a very short space of time people have become reliant on technology such as mobiles and the internet in both their working and social lives. Most children are also constantly interfacing with technology, from using instant messaging to talk to their friends, to downloading music onto their MP3 player to watching DVDs to playing computer games. Children do not need to be taught how to use technology in schools, as it is already an integral part of their lives. In many cases they may know more about how to use it than their teachers.

“Two thirds of the country has access to the internet. Millions of people are ordering flights or books or other goods online, they are talking to their friends online, downloading music, all of it when they want to, not when the shop or office is open. The Google generation has moved beyond the idea of 9 to 5, closed on weekends and Bank Holidays. Today’s technology is profoundly empowering.”<sup>7</sup>

### **Transformational change**

The quality of English education in the current system needs transformational change. In the current system only 41 per cent of children achieve A\*-C grades at GCSE in English, maths and science.<sup>8</sup> Given the transformational impact of technology on the other aspects of life, it is appropriate to consider its potential to transform the English schools system.

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<sup>7</sup> Tony Blair, Labour Party Conference Speech, 2006.

<sup>8</sup> *GCSE and Equivalent Results and Associated Value Added Measures in England 2004/05 (Final)*, Department of Education and Skills, June 2006.

## 2. Current use of technology

Technology plays a role in education in all schools. Students' access to computers is continually increasing and most schools also frequently use other types of technology such as interactive whiteboards. Inequity does still however exist in the provision of ICT resources, and other practical considerations hamper its more effective use.

<b>Table 1: Number of pupils per computer</b>		
<b>Year</b>	<b>Primary school</b>	<b>Secondary school</b>
2000	12.6	7.9
2001	11.8	7.1
2002	10.1	6.5
2003	7.9	5.4
2004	7.5	4.9
2005	6.7	4.1
<i>Source: Becta Review 2006</i>		

The table above shows the mean numbers of pupils per computer that is used for teaching and learning. It demonstrates how students have over a very short period of time gained much greater access to technology. These numbers also meet the Government's 2004 target ratios for students to computers in schools, which were one to eight in primary schools and one to five in secondary schools.

The improvement in the amount of resources available for teaching and learning has been reflected in a rise in the amount of spending on ICT in schools. Central funding channelled through the Department for Education and Skills has risen substantially over the past five years and projections suggest that this trend will continue.

<b>Table 2: Spending on ICT in schools in the Department for Education and Skills Expenditure Limit</b>	
<b>Year</b>	<b>Spending (£ millions)</b>
2000-01	109
2001-02	156
2002-03	308
2003-04	395
2004-05	408
2005-06	443
2006-07 (projected)	558
2007-08 (projected)	618
<i>Source: Department of Education and Skills Annual Report 2006</i>	

## Use of ICT resources

Teachers are making use of an increase in the number of ICT resources available in lessons. The number of teachers in primary schools using computer packages in over half of lessons has increased from 20 per cent in 2002 to 36 per cent in 2005. In secondary schools the increase has been from 9 per cent to 19 per cent in the same period.<sup>9</sup>

At secondary level more schools are setting homework that requires the use of a computer or the internet. Between 2002 and 2005 the numbers of schools setting homework “very” or “quite often” that required use of a computer rose from 13 to 30 per cent. In relation to the internet, the percentage rose from 15 per cent to 28 per cent.<sup>10</sup>

Many teachers still think that they have less ICT resources than they need to deliver the curriculum. A survey by Becta found that 35 per cent of teachers in primary schools thought they needed more desktop computers and 45 per cent felt they needed more Laptops. At secondary level, 68 per cent of teachers felt that they needed more desktop computers with 56 per cent thinking that the number of laptops was insufficient.<sup>11</sup>

## Broadband

The Government has made the commitment that all schools will have broadband access by 2006. This follows the example of universities which already all have access to broadband. Becta concluded in its 2006 review that the Government is well on its way to achieving this target. In the last quarter of 2005 83 per cent of primary schools were connected at broadband speeds, and 99 per cent of secondary schools.

## The benefits

There is evidence to suggest that effective use of technology can produce positive results on pupil attainment and behaviour.

“Pupils respond very positively to the use of ICT, they engage well with lessons, their behaviour is good and their attitudes towards learning are very good.”<sup>12</sup>

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<sup>9</sup> *Evaluation of Curriculum Online Report of the third survey of schools*, Becta Online Research, 2006.

<sup>10</sup> *ibid.*

<sup>11</sup> *ibid.*

<sup>12</sup> *ICT in schools – The Impact of the Government initiative five years on*, Ofsted, 2004.

“There is a growing body of evidence that the use of ICT in education has a positive, if small, impact on learner attainment as measured in national tests.”<sup>13</sup>

These benefits can be built on further when pupils have access to a computer at home. A Department for Education and Skills (DfES) commissioned report found that there was a positive association between pupil’s home use of ICT for educational purposes and improved attainment in mathematics at years 6 and 9, and in English and Mathematics at year 11.<sup>14</sup> Reports from the OECD have also identified these benefits:

“There is a consistent and significant positive and curvilinear relationship between the frequency of computer use at home and mathematics performance, both before and after accounting for socio-economic and systematic variables.”<sup>15</sup>

### **Home access**

In the 2004 Labour Party conference Tony Blair pledged to “end the digital divide” and provide broadband to every home which wanted it by 2008.<sup>16</sup> Home access to computers has increased rapidly over the last few years. 67 per cent of households now have a computer, with 60 per cent having access to the internet.<sup>17</sup> In households with children the percentage of ownership increases to 89 per cent.

There is still a significant minority of children who don’t have home access. The e-learning foundation has calculated that three million children don’t have access to the internet at home, equating to 16 per cent of all school children. The majority of these children are from lower income families as computer ownership and internet use is concentrated in higher social classes.

As the table shows, 93 per cent of households in the highest income group had a home computer and 89 per cent had an internet connection. In the lowest income group the figures were just 25 per cent and 18 per cent.

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<sup>13</sup> *The Becta Review 2006: Evidence on the progress of ICT in Education*, Becta ICT Research.

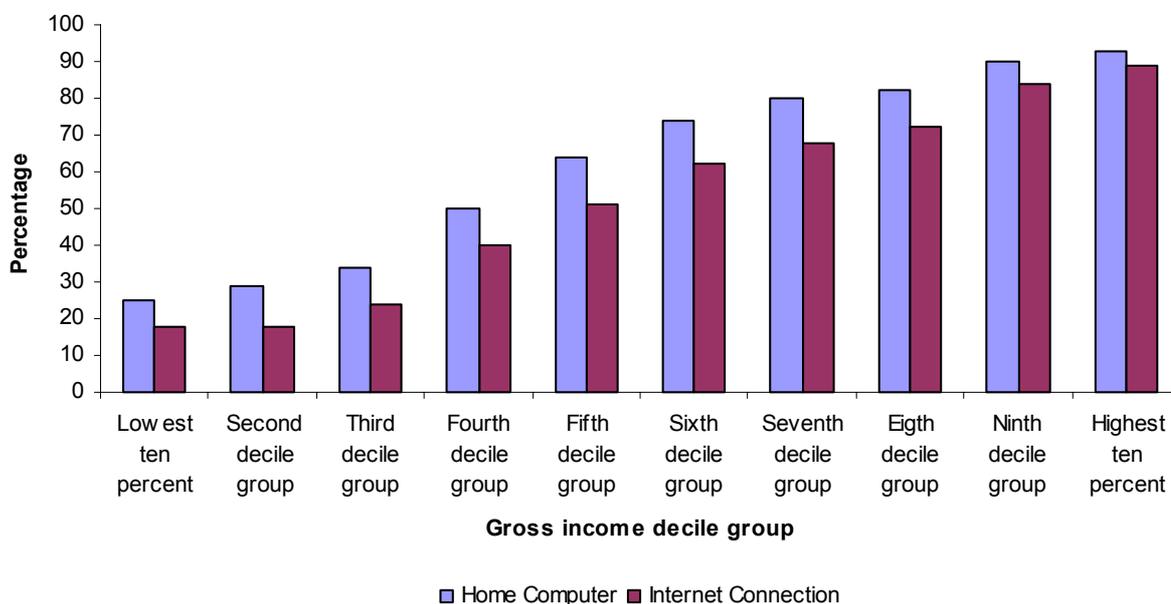
<sup>14</sup> Valentine, G., Marsh, J., and Pattie, C., *Children and Young People’s home use of ICT for Educational purposes: The impact on Attainment at Key Stages 1-4*, DfES, 2005.

<sup>15</sup> *Are students Ready for a Technology-Rich World? What PISA studies tell us*, OECD, 2005.

<sup>16</sup> Arnott, S., *Computing*, 29 Sep 2004.

<sup>17</sup> *The Communication Market 2006*, Ofcom.

### Home ownership of technology by income group



Source: Office of National Statistics

A DfES report also found that pupils from higher social groups were more likely to have more independent or exclusive access to computers in the home. This means they are more likely to be able to use them for school work. There is also an urban/rural divide in terms of access, with the report finding that urban children were more likely never to use a computer at home for school work than rural children.<sup>18</sup>

In response the Department has established a central £60 million programme – The Computer for Pupils programme – to give disadvantaged secondary school children home access to computers. The funding will be available in the years 2006-7 and 2007-08.

### Technological issues

Technology is being constantly revised and developed, and high maintenance costs are associated with keeping facilities up to date. If computers are not constantly updated they may not be able to cope with the newest versions of software or increasing internet speeds. This issue is proving a major barrier to the embedding of ICT.

<sup>18</sup> Valentine, G., Marsh, J., and Pattie, C., *Children and Young People's home use of ICT for Educational purposes: The impact on Attainment at Key Stages 1-4*, DfES, 2005.

The BESA survey has found that schools are finding it hard to keep up the replacement costs of their 2.1 million computers.<sup>19</sup> It found that over half a million computers are considered ineffective for teaching the curriculum and need to be replaced, a process that many schools cannot afford.

Analysis by Becta also found that approximately half of primary and secondary schools do not have a policy in place for replacement of computer workstations. It found that even in those cases where a policy was in place the rate of replacement is not at a level to maintain the “longer-term currency of the technology”.

Alongside the costs of replacing computers the costs associated with maintaining them are also high. There are concerns that in many schools there is a lack of technical staff to support IT systems. Ofsted has found that this is an issue particularly at primary school level.

## **Buildings**

Many schools have poor infrastructure. They are made up of old or temporary buildings that can make implementation of new technology difficult. In some cases buildings are either too old or not sufficiently maintained to support new technology. Becta have recognised this to be an issue. They observed that “in some cases ICT developments have been found to be held back by the condition of school buildings”.<sup>20</sup> Schemes are in place to regenerate all school buildings but this process will take time. This will disadvantage those schools that already suffer as a result of poor facilities.

## **Teachers**

In order to make full use of technology teachers need to be trained properly how to use it. Their qualifications need to be updated frequently in order to deal with rapid technological developments, and to make full use of new resources.

Ofsted found that between 1992 and 1997 the competence of staff in ICT has risen “steadily” and since 1997 it has risen “dramatically”. The BESA survey, however, reported that many teachers still lack confidence in the teaching of ICT. It found that 32 per cent of primary school teachers and 41 per cent of secondary school teachers are not considered to be confident and competent.

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<sup>19</sup> *Information and Communication Technology in UK State Schools*, BESA Research, 2005.

<sup>20</sup> *The Becta Review 2006: Evidence on the progress of ICT in Education*, Becta ICT Research.

In schools that have a high turnover of staff, typically those that are not performing as well, it can be particularly difficult to keep teachers up to date on the latest practices.

### 3. Government strategy

The Government has committed itself to improving the use of Information and Communications Technology (ICT) in schools.

“Our plans for boosting performance and standards across education are far reaching and radical. We aim to put learners, young people – and their parents – in the driving seat, shaping the opportunities open to all learners to fit around their particular needs and preferences. In achieving these goals the use of interactive technologies is absolutely crucial and I am determined that we grasp them.”<sup>21</sup>

In March 2005 the Department for Education and Skills (DfES) published its e-strategy, *“Harnessing Technology – Transforming Learning and Children’s Services”*. It also created a technology group in the DfES, reflecting the Government’s determination to make a “step-change” in the use of ICT in learning, skills and the education sector.

The stated objectives of the strategy were to:

- transform teaching, learning and child development to enable everyone to meet their highest expectations
- connect with “hard-to-reach” groups in new ways
- open up education to partnerships with other organisations
- move to a new level of efficiency and effectiveness in delivery.

The Government’s e-strategy states that technology is the key to personalised learning. It outlined six priorities central to delivering the strategy. The first of these was “to establish an integrated online information service for all citizens.” This would make information and services accessible through one central website. DfES aims to improve everyone’s access to online information and advice services. The Government is encouraging schools to use their online networks to provide parents with more information. Education and children’s organisations will be expected to collaborate with one another in providing easy integration of information.

The second priority is to “provide integrated personal support for children and learners”. The DfES will encourage every school to offer a personal online learning space to store coursework, course resources, results, and achievements. They aim to develop a “personal identifier” for each learner, so that any

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<sup>21</sup> Ruth Kelly, former Education Secretary, *Foreword to Harnessing Technology Transforming Learning and Children’s Services*, Department of Education and Skills, 2005.

educational organisation can recognise them and carry forward the record of their achievements. The aim is that this will become an “electronic portfolio”, making it easier for learners to build their record of achievement throughout their learning.

The DfES’s third priority is to “establish a collaborative approach to personalised learning activities”. They aim to do everything possible to accelerate the move to the next generation of e-learning activities and resources. Better digital resources are needed and they need to be made more widely available. “To help establish a collaborative approach” the Government must support innovation in the market by improving teacher’s knowledge of where e-learning works particularly well. Furthermore it states they must keep the curriculum up to date, to take advantage of new methods in all subject areas.

The fourth priority is to provide “training and support for all practitioners”. Teachers should have access to good quality ICT resources, online support networks and technology which enables them to cut down paperwork. Support should also be available to those wishing to learn more and specialise further in ICT.

The fifth priority is to create “a leadership and development package for organisational capability in ICT”. The aim is that through better training and development, and improved links with other schools and institutions, leaders can ensure that the strategy can be implemented with greater success.

The final key priority was “a common digital infrastructure to support transformation and reform”. This will create a common standard across the programmes to extend ICT usage in schools, in order to ensure equity of provision. The strategy will also enable all schools to benefit from a collaborative approach to purchasing ICT equipment and services.

## **Becta**

One of the key Government partners in the implementation of their e-strategy is The British Educational Communications and Technology Agency (Becta). Becta provides strategic leadership in the innovative and effective use of ICT. It advises Government and national agencies on embedding technology into their policies and programmes.

Becta is responsible for co-ordinating the Government’s e-strategy for education. This involves developing and implementing a delivery strategy and establishing effective programme management. It works with Government and key agencies

to ensure continuity and communication across sectors and across different elements of the strategy.

Becta also researches technology and looks at ways in which it can help in education. Through this it wishes to stimulate debate and look at new approaches.

## **Ofsted**

Ofsted is another important agency involved in the Government's ICT strategy. It is a non-Ministerial government department accountable to Parliament. Ofsted has monitored the introduction of ICT in schools since 1999. It has written a number of reports reflecting its findings about the usage of ICT in primary and secondary schools.

## **Training Staff**

One of the six priorities outlined in the e-strategy was a good quality ICT training and support package for practitioners. Insufficient training was highlighted as holding back ICT development in schools. In 1999 a programme funding free ICT training for all full-time state-school teachers and school librarians was launched by the National Opportunities Fund (NOF). Over £230 million of National Lottery good cause money was earmarked for this training programme.<sup>22</sup> All teachers and school librarians in the state sector who wanted and needed the training were eligible. They were trained how to use new technology in the curriculum. In England alone, over 485,000 teachers and librarians signed up for free training<sup>23</sup>. The money provided by the NOF had to be spent before 2003; the scheme is no longer in action.

Becta reports that by December 2008 the use of ICT and e-learning to deliver learning, teaching and support services will be embedded in all Initial Teacher Training. Teachers can now seek assistance from online resources, established as part of the Government's ICT strategy, for help in how to effectively implement ICT in education.

## **Online resources**

A number of online resources, aimed at assisting teachers with using ICT in the curriculum, have been developed for ICT staff and teachers. Curriculum Online is a website which can be used to find relevant software for lessons. It was

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<sup>22</sup> [www.biglotteryfund.org.uk](http://www.biglotteryfund.org.uk).

<sup>23</sup> *ibid.*

established in 2003 and allows teachers to search for software, applicable to different areas of the curriculum. They can also specify that they want software to use in conjunction with other ICT products such as an interactive whiteboard.

Curriculum Online is central to the Government's drive to transform teaching and learning in schools by improving access to ICT and multimedia resources for all pupils. The Government has set aside funds in the form of eLCs (electronic learning credits). This eLC money goes straight to schools to spend on multimedia resources. Schools are receiving an increasing amount of money to spend on eLCs. Between 2002 and 2005 £330 million was given to schools in eLC funding.<sup>24</sup> Curriculum Online provides a way for teachers to search through all the thousands of multimedia resources which can be bought with eLCs, as well as free ones.

TeacherNet is another online resource for teachers supported by DfES and partner organisations. It was established in 2001 with a primary aim of supporting the education community and reflecting its views and concerns. The website provides easy access to teaching resources, such as lesson plans, information on Government policies, and links to hundreds of free online education resources.

The DfES aims to fit its schools websites, including TeacherNet, into one user-friendly site, accessible via one username and password, with a better search facility and more concise content. Learning and Skills Web (NLN online) is the start of such a project and is funded by the DfES through the Learning and Skills Council. However, it is just directed towards practitioners in the 16+ education sector. It aims to offer a personalised single gateway across many services. Users can create a profile which records previous searches for resources which they have made, and can help them in the future in finding the resources most useful to them. Learning and Skills Web is working in partnership with key organisations across the Learning and Skills Sector. They believe this service will constantly evolve as this process develops and more partners are attracted.

## **Building Schools for the Future**

The Building Schools for the Future (BSF) programme aims to rebuild and refurbish every secondary school building in England within 15 years. It has seen the largest Government investment ever in school buildings. In 2007-8 investment will be £6.3 billion. The 2006 Budget increased the annual spend to over £8 billion by 2010-11.<sup>25</sup>

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<sup>24</sup> [www.curriculumonline.gov.uk](http://www.curriculumonline.gov.uk).

<sup>25</sup> *Budget 2006: Report*, HM Treasury, 2006.

BSF has the aim of bringing together significant investment in buildings (and ICT) with significant educational reform. The programme aims to ensure that secondary school pupils throughout England will learn in modern facilities. BSF will aim to show how investment can drive reform in the organisation of schooling, teaching and learning, it is based on partnership between all sections of the educational community.

The Commission for Architecture and the Built Environment (CABE) has been working closely with the government on this programme. CABE was established in 1999 and stands for improving people's quality of life through good design. CABE works directly with architects, planners, designers, developers and clients offering them guidance on projects. They work on the basis that good design has a powerful influence on staff morale, pupil motivation and the way children learn.

CABE highlighted ten points which should be considered in a well designed school. One of these points is "Flexible design that will facilitate changed in the curriculum and technology and which allows expansion or contraction in the future where appropriate." CABE also highlighted the need for space to place ICT facilities. CABE also gave some key recommendations to the DfES, individual local authorities and the schools themselves; they called for an urgent review of school design briefs. They commented that these have hardly changed in the past twenty years and now need to be updated to reflect the new ideas about how pupils learn, including the massive impact of ICT.

## 4. Delivery

The Government itself feels it is performing well in delivering technology. Tony Blair said in a recent statement:

“Teachers can use the latest technology to deliver livelier lessons: the average secondary school now has 218 computers, compared with 101 in 1998. Most have interactive whiteboards and broadband access.”<sup>26</sup>

But the Government did recognise in its 2005 e-strategy, *Harnessing Technology – Transforming Learning and Children’s Services*, that its previous strategies had failed to deliver in several key areas. In particular it identified that there was considerable inequity of provision in the system. The document recognised that gaps in provision are particularly acute in five areas:

- The ability to spot innovation and embed it effectively
- The quality of leadership and management
- The degree of commitment to improving workforce skills
- Effectiveness in improving attainment and outcomes or well-being
- Success in ensuring equal access to technology for all children, young people, families and learners.

This view that access to and development of technology in schools is very mixed is reflected by other agencies.

“The overall positive picture conceals wide variations in both the impact of training programmes and the provision of hardware – the gap between the best and worst ICT provision is unacceptably wide and increasing.”<sup>27</sup>

This makes it clear that there is a long way to go before all children have access to even a basic level of ICT provision at school.

## Evaluation

By reviewing the reports of organisations that have been responsible for monitoring and assisting in the implementation of the Government’s ICT strategy, an idea of its progress can be established. The key agencies in this evaluation progress are Becta, Ofsted and CAFE.

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<sup>26</sup> Tony Blair, Speech on Education to City of London Academy, 12 September 2005.

<sup>27</sup> *ICT in schools – The Impact of the Government initiative five years on*, Ofsted, 2004.

## Not “embedded”

The Government’s vision for technology is for it to become completely embedded in schools. Technology should be used across all subjects and in all aspects of school administration and life.

“Transforming how people learn by harnessing the full potential of new technology across all subjects and skill development, and embedding assessment more appropriately within learning and teaching.”<sup>28</sup>

The Government’s e-strategy recognises the failure to deliver in this area:

“Progress is patchy: for every school that has embraced technology in teaching and learning, class management and administration, there are two others that have barely begun to use ICT as well.”

Ofsted is particularly critical of the Government’s failure to embed ICT into schools. In its most recent report it states that: “In most schools, ICT has not yet become integral to teaching and learning or a driver for school improvement.”<sup>29</sup> The majority of schools are reportedly missing easy opportunities to embed ICT more thoroughly.

In many secondary schools there is a continued debate over whether ICT should be taught as a separate subject or only used in context. ICT is currently used much more in some subjects than in others. English is a subject where ICT resources are generally made good use of in the majority of secondary schools. Ofsted found that the impact of ICT on teaching in English was “good” or better in over half of all schools inspected.<sup>30</sup> In science there has also been considerable success in the use of ICT.<sup>31</sup> Ofsted reported that science teachers are “enthusiastic” and show high levels of skill in the incorporation of technology into learning. In mathematics the use of ICT resources has generally been less widespread, with access to ICT facilities remaining “inadequate”.<sup>32</sup> Use across all subjects is being hampered by dedicated ICT rooms being monopolised by discrete ICT teaching.

In primary schools ICT in English and maths is often being used effectively. Its use has particularly helped those pupils that have previously displayed poor

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<sup>28</sup> *Harnessing Technology Transforming Learning and Children’s Services*, Department of Education and Skills, 2005.

<sup>29</sup> *Embedding ICT in schools: A dual evaluation exercise*, Ofsted, 2005.

<sup>30</sup> *2004 Report: ICT in schools the impact of Government initiatives*, Secondary English, Ofsted.

<sup>31</sup> *2004 Report: ICT in schools the impact of Government initiatives*, Secondary science, Ofsted.

<sup>32</sup> *2004 Report: ICT in schools the impact of Government initiatives*, Secondary maths, Ofsted.

behaviour and negative attitudes to learning. ICT use is often limited to these subjects with few schools experimenting at using it in other areas.

## **Buildings**

The Building Schools for the Future programme has set itself the goal of rebuilding and refurbishing all school building in 15 years. This investment in buildings provides the essential infrastructure for increased use of technology in schools.

A report by CABA evaluating the programme is highly critical of the standard of building. CABA said that it believed the quality of secondary schools built in the BSF programme to date were not of a sufficient standard to transform the education of young people as the government intended. It audited 52 out of the 124 completed schools and assessed over half of them to be “poor” or “mediocre.”<sup>33</sup> It particularly noted that there seemed to be a lack of ICT space in these buildings.

However 19 per cent of the sample of schools that CABA assessed were “good” or “excellent”. All of these were completed in 2005, which is an encouraging sign as it suggests design is getting better. The report also said however that whilst design might be improving, it was not doing so quickly enough.

The report identified a number of problem areas. In a number of cases the initial preparation was wrong. Concerns about cost and time are taking precedence over ideas of transformational design. Best practice is frequently not applied and designers do not have time to work creatively.

The report has some recommendations for the DfES which should be taken into consideration to ensure that the BSF programme is successful. Firstly the report highlighted the importance of investing in preparation. The report emphasised the need for a “good brief” and said that preparation for BSF projects needs to be more extensive. CABA also recommends that the DfES funds a review of school design as this has barely changed over the last 20 years and new ideas of learning need to be reflected. Existing projects should also be evaluated to help decide the best course for the new project. The potential users of the school and the headteachers should be involved so that their needs can also be taken into consideration.

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<sup>33</sup> *Assessing secondary school design*, CABA, July 2006.

## Online resources

Curriculum Online is one of the Governments key resources in the drive to improve and increase the use of ICT in schools. It is a website that exists to “bring teaching resources and multimedia professionals together”. Becta has been responsible for reviewing the scheme and evaluating its performance.

The survey of schools using the resource has found that awareness of the website is fairly high amongst teachers, with 88 per cent of secondary school teachers being aware of the service and 77 per cent of primary school teachers. The percentage of teachers using the site regularly is smaller, with 44 per cent of secondary teachers and 29 per cent of primary teachers visiting the website at least once each month. There has been a decline in its usage by primary school teachers with 38 per cent of teachers visiting the site regularly in 2003. There is also evidence of decreasing use of the site by secondary school teachers. In 2003 61 per cent of respondents had visited the site in the last term but by 2005 the percentage has fallen to 42.<sup>34</sup>

The majority of schools now have access to broadband. This increases the range of software and internet applications that they can make use of. Ofsted has found that so far this potential isn't being exploited. Many schools are failing to make use of applications that demand broadband.

“Few schools as yet make significant use of applications that specifically require broadband.”<sup>35</sup>

## Networks

The Government has placed a high priority on the importance of networks in enabling new technologies to be used fully.

“Online networks open education institutions to the wider world. They can turn the school or college into a community hub linked sports organisations, libraries, social services, industry and other schools and colleges.”<sup>36</sup>

Schools to date have been very poor at making good use of network facilities, both to engage with local communities and to improve student learning. Becta found that few schools offer access to school networks from remote locations for

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<sup>34</sup> *Evaluation of Curriculum Online Report of the third survey of schools*, Becta Online Research, 2006.

<sup>35</sup> *ICT in schools – The Impact of the Government initiative five years on*, Ofsted, 2004.

<sup>36</sup> *Harnessing Technology Transforming Learning and Children's Services*, Department of Education and Skills, 2005.

staff and pupils. It identified that there is a fear in the teaching profession of the impacts of these kinds of networks. There is a worry that if students were able to contact their teachers more easily from home than it would put more pressure on teachers increasing their workload.<sup>37</sup>

The further development of networks will allow better use to be made of high cost resources. If software and information can be shared between schools and with the community then it makes them more economical. The ability to access school networks from home will also provide more support to children in the holidays or those away from school for activities such as study leave. It could provide a useful tool for schools to keep parents informed of their children's progress.

Broadband is also an essential element of networks. The Broadband Stakeholders Group has identified a number of aspects effecting its further spread. These included the slow pace of broadband spread especially in rural areas, the lack of sustainable and affordable broadband connections to schools in the long term, the lack of high quality, affordable technical support and the lack of pedagogically sound content which can take advantage of the higher bandwidths.

## **Teacher Training**

The training provided by the New Opportunities Fund (NOF) programme was largely ineffective. The programme failed to meet the needs of the majority of teachers with many having either greater or less expertise than the scheme had anticipated. Many teachers at secondary level felt that the training lacked few subject specific examples, which meant that the training lacked relevance. Ofsted reported that in most schools many senior managers saw relatively little benefit from the training, concluding that the funding could have been better spent.<sup>38</sup>

The programme did have the benefit of raising teachers awareness of ICT, particularly in regards to its implementation in the National Curriculum. A lack of follow up in the training, meant it had little lasting impact. After the end of the NOF training many schools and LEAs have undertaken their own training, which has been more effective at meeting individual needs.

## **Leadership**

Coherent leadership is essential in order to fully implement an ICT strategy that

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<sup>37</sup> *The Becta Review 2006: Evidence on the progress of ICT in Education*, Becta ICT Research.

<sup>38</sup> *2004 Report: ICT in schools the impact of Government initiatives*, Secondary English, Ofsted.

is embedded in all aspects of school life. This is not currently happening. All agencies surveying the implementation of these strategies recognised that there was a lack of coherence in their delivery in schools.

“There is a low level of familiarity among head teachers with the concept of a personalised online learning space.”<sup>39</sup>

This lack of coherence didn’t just occur at the whole school level, the same was the case within individual subjects:

“In too many schools the contribution of the science departments to teaching and learning in ICT is not well co-ordinated.”<sup>40</sup>

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<sup>39</sup> *The Becta Review 2006: Evidence on the progress of ICT in Education*, Becta ICT Research.

<sup>40</sup> *2004 Report: ICT in schools the impact of Government initiatives, Secondary science*, Ofsted.

## 5. A different view of the classroom

The use of ICT in many schools is limited to increased use of certain technologies, including desk based and laptop computers, whiteboards and software packages, in a traditional classroom setting. Many organisations, such as Futurelab, have encouraged more innovative thinking into the future of education, including the demise of the “Victorian” classroom. One author has written:

“Why is it that in 150 years our schools have changed so little, with some still housed in Victorian buildings? Children, at least in secondary school, still sit in rows; there is a teacher at the front of the class, though usually with a whiteboard rather than a blackboard; there are still draughty classrooms and narrow corridors. Yet the modern economy demands that we no longer produce ‘obedient specialists’ but independent-minded and adaptable adults.”<sup>41</sup>

In another authors view, the use of new technologies, such as interactive whiteboards, has just strengthened the ideal of the typical classroom not moved away from it:

“While the rest of society has used technology to transform the way in which we do things, schools tend to accept new technology only when it reinforces the old conventions of teaching, or when its saturation of the market is so complete that it cannot be ignored. Interactive whiteboards are a case in point.

“Their appeal lies in the fact that they provide something that teachers have wanted for centuries: a writing board that draws text and images by itself and never forgets anything written on it. However, while they replace or sit alongside the blackboard, they leave the rest of the classroom almost wholly unchanged.”<sup>42</sup>

These ideas are an integral part of the debate about the future use of technology in education. The cost of these solutions may make it impossible to implement them throughout the whole sector. There are, however, already several examples of where the innovative use of technology is being put into place both in the UK and abroad.

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<sup>41</sup> Thomas, K., *The School of the Future*, 2006.

<sup>42</sup> McDougall, S., Managing Director of Stakeholder Design, *One tablet or two? Opportunities for change in educational provision in the next 20 years*, 2006.

## **Test Bed**

Becta, the Government's key strategic partner in the delivery of its ICT strategy, has created the Test Bed project to determine the effects of a complete embedding of ICT into schools in areas of social disadvantage. The project, which is funded by the DfES has run over four years from 2002-2006, in three areas; Durham, Sandwell and Barking and Dagenham. Thirty institutions are involved, 22 primary schools, five secondary schools, and three colleges.

The project has five areas in which it wanted to embed ICT. These areas are learning and teaching, leadership and management, effective use of teacher time, inter-institutional collaboration, and institutional links with the home and community.

The schools in these areas are experimenting with a range of different technologies in lessons including visualisers, digital cameras and video, and equipment for music technology. Technology such as management information systems is also being used to allow teachers to make reports from online assessment data from students.

Evaluation of the project has found it has delivered positive results. The local authorities (LAs) where the project was being undertaken narrowed the gap in attainment levels with other benchmark LAs. It also had beneficial effects on attendance and discipline.

## **Djangoly City Academy**

An example of a state of art school where technology is being used to its full potential is Djangoly City Academy in Nottingham. The academy was opened in 2003 replacing Djangoly City Technology College and the Forest Comprehensive School. The Academies specialism is Information and Communications Technology.

The academy has eliminated traditional computer suites and interactive whiteboards that unusually embody the idea of ICT in schools. Instead it makes use of tablet PCs, a very sophisticated network system and an innovative physical infrastructure. Other technology at the school includes information kiosks, plasma screens, recording equipment and wireless projectors. Every pupil has access to a tablet PC, which they can read their lessons off and work directly onto. Oral work can also be relayed to the class using a built in audio system.

This new technology has led to a change in classroom design. It has enabled the

teacher to be moved from the traditional position at the front of the classroom. The use of tablet PCs that are connected to a wireless projector enables teachers to deliver lessons from anywhere in the room. This allows them to give work to the rest of the class while sitting with a particular pupil who may need extra help or supervision. Teachers can even project lesson information into a different room, something that is particularly useful when a teacher is absent.

### **Lambeth Academy**

Lambeth Academy, in London, is a newly built school completed in 2004. It cost £22.4 million and was funded by DfES and the United Learning Trust. A CABA case study details how ICT provision has clearly had a central impact in the design of the school. There are a number of ICT suites with good daylight and interesting design. A particularly interesting design feature of the school is the use of “stepped classrooms” for ICT. These can be used with the pupils facing down the steps like a lecture theatre with an interactive whiteboard at the front or pupils can face backwards to use a PC placed on the bench behind their chair, enabling the teacher to see the screen from below. The school was described by CABA as being an “intelligently designed” school.

### **Caspian Learning**

Caspian Learning is a software based e-learning organization which was launched in 2002. They are the UK pioneer in learning based games. They use research into memory and learning in order to develop 3D games which can be used for computer based teaching. Instead of being passively taught pupils are immersed into 3D games based environments such as 18<sup>th</sup> Century France, a bombed World War II London Street or the human respiratory system. They then can take part in “active learning” which has been found to have benefits in terms of increasing student engagement and performance. In the near future Caspian’s authoring tool Qcreate™ will allow teachers and students to author their own games environment to teach themselves and other students any particular subject. The Caspian website also includes teacher guides and sample lesson plans in order to assist the teachers with using the technology.

Caspian also found that 90 per cent of students agreed that they preferred using Caspian Software to normal teaching methods and 88 per cent found the software made learning the material easier.<sup>43</sup>

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<sup>43</sup> <http://www.caspianlearning.co.uk/home.php>.

## **Hertfordshire County Council/NTL**

Hertfordshire County Council has aimed to increase the level of broadband connectivity across all of its schools. NTL has been the Council's communications.

NTL has ensured all 560 schools in Hertfordshire had a minimum of 2 Mbps connectivity. Having achieved this NTL upgraded the 85 secondary schools to 10 Mbps broadband, which exceeds the Government's requirement of 8 Mbps. This will allow faster internet access for more PCs. It will also create other opportunities such as the chance to use video conferencing or the new content being developed by the BBC as part of the Curriculum Online programme.

St Clements Dane School was one of the first to be connected to broadband in Hertfordshire. It has over 200 PCs in the school which are connected to the internet so that pupils can access curriculum content. The high speed of the broadband access reportedly increases student participation as the internet is more responsive and more students can use the service at one time. The school has also been using broadband to enable it to communicate with schools in Germany, Spain and France.<sup>44</sup>

## **International Examples**

Overall, the Nordic countries – Denmark, Finland, Norway and Sweden – appear to have the greatest number of strengths, followed by Korea. For the Nordic countries much of this strength is centered on the availability and use of computers and teachers' professional development.<sup>45</sup>

## **Swedish Schoolnet**

The Swedish Schoolnet, provided by the Swedish National Agency for School Improvement, is a website for teachers, educators and students. The Schoolnet offers many different services, functioning as an information centre, a library and a news agency. The goal is to stimulate the use of information technology in schools. It enables teachers to integrate ICT into a practical classroom setting. The Schoolnet offers an extensive choice of services and information, all available at a single site. The contents are selected and checked for both quality and

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<sup>44</sup> *Hertfordshire Country Council: Delivering broadband services to 560 schools across Hertfordshire*, NTL:Telewest Business, 2006

<sup>45</sup> Venezky, R.L., Davis, C., *Quo Vademus? The Transformation of Schooling in a Networked World*, OECD/CERI, March, 2002.

functionality; they must be relevant to schools and be directly applicable in an educational setting.

The Schoolnet's statistics compare very favourably with those of other major Swedish portals. During an average day in term-time, web pages available via the Schoolnet are accessed over 200,000 times. Most of the Schoolnet's visitors use the website several times a week.

An evaluation has shown that users mostly access the site to keep themselves informed of events in the world of schools and education. Many also use the Schoolnet's on-line dictionary to look up and translate words; others use it for virtual meetings, to establish new contacts and to get in touch with other schools and teachers.

In addition, the Schoolnet provides a platform for the development of the new educational approaches opened up by the Internet and new multimedia technologies. By providing the tools and practical knowledge required, the Schoolnet inspires creativity and the development of existing skills. Once familiar with the basic technology, teachers and students can proceed as they choose.

### **Kunskapsskolan**

Kunskapsskolan is a chain of innovative independent schools in Sweden. It regards the use of computers as an important tool for their work with students. It has a web portal – "Kunskapsporten" (the Knowledge Portal) – where students have 24-hour access to the school's resources. The portal can be accessed via the internet from school as well as from home or any other place. The portal contains texts and pictures, as well as steps and courses with distinct goals. There are clear instructions and pedagogical assignments as well as marks criteria.

### **International School of Toulouse**

The International School of Toulouse (IST), was designed in 1999 for the children of Airbus employees who had relocated to the south of France. The school has a highly innovative design. It has no corridors: instead the classrooms connect to an area that is about four or five metres wide and seven metres high. These areas are carpeted (like the classrooms themselves) to muffle sound, and contain leather sofas, where pupils can sit and socialise. The classrooms at IST are small with only 20 children in each class, and they have glass doors and walls.

## 6. Conclusion

In recent years the focus on policy on technology in education has been inputs-led. Speaking in October 2005, for example, the Prime Minister said:

“As I said earlier, crucially, these reforms were supported by an unprecedented level of investment in better teachers’ pay; more support staff; new computers, new facilities; and new buildings. Schools have access to twice as many computers, as well as new interactive whiteboards and broadband technology. Investment in school buildings has risen six-fold.”<sup>46</sup>

The increase in resources cannot be denied but the impact on learning is much more questionable. Independent evaluations confirm that effective use of technology is very limited.

In a system where there is already great variation in the quality of state schools, with disadvantaged pupils gaining the least from education, poor technology provision may only increase their disadvantage. Becta has commented:

“When working with young people, we assumed they would be skilled users of ICT, but were surprised to find that many socially disadvantaged groups lacked confidence and actively avoided ICT. After our trials, though, several initiated steps back into learning in order to learn about ICT.”<sup>47</sup>

The implication is that the last period of English schools policy – top-down, inputs-led and centralised – has not realised technology’s potential benefits. As all political parties move away from a centralised approach towards a focus on the individual pupil and on supply side reform, it is likely that the beneficial role of technology will increase. Key themes in this new environment will be devolved, pupil number-led budgets and both competition and co-operation between groups of schools.

*Reform* will develop these findings in a major new study of the reform of the supply side of state education – also covering teaching and capital infrastructure – in early 2007.

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<sup>46</sup> Tony Blair, speech at 10 Downing Street, 24 October 2005.

<sup>47</sup> *Emerging Technologies for Learning*, BECTA, 2006.

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Connecting for Health: <http://www.connectingforhealth.nhs.uk/>

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Learning and Skills Web: <http://www.lsweb.ac.uk/home.do>

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